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ABSTRACT

The question of whether students change in broad abilities indicative of human potential for cognitive-development, learning styles, and other generic abilities was studied at Alverno College. An additional study objective was to determine whether such change can be attributed to performance in a performance-based curriculum, rather than age, background factors, and program characteristics. Over 750 students participated in the longitudinal and cross-sectional studies by completing a battery of 12 instruments with developmental characteristics, and which employed both recognition and production tasks. The instruments were drawn from cognitive-developmental theory, experiential learning theory, and competence assessment. Cognitive-developmental and learning style measures were better indicators of change than were the generic ability measures, and recognition measures showed more change than did the production measures. The effects of the learning process on student change were more evident during the last 2 years of college. Students demonstrated intellectual ability and socioemotional maturity at entrance to college, and these abilities were integrated by graduation. The findings indicate that change is measurable, and that broad outcomes of college can be specified and assessed.  
 (Author/SW)

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**A LONGITUDINAL STUDY OF STUDENT CHANGE  
IN COGNITIVE DEVELOPMENT AND GENERAL ABILITIES  
IN AN OUTCOME-CENTERED LIBERAL ARTS CURRICULUM**

**Marcia Mentkowski      Michael J. Strait**

**Office of Research & Evaluation  
ALVERNO COLLEGE**

**FINAL REPORT TO THE NATIONAL INSTITUTE OF EDUCATION:  
RESEARCH REPORT NUMBER SIX**

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**Funded by a grant from the National Institute of Education:  
Career After College: Establishing the Validity of Abilities  
Learned in College for Later Success  
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An overview and rationale for our approach to the study of college outcomes, and a summary of the results from the following series of ten research reports, are found in:

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Research Reports:

- One: Friedman, M., Mentkowski, M., Earley, M., Loacker, G., & Diez, M. *Validating Assessment Techniques in an Outcome-Centered Liberal Arts Curriculum: Valuing and Communications Generic Instrument*, 1980.
- Two: Friedman, M., Mentkowski, M., Deutsch, B., Shovar, M.N., & Allen, Z. *Validating Assessment Techniques in an Outcome-Centered Liberal Arts Curriculum: Social Interaction Generic Instrument*, 1982.
- Three: Assessment Committee/Office of Research and Evaluation. *Validating Assessment Techniques in an Outcome-Centered Liberal Arts Curriculum: Insights From the Evaluation and Revision Process*, 1980.
- Four: Assessment Committee/Office of Research and Evaluation. *Validating Assessment Techniques in an Outcome-Centered Liberal Arts Curriculum: Integrating Competence Seminar*, 1982.
- Five: Assessment Committee/Office of Research and Evaluation. *Validating Assessment Techniques in an Outcome-Centered Liberal Arts Curriculum: Six Performance Characteristics Rating*, 1983.
- Six: Mentkowski, M., & Strait, M. *A Longitudinal Study of Student Change in Cognitive Development and Generic Abilities in an Outcome-Centered Liberal Arts Curriculum*, 1983.
- Seven: Much, N., & Mentkowski, M. *Student Perspectives on Liberal Learning at Alverno College: Justifying Learning as Relevant to Performance in Personal and Professional Roles*, 1982.
- Eight: Mentkowski, M., Much, N., & Giencke-Holl, L. *Careering After College: Perspectives on Lifelong Learning and Career Development*, 1983.
- Nine: Mentkowski, M., DeBack, V., Bishop, J., Allen, Z., & Blanton, B. *Developing a Professional Competence Model for Nursing Education*, 1980.
- Ten: Mentkowski, M., O'Brien, K., McEachern, W., & Fowler, D. *Developing a Professional Competence Model for Management Education*, 1982.

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## ABSTRACT

That students change in college is taken for granted. That students change as the result of performing in a particular curriculum is more difficult to show, and describing who changes and why, in relation to such complex abilities, is even more illusive. This longitudinal and cross-sectional study was designed to investigate three questions: Do students change in broad abilities indicative of human potential for cognitive-development, learning styles and other generic abilities? Can we attribute change to performance in a performance-based curriculum, rather than to age, background factors and program characteristics? What are the underlying themes or patterns of change that could be used to assist curriculum developers in higher education concerned with responding to current frameworks in adult learning and development?

Over 750 students participated in the longitudinal and cross-sectional studies by completing a battery of twelve instruments with developmental characteristics, and which employed both recognition and production tasks. The instruments were drawn principally from three sources: cognitive-developmental theory, experiential learning theory, and competence assessment designed to measure abilities which link those learned in college to professional performance afterwards. Students ranged in age from 17 to 55; 200 formed a core group for the longitudinal study using a time series design with assessments at three times during college. Change occurred in varying degrees across the instrument set; some of this change could be attributed to performance in the learning process when age, background and program characteristics were controlled. Cognitive-developmental and learning style measures were better indicators of change than were the generic ability measures, suggesting that educators can measure development as an aim of higher education. As expected, recognition measures showed more change than the production measures. Initial performance at entrance to college was related to age for the cognitive-developmental measures, and to high school grades for the generic ability measures. While more change occurred during the first two years (between the entrance assessment and the one two years later), the effects of the learning process on student change were more evident during the second two years (between the midpoint assessment and the one two years later near the end of college). Students appear to demonstrate two dimensions of cognitive development, intellectual ability and socio-emotional maturity at entrance to college; these abilities are integrated by graduation.

Implications for practice are that change is measureable, and that broad outcomes of college can be specified and assessed. Future interpretations of results specific to the several instruments and their interrelationships will more directly contribute to our understanding of the development of abilities learned in college. New outcome measures have been tested, and the longitudinal data base of college learning is necessary to establish relationships between abilities learned in college and professional performance in followup studies of alumnae.

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Austin Doherty, a principle investigator, was a key figure in the design and implementation of this work. Several current and former members of the Office of Research and Evaluation contributed to the study at some time during the five year span of data collection and two years of data analysis and writing. While their responsibilities and their contribution varied, all were committed to respect for the involvement of the longitudinal participants, and to high standards for data collection, accurate recording and careful analysis. They include Mary Moeser, Elizabeth Davies, Nancy Miller, Eunice Monroe, Miriam Friedman, ZaZa Popovic, Nevenka Davis, Jerilyn Bar, Donna Siekert, Judith Meehan, Laura Giencke-Holl, and student assistants Sue Schultz, Jean Van Sciver, Vicki Lengyel, Lisa Nevins, Jacqueline Guillory and Bernadette Mayer. Laura Giencke-Holl produced this report with the assistance of Margaret Quinn; Nancy Much edited the final draft.

The administration and faculty of Alverno College worked in close concert with Office of Research and Evaluation staff to create and carry out the procedures for involving students. Chairpersons Vivien DeBack, Mary Hueller, Rosemary Hufker, Theophane Hytrek, Alice Theine, Christine Trimberger, Allen Wutzdorff, several department coordinators and other individual faculty assisted in various ways.

Alverno students contributed samples of their performance on numerous occasions and in a range of modes. Their interest and involvement was both the stimulus and support for our efforts.

Many production instruments were used in this study, and assessors showed ingenuity and insight in judging and rating the data. They include Mary Moeser, Elizabeth Davies, Nancy Miller, Michael Strait, and ZaZa Popovic of the Office of Research and Evaluation staff. John Gibbs and Clark Power, then at the Center for Moral Education at Harvard University, coded the Moral Judgment Instrument. McBer and Company of Boston coded instruments from the Cognitive Competence Assessment Battery under the direction of Ann Litwin. Other instruments were coded by Office of Research and Evaluation staff using scoring schemes and other help provided by Glen Gish, David Kolb, John Renner and James Rest.

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A LONGITUDINAL STUDY OF STUDENT CHANGE  
IN COGNITIVE DEVELOPMENT AND GENERIC ABILITIES  
IN AN OUTCOME-CENTERED LIBERAL ARTS CURRICULUM

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INTRODUCTION

This paper addresses the multi-faceted problem of identifying, assessing, and validating both classical and contemporary aims of liberal education. While societal and institutional goals necessarily change in response to trends and pressures in the external environment, an enduring goal, central to all liberal education enterprises, is that of enabling the individual's potential for cognitive or intellectual development.

The classical problem is to institutionalize the intellectual circumstances which help persons become freely functioning participants in intellectual activity and autonomous members of the intellectual community (Wegener, 1978). This is also a contemporary problem, but we now have additional goals focused on practical benefits from liberal education. It is doubtful there has ever been a time when educators were unconcerned with the practical benefits of liberal education, but contemporary aims more openly and explicitly stress development toward free functioning in social and economic activities along with intellectual activities. In any case it is now plainly acknowledged that liberal education must show a relationship to personal growth, the world of work and to economic mobility. Whether the stress on these additional goals is implicit or explicit, classical and contemporary aims are not different in the intent of actualizing human potentials, enabling the student to become all that she or he can become.

We view our work in part as advancing the argument that encouraging intentional developmental change in students throughout the life cycle should be the overarching purpose of a college or university education (Chickering, 1981). We hope this research helps to reduce the "size of the existing gap between developmental theory and educational practice" (Astin, 1983).

The task is to identify kinds of development and ways of understanding developmental processes in relation to teaching and learning activities. To institutionalize intellectual circumstances, we must first identify components of intellectual activity and design methods of validating the circumstances which enable intellectual activity.

What forms of intellectual or cognitive development facilitate improved functioning in personal, social, and work domains? What generic abilities, cognitive or learning styles, dispositions, etc., work in what relationships to cognitive development to enhance growth in college and effective performance after college?

For most of the history of liberal education, these student development goals have been considered to be the more "intangible" outcomes of college. In the past half century, ideas and methods have begun to evolve which create the possibility of approaching these aims in more tangible ways. While the more visible preoccupations of the past two decades have been student political activism and then fiscal problems and declining enrollments, there has been steady development in, and a growing concern with, operational understanding of student development outcomes since publication of The American College (Sanford, 1962).

The social and behavioral sciences have not only begun to open the worlds of intellectual and social development of the young; they show that development can and does occur over the full life span (Knox, 1977; Mentkowski, 1980). These "new" domains of knowledge and methods of inquiry have stimulated educators in all fields to think about what they do to promote life-long development and how they do it. They are asking these questions in relation to the classical aims of intellectual or cognitive development, and in relation to other abilities developed in college towards future personal and professional performance (Mentkowski & Doherty, 1977, 1983).

While some educators may have an intrinsic interest in studying developmental and career-related change in college, there are other reasons to identify, assess, and validate student outcomes. As new populations of students come to college, it becomes obvious that a good deal of the recognized character, processes, and value of liberal education were intimately connected to the personal and socio-economic characteristics of the traditional liberal arts student. More and more students, of all ages, come to college already pursuing a career or with a particular career already chosen (Astin, 1982). They come to college to prepare for a career or to advance themselves in a career they have already begun. They want a liberal education as always (Levine, 1978), but they want it to fulfill definite and present purposes. "Business as usual" in liberal education is inadequate not just for the new populations of older, minority, or women students; it is inadequate for the now more career-minded traditional student as well. The new knowledge afforded by study of intellectual and career-related outcomes is needed to adapt curricula and teaching methods that respond to developmental patterns, learning styles, and generic abilities of adults of all ages and circumstances.

The current state of knowledge and practice concerning developmental goals of higher education has recently be surveyed by Chickering and others in The Modern American College (Chickering, 1981). Numerous conceptual frameworks and bodies of empirical research are presented. The Alverno faculty

anticipated many of these learning and development goals in their curricular reorganization in the early seventies. Thus, several frameworks presented in The Modern American College were integral to our longitudinal study of student change. In particular, we identified the concepts of ego, moral, and cognitive development, experiential learning theory and individual learning styles as critical components of intellectual activity.

#### Human Potential: Cognitive Development

To assess students' college learning in the context of life-long learning and development, we used cognitive-developmental theorists' descriptions of human growth and development as sources for college outcomes measures (Mentkowski & Doherty, 1977). Developmental psychologists have described broad developmental domains that can be measured, such as moral development (Kohlberg, 1976, 1981); ego development (Loevinger, 1970, 1976); cognitive development (Piaget, 1958, 1972); and intellectual and ethical development (Perry, 1970, 1981). These theorists provide us with descriptions of ways in which individuals cognitively structure meaning and make sense out of their experiences. Descriptions of development, whether via a series of stages (Piaget, Kohlberg), ego levels (Loevinger), or positions (Perry), provide us with a partial picture of students' potential for growth. They describe some of the more universal outcomes of human functioning against which educators can validate heretofore intangible curriculum outcomes.

While we do not expect that educators will use a student's current developmental level, position or stage as a measure of performance to credential or pass a student, such information can be used to describe where the student is in his or her development. Assessing student performance on these measures over time gives us important information on individual patterns of development during college, and helps us evaluate the extent to which college and/or specific curriculum interventions are contributing to the general cognitive growth of learners.

This approach to validating student outcomes suggests assessing students on various levels of cognitive development as part of program validation designs. The results can be used to inform instruction, and to assist in creating appropriate curricula.

At Alverno College, the student's continual development is at the center of institutional goals. An overriding concern of educators is to foster the development of the whole person. It is precisely because the student's development is at the heart of Alverno's educational philosophy that we have used cognitive-developmental descriptions of human growth as college outcomes measures. The faculty works to develop processes accountable to the best available understandings of overall human potential. We do not propose that any educational institution select cognitive-developmental descriptions as one basis for measuring college outcomes unless similar relationships can be drawn between the goals and objectives of the institution and such developmental descriptions of growth.

## Human Potential: Generic Abilities

Several efforts in assessing college outcomes are specifically focused on performance measures of general abilities and characteristics predictive of effectiveness in later life (e.g., ACT's College Outcome Measures Project, McBer and Company's Cognitive Competence Assessment Battery). These more focused measures might appear more redundant with the usual grade reports and standardized achievement or aptitude tests in predicting future performance. Yet these conventional measures and indices have not shown much relationship to later behavior (McClelland, 1973). The effectiveness of the new performance measures has not been determined by any means, but initial tests have been encouraging (Winter, McClelland & Stewart, 1981).

In the recent past, some educators, colleges and professional schools have identified performance outcomes and developed ways to assess them. (These have included, besides Alverno, College III, Florida State, Harvard University, Kirkhof College, Mars Hill College, Metropolitan State, New Rochelle College, Our Lady of the Lake, Sterling College, Antioch School of Law, College for Human Services, Mt. Hood School of Nursing, Southern Illinois University School of Medicine, and others.) Many of these institutions are now addressing program validation issues. They are asking hard questions about the extent to which students are able to demonstrate outcomes educators have identified as important for college students to master.

In 1975, the Fund for the Improvement of Postsecondary Education supported a consortium of colleges in trying out some newer measures to assess outcomes. As a member of this group of colleges, Alverno participated in the FIPSE project, awarded to McBer and Company, by administering some of these new measures. These instruments, collected or developed by McBer, later became known as the Cognitive Competence Assessment Battery (Winter, McClelland & Stewart, 1981).

When Alverno sought to identify external criterion measures for inclusion in a validation study of student outcomes, we selected these measures because they most nearly represented some of the abilities identified by Alverno faculty. The Cognitive Competence Assessment Battery (Winter, McClelland & Stewart, 1981) provided a particular focus on generic abilities of analysis, and included assessment of motive dispositions and other characteristics important to the relationship between learning and later behavior.

For this combination of practical and theoretical reasons, as we moved from broad purposes to research questions and instrumentation, we assembled a set of twelve instruments to assess cognitive-developmental and career-related outcomes. Seven of the twelve were based on the cognitive-developmental theories of Piaget, Kohlberg, Loevinger, and Perry, and the experiential learning theory of David Kolb (in press). These included:

- Measure of Vocational, Educational and Personal Issues (Knefelkamp, 1974; Widick, 1975; now titled: Measure of Intellectual Development; after Perry)
- Sentence Completion Test (Loevinger, et al., 1970)
- Moral Judgment Instrument (Kohlberg, et al., 1978) et al., 1978)
- Defining Issues Test (Res., 1979b)
- Test of Cognitive Development (Renner et al., 1976; after Piaget)
- Learning Style Inventory (Kolb, 1976)
- Adaptive Style Inventory (Kolb, 1978)

For more focused abilities and characteristics, we used McBer and Company's Cognitive Competence Assessment Battery, including:

- Picture Story Exercise (scored for Stages of Adaptation (Stewart, 1977b); Self-Definition (Stewart & Winter, 1974); and Achievement (McClelland et al., 1953), Affiliation (Atkinson, 1958), and Power (Winter, 1973) motives)
- Test of Thematic Analysis (Winter, 1976)
- Analysis of Argument (Stewart, 1977a)

We added, as another measure of critical thinking abilities:

- Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1964)

Finally, a new measure of interpersonal abilities being developed by McBer and Company was included:

- Life History Exercise (Klemp & Connelly, 1977)

Clearly, selection of frameworks, and corresponding instruments as external criteria against which a college examines its ability to facilitate student growth is appropriate if there is 1) a match between the goals and objectives of the college and the framework used and 2) a match between the college's theory of assessment and the theory of assessment used to develop instrumentation based on the framework:

Instruments which have been used for theory testing--even though they have demonstrated reliability and validity--need to be filtered first through the practitioner's goals, objectives, learning strategies and assessment processes. Once they emerge from this crucial dialectic, they may be effective program evaluation instruments as well (Mentkowski, 1980, p. 28).

Therefore, our work using any of the measures as an assessment of college outcomes needs to be understood in the context of its use at Alverno College. This context includes an outcome-centered curriculum and principles of assessment which have been in the process of development by Alverno faculty for over ten years. A fuller treatment of the rationale for selection of these measures is included in Mentkowski and Doherty (1983).

### Alverno Learning Process

#### Alverno Competences

Outcomes identified by Alverno faculty as descriptive of the liberally educated person (Alverno College Faculty, 1976) consist of a theoretical and pedagogical framework of eight competences:

- Communications
- Analysis
- Problem Solving
- Valuing
- Social Interaction
- Taking Responsibility  
for the Environment
- Involvement in the  
Contemporary World
- Aesthetic Response

The competences and an accompanying theory of learning and assessment are the product of curriculum development collaboratively undertaken by the corporate faculty in 1971. The faculty implemented an outcome-centered curriculum in 1973, which is continuously revised and developed out of the faculty's experience teaching and assessing students.

Each of the competences is defined as generic, developmental and holistic. The term generic means that the competences are

attributes or characteristics of the student herself. While they are learned and demonstrated in specific settings, these generic abilities can be modified and transferred to a variety of situations. The term developmental means that each competence is analyzed into a set of six competence levels that are sequenced in a progressive learning pattern (these pedagogical levels are not thought of as cognitive-developmental stages or positions). Students are required to attain competence levels in sequence and to demonstrate cumulative mastery. Finally, the competences are holistic. While the faculty break them into levels and components to teach and assess them, they see the competences as inseparable parts of the whole person they are seeking to develop as educators (Alverno College Faculty, 1979).

Alverno faculty conceptualize education in part as developing each student's personal and professional potential by increasingly involving the student in her own learning. Alverno educators ask the student to actively engage herself in the many learning contexts available to her. Faculty expect her to ultimately become self-directed in her own learning, to become the initiator, setting the direction of her development (Earley, Mentkowski & Schafer, 1980). Faculty have designed learning methods and assessments to teach toward and measure the competences and other more intangible outcomes of college, with a heavy emphasis on creating opportunities for "experiential learning" (Doherty, Mentkowski & Conrad, 1978).

#### Alverno Principles of Assessment

The Alverno faculty developed an assessment process for evaluating students' increasingly sophisticated performance on the eight broad competences described as outcomes of college. The characteristics and principles of the assessment process are described in Assessment at Alverno College (Alverno College Faculty, 1979), and represent one of the more recent directions in reconceptualizing assessment (Willingham, 1980).

One characteristic of this approach to assessment is a focus on measuring performance, rather than knowledge alone. Because of the complexity of the performances being assessed, faculty design instruments complete with stimulus, performance mode and criteria designed to elicit to the fullest extent, the student's developing ability. Thus, Alverno faculty have committed themselves to designing assessment techniques that employ production tasks rather than recognition tasks. That is, the student is required to generate a response to an instrument's stimulus, rather than simply to indicate recognition of information. Consequently, faculty are likely to employ performance modes such as essay, group discussion, oral presentation, interview, and in-basket, rather than modes such as multiple choice, short answer, true-false, etc. Performance modes are designed requiring her to demonstrate behavior similar to the ability as usually expressed rather than an artificial mode (e.g., to demonstrate Social Interaction skills, she would perform in an actual group discussion; a nursing major would

demonstrate higher levels of this ability with clients in a health care setting).

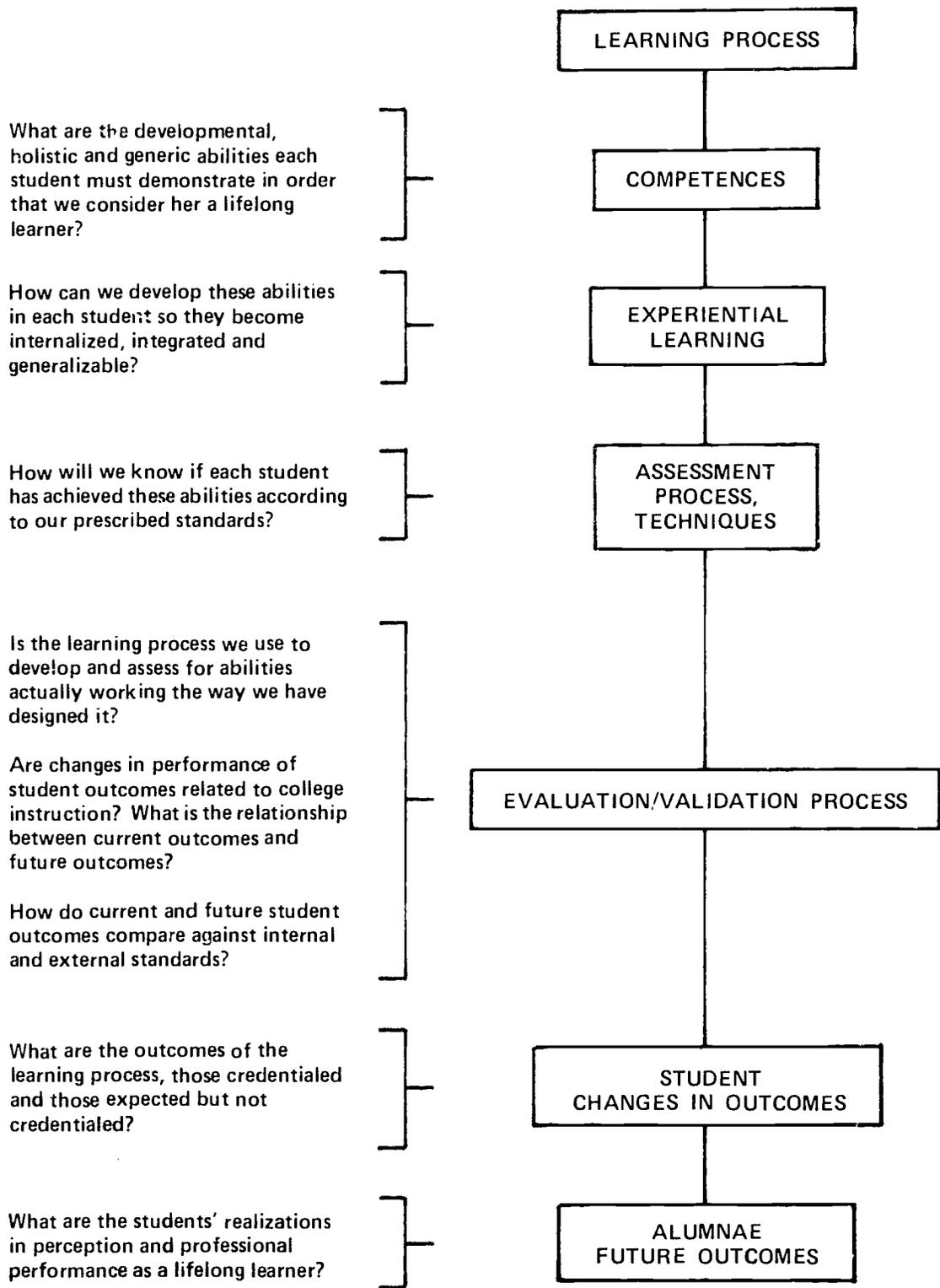
A predominant mode of assessment represented by the external criterion measures in contrast to most studies of college outcomes (Astin, 1977; Pace, 1980) is the production type task. Production tasks necessitate development of a judging process and trained assessors. Of the twelve measures, in this study of student change, six require assessor training and reliability studies to insure the validity of expert judgment and the scores assigned to performance.

### Validation of Outcomes

Alverno's Office of Research and Evaluation has also developed strategies for validating instruments and competences. These strategies involve criteria evaluation, establishing inter-rater reliability of assessor judgments, and comparing instructed and uninstructed student performance. The office, in collaboration with faculty, conducts studies that examine the extent to which instruments measure the effects of instruction, analyzes student performance across competence levels, compares cross-college performance across competences, etc. (Friedman, Mentkowski, Earley, Loacker & Diez, 1980; Friedman, Mentkowski, Deutsch, Shovar & Allen, 1982; Mentkowski, Moeser & Strait, 1983). All of these strategies contribute to faculty understanding of the nature of the competences being assessed and the specification of the criteria for student performance assessment.

The relationships between faculty questions and components of the learning process are presented in Graphic 1. This report focuses on one part of the process, student changes in outcomes. It focuses on outcomes expected from a liberal education, but not those outcomes specifically credentialed. This distinction is an important one: the eight competences identified by Alverno faculty are outcomes credentialed through Alverno's assessment process; the outcomes studied in this research, as instrumented with the cognitive-developmental and generic ability measures, represent expected but not credentialed outcomes.

The strategies for validating these outcomes, and the learning process as a whole, were developed as part of Alverno's overall validation efforts. In 1976, Alverno began conceptualizing and carrying out a model designed to validate its outcome-centered curriculum (Mentkowski & Doherty, 1977; Mentkowski, 1980). The model incorporates various research and evaluation methods, with the ultimate goals of establishing program validity, contributing to program development, and developing a picture of adult learning and development that can be used in the service of goal setting, assessment and instruction. Most strategies are designed to illuminate how students learn in college, to follow students in their various personal and professional roles after college, and to chart the longitudinal patterns of learning demonstrated by students as



Graphic 1. Faculty Questions and Alverno Learning Process Components

they move through the curriculum. In addition, we are working to validate the curriculum through studies of the competences demonstrated by practicing professionals in professional areas characteristic of those chosen by our students (Mentkowski & Doherty, 1983).

Graphic 2 details the several components of the validation model. Graphic 2 elaborates Graphic 1, showing with arrows the feedback loops in the model in addition to the multiple validation components.

The study of "potential" and "performance" and their interrelationships are included in this report. Students who contributed data for this study were a subset of those for whom "performance characteristics" data were collected, and a superset of those who contributed to the "perceptions" component. Some were followed up after college for the study of alumnae future outcomes. Other papers present results linking components of this report to performance in the Integrated Competence Seminar, and the Six Performance Characteristics Rating (Alverno Assessment Committee/Office of Research and Evaluation, 1982, 1983). This report relates the measures of "potential," the cognitive-developmental and generic ability measures, to the following performance indices:

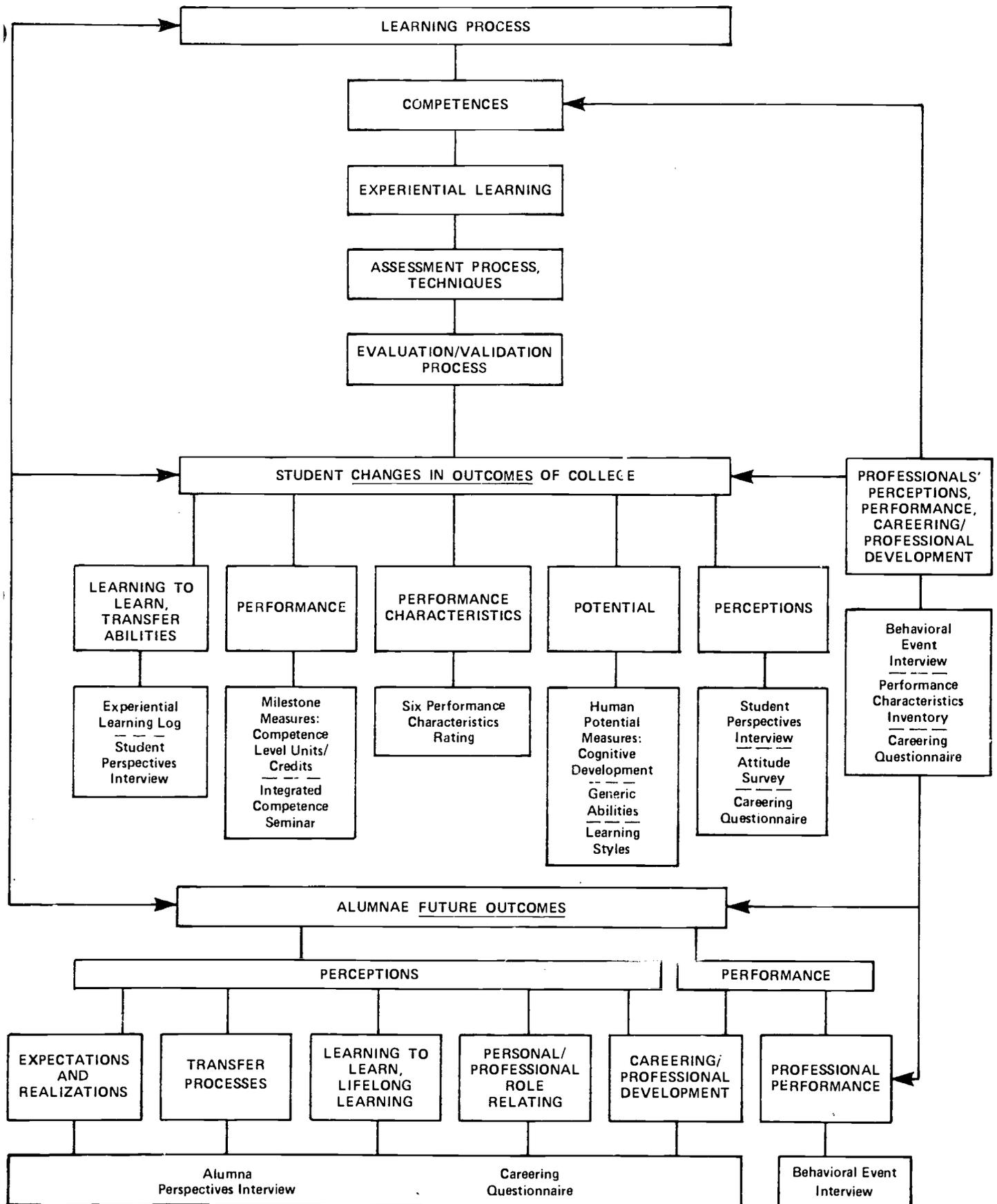
- Number of semesters enrolled
- Semester credit hours completed
- Competence level units accumulated

In addition, we collected information from students that would allow us to measure and examine the degree to which change is due to differences in age, background or college program.

### Research Objectives

A major purpose in undertaking this study was to bridge the gap between researchers' current work with these frameworks and instrumentation, and educators' development of learning and assessment techniques that assist students to develop the more sophisticated constructs and patterns the theories describe.

We recognize that our work with the constructs measured and our own experiences carrying out this study have benefits to the larger research community working to continually extend and further validate the instruments and the theories they represent. This study will aid in the development of college outcome instruments that are better measures of the constructs under study. We expect that our use of these instruments as college outcomes measures within a context such as Alverno will enable faculty in higher education to create learning strategies and assessments that rest on an understanding of patterns of adult development and learning. This study, in response to these issues, researches the following questions:



Graphic 2. Components of a Validation Model for the Alverno Learning Process with External Validation Instruments

- How do student outcomes compare with their potential for realizing cognitive development and generic abilities?
- How do students change over time on measures of human potential?
- To what extent is change due to college performance rather than differences in age, background, or college program?
- What patterns of change emerge in the interrelationships of the human potential measures of cognitive development and generic abilities, and generic measures of college performance and performance characteristics?

### Orientation of the Study

This section describes some of the boundaries and special emphases of the present study. From the beginning we want to emphasize that this report opens but does not close our study of student change in cognitive development and generic abilities. Besides continuing to follow Alverno's students into the world of work as part of our broader program validation model, we are committed to using our data to promote curriculum development and advance theory and research practice in higher education and adult learning and development.

We set out the major questions with which we began, making only a first pass through the collected data to answer those questions at the most general level. Along the way we focus on some special concerns that figured in the initial organization of the study, and that form the external framework of the data in this initial report. A complex approach to program validation must be reported as a series of studies. Therefore, this report appears to leave a great deal unsaid or unexamined. We do plan additional work with the data bank we have created.

### Focus on Change

Our pivotal concern is the study of change. The first implication is that we do not focus on what level of development or what degree of an ability seems to be manifest at the beginning or end of college. We are focused on change over time and the relationship of those changes or lack of changes to student, program, and performance differences. We do not begin by doubting that change occurs. We know, as do all experienced educators, that students undoubtedly change during college. And we do not doubt that the older or returning students, who make up half of our student body, change as well as traditional age students. If we are not questioning the fact of change, what are we doing? We wish to learn whether certain fundamental and

enduring changes, which we and others believe can and should occur with liberal education, can be measured in ways that will help us to better understand and facilitate such change. The objective is simple, the task is complex. Our successes and failures in measuring change will not prove or disprove the fact of change; we hope that both our successes and failures will teach us more about the ways we can study and effect desired change.

We examine cross-sectional as well as longitudinal differences. While our emphasis is on the longitudinal study in subsequent questions, cross-sectional data provide an important kind of interplay with longitudinal data in studying change. In particular, cross-sectional results are not subject to effects of retesting or uncontrolled events between assessments, since they involve a single assessment of comparison groups at the same time. The interplay between longitudinal and cross-sectional results gives us information that can not be obtained from either design alone. In the simplest case, significant differences between entering and graduating students in the cross-sectional study, followed by significant change over time in the longitudinal study, builds a stronger case for change.

#### Relating Change to College Performance

Our second question is, to what can we attribute measured change? We are of course aiming for a link between measured change in development and generic abilities and the learning process implemented by the college. We want to find not just that college makes a difference, but the kinds of difference it makes. In this first phase of data analysis concerning this question, we have taken the position that if anything logically or chronologically prior to a student's performance in college can explain measured change, we can not stake our claim to have influenced that change with the learning process. But if we can account for many prior relationships between change and student or program differences, and still associate change with student performance, then we have reason to invest more time, money, and energy in exploring the details and dynamics of that connection.

This is not to say that we have no further interest in evidence of change that can be accounted for by other variables than student performance in the learning process. While we cannot control student background characteristics, information about different change patterns related to individual differences can provide leverage in the design of programs and in offering guidance to new students. Differences attributable to program, such as resident status or major, are more within the control or influence of the college and these variables can be modified to enhance the prospects for desired change to some degree.

## Underlying Themes of Change

The third main question of this study is to identify any underlying themes of change that may only be evident in the multiple relationships of the several kinds of outcomes we are attempting to measure. At the bottom of our many layers of assumptions and goals affecting the nature of this work is the clear knowledge that the person, analyzed into hundreds of aspects, dimensions and events, is a living organic unity.

While we assume as part of our framework for understanding persons that there are degrees of integration and fragmentation in any person's character and abilities, there are most certainly not as many discrete and independent events as we have measures. Among our measures are tests of intellectual, moral, and ego development, learning style, and several abilities and characteristics important to learning. Can we see, by considering many such measures of many students over multiple occasions, what underlying change is taking place in the organic whole? This question is rife with difficulties of concept and method, but we have made a start in responding to it nonetheless.

## Organization of the Analysis and Results

Educators and researchers in different settings could take these three major questions and the identical battery of instruments, and produce several different reports covering little of the same territory. This is not a statement about the generalizability of the findings, but about the variety of perspectives and special concerns which can and do shape results at the point of planning the data analyses. Along the way we have been pulled or pushed by many special concerns; some of local importance, and many of general importance to other educators and researchers.

### Age and Age Cohort

Prominent in our report is our concern with age and age cohort differences. Because our student population ranges in age from 17 to 55 years, and because we expect to continue to attract older students in the future, we have a special opportunity to examine change across a larger range of adult life in relation to college learning. It is not age per se that we are interested in, but the broad life experience differences for which the variable of age can partially proxy in our study. We have used age, broken down into traditional and older student cohorts, to compare the general influence of life experience to formal education experience in change over time on all measures. We have used age, standing in part for life experience in general, as the logical first cause of differences in development and other abilities when beginning the causal analysis of change. While

age used in this manner helps us to construct the most conservative estimates of possible effects of the learning process, and thus to make general decisions about future areas in which to invest ourselves, it plays a different and less positive role in relation to detailed analysis and theory building. In ensuing phases of our analysis, the role of age will be diminished as we look for those particular aspects of life experience which aid or compete with college as contributors to student development and learning.

### Class Cohort

Another special concern which plays a large role in the structure and organization of the study is that of class cohort. For the purposes of general program validation, we undertook the extra effort of studying two successive years of class cohorts to minimize the possibility of unseen cohort effects in our general conclusions about change (Nesselrode & Baltes, 1979). Similar issues spring up in relation to change as with age. The cohort variable is not interesting in itself, but it proxies for whatever events on a social level were influential in student selection of a year to enter college. With the age range of our population, and the volatile environment of the seventies and eighties in the changing roles of women, this issue is not trivial. It is particularly not trivial at Alverno as a college for women, many of whom are first generation college students. Again, more in-depth probes of the data reported here will require ways to get beyond this large variable to particular social influences.

### Methodological Issues

#### Time Series Analysis

Several methodological issues contributed a certain special character to the framework of our study over and above the special concerns just addressed. In overall design, special note must be made of the use of constant time intervals in scheduling the three assessments in the longitudinal study. The problem we are anticipating is the ambiguity caused by the approximation of times of assessment to regular classification levels of students or to structural components of the curriculum. Many studies of college effects, whether cross-sectional or longitudinal, have assessed students when they are freshmen and when they are seniors, for example. In contrast, we have assessed an entire entering class as they began their studies. Most will be new freshmen, but many will have prior college credits and, in class terms, will be sophomores or juniors at entrance assessment. We have then re-assessed the members of an entering class who are attending Alverno two years later. A typical student who entered as a new freshman and attended regularly for two years might in fact be a first semester junior at second assessment,

but another student might have entered Alverno as a sophomore by standing, taken only two courses in the entering semester, not registered again until second assessment, and still be a sophomore.

When appropriate, we take advantage of the fact that our design approximates the beginning, middle, and end of a typical student's college career, or that the assessment intervals approximate the periods of general education and pre-professional education for the typical student. Still, it is important to remember that this does not accurately describe the case for all students in the study. It is precisely this variability in attendance and performance over a specified period of time that we use to investigate claims of change effects for the learning process as a global entity.

#### Rate of Participation

Readers experienced in longitudinal data collection will be interested in the extensive and detailed description we provide of our data collection procedures. We employed a range of effective strategies to get and keep the cooperation and participation of all students entering during the two-year entrance phase of the project. The continuous effort to motivate students to participate, and the feedback mechanisms in particular will raise questions about our results that we cannot answer. By some traditional research standards, our efforts may be seen as contaminating the data and reducing its generalizability to populations not so motivated. We have taken the position that a worse kind of contamination of results is incomplete data. We have accepted the risk of motivating students to participate in order to achieve the highest possible rates of participation, and because we are ultimately interested in stimulating the highest level of their performance.

#### Matching Comparison Groups for Persistence

A well known problem with comparing groups of entering and graduating students in cross-sectional studies is that entering classes include many students who will not persist through college, while a graduating group consists of persisters by definition. Many studies try to control for this difference by matching students on some variable believed to predict persistence, most often an academic achievement variable. We explain in our research design section how we were able to control directly for persistence in the cross-sectional study by using one of the entrance cohorts of the longitudinal study as our entering student comparison group.

## Recognition and Production Measures

We focus on overall trends and aggregate data to answer the initial questions posed in this report. Detailed outcomes are presented in terms of multiple unit outcomes and in a particular format designed to reveal what we anticipate will be figural questions of the next phases in the analysis.

Two forms of organization were explicitly built into some of the table formats to prepare for our second phase: the production vs. recognition characteristic and the developmental continuum characteristic.

The task characteristic of production versus recognition has been given a thorough treatment by McClelland (1980) though he refers to them as "operant" versus "respondent" measures. The basic issue is that, across many kinds of research questions, assessment tasks that in some way ask the participant to respond in the terms of the test developer rather than create or produce a response, have been poor predictors of future behavior of the person. Recognition measures test the investigators' reality, but not necessarily the reality of the participant, and it is usually the participant we want to know something about. While this perspective puts a higher value on operation or production measures, a more neutral view would still hold that the two types of measures assess different things, so there is more to learn by using both types of measures. We have intentionally used both production and recognition measures, and plan to pursue this question in later reports. For now the reader can, along with us, see patterns of difference at a glance illuminated simply by the ordering of the measures in the tables.

## Developmental Characteristics

The same preparation for future research was made with respect to the question of the developmental character of each measure. Some of our measures were designed by developmental psychologists to explore developmental phenomena, but others were designed for other purposes. Our beginning assumption is that performance on every measure has a developmental component, but that there are aspects of the task which are affected by non-developmental experiences and abilities. We have organized the displays of outcomes according to our initial understanding of the instrument's developmental character as well as its type.

## Methods of Analysis

The analyses reported correspond to the three major questions presented above. Change was examined first in cross-sectional and then in longitudinal data. The longitudinal data were analyzed for change in two ways: first, assessments over all three occasions were analyzed as a function of time; second, change during each interval was investigated. Differences

between entering students and graduating students in the cross-sectional study were compared with change across time and between intervals in the longitudinal study.

To relate change to performance in college, a series of analyses were conducted to explain as much change as possible in terms of other factors than performance before testing for performance effects. First, age and other background variables (religion, parent's education and occupation, high school grades, prior college experience, and marital status) were tested for correlation with entrance assessments. Those variables that accounted for differences in entrance assessments were then further examined for relationship to change between assessments. If any background variable accounted for change between assessments, then that difference was controlled in testing effects of performance. Similarly, effects of program differences incidental to the learning process (entrance cohort, residence, part-time or full-time status, and major) were tested after background variables but before testing for performance effects. Program variables accounting for change over that accounted for by background variables were also controlled before testing the relationship of change to performance. Thus, any relationship between performance and change was only considered an effect of performance once the other possible sources of variance we measured were controlled.

There are many relationships among outcome measures that might reveal patterns of student learning and development. Our first step in this direction was to reduce the data through a series of factor-analytic studies in search of underlying themes of change. Factors derived from entrance assessments were studied most carefully on the assumption that later assessments could be affected in unknown ways by test familiarity. Factor analyses were then conducted on sets of measures from second and third assessments which would replicate the analysis of entrance assessments. With interpretation of the factors based on entrance assessment data, we examined changes in the primary factors and secondary factors across assessments.

#### Summary

This paper addresses many issues related to the identification, assessment and validation of classical and contemporary aims of liberal education. Building on accomplishments of the social and behavioral sciences over the last few decades, we employ several theories and measures of cognitive development and other generic abilities as external criterion measures in a multi-dimensional evaluation/validation process aimed at understanding the ways students learn and grow in an outcome-centered liberal arts curriculum. We particularly hope to demonstrate through this report some ways in which the existing gap between developmental theory and educational practice may be reduced or bridged.

## METHOD

### The Measures

#### Cognitive-Developmental Measures

Five instruments were selected on the basis of their definition as measures of broad domains of human development, particularly cognitive and psychosocial development. These are aspects of human potential which might reasonably be affected by college learning, and represent student development objectives of Alverno faculty.

#### Measure of Vocational, Educational, and Personal Issues (Measure of Intellectual Development)

The MVEPI, formerly called the KNEWI (an acronym of the authors' names), was developed by Knefelkamp (1974) and Widick (1975) and revised by Knefelkamp and Slepitzka (1976). The instrument, now called the Measure of Intellectual Development (Mines, 1982; Moore, 1982), was developed to assess intellectual and ethical development as originally described by Perry (1968, 1970) and his colleagues at Harvard's Bureau of Study Counsel. This developmental scheme, abstracted from in-depth analysis of longitudinal interview data collected from Harvard undergraduates in the mid-fifties and early sixties, details a progression of positions which

characterize the structures which students explicitly or implicitly impute to the world, especially those structures in which they construe the nature and origins of knowledge, of value, and of responsibility (Perry, 1970, p.1).

The progression of positions is briefly described in Table 1. The scheme has recently been presented again along with a review of several research and intervention programs it has spawned (Chickering et al., 1981).

To complete the MVEPI, students were asked to write three short essays describing: a) "the best class you've taken . . . ," b) "a decision about something that had major importance . . . ," and c) "things you consider when approaching . . . the question of career choice . . . ." While these questions were retained in the same form throughout the study, the rating procedures and criteria initially formalized by Knefelkamp (1978) were extensively modified at Alverno before final rating (Mentkowski, Moeser & Strait, 1983).

The three essays obtained from each student were independently rated and the three ratings were retained as separate indices in the analyses of outcomes. The scoring system used permits the designation of a 'stable' position rating, or a

Table 1.

Main Line of Development of Perry Scheme

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- POSITION 1: The student sees the world in polar terms of we-right-good vs. other-wrong-bad. Right Answers for everything exist in the Absolute, known to Authority whose role is to mediate (teach) them. Knowledge and goodness are perceived as quantitative accretions of discrete rightnesses to be collected by hard work and obedience (paradigm: a spelling test).
- POSITION 2: The student perceives diversity of opinion, and uncertainty, and accounts for them as unwarranted confusion in poorly qualified Authorities or as mere exercises set by Authority "so we can learn to find The Answer for ourselves."
- POSITION 3: The student accepts diversity and uncertainty as legitimate but still temporary in areas where Authority "hasn't found The Answer yet." He supposes Authority grades him in these areas on "good expression" but remains puzzled as to standards.
- POSITION 4: (a) The student perceives legitimate uncertainty (and therefore diversity of opinion) to be extensive and raises it to the status of an unstructured epistemological realm of its own in which "anyone has a right to his own opinion," a realm which he sets over against Authority's realm where right-wrong still prevails, or (b) the student discovers qualitative contextual relativistic reasoning as a special case of "what They want" within Authority's realm.
- POSITION 5: The student perceives all knowledge and values (including Authority's) as contextual and relativistic and subordinates dualistic right-wrong functions to the status of a special case, in context.
- POSITION 6: The student apprehends the necessity of orienting himself in a relativistic world through some form of personal Commitment (as distinct from unquestioned or unconsidered commitment to simple belief in certainty).
- POSITION 7: The student makes an initial Commitment in some area.
- POSITION 8: The student experiences the implications of Commitment, and explores the subjective and stylistic issues of responsibility.
- POSITION 9: The student experiences the affirmation of identity among multiple responsibilities and realizes Commitment as an ongoing, unfolding activity through which he expresses his life style.
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Note. William G. Perry, Jr. Forms of Intellectual and Ethical Development in the College Years: A Scheme. New York: Holt, Rinehart and Winston, Inc., 1970.

'dominant/subordinate' rating indicating transition between defined positions of the scheme. The rating scale is symbolized with a three digit code. A stable rating shows the same digit in all three places (e.g., a stable Position 3 is symbolized by the code, 333). Transitional ratings are shown with the subordinate position indicated by the leftmost or rightmost digit (e.g., 223 indicates a dominant Position 2 rating with significant elements of Position 3 emerging and 233 indicates a dominant Position 3 rating with significant traces of Position 2 remaining).

#### Sentence Completion Test of Ego Development

This instrument was designed to assess levels of ego development as described in the work of Loevinger and her colleagues at Washington University in St. Louis (Loevinger, 1976; Loevinger & Wessler, 1970). In contrast to the fluid state of instrument development surrounding Perry's scheme, the Sentence Completion Test may be considered an established though not immutable instrument for measuring ego development (Loevinger, 1979). Table 2 presents a set of milestones used to describe the developmental process. Loevinger and Knoll (1983) provide a current overview of ego development theory and its relationships to other cognitive-developmental stage theories.

The instrument consists of thirty-six sentence stems (e.g., "Raising a family --"); students are asked to complete the sentences. Responses to all thirty-six stems are independently rated as manifesting one of the levels represented in Table 2 (codes are shown in the table), and then the distribution of ratings is used to estimate the level of core functioning manifest in the total protocol. The single total protocol rating is then used as a general index in the analyses of student outcomes.

#### Moral Judgment Instrument and Defining Issues Test

Both measures stem from Kohlberg's theory of moral development, although the latter instrument was conceived by Rest (1979a) as more than simply an alternate test of the same characteristics.

The descriptions of Kohlberg's stages and the complex scoring system have been undergoing extensive revision in recent years. The most recent exposition of the theory and survey of the development and validation of the measure (Kohlberg, 1981a, 1981b) guided our use of the measure. A scoring manual has been published (Colby et al., 1983). A subset of our students completed the Moral Judgment Instrument, and their responses were scored by John Gibbs, one of the authors of the new scoring manual, and Clark Power, at Harvard's Center for Moral Education.

Kohlberg's instrument presents students with incomplete stories that pose a moral dilemma, and asks for completion of the

Table 2.

## Some Milestones of Ego Development

Stage	Code	Impulse Control, Character Development	Interpersonal Style	Conscious Preoccupations	Cognitive Style
Presocial			Austistic		
	I-1			Self vs. non-self	
Symbiotic			Symbiotic		
Impulsive	I-2	Impulsive, fear of retaliation	Receiving, dependent, exploitive	Bodily feelings, especially sexual and aggressive	Stereotypy, conceptual confusion
Self-protective	Δ	Fear of being caught, externalizing blame, opportunistic	Wary, manipulative, exploitive	Self-protection, wishes, things, advantage, control	
Conformist	I-3	Conformity to external rules, shame, guilt for breaking rules	Belonging, helping, superficial niceness	Appearance, social acceptability, banal feelings, behavior	Conceptual simplicity, stereotypes, clichés
Conscientious	I-4	Self-evaluated standards, self-criticism, guilt for consequences, long-term goals and ideals	Intensive, responsible, mutual, concern for communication	Differentiated feel- ings, motives for behavior, self-respect, achievements, traits, expression	Conceptual complexity, idea of patterning

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Table 2 continued.

Stage	Code	Impulse Control, Character Development	Interpersonal Style	Conscious Preoccupations	Cognitive Style
Autonomous	I-5	Add: Coping with conflicting inner needs, toleration	Add: Respect for autonomy	Vividly conveyed feelings, integration of physiological and psychological, psychological causa- tion of behavior, development, role conception, self-fulfillment, self in social context	Increased conceptual complexity, complex patterns, toleration for ambiguity, broad scope, objectivity
Integrated	I-6	Add: Reconciling inner conflicts, renunciation of unattainable	Add: Cherishing of individuality	Add: Identity	

Note. "Add" means in addition to the description applying to the previous level.

Jane Loevinger & Ruth Wessler. Measuring Ego Development, Volume 1. San Francisco: Jossey-Bass, Inc., 1970.

story via a set of structured questions which probe the student's reasoning on moral issues.

Rest created the Defining Issues Test as an objective measure of the degree of principled thinking students recognize in a set of "stage prototypic statements." Rest's description of moral development stages, highlighting two major dimensions and a central concept important to his work, is presented in Table 3. The construction of the measure as an objective test permitted computer scoring (Rest, 1979b).

In our analyses and reports, we have utilized two indices, the "P%" score and the "D" score. The former is the most widely used general index from the instrument, and reflects the percentage of statements prototypic of principled thinking levels chosen by the student. The six stages of development may be collapsed into three levels, two each at preconventional, conventional, and principled levels.

The D score, created by Mark Davison (see Chapter 8 in Rest, 1979a and Section 4 in Rest, 1979b), is mathematically more complex and, for all practical purposes, requires scoring by computer. The advantage of the D score is that it reflects the student's relative preferences for principled thinking over preconventional and conventional thinking. The D score is reported along with the better known P% score in our work as a contribution to the ongoing evaluation of the relative merits of the two indices as a general purpose index.

#### Test of Cognitive Development

This instrument was inspired by the work of Inhelder and Piaget (1958) and is more narrowly focused on a single stage of cognitive development, formal operations, than are the preceding measures. Piaget's four major stages of the development of intelligence are sensori-motor, pre-operational, concrete operations, and formal operations. Formal operations involve the ability to reason with propositions and hypotheses.

Although several problems from different sources were experimented with in our studies, the results reported here were based upon a five item set prepared by Renner, Fuller, Lockhead, and Johns (1976). This set included two experiments in proportionality (shadow length, arm balance), two in conservation of volume (cylinders, water in bottle), and one on separation of variables (flexibility of rods). The scoring key was prepared by George Klemp of McBer and Company.

#### Generic Ability Measures

The seven instruments described below do not all measure abilities in the strict sense; the phrase has been employed broadly to distinguish a set of ability, motivation, cognitive style, and other personal characteristic measures from the preceding set of measures derived from developmental theory.

Table 3.

Stages of Moral Judgment

Stage	Coordination of expectations about actions (how rules are known and shared)	Schemes of balancing interests (how equilibrium is achieved)	Central concept for determining moral rights and responsibilities
Stage 1	The caretaker makes known certain demands on the child's behavior.	The child does not share in making rules, but understands that obedience will bring freedom from punishment.	The morality of obedience: "Do what you're told."
Stage 2	Although each person is understood to have his own interests, an exchange of favors might be mutually decided.	If each party sees something to gain in an exchange, then both want to reciprocate.	The morality of instrumental egoism and simple exchange: "Let's make a deal."
Stage 3	Through reciprocal role taking, individuals attain a mutual understanding about each other and the on-going pattern of their interactions.	Friendship relationships establish a stabilized and enduring scheme of cooperation. Each party anticipates the feelings, needs, and wants of the other and acts in the other's welfare.	The morality of inter-personal concordance: "Be considerate, nice, and kind, and you'll get along with people."
Stage 4	All members of society know what is expected of them through public institutionalized law.	Unless a society-wide system of cooperation is established and stabilized, no individual can really make plans. Each person should follow the law and do his particular job, anticipating that other people will also fulfill their responsibilities.	The morality of law and duty to the social order: "Everyone in society is obligated and protected by the law."

Table 3 continued.

Stage	Coordination of expectations about actions (how rules are known and shared)	Schemes of balancing interests (how equilibrium is achieved)	Central concept for determining moral rights and responsibilities
Stage 5	Formal procedures are institutionalized for making laws, which one anticipates rational people would accept.	Law-making procedures are devised so that they reflect the general will of the people, at the same time insuring certain basic rights to all. With each person having a say in the decision process, each will see that his interests are maximized while at the same time having a basis for making claims on other people.	The morality of societal consensus: "You are obligated by whatever arrangements are agreed to by due process procedures."
Stage 6	The logical requirements of non-arbitrary cooperation among rational, equal, and impartial people are taken as ideal criteria for social organization which one anticipates rational people would accept.	A scheme of cooperation that negates or neutralizes all arbitrary distribution of rights and responsibilities is the most equilibrated, for such system is maximizing the simultaneous benefit to each member so that any deviation from these rules would advantage some members at the expense of others.	The morality of non-arbitrary social cooperation: "How rational and impartial people would organize cooperation is moral."

Note. James Rest. Development in Judging Moral Issues. Minneapolis: University of Minnesota Press, 1979.

The Picture Story Exercise, Learning Style Inventory, and Adaptive Style Inventory are not measures of ability; the remaining measures group into one set of three which do measure aspects of analytic ability, and one which was designed to measure a component of human relations ability.

### Picture Story Exercise

Several cognitive, motivational and emotional variables have been derived from this instrument. It is one of several modifications of the Thematic Apperception Test first developed by Henry Murray (Morgan & Murray, 1935) that have been devised by McClelland and others to study motivation and personality variables in non-clinical settings. The present application is described by Winter, McClelland & Stewart (1981). Along with two of the analysis measures introduced below, this instrument is marketed by McBer and Company as the Cognitive Competence Assessment Battery.

The variables derived from the Picture Story Exercise in our study included Stewart's four Stages of Adaptation (1977b), Self-Definition (Stewart & Winter, 1974), and the three motive variables of Achievement (McClelland et al., 1953), Affiliation (Atkinson, 1958) and Power (Winter, 1973).

Stewart's stages of psychological adaptation to the environment were derived from Freud's oral, anal, phallic, and genital stages of psychosexual development. Stewart associated four behavioral categories with these stages: receptive, autonomous, assertive, and integrative, respectively. Table 4 displays the content areas and behaviors found in students' responses on the Picture Story Exercise which were scored for Stages of Adaptation.

Unlike the cognitive-developmental stage measures presented above, a separate score was given for each stage. While composite or model stage scores are possible, the four raw scores were all included in the present analysis.

The Self-Definition variable was developed by Stewart and Winter (1974) on the basis of differences in Picture Story responses between women who planned on full-time careers after college and those who planned on marriage and family. Behaviorally, Self-Definition (equated with planning full-time careers) was scored on the basis of cause-effect relationships and instrumental action considered in students' imaginative stories. A higher score indicates more evidence of Self-Definition.

The motivation variables each have independent scoring schemes which are applied to the same stories evaluated in terms of Stages of Adaptation and Self-Definition. Briefly, the Achievement motive score is a measure of a student's concern with doing something well, according to some standard of excellence. The Affiliation motive score represents a concern with relationships and nurture. Power motivation is to be understood as a concern for having impact on others.

Table 4.

## Four Stages of Adaptation

## Content Areas and Behaviors

	Content Areas			
	Attitude toward authority	Relations with others	Feelings	Orientation to action
Receptive	Authority is benevolent	Immediate gratification	Loss, despair, confusion	Passivity
Autonomous	Authority is critical, reprimanding	Lack of gratification	Auxiety about competence	Clearing of disorder
Assertive	Opposition to authority	Flight and exploitation	Hostility, anger	Failure, in context of confident attempt
Integrative	Authority is limited	Mutuality, sharing	Ambivalence	Work commitment and involvement

Note. Abigail J. Stewart. "The course of individual adaptation to life changes." Journal of Personality and Social Psychology, 1982, 42(6), 1100-1113.

Each of these concepts and scoring schemes have been described in relation to measuring outcomes of liberal education in a new case for the liberal arts (Winter, McClelland & Stewart, 1981).

### Learning Style Inventory and Adaptive Style Inventory

The Learning Style Inventory instrument was designed to measure learning style preferences derived from experiential learning theory as formulated by David Kolb (in press). Figure 1 displays the four stage learning cycle. The idea of development here is decidedly not one of progressive stages as in the cognitive-developmental theories and measures presented earlier. This model is dialectic, following Jung's (1923) notion that "fulfillment in adult development is accomplished by higher level integration and expression of nondominant modes of dealing with the world" (Kolb, 1976).

The four stage cycle reduces to two primary dimensions of the learning process: one involving tension between active and reflective modes, and the other involving tension between concreteness and abstraction. Theories of cognitive growth generally suggest movement from concreteness to abstraction, and action to reflection, from the perspective of developing abilities. This model focuses on differences in adult learning style or characteristic functioning assuming the two pairs of polar opposites exist to oppose each other.

The instrument is a nine item self-report questionnaire. Each item requires the student to rank order four words in a way that best describes her learning style. One word in each item corresponds to the four stages of the learning cycle. Rankings determine scores such that higher scores indicate greater preference.

Composite scores for the two dimensions, Active/Reflective and Abstract/Concrete, are computed by subtracting the latter from the former score. All six indices were included in our analyses.

The Adaptive Style Inventory (Kolb, 1978) was designed in part to address criticisms of the Learning Style instrument and also to bring within the scope of the measure situational variability (Gish, 1981). The instrument was included midway through our longitudinal study so our data are incomplete. We have included comparison data, however, for the purposes of contributing to the validation of the new measure and as a source of cross-validation of the learning style outcomes.

### Test of Thematic Analysis and Analysis of Argument

These instruments are described as new measures of intellectual abilities which are expected to develop through liberal education. The Test of Thematic Analysis (Winter &

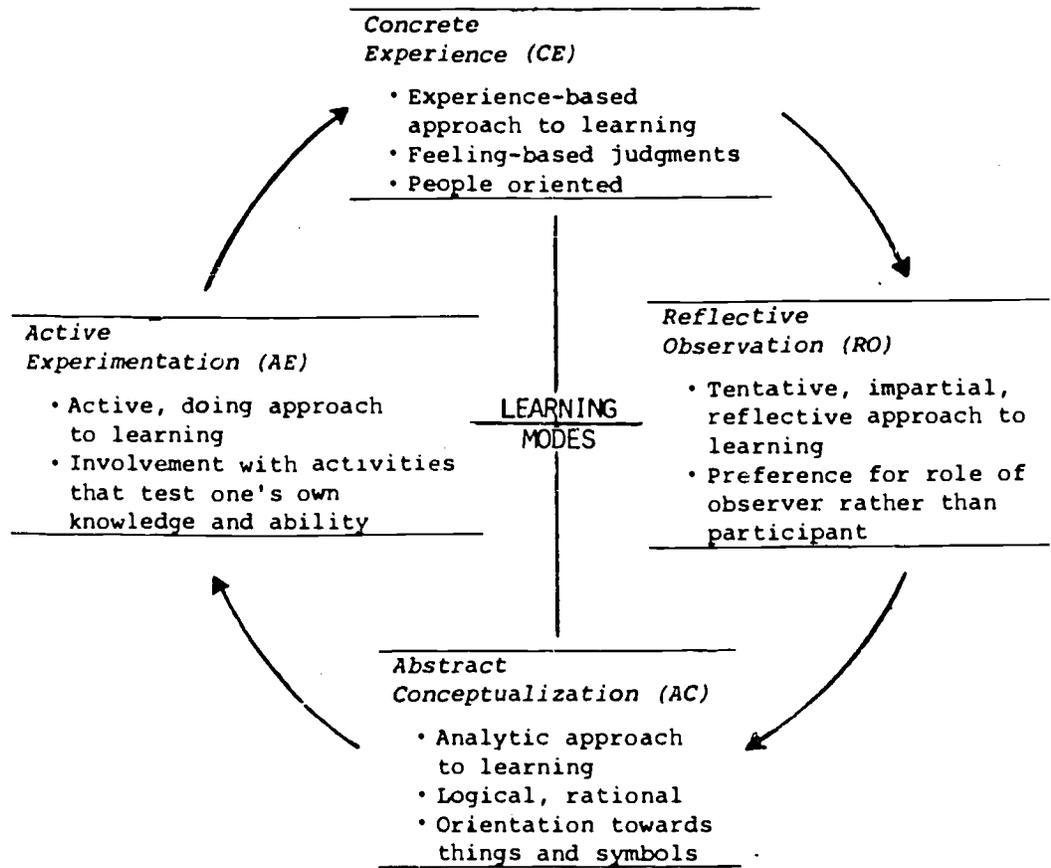


Figure 1. The Experiential Learning Model

Note. David A. Kolb. Learning Style Inventory: A Self-Description of Preferred Learning Modes. Boston: McBer & Co., 1977.

McClelland, 1978) is a measure of critical thinking similar in form to the traditional "compare and contrast" essay familiar to all college students and teachers. The scoring of the students' work is designed to tap the ability to form complex concepts and communicate them. Higher scores indicate more evidence of this ability (Winter, 1976).

The Analysis of Argument (Stewart, 1977a) is intended to assess intellectual flexibility by requesting the student to argue against a controversial opinion, and then defend the opinion just attacked. Separate scores are given for the first argument attacking the presented opinion, and for the second argument defending it. Higher scores for the attack argument indicate more evidence of central organization and focus on the logic of the position. Higher scores for the defense accrue to evidence of modified endorsement or acceptance which does not contradict the attack argument.

The scoring systems for both the Test of Thematic Analysis and the Analysis of Argument provide for negative scores. The scoring keys were devised by comparing elements common to essays of seniors and elements common to essays of freshmen. The former earn positive marks and the latter earn negative marks. In the case of forming complex concepts, negative scores are given for "apples and oranges" comparisons, and for affective or subjective reactions. In the case of the flexibility measure, negative scores are given for stringing together criticisms in the attack in an unorganized fashion, and for focusing on facts and counter-facts rather than on logic. Negative elements in scoring the defense include simple reversal to total endorsement of the position just attacked or proposing new arguments not even given in the original opinion.

#### Watson-Glaser Critical Thinking Appraisal

This is a traditional and time tested measure of critical thinking abilities (Watson & Glaser, 1964). Three of the five subtests were administered: the first, Inference, assesses the ability to distinguish degrees of truth or falsity of inference drawn from data, Second, Recognition, assesses the ability to recognize unstated assumptions or presuppositions in given assertions, Third, Deduction, assesses deductive reasoning. Not used were two subtests assessing ability to weigh evidence and ability to evaluate arguments.

#### Life History Exercise

The three measures just presented all focus on elements of analytic ability. Only the Life History Exercise (Klemp & Connelly, 1977) was specifically designed to measure human relations ability. The instrument was in the early stages of development when longitudinal study began, so as with Kolb's Adaptive Style Inventory, our data are incomplete.

The instrument is still under development by McBer and Company (Winter, McClelland & Stewart, 1981). The Alverno data will contribute to the interpretation and refinement of this instrument.

### Research Design

The research design specified both a cross-sectional comparison of entering and graduating students, and a longitudinal study of two consecutive entering classes. Longitudinal data collection began with the class entering in the fall of 1976. In the fall of 1977, the college inaugurated a new weekend time-frame for women unable to attend during the traditional weekday time-frame. The research plan was amended to include women entering the new Weekend College program as a third entrance cohort; the longitudinal data reported reflect this amended data structure. For the cross-sectional comparison of entering and graduating students, data were collected on students graduating in the spring of the 1977-78 academic year. The 1977-78 Weekday College entering class, which was participating in the longitudinal study, provided the comparison group for the cross-sectional study. Table 5 presents the overall design for the administration of the human potential measures against a common time-line.

The conventional procedure for cross-sectional comparisons is to assess two or more groups at the same point in time. This procedure was slightly modified in the present study because of conflicting time and design requirements of the longitudinal and cross-sectional data collection strategies. Given circumstantial limitations, comparison of entering and graduating groups in the same academic year best approximated coincidence of time (actual assessment times were seven months apart). While on the one hand this adjustment was a practical accommodation of conflicting schedule requirements, it is worth noting that the data more accurately represent the desired comparison than would a "correct" cross-sectional design, since students do not typically enter and graduate at the same point in time.

### Selecting the Cross-Sectional Sample

Among the validity issues of cross-sectional designs, two were of special concern in the present study. Both involved judgments in selecting an entering class comparison group. The first problem derived from the inauguration of the Weekend College in the fall of 1977. This raised the possibility of changes in recruitment activity and/or student self-selection with respect to students entering the traditional weekday time-frame that year, which might affect the comparability of that group with the graduating group. The second problem was that of matching groups for comparison on multiple measures.

Table 5.

Design for the Administration of Human Potential Measures and Student Perception Measures for Longitudinal and Cross-Sectional Studies of Student Outcomes

	Entrance Cohort	Academic Year					
		1976/77	1977/78	1978/79	1979/80		1980/81
Longitudinal	1976 Weekday College	HPM SPI AS	SPI AS	HPM SPI AS ICS SPC	HPM SPI AS CQ SPC	Careering Follow-up →	
	1977 Weekday College		HPM SPI AS	SPI AS ICS SPC	HPM SPI AS SPC	HPM SPI AS CQ SPC	Careering Follow-up →
	1977 Weekend College		HPM SPI AS	SPI	HPM SPI AS	HPM SPI AS CQ	
	1972/73 Weekday College (Pilot)	HPM/HPM SPI/SPI AS					
	1973/74 Weekday College		HPM/HPM SPI/SPI AS SPC			Careering Follow-up → SPI CQ	

Note. See Graphic 2 for overview of components of the program validation model with measures. Student Perspectives Interview (SPI) data were collected on a subsample of students participating in the administration of the Human Potential Measures (HPM), but all completed the Attitude Survey (AS) and Careering Questionnaire (CQ). All Weekday College students completed the Integrated Competence Seminar (ICS) and were rated by faculty on the Six Performance Characteristics (SPC).

The inauguration of Weekend College in the 1977-78 academic year posed the potential problem of recruitment and selection differences between the Weekday College groups represented by the graduating students (who entered before there was a Weekend College) and the new entering students (who entered the Weekday College as opposed to the new Weekend College). The decision to compare 1977-78 graduating students with students entering the Weekday College in the fall of 1977 was finally based on three factors. First, there was an a priori determination that the mutually exclusive time-frames of Weekday and Weekend Colleges were not interchangeable options for most students. Recruitment for the new Weekend College was specifically targeted for women who were not able to attend classes during the week. No new recruitment policies were initiated with respect to the traditional weekday time-frame. It was not unreasonable to presume that women who were able to attend weekday classes would not choose the weekend time-frame.

The other two factors, more empirical in nature, supported this presumption. Distributional statistics compiled on student background and personal characteristics of students entering the Weekday College in 1977 were not dissimilar to previous entering classes, and were different from those of the first Weekend College entering class. This can be seen in the statistical description of the three entrance cohorts participating in the longitudinal study. The 1977 Weekday College entrance cohort was much the same as the 1976 Weekday College entrance cohort, and both were different than the 1977 Weekend College entrance cohort. (See Tables 9 through 16.) And finally, in subsequent years of the longitudinal study, it was confirmed that very few students transferred between Weekday and Weekend time-frames in either direction. In summary, the Weekend College attracted a new population of students, and its advent did not seriously affect the composition of Weekday College in relation to previous entering classes.

The second problem, matching entering and graduating groups, arises from the fact of attrition. It is normally assumed that, among other reasons, students drop out of college before graduating because they are less able, or at least less academically successful, than peers who go on to graduate. When comparison groups are not pre-selected on the basis of matched ability, relevant ability-level characteristics are normally statistically controlled in the data analysis phase. This practice is a partial solution, but does not directly address the problems posed by attrition. In the present study, the fact that longitudinal data were being collected on the 1977 entering class permitted a novel solution: matching groups on the gross behavioral criterion of persistence. That part of the 1977 entering class which persisted through the three and one-half years of the longitudinal study was selected as the entering student group to compare with the graduating students. As is reported in the data analysis section, comparisons on particular outcome measures were further controlled for differences in background or ability where necessary.

## Collecting the Longitudinal Data

The three entrance cohorts involved in the longitudinal study were assessed on three occasions: at entrance, two years after entrance, and three and one-half years after entrance. The goal was to collect outcome data on all students entering in 1976 and in 1977, rather than depend on random sampling. The actual procedures of data collection are detailed in the following section. The overall success of the data collections is shown by the percentages of students assessed in Table 6. Overall, 92% of the eligible student population took part in the entrance assessments. Only a small subgroup of older, part-time students in the Weekday College time-frame were under-represented in the entrance assessments. Of the students from these entrance cohorts who were enrolled at the time of the second assessment, 90% participated; the corresponding figure for the third assessment was 94%. The losses in absolute numbers from first to last assessment were due almost entirely to attrition rather than non-participation of eligible students.

Stated positively, we have confidence in the representativeness of the data for women attending Alverno during the study period. This does not of course affect the limits on generalizability beyond Alverno College, nor to later Alverno populations. The latter qualification must be emphasized particularly in the case of the Weekend College entrance cohort, as this group may possess some unique characteristics by virtue of being a "pioneer" class for the new time-frame.

No attempts were made to assess students who were not enrolled at the time of the second or third assessments. There were group differences between those that persisted and those students who left. These differences can be reviewed in Tables A, B, and C of Appendix I. The longitudinal data analyzed for this report include only those students who participated in all three assessments.

### Descriptions of Student Characteristics and Program Variables

Several personal and background characteristics that are commonly identified as important input variables in studies of educational outcomes were, in the present case, not variables at all, but rather population descriptors. An obvious example is the variable of sex; in the present study, all of the students were women.

Other population descriptors which limit generalizability include race, geographic origin, work experience, basic skills, and off-campus learning experiences during college. While some minority and out-of-state students do attend Alverno, their numbers were proportionately very small. On average, about 95% of Alverno's students were Caucasian and resided in the southeastern region of Wisconsin before entering college. Students were from a range of urban and rural areas. Virtually all had some type of work experience, including the traditional

Table 6.

Number and Percentage of Eligible Students Participating  
in the Longitudinal Study

	1976 Weekday College		1977 Weekday College		1977 Weekend College	
	Eligible Students	Percent Assessed	Eligible Students	Percent Assessed	Eligible Students	Percent Assessed
Time 1	237	87.7	222	90.0	270	99.3
Time 2	89	94.4	101	83.4	141	91.4
Time 3	72	95.5	100	93.0	85	92.9

age students who entered directly from high school. Less than 10% came to Alverno identified as in need of assistance with basic skills. Due to Alverno's broadly institutionalized commitment to experiential learning, virtually all students participated in some type of supervised off-campus learning as part of their college program.

In various studies of more heterogenous student populations, all of these characteristics have been cited as accounting for differences in educational outcomes.

It should be noted that while these parameters are limitations for the purposes of generalizability, they are just as much advantages for the purposes of validation and exploration of the effects of the Alverno college experience. Analogous to the manner in which the study of twins carries special weight in "nature-nurture" investigations, the relative homogeneity of the Alverno student population serves to eliminate several common alternative explanations for observed differences in educational outcomes.

Tables 7 through 20 present characteristics of the student population which were later analyzed as input variables in relation to the selected outcome measures of human potential. Tables 7 and 8 describe comparable background characteristics of the entering and graduating student groups employed for the cross-sectional study.

Age and marital status are given at the time of assessment. Both groups include a comparable proportion of older students. For both theoretical and practical reasons, academic performance in high school, indexed by grade average, was treated as a categorical rather than interval variable. On the practical side, differences in transcript recording systems from high schools made it difficult to assign an accurate decimal equivalent. On the theoretical side, two factors were taken into consideration. First, the variance in time elapsed between high school and college for older versus traditional age students probably precludes the comparability of grade points as an index of current academic ability. Second, the outcome measures of this study were not traditional measures of academic ability, and thus the usual correlation of past with present indices of academic ability would not be expected to apply. We anticipated that, in relation to the selected measures of human potential, the high school grade variable might function more as a self-classification of ability than as a measure of actual differential ability on a common interval level scale. In any event, high school grade was recorded and treated as a categorical variable.

Religion and parent's occupation and education are not shown for the cross-sectional comparison groups, but are included in Tables 9 through 13 for the longitudinal cohorts. As is indicated later in the results section, almost none of the outcome measures were significantly correlated with these variables for the Alverno student population. These characteristics are included in the description of the longitudinal cohorts as additional evidence for the proportional continuity and representativeness of the longitudinal cohorts through loss of eligible student participants.

Table 7.

Age and High School Grade Point Average Distributions  
for the Cross-Sectional Study

	Age at Assessment		High School Grade Point Average				
	<u>M</u>	<u>SD</u>	<u>Missing</u>	<u>"D"</u>	<u>"C"</u>	<u>"B"</u>	<u>"A"</u>
1978 Weekday Graduating Students							
Traditional (n = 45)	21.2	0.57	4.4	00.0	4.4	55.6	35.6
Older (n = 15)	33.5	8.69	13.3	00.0	33.3	33.3	20.0
1977 Weekday Entering Students							
Traditional (n = 60)	17.7	0.55	13.3	00.0	10.0	55.0	21.7
Older (n = 17)	29.5	9.24	23.5	5.9	35.3	35.3	00.0

Table 8.

Prior College Experience and Marital Status Distributions  
for the Cross-Sectional Study

	Prior College Experience			Marital Status at Assessment		
	<u>None</u>	<u>Some</u>	<u>More</u>	<u>Single</u>	<u>Married</u>	<u>Divorced/ Widowed</u>
1978 Weekday Graduating Students						
Traditional (n = 45)	97.8	00.0	2.2	84.4	11.1	4.4
Older (n = 15)	53.3	20.0	26.7	13.3	80.0	6.7
1977 Weekday Entering Students						
Traditional (n = 60)	95.0	1.7	3.3	100.	00.0	00.0
Older (n = 17)	35.3	5.9	58.8	47.1	41.2	11.8

Both cross-sectional groups and longitudinal cohorts are further divided into two age cohorts. Although the investigation of differences between traditional age and older student groups was not a specified objective of the study, we have made use of this categorization at several points to examine and present differences between these two groups.

Tables 9 through 16 describe the background characteristics of the longitudinal cohorts. Age at entrance is shown for both second and third assessments, rather than age at assessment, to more clearly indicate what changes occurred in subgroup composition over time. Marital status was of course the one "background" variable that could and did change for some students during college. This fact was accommodated in the table by columns indicating two categories of changed status at the time of the second and third assessments.

The Time 3 figures in each column represent the 208 cases analyzed in the longitudinal study. Each of the individuals represented completed one or more instruments on all three occasions of assessment; most completed all instruments (except for Kohlberg's Moral Judgment Instrument, which was purposely administered to a smaller subsample).

Extensive analyses of the interrelationships among input characteristics divulged several strong correlations and clustered subsets, indicating definite student "types" in the population. Dominant patterns in the data characterized two major student types. First, what might be called the traditional student. She was 17-19 years old at entry, and identified herself as Catholic and single on her college application. Her parents were high school graduates, and in some cases have post-secondary education; they were often employed in professional, technical or managerial occupations. She was an A or B student in high school and entered Alverno with no prior college experience. The second type was older, but this age ranged over 35 years, from 20 to 55. The students in this category were about half Catholic and half Protestant or unidentified. The typical older student was married, some were divorced or widowed. Her parents had less education than the traditional student and worked in service occupations or skilled trades. She did less well in high school, and entered Alverno with some prior post-secondary experience.

Tables 17 through 20 show college-level inputs taken into account in examining the effects of the general Alverno College experience on outcome measures. As with the background characteristics, definite patterns of inter-relationships existed, and the patterns of college experience input characteristics were related to background patterns as well. The traditional age student was enrolled in the Weekday College program, and was more likely to be a full-time student and live in the residence hall. She was most likely a Nursing student. The older student was more likely to be enrolled in the Weekend College program, and was more likely to attend part-time and to commute. During the period of the study, three majors were offered in the Weekend College: Behavioral Sciences (Management), Communications, and Nursing. The majority of students majored in Management.

Table 9.

Age, Race and Religion Distributions across Occasions  
for the Longitudinal Study

	Age				Race		Religion	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	% Caucasian	% Catholic
<u>1976 Weekday College</u>								
T1 Traditional (n=120)	17.9	0.62					95.0	74.2
Older (n=88)	32.9	8.75					88.6	50.0
T2 Traditional (n=60)			17.9	0.60			95.0	70.0
Older (n=24)			30.1	9.10			87.5	37.5
T3 Traditional (n=48)					17.8	0.56	95.8	75.0
Older (n=11)					30.9	10.5	100.	54.5
<u>1977 Weekday College</u>								
T1 Traditional (n=133)	17.8	0.60					94.0	66.9
Older (n=67)	30.4	7.31					92.5	56.7
T2 Traditional (n=77)			17.8	0.60			96.1	67.5
Older (n=24)			29.2	8.10			95.8	58.3
T3 Traditional (n=60)					17.7	0.55	98.3	73.3
Older (n=17)					29.5	9.24	100.	64.7
<u>1977 Weekend College</u>								
T1 Older (n=268)	32.9	7.89					88.4	51.9
T2 Older (n=129)			32.8	7.54			87.6	51.2
T3 Older (n=72)					31.3	7.02	88.9	52.8

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Table 10.

Mother's Education Distributions across Occasions  
for the Longitudinal Study

		Mother's Education				
		Missing	Primary	H. S.	Post H.S.	Graduate
<u>1976 Weekday College</u>						
T1	Traditional (n=120)	12.5	10.0	48.3	16.7	12.5
	Older (n=88)	35.2	20.5	29.5	11.4	3.4
T2	Traditional (n=60)	6.7	13.3	50.0	20.0	10
	Older (n=24)	25.0	16.7	33.3	16.7	8.3
T3	Traditional (n=48)	6.3	10.4	47.9	22.9	12.5
	Older (n=11)	18.2	18.2	45.5	9.1	9.1
<u>1977 Weekday College</u>						
T1	Traditional (n=133)	17.3	7.5	44.4	15.8	15.0
	Older (n=67)	23.9	23.9	34.3	9.0	9.0
T2	Traditional (n=77)	14.3	9.1	44.2	15.6	16.9
	Older (n=24)	12.5	33.3	33.3	8.3	12.5
T3	Traditional (n=60)	13.3	10.0	46.7	13.3	16.7
	Older (n=17)	11.8	29.4	35.3	5.9	17.6
<u>1977 Weekend College</u>						
T3	Older (n=72)	5.6	33.3	41.7	11.1	8.3

Table 11.

Father's Education Distributions across Occasions  
for the Longitudinal Study

		Father's Education				
		Missing	Primary	H. S.	Post H.S.	Graduate
<u>1976 Weekday College</u>						
T1	Traditional (n=120)	21.7	10.0	35.8	15.0	17.5
	Older (n=88)	45.5	20.5	20.5	4.5	9.1
T2	Traditional (n=60)	13.3	10.0	40.0	18.3	18.3
	Older (n=24)	33.3	20.8	37.5	0.0	8.3
T3	Traditional (n=48)	12.5	8.3	35.4	20.8	22.9
	Older (n=11)	27.3	18.2	36.4	0.0	18.2
<u>1977 Weekday College</u>						
T1	Traditional (n=133)	19.5	14.3	30.8	18.0	17.3
	Older (n=67)	25.4	26.9	25.4	11.9	10.4
T2	Traditional (n=77)	19.5	14.3	41.6	14.3	10.4
	Older (n=24)	20.8	20.8	37.5	12.5	8.3
T3	Traditional (n=60)	16.7	15.0	43.3	11.7	13.3
	Older (n=17)	17.6	23.5	35.3	11.8	11.8
<u>1977 Weekend College</u>						
T3	Older (n=72)	5.6	34.7	25.0	25.0	9.7

Table 12.

Mother's Occupation Distributions across Occasions  
for the Longitudinal Study

		Mother's Occupation				
		Missing	Level 1	Level 2	Level 4	Level 5
<u>1976 Weekday College</u>						
T1	Traditional (n=120)	10.0	18.3	21.7	42.5	7.5
	Older (n=88)	20.5	15.9	11.4	34.1	18.2
T2	Traditional (n=60)	6.7	21.7	23.3	41.7	6.7
	Older (n=24)	16.7	12.5	16.7	37.5	16.7
	T3 Traditional (n=48)	6.3	25.0	22.9	37.5	8.3
	Older (n=11)	9.1	9.1	18.2	54.5	9.1
<u>1977 Weekday College</u>						
T1	Traditional (n=133)	10.5	19.5	16.5	49.6	3.8
	Older (n=67)	11.9	10.4	13.4	40.3	23.9
T2	Traditional (n=77)	7.8	24.7	15.6	49.4	2.6
	Older (n=24)	4.2	20.8	25.0	41.7	8.3
	T3 Traditional (n=60)	6.7	23.3	16.7	50.0	3.3
	Older (n=17)	5.9	17.6	35.3	29.4	11.8
<u>1977 Weekend College</u>						
T3	Older (n=72)	16.7	2.8	20.8	59.7	0.0

Note. Occupational categories at each level include: 1) Professional, technical, managerial; 2) Clerical, sales, service; 3) Farming, manufacturing trades; 4) Homekeeper; 5) Miscellaneous

Table 13.

Father's Occupation Distributions across Occasions  
for the Longitudinal Study

		Father's Occupation				
		Missing	Level 1	Level 2	Level 3	Level 5
<b>1976 Weekday College</b>						
T1	Traditional (n=120)	14.2	36.7	14.2	26.7	8.3
	Older (n=88)	17.0	15.9	12.5	13.6	40.9
T2	Traditional (n=60)	8.3	40.0	11.7	33.3	6.7
	Older (n=24)	8.3	12.5	33.3	8.3	37.5
T3	Traditional (n=48)	10.4	43.8	14.6	27.1	4.2
	Older (n=11)	9.1	9.1	45.5	0.0	36.4
<b>1977 Weekday College</b>						
T1	Traditional (n=133)	10.5	41.4	16.5	27.8	3.8
	Older (n=67)	9.0	20.9	9.0	16.4	44.8
T2	Traditional (n=77)	7.8	39.0	18.2	32.5	2.6
	Older (n=24)	8.3	20.8	8.3	25.0	37.5
T3	Traditional (n=60)	3.3	38.3	23.3	33.3	1.7
	Older (n=17)	5.9	29.4	11.8	23.5	29.4
<b>1977 Weekend College</b>						
T3	Older (n=72)	11.1	20.8	15.3	50.0	2.8

Note. Occupational categories at each level include: 1) Professional, technical, managerial; 2) Clerical, sales, service; 3) Farming, manufacturing trades; 4) Homekeeper; 5) Miscellaneous

Table 14.  
High School Grade Distributions across Occasions  
for the Longitudinal Study

		High School Grade Point Average				
		Missing Data	"D" Average	"C" Average	"B" Average	"A" Average
<u>1976 Weekday College</u>						
T1	Traditional (n=120)	14.2	0.0	12.5	52.5	20.8
	Older (n=88)	20.5	2.3	22.7	46.6	8.0
T2	Traditional (n=60)	18.3	0.0	0.0	58.3	23.3
	Older (n=24)	16.7	0.0	16.7	54.2	12.5
T3	Traditional (n=48)	16.7	0.0	0.0	60.4	22.9
	Older (n=11)	9.1	0.0	27.3	45.5	18.2
<u>1977 Weekday College</u>						
T1	Traditional (n=133)	15.8	0.0	15.8	49.6	18.8
	Older (n=67)	32.8	6.0	28.4	28.4	4.5
T2	Traditional (n=77)	13.0	0.0	10.4	57.1	19.5
	Older (n=24)	33.3	4.2	33.3	29.2	0.0
T3	Traditional (n=60)	13.3	0.0	10.0	55.0	21.7
	Older (n=17)	23.5	5.9	35.3	35.3	0.0
<u>1977 Weekend College</u>						
T1	Older (n=268)	11.2	2.2	30.2	45.5	10.8
T2	Older (n=129)	10.1	3.9	33.3	41.9	10.9
T3	Older (n=72)	8.3	5.6	27.8	45.8	12.5

Table 15.

Prior College Experience Distributions across Occasions  
for the Longitudinal Study

		Prior College Experience		
		No Prior	1-12 Credits	13 + credits
<u>1976 Weekday College</u>				
T1	Traditional (n=120)	85.0	5.8	9.1
	Older (n=88)	42.0	18.2	39.8
T2	Traditional (n=60)	88.3	1.7	10.0
	Older (n=24)	33.3	16.7	50.0
T3	Traditional (n=48)	93.8	0.0	6.3
	Older (n=11)	27.3	18.2	54.5
<u>1977 Weekday College</u>				
T1	Traditional (n=133)	90.2	3.8	6.0
	Older (n=67)	34.3	19.4	46.3
T2	Traditional (n=77)	88.3	3.9	7.8
	Older (n=24)	33.3	12.5	54.2
T3	Traditional (n=60)	95.0	1.7	3.3
	Older (n=17)	35.3	5.9	58.8
<u>1977 Weekend College</u>				
T1	Older (n=268)	32.5	15.3	52.2
T2	Older (n=129)	33.3	19.4	47.3
T3	Older (n=72)	38.9	23.6	37.5

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Table 16.

Marital Status Distributions across Occasions  
for the Longitudinal Study

		Marital Status				
		<u>Single</u>	<u>Married</u>	<u>Divorced/ Widowed</u>	<u>Newly Married</u>	<u>Other Change</u>
<u>1976 Weekday College</u>						
T1	Traditional (n=120)	100.	0.0	0.0	NA	NA
	Older (n=88)	27.3	63.6	9.1	NA	NA
T2	Traditional (n=60)	98.3	0.0	0.0	0.0	1.7
	Older (n=24)	37.5	45.8	8.3	4.2	4.2
T3	Traditional (n=48)	89.6	0.0	0.0	8.3	2.1
	Older (n=11)	45.5	45.5	9.1	0.0	0.0
<u>1977 Weekday College</u>						
T1	Traditional (n=133)	99.2	0.8	0.0	NA	NA
	Older (n=67)	32.8	61.2	6.0	NA	NA
T2	Traditional (n=77)	94.8	0.0	0.0	5.2	0.0
	Older (n=24)	45.8	33.3	8.3	4.2	8.3
T3	Traditional (n=60)	88.3	0.0	0.0	11.7	0.0
	Older (n=17)	35.3	41.2	11.5	11.8	0.0
<u>1977 Weekend College</u>						
T1	Older (n=267)	31.8	52.1	16.1	NA	NA
T2	Older (n=129)	32.6	39.5	18.6	1.6	7.8
T3	Older (n=72)	40.3	31.9	16.7	1.4	

Note. N.A.--Not Applicable

Table 17.

## College Experience Variables for the Cross-Sectional Study

	Resi- dent	Full Time	Major						
			Arts	Beh Sci	Ed	Sci	N	Fine Art	Unde- cided
1978 Weekday Graduating Students									
Traditional (n = 45)	24.4	100.	4.4	0.0	13.3	0.0	62.2	20.0	0.0
Older (n = 15)	0.0	93.3	13.3	33.3	0.0	13.3	26.7	13.3	0.0
1977 Weekday Entering Students									
Traditional (n = 60)	30.7	100.	5.0	5.0	3.3	1.7	63.3	18.3	3.3
Older (n = 17)	11.8	47.1	0.0	17.7	5.9	0.0	58.8	5.9	11.8

Table 18.  
Residence Distributions across Occasions  
for the Longitudinal Study

		Residence			
		Commute	Resident	Moved on Campus	Moved off Campus
<u>1976 Weekday College</u>					
T1	Traditional (n=120)	63.3	36.7	NA	NA
	Older (n=88)	94.3	5.7	NA	NA
T2	Traditional (n=60)	51.7	20.0	11.7	16.7
	Older (n=24)	87.5	0.0	4.2	8.3
T3	Traditional (n=48)	50.0	16.7	4.2	29.2
	Older (n=11)	81.8	0.0	9.1	9.1
<u>1977 Weekday College</u>					
T1	Traditional (n=133)	63.2	36.8	NA	NA
	Older (n=67)	92.5	7.5	NA	NA
T2	Traditional (n=77)	53.2	35.1	9.1	2.6
	Older (n=24)	91.7	4.2	0.0	4.2
T3	Traditional (n=60)	48.3	23.3	5.0	23.3
	Older (n=17)	88.2	0.0	0.0	11.8
<u>1977 Weekend College</u>					
T1	Older (n=267)	95.1	4.9	NA	NA
T2	Older (n=129)	96.1	0.8	2.3	0.8
T3	Older (n=72)	93.1	0.0	5.6	1.4

Note. N.A.--Not Applicable

Table 19.

Student Status Distributions across Occasions  
for the Longitudinal Study

		Student Status			
		Full-time	Part-time	Changed to Part-time	Changed to Full-time
<u>1976 Weekday College</u>					
T1	Traditional (n=120)	97.5	2.5	NA	NA
	Older (n=88)	40.9	59.1	NA	NA
T2	Traditional (n=60)	96.7	0.0	0.0	3.3
	Older (n=24)	50.0	20.8	0.0	29.2
T3	Traditional (n=48)	95.8	0.0	0.0	4.2
	Older (n=11)	36.4	18.2	0.0	45.5
<u>1977 Weekday College</u>					
T1	Traditional (n=133)	97.7	2.3	NA	NA
	Older (n=67)	53.7	46.3	NA	NA
T2	Traditional (n=77)	98.7	0.0	0.0	1.3
	Older (n=24)	50.0	8.3	0.0	41.7
T3	Traditional (n=60)	91.7	0.0	8.3	0.0
	Older (n=17)	41.2	5.9	5.9	47.1
<u>1977 Weekend College</u>					
T1	Older (n=268)	60.1	39.9	NA	NA
T2	Older (n=129)	23.3	31.0	37.2	8.5
T3	Older (n=72)	8.3	27.8	6.9	56.9

Note. N.A.--Not Applicable

Table 20.

College Major Distributions across Occasions  
for the Longitudinal Study

	Undecided Major	Arts/ Hum	Behav. Science	Commun.	Education
<u>1976 Weekday College</u>					
T1 Traditional (n=120)	4.2	6.7	3.3	0.0	11.7
Older (n=79)	16.5	11.4	13.9	0.0	12.7
T2 Traditional (n=60)	NA	3.3	0.0	0.0	8.3
Older (n=24)	NA	8.3	12.5	0.0	20.8
T3 Traditional (n=48)	NA	4.2	0.0	0.0	8.3
Older (n=11)	NA	9.1	0.0	0.0	9.1
<u>1977 Weekday College</u>					
T1 Traditional (n=128)	3.9	7.8	7.0	0.8	4.7
Older (n=64)	17.2	3.1	20.3	0.0	9.4
T2 Traditional (n=77)	NA	5.2	3.9	0.0	2.6
Older (n=24)	NA	0.0	12.5	0.0	4.2
T3 Traditional (n=60)	NA	5.0	3.3	0.0	3.3
Older (n=17)	NA	0.0	17.6	0.0	5.9
<u>1977 Weekend College</u>					
T1 Older (n=268)	0.0	NA	47.8	22.0	NA
T2 Older (n=129)	NA	NA	58.1	22.5	NA
T3 Older (n=72)	NA	NA	66.7	6.9	NA

Note. N.A.--Not Applicable

Table 20 continued.

College Major Distributions across Occasions  
for the Longitudinal Study

	Science	Nursing	Fine Art	Changed
<u>1976 Weekday College</u>				
T1 Traditional (n=120)	7.5	58.3	8.3	NA
Older (n=79)	3.8	39.2	2.5	NA
T2 Traditional (n=60)	6.7	65.0	8.3	8.3
Older (n=24)	0.0	33.3	4.2	20.8
T3 Traditional (n=48)	4.2	64.6	6.3	12.5
Older (n=11)	0.0	54.5	9.1	18.2
<u>1977 Weekday College</u>				
T1 Traditional (n=128)	3.9	57.0	14.8	NA
Older (n=64)	3.1	45.3	1.6	NA
T2 Traditional (n=77)	2.6	59.7	14.3	11.7
Older (n=24)	4.2	58.3	4.2	16.7
T3 Traditional (n=60)	0.0	61.7	16.7	10.0
Older (n=17)	0.0	58.8	5.9	11.8
<u>1977 Weekend College</u>				
T1 Older (n=268)	NA	30.2	NA	0.0
T2 Older (n=129)	NA	19.4	NA	0.0
T3 Older (n=72)	NA	5.6	NA	20.8

Note. N.A.--Not Applicable

## Sampling and Data Collection Procedures

### Cross-Sectional Study

The first phase of data collection procedures for a cross-sectional sample began in a pilot study in May, 1977 ( $n = 72$ ). During their final weeks at Alverno, these students were mailed a written rationale for the study requesting their participation in a letter from the Academic Dean. The response rate was 33 percent for this initial data collection. A follow-up by faculty members indicated that the pressures of the pre-graduation weeks accounted for low participation. Since we were reluctant to alter our timing, for the next group, the December, 1977 graduating seniors ( $n = 32$ ), we enlisted the help of department coordinators and divisional Chairpersons, who encouraged their major-area students to participate. We also offered more flexible scheduling options within the final weeks of the term, but were still less than successful.

As a result of these data collection experiences, we obtained as soon as possible, a list of May 1978, graduating seniors ( $n = 65$ ) who were to participate in the cross-sectional study. The following procedures were used to enlist participants. Actual materials are contained in Appendix II and are lettered consecutively. We conferred with division Chairpersons and reinforced our request for aid in enlisting student participants at the faculty-wide institute in January, 1978. The professional disciplines (Nursing, Education and Management) all agreed to allow us class time. The Music Division, whose graduating seniors had no common classes, offered to forego the traditional day for completing college-wide assessments (Assessment Day: March 10), so that students could complete the measures. Chairpersons in the other divisions sent memos requesting participation to each of their students, and the Director of the Office of Research and Evaluation contacted them for individual appointments in which the goals and rationale of the study were explained. Chairpersons were asked (Appendix A) to send a letter shortly before the event (Appendix B).

The Director of Research and Evaluation (also a principal investigator) spoke to each student detailing the rationale for the study. Individual talks were similar to the speech given at group sessions in each of the professional disciplines. The speeches that seemed to generate most student interest were those given to Nursing, Education and Management students in which we tied student participation to the projected or concurrent studies of practicing professionals in Nursing, Education and Management. All groups were informed that NIE was funding the research, which seemed to generate interest in the study. These procedures for enlistment of participants proved to be effective.

This 1978 graduating class contributed 400 hours towards the project during the 1978 spring semester. Instruments were spaced between mid-March and the beginning of May, except for the written Interview for Graduating Seniors, which students were

asked (and readily agreed) to take during final exam week to persevere the "I'm graduating" effect. Students were contacted by letter regarding their appointments for participation (Appendix C). Of the total, 250 hours were contributed in classes or during a regularly scheduled college-wide assessment day. The other 150 hours were scheduled individually in the Office of Research and Evaluation. The high percentage of volunteers (only 3 percent of those invited did not participate) and the high percentage who gave all the time requested (85 percent gave 6 hours each; 15 percent after graduation) point to the success of the revised procedures. We thanked students for their contribution (Appendix D).

## Longitudinal Study

### Entrance Assessments

For the longitudinal study begun in Fall, 1976 and 1977, the Human Potential Measures were administered to all entering students in Weekday College during orientation days. Most instruments were administered to students entering Weekend College in Fall, 1977, during their first weekend of classes. They completed the remaining instruments in January, 1978.

Kolb's Adaptive Style Inventory (ASI), an important supplement to the Learning Style Inventory (LSI), was included in the battery of Human Potential Measures given to participants in the re-assessment of the Fall, 1976 sample. Data on the two inventories were collected from the Fall, 1978, entering students in both Weekday and Weekend College.

Prior to their involvement, students were introduced by the Director of Research and Evaluation (one of two principal investigators) to the purpose and rationale for the study. For students entering in Fall, 1976, a total of 236 initially participated in the longitudinal study using the Human Potential Measures. The following fall (1977), a total of 217 Weekday College and 274 Weekend College entering students participated in the initial data collection phase and these students comprise the second longitudinal sample.

Each spring, following the first assessment of entering students in the longitudinal data collection for the 1976 and 1977 entering cohorts, feedback sessions were conducted by the Director of Research and Evaluation (Appendix E). At these sessions, students in the longitudinal studies were given their Learning Style Inventory profile and an interpretation of their individual scores, as well as group results. Appendix F, "Changes in Student Profiles on the Learning Style Inventory," (Mentkowski, 1981) is a composite of the various materials that were successively distributed during the longitudinal study period. Any student unable to attend one of the feedback sessions was mailed her profile and an interpretation (Appendix G). In addition, all 1978 graduating seniors in the cross-sectional study were mailed their feedback on the LSI (Appendix H).

## Second Assessments

### 1976 Weekday College Sample

During Fall, 1978, the first longitudinal sample (students who entered in Fall, 1976) completed a midpoint retest on the Human Potential Measures. Our initial contact with these students took the form of a talk and a letter re-introducing them to the study and inviting them to further participate. The letter, from both the Director of Research and Evaluation and the division Chairperson of each student's major area (Appendix I), identified the study as part of the Alverno experience and emphasized that they were contributing not only as students, but as future professionals. Of the 89 students in this group, 84 participated (94 percent).

About half the students completed the inventories during regular class meetings by arrangement with departments and instructors. The remaining students came to special group sessions or were scheduled individually.

The procedures for obtaining cooperation of the longitudinal participants were similar to those used to enlist graduating seniors in the Spring, 1978, semester. The project and the rationale for participating were explained in large group sessions where possible. The remaining students were sent letters from their division Chairpersons introducing the study (Appendix J). Then the Director met individually with these students to explain the nature of the study and the benefits from participating. Students were introduced to all the objectives of the NIE project, and were assured that they would be receiving feedback on two Learning Style Inventory Scores.

The inventories were administered to students in large group sessions, during class time where possible. Students who did not have common classes were scheduled for large group sessions outside of class time. The remaining students were assessed individually through special appointments that were arranged at their convenience. Students received follow-up phone calls until the inventories were complete. Learning Style Inventory feedback packets were mailed to all participants (Appendix F).

### 1979 Weekend College Graduates

In Spring, 1979, we conducted a midpoint assessment for the 26 Weekend College students who entered the nursing program for Registered Nurses in Fall, 1977. They were individually contacted by the Director, by telephone and by letter (Appendix K). Of the 24 students, 20, or 83 percent, participated. They were also mailed feedback on the Learning Style Inventory (Appendix F).

1977 Weekday and Weekend  
College Sample

In Fall, 1979, we conducted the major midpoint retest of the second longitudinal sample (entered Fall, 1977). Letters of re-introduction to the study were sent to each student from her Chairperson in August (Appendix L, M), together with a written progress report prepared by the Director of Research and Evaluation titled "Understanding the Development of Thinking in College" (Mentkowski, 1981, Appendix N). A reminder letter followed at the start of the semester (Appendix O). Letters were also sent to the faculty, apprising them of the retest plans (Appendix P), and informing them who would be absent from class. One hundred twenty-six Weekend College students and 101 Weekday College students participated (91 percent and 83 percent participation, respectively). Seventy-seven percent of the total Weekend College student sample completed the inventories during orientation weekend in August. The remaining students were contacted as part of an intensive follow-up procedure and completed the inventories individually at their own convenience, sometime during the fall semester. Follow-up procedure included assistance from the Nursing Division Chairperson and the coordinators of the Management and Professional Communications Departments, all of whom agreed to send letters encouraging participation in the inventory collection (Appendix Q).

Sixty-nine percent of the total Weekday College sample participated in the inventory collection on September 12 (September 13 for some nursing students whose clinical schedule made this a more feasible date). Faculty showed their support of the study by excusing students from class on these dates to allow for their participation (Appendix R). Since many of the Weekday College students we followed up were in the Nursing Division, the Director met with the Chairperson of this division, and the Dean to decide on an appropriate follow-up procedure. The Director made a presentation to a group of nursing students who did not attend the inventory session, to elaborate on the purposes and importance of the study and to encourage their participation. These students were then sent a follow-up letter explaining that they could take the inventories at a time most convenient for them (Appendix S). They were asked to complete and return a form indicating their availability.

Office of Research and Evaluation staff later met with the Nursing Division Chairperson to discuss contacting students who did not respond. Taking into consideration the individual circumstances of students, varied follow-up approaches were used. Some were contacted by nursing advisors or instructors, others were called or written to by Office of Research and Evaluation staff.

Students who were in other divisions were contacted by their respective Chairpersons via mail, phone, or in person. In order to accommodate the students and allow them to choose a time most convenient for them (including evenings and weekends) we arranged a schedule to meet the students' needs and administer the inventories to them.

Efforts of the divisions, departments, and individuals noted above resulted in a 28 percent increase in total participation in the Fall inventory collection (14 percent increase for the Weekend College group and 14 percent for the Weekday College sample).

As with the first inventory collections, in the Spring following each midpoint assessment, feedback on the Learning Style Inventory was sent to students who participated in the second phase of the two longitudinal studies (Appendix F). For the entering Fall, 1976 group, the feedback packets included an explanation of the meaning of the individual profiles and some qualifications in interpreting one's own Learning Style Inventory profile. Graphs showing outcomes on the LSI for several groups at Alverno (Freshmen, Seniors, and students who did not return after their first year) were also included, and these results were discussed. Some students contacted us with questions and comments, all of which indicated interest in the study.

Feedback packets on the Learning Style Inventory prepared for the participants in the second longitudinal sample (Weekend and Weekday students entering Fall, 1977) consisted of individual profiles from 1977 and 1979, as well as group results (Appendix F). As previously mentioned, this feedback was combined with results from the 20 Weekend College students who graduated in Spring, 1979 (Appendix T). Comparisons with other Alverno groups were also included.

### Third Assessment

#### 1976 Weekday College Sample

During Spring, 1980, the first longitudinal sample (students who entered in Fall, 1976) completed a third and final assessment on the Human Potential Measures ( $n = 68$ ).

During the first week prior to the start of classes (in August, 1979) each student received a letter from her Chairperson, inviting her to participate the following March and stating, once again, the rationale for the study.

This letter was mailed again to each student in a note from her Chairperson in January telling her when the administration of the Human Potential Measures (called inventories) would take place (Appendix U). The letter also reviewed the rationale for the study. In addition, the Director of Research and Evaluation, with some students who would be participating, generated a list of questions students usually ask about the inventory collections. She then developed extensive written responses to these questions which further detailed the rationale and purposes of the inventory collections (Mentkowski, 1979) (Appendix V). This letter was mailed to all students, together with a note from her Chairperson (Appendix W), shortly before the March 13 inventory administration session. In addition, the Director delivered a 20 minute talk to nursing students about the expected impact of their participation, and the participation of the nurses who contributed to the nursing study, on the nursing

profession. These procedures resulted in an initial participation rate of 63 percent.

We ultimately achieved 96 percent participation in the collection of the Human Potential Measures in spring ( $n = 68$ ) through extensive follow-up. Sixty-eight students remained in the longitudinal sample in Spring, 1980. Three additional persons from 1976 were still in school, but since they did not take the inventories in 1978 for the midpoint assessment, they were not included in the follow-up, although we invited them (one did participate). Four persons were on leave. Two persons were invited, but since they were being counseled out of the program because they were not expected to meet graduation requirements at Alverno, we did not include them in the sample (one did participate).

The 96 percent participation rate was achieved through extensive follow-up of the students. Follow-up consisted of personal contact with students by the student's Chairperson, instructor, or Office of Research and Evaluation staff. This follow-up raised participation from 63 percent to 94 percent participating, with 79 percent completing all 13 measures. After graduation, the Director continued the follow-up (some students indicated they could not participate until after school was over). Follow-up after graduation was 50 percent successful, and it was more successful with students who had started some participation prior to graduation. This post-graduation follow-up raised participation from 94 percent to 96 percent, with the percent of students completing all measures increasing from 79 percent to 85 percent.

In Fall, 1980, participants in the first longitudinal sample were sent their individual LSI profiles from 1976, 1978 and 1980 (Appendix F). Graphs showing mean scores of various groups at Alverno were also included along with an explanatory letter.

#### 1977 Weekday and Weekend College Sample

For the third longitudinal assessment of students in the 1977 entrance cohort, an effort was made to enhance preparation for students to participate in Spring, 1981, and to reduce the need to follow-up nonresponders. In August, 1980, each Weekday College student received a letter from her Chairperson outlining the rationale for the study and inviting her participation the following spring (Appendix X). The letter to students with "Some Questions and Answers About Evaluation Studies" was also mailed to each student at that time (Appendix V). Faculty were apprised of the data collection at the August Institute. During Fall, 1980, Chairpersons met and selected a date in March 1981 for the inventory administration. Faculty were informed in December of the March date, together with an extensive rationale and the "questions and answers" letter (Montkowski, 1979) (Appendix Y); the date and rationale were reaffirmed at the January Faculty Institute.

In early February, students were apprised of the March date, together with the rationale (Appendix Z). Faculty were mailed information on who would be absent from class that day (Appendix AA). At the same time, the Director of Research and Evaluation made group or individual presentations to each person involved, providing the most up-to-date general results from the study--mostly from the professional studies and the follow-up study of alumnae conducted the previous year. The paper prepared for this purpose, "Learning to Learn at Work," together with a letter from the Director (Mentkowski & Fowler, 1981, Appendix BB), was given to students at the session with an elaborated question and answer letter (Appendix V). Participation for those expected to attend the March session was 96 percent, up from 63 percent the previous year. Those who had already rescheduled, did meet their appointments.

Others were contacted, six persons did not respond to follow-up procedures; all were older women attending college part-time. One younger person asked to be excused for health reasons.

Weekend students were involved a bit differently. They also received letters inviting their participation in a May 5, 1981 assessment in August, 1980, but were also invited to attend an August feedback session (Appendix CC) at which the Director and Academic Dean (the other principal investigator) met for an hour and provided feedback, mostly on the professional and alumnae studies. A letter from their Chairperson and the question and answer letter (Appendix V) were distributed (Appendix DD). The Director and Dean kept count of attendance, and scheduled more sessions during Fall, 1980 and one in January 1981 until almost all had received feedback (Appendix EE). Some individual feedback was given by phone or by the Director in a personal session. The Director wrote to students and called them if they had not indicated on a return form which session they planned to attend.

During April, 1981, the Dean and Director met with all but one student in the 1977 entrance cohort for Weekend College, either in a class or individually. All students' schedules were examined to see where they could be met, either during or between classes; faculty were asked their permission to visit their class, or to ask to see a student in the hall between classes. The Dean and Director encouraged student participation, provided a rationale and disseminated results orally and in written form in the paper "Learning to Learn at Work" (Mentkowski & Fowler, 1981, Appendix BB).

Faculty were notified of all procedures (Appendix FF), and assessment times were scheduled during the regular assessment weekend with the assistance of the Assessment Center (Appendix GG). Follow-up, or rescheduling, occurred either before or after the scheduled session for those unable to attend. As a result of the follow-up, ultimately 93 percent of the Weekday ( $n = 100$ ) and 93 percent of the Weekend College students ( $n = 35$ ) completed the third phase of the study for this sample.

In December, 1981, the results of the individual LSI scores for 1977, 1979 and 1981 were seen to the second longitudinal

sample group (Appendix F). This group was also sent graphs of their groups' mean LSI scores and a letter of explanation of the results.

### Administration of the Inventories

For the most part, administration of all Human Potential Measures occurred on a single day. As a student arrived, she was given a form for collecting information on age, major, etc., and a list of names and corresponding code numbers. Each student used her code number on all the instruments, plus the date. Code lists and the information sheet were returned. If a student arrived early she began the untimed instruments.

Following a welcome and restatement of the purpose and rationale for the session, all students began by completing the timed instruments. The Director of Research and Evaluation paced the students through those, and then, following instructions for completing each instrument, the students were directed to complete the untimed instruments in a particular order. The timed instruments were completed in one hour and fifteen minutes. Students were then directed to take a break (refreshments were provided), and to then work at their own pace, being careful not to let themselves become too fatigued, and to take a break when they needed one. As each inventory was completed, the student brought it to the front of the room, took another, and so on. Students usually completed the inventories in 4 to 5 hours; the session began at 8:00 a.m. and continued until 3:00 p.m. The inventories were completed in the following order:

- Test of Thematic Analysis
- Picture Story Exercise
- Analysis of Argument
- Defining Issues Test
- Measure of Educational, Vocational and Personal Issues
- Learning Style Inventory
- Moral Judgment Instrument
- Adaptive Style Inventory
- Life History Exercise
- Test of Cognitive Development
- Watson Glaser Critical Thinking Appraisal
- Attitude Survey
- Careering Questionnaire (third assessment only)

Students who were in the interview subgroup were asked to complete the Moral Judgment Instrument after they completed the Learning Style Inventory.

Students who, for a variety of reasons, completed the inventories at a time scheduled at their convenience, were given the same instructions and asked to complete the instruments in the same order. Students were, however, asked to time themselves on the timed inventories.

During the lunch hour and after students completed the inventories in the midpoint assessment, the Director met with them individually and in small groups to hear their comments and to give them general outcomes of the work. At the final assessment, she met with students who had not been in class or individual feedback sessions, in order to see that all students had similar information and personal contact.

### Data Analysis Plan and Methods of Analysis

The data analysis plan was organized around three basic questions. First, did the selected instruments record change across the three occasions of assessment? Second, to what extent might change be due to the Alverno learning process rather than to age-related maturation or differences in background and variations in type of college experience? Finally, what, if any, patterns of change emerge in the interrelationships of the human potential measures and other measured variables?

The purposes of this report do not include in-depth analysis of any particular instrument in isolation from the others. While it was necessary to conduct parallel analyses of individual measures to take full advantage of complete longitudinal data, we were primarily concerned with the overall patterns of results across instruments. One important aspect of this orientation is that we have not concerned ourselves with individual reliability analyses and adjustments as we would if our inferences and conclusions were based on only one or two instruments.

It should also be noted that the data analysis plan was created and implemented with the emphasis on description and exploration of relationships in the data that might indicate "value-added" by the learning process. In this spirit, we have in many cases highlighted relationships between variables at the  $p < .10$  level as well as at higher levels of statistical significance.

### Describing Change Over Occasions

Change over occasions of assessment was investigated in two ways: (1) change as a function of time and (2) change between occasions of assessment. The former emphasizes the developmental nature of the investigation and the latter emphasizes its quasi-experimental character as a study of outcomes at the mid-point and end of the college experience. The first question, Did change occur?, was answered in both ways for all instruments. Multiple linear regression techniques were employed to describe change as a function of time. Analysis of variance techniques for repeated measures were used to evaluate differences between first and second assessments, and between second and third assessments.

In the analysis of measures as a function of time, the data from each instrument were examined for both linear and non-linear relationships with time. Values of 0 (at entrance), 2 (for two years after entrance), and 3.5 (for three and one half years after entrance) were established for the three assessment occasions. Quadratic time (time squared) was included in all subsequent analyses of the time function only when its contribution to variance explained (over linear time) was statistically significant at the .05 level. In the evaluation of change between occasions of assessment, possible background and program covariates were initially ignored to simply describe the overall pattern of observed differences across measures which were statistically significant at .10 or higher levels.

#### A Causal Analysis of Change for Both Intervals

The second question, concerning the value added by student experience in the learning process over age-related maturation and other background and program differences was investigated using a combination of simultaneous and hierarchical set-wise regression procedures. A common procedure was followed in independent analyses of each measured outcome for both intervals of assessment. Our approach to the analysis of change between occasions of assessment was basically a hierarchical method of variance partitioning. Assessments defining each interval were treated in effect as pre-post assessments on each measure. Post-scores were regressed on pre-scores and the residual, or regressed change, was then analyzed in relation to student and program characteristics and performance variables indicative of student experience in the learning process. The five steps of this procedure were as follows:

##### Step 1

Data from the three entrance cohorts were pooled and the pooled data for each instrument were examined for correlation with age and other background variables in individual regression analyses. Since all background data were categorical, multiple regression with dummy variables was used to determine the multiple correlation of categories defining each variable with scores derived from each instrument.

##### Step 2

The categorical background variables found to correlate significantly ( $p < .05$ ) with the dependent measure were then submitted to hierarchical set-wise regression in a pre-determined order. The imposed order was a weak causal ordering based on presumed temporal sequence

of influence. From one perspective, this step provides at least a partial historical explanation of observed variation in developmental and ability levels at entrance to college. From another perspective, it signals particular instances of statistical relationship between the outcome measures and individual or subgroup characteristics, pre-existing potential effects of college that must be controlled to answer the "value-added" question. At this step, possible interaction effects among multiple background predictors were ignored, since most, if not all, of the variance accounted for by the background variables is absorbed by pre-scores as predictors of post-scores in the next step.

### Step 3

Next, post-scores were regressed on pre-scores for both intervals, i.e., scores from the second assessment were regressed on scores from the first, or entrance, assessment, and third assessment scores were similarly regressed on second assessment scores. As with the time function, non-linear as well as linear relationships were tested. Non-linear elements were included in further tests when their unique contribution to post-score variance explained was statistically significant at the .05 level. Background correlates of entrance scores were then tested for unique contribution to post-scores with pre-scores held constant. Background variables accounting for post-score variance with pre-scores controlled were then retained as covariates in investigating regressed change in relation to variations in type of college experience.

### Step 4

College experience variables presumably irrelevant to the competence based learning process included entrance cohort, resident or commuter status, full-time or part-time status, and major field. Post-test scores were regressed on each college experience variable, with pre-test scores and background covariates held constant. In cases where more than one college experience variable contributed significantly to variance in post-scores under these conditions, entrance cohort was first accepted and other variables were then entered in all possible hierarchical combinations. The combination achieving the highest cumulative increment in variance explained determined which college experience variable would be retained as covariate.

## Step 5

The preceding steps were used to build a unique equation for each second and third assessment score of each instrument that accounted for the maximum amount of variance as a function of pre-test scores, age and other background variables, and program variables, in this last order. With covariate sets determined for each measure, three performance variables indicating student experience in the learning process were entered to investigate the "value-added" question. The three performance variables were a) number of semesters attended, b) number of credit hour units accumulated, and c) number of competence level units accumulated. Conclusions concerning the value-added by the competence-based learning process are linked particularly to the number of competence level units accumulated and the relative contribution of this variable vis-a-vis the other two.

### Relationships Among Human Potential Measures

To investigate patterns of interrelationships among the human potential measures, several factor analyses were performed on all measures together, and then on a subset of measures which permitted comparisons of factors across occasions of assessment. Not all measures could be included because of incomplete data, especially for entrance assessments. Some indices had to be excluded because of mathematical dependencies, while others were excluded because of questions emerging in the data analysis about what they measure.

Analyses of entrance assessments were given the greatest weight in efforts to interpret factors, since retesting had an unknown and certainly variable effect on different instruments. Our basic approach was to accept factors extracted from first assessments as establishing the grounds for interpretation of underlying dimensions, and then to consider differences in factors extracted from second and third assessments in relation to entrance factors as possible effects of the learning experience.

While principal components were extracted routinely to establish reference points for total variance vs. common variance, number of factors to extract, etc., the interpreted factors were inferred through a factor method (Alpha factor, Nie et al., 1975) which estimates common variance from the multiple correlations of each variable with all other variables, and produces factors that have maximum generalizability across measures. Oblique rotations were chosen both to permit extraction of higher-order factors, and to facilitate interpretation of factors.

Indices or measures not included in the common factor analyses were still utilized in interpreting factors through examination of their correlations with the extracted factors.

In this phase of the analysis, the emphasis is more on theory construction than theory validation, and consequently, the statistical significance of relationships was not afforded the kind of attention and use as a criterion of judgment as in the causal analysis. In the presentation of factor matrices, higher loadings are underscored, but all loadings were presented and taken into account in the interpretation of 1. Factor.

Based on the framework developed through the series of factor analyses and correlations of factors and measures, relationships were sought between dimensions of development and change underlying the human potential measures.

## RESULTS

The measures of human potential were provisionally considered to divide into two subsets. Five of the selected instruments were constructed to assess dimensions or levels of development from primarily cognitive-developmental perspectives. The remaining seven instruments were constructed to assess a variety of characteristics and abilities related to development and learning, but not from explicitly cognitive-developmental perspectives.

For the immediate purpose of reporting and comparing results from individual instruments, a tentative hypothesis was developed concerning the relative influence of cognitive-developmental factors among the second set of instruments. The hypothesis was that, among those instruments not designed explicitly on cognitive-developmental grounds, the measures derived from the Picture Story Exercise would be most affected by developmental factors. We expected the Learning Style Inventory and Adaptive Style Inventory to show less relationship to developmental factors than the dispositional indices of the Picture Story Exercise, but more of a relationship to these factors than to the narrower measures of analytic ability.

Our initial hypothesis was that the order of influence of developmental factors would show up both in the interrelationships of measures and in the separate relationships with student and program variables. In the latter case specifically, we hypothesized that the more developmental measures would show stronger associations with variables representing greater life experience, such as age, and parent's education and occupation. Less developmental measures would show stronger associations with indices of academic experience, and be more affected by college program differences, such as residence and major.

The order of presentation, and table formats including all instruments, reflect in part our initial hypotheses. The distinction between production and recognition tasks in instrument design was also taken into account as a subsidiary factor in organizing the presentation of results, as were conceptual and quantitative similarities and differences. All of these features of instruments were considered to facilitate comparisons among the results of independent analyses performed on each measure. Further divisions and categorizations of individuals, measures, and occasions used as guidelines in data analysis and organization of presentation are noted and discussed as they appear in the text.

The first purpose of using the external criterion measures of human potential was to describe differences and change in student development. The cross-sectional data describe differences between comparable groups of entering students and graduating students assessed in the 1977-78 academic year. The longitudinal data describe changes in development of students entering Alverno in the Fall of 1976 and in the Fall of 1977. For each of the three entrance cohorts included, assessments were administered at

entrance, two years after entrance, and three and one-half years after entrance. As anyone familiar with the usual wide range and variability of development and abilities of college students might expect, the results from multiple measurements on multiple occasions produce a complex picture of difference and change. There are no concise aggregate results, and no simple conclusions.

General descriptions of the group data are presented below in two parts. First, the cross-sectional data are illustrated in the form of raw score frequency distributions. Frequencies have been reduced to percentages of students responding at the given level, and are shown on the vertical axes. The horizontal axes are marked with the metric particular to the given instrument. Following the cross-sectional data descriptions, the longitudinal data are presented in the form of estimated raw scores as a function of time of assessment and dichotomous classifications of age and cumulative educational achievement. Summaries of the quantitative data illustrated in the graphs, and related tests of statistical significance presented in the text, can be found in Appendix I.

### Cross-Sectional Results

Figures 2 through 14 show, for each instrument, the distributions of scores for entering and graduating students in the cross-sectional study. Most plainly evident across the spectrum of measures is the large overlap in distribution. This underscores the obvious: students do not enter college at a uniformly lower level of development or ability, nor do they graduate at a uniformly higher level.

#### Cognitive-Developmental Measures

The distribution of ratings on the three essays comprising the Measure of Vocational, Educational, and Personal Issues are shown in Figure 2. We have referred to this measure throughout as the MVEPI; recently the name has been changed to the Measure of Intellectual Development (Mines, 1982; Moore, 1982). While all three essays show identical ranges for entering and graduating students, there appears to be a shift in central tendency from transition between dualistic and multiplistic thinking to a stable multiplistic perspective. Only the "Career" essay shows a noticeable percentage of graduating students in transition towards more relativistic thinking. (Based on our extensive work with this instrument at Alverno, we have strong doubts about its sensitivity to higher positions of Perry's scheme.)

Summaries of analysis of variance tests of this and following cross-sectional comparisons are presented in Appendix I, Table D. Main effects of group were statistically significant on the "Decision" and "Career" essay ratings, but not on the "Best Class" ratings.

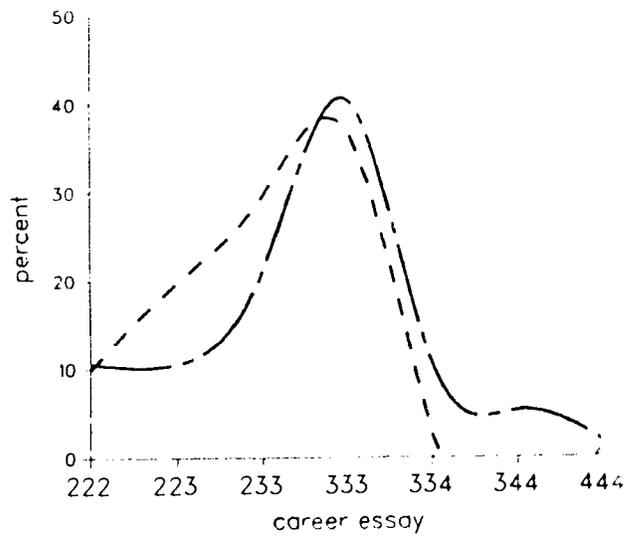
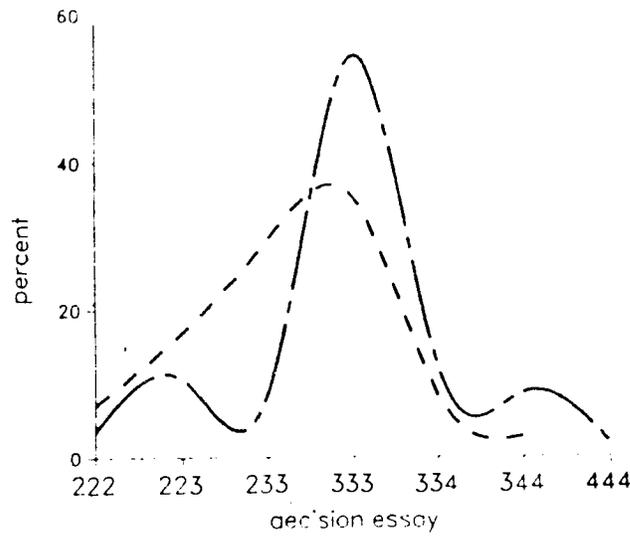
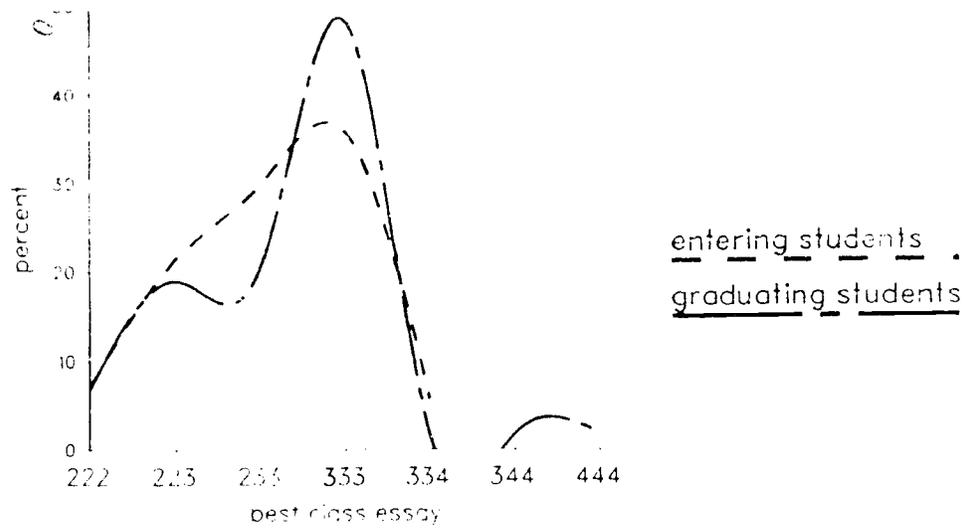


Figure 2. Measure of Vocational, Educational, and Personal Issues score distributions for cross-sectional comparison of entering and graduating students.

Figure 3 presents the distributions of Total Protocol Ratings from the Washington University Sentence Completion Test of Ego Development. This figure shows the mean level of entering students to be the transition between Conformist and Conscientious stages of Ego Development, while the majority of graduating students were rated at the Conscientious level or at the transition between Conscientious and Autonomous levels.

The difference between groups was statistically significant on the Ego Development measure. Even though age was not found to significantly correlate with the pooled entrance cohorts of the longitudinal study, it was entered as a covariate in the analysis of variance of cross-sectional groups. The finding of no correlation was confirmed for this group comparison.

As previously reported, two instruments based on Kohlberg's Moral Development theory were utilized. Figure 4 presents the distributions of Moral Maturity Scores derived from Kohlberg's production-type instrument, and Figure 5 presents the two indices calculated from Rest's Defining Issues Test (a recognition-type measure of Moral Development). The reported indices for both instruments are continuous scale scores rather than position or stage scores. Please note that the data from Kohlberg's Moral Judgment Instrument in Figure 4 are from a small subsample of the cross-sectional groups. Though most students from both groups fall into the Moral Maturity Score range indicative of Conventional thinking, there are noticeably fewer graduating students in the Pre-Conventional range and more in the Post-Conventional range. While the simple mean difference was significant, when age is controlled, the main effect of group was not significant.

Of the five instruments initially conceived and selected as measures of cognitive-developmental outcomes, only the Defining Issues Test results show a general shift in distribution between entering and graduating groups. The better known P% score distribution--the percentage of responses indicative of principled thinking--for the graduating students broadens and the entire range shifts higher on the scale. The D Score, calculated from all responses, shows the same general shift up the scale, but does not flatten out like the P% index. For both indices, age was a significant covariate. But, unlike the Moral Maturity Score, there remained a significant main effect for group with age controlled.

There appears to be little difference in distributions on the Piagetian Test of Cognitive Development shown in Figure 6. There was no statistically significant difference between groups on this measure, but there was significant covariance with high school grade average.

Briefly summarizing the cross-sectional results on the five cognitive-developmental measures, significant main effects of group were found on three instruments: the Measure of Vocational, Educational, and Personal Issues; the Sentence Completion Test of Ego Development; and the Defining Issues Test. For these comparison group data, the measure of Perry's developmental scheme and the Ego Development measure were not related to age. Both measures of Moral Development were related to age, and with

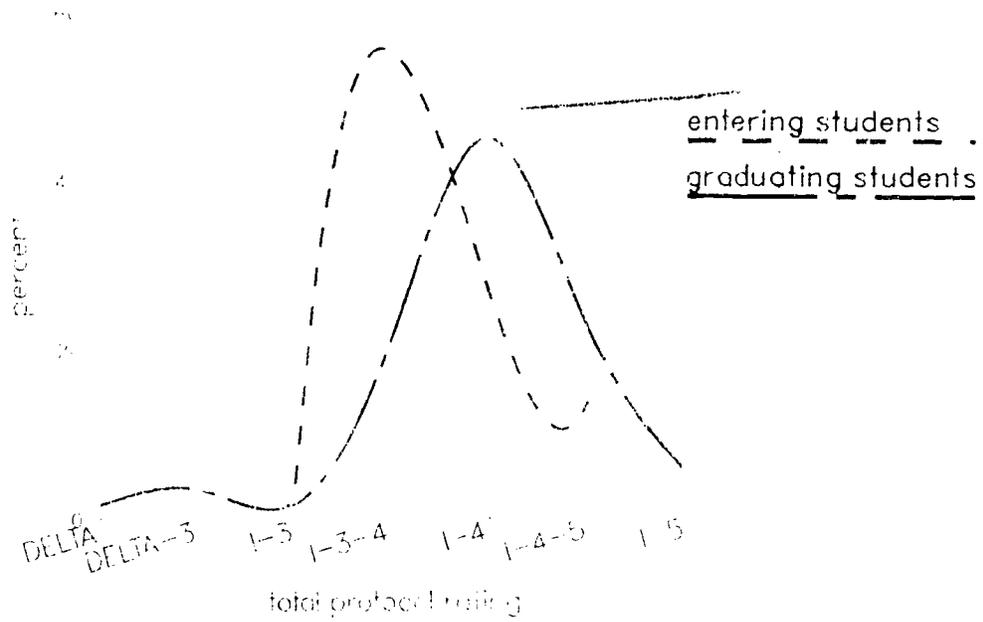


Figure 3. Sentence Completion Test score distributions for cross-sectional comparison of entering and graduating students.

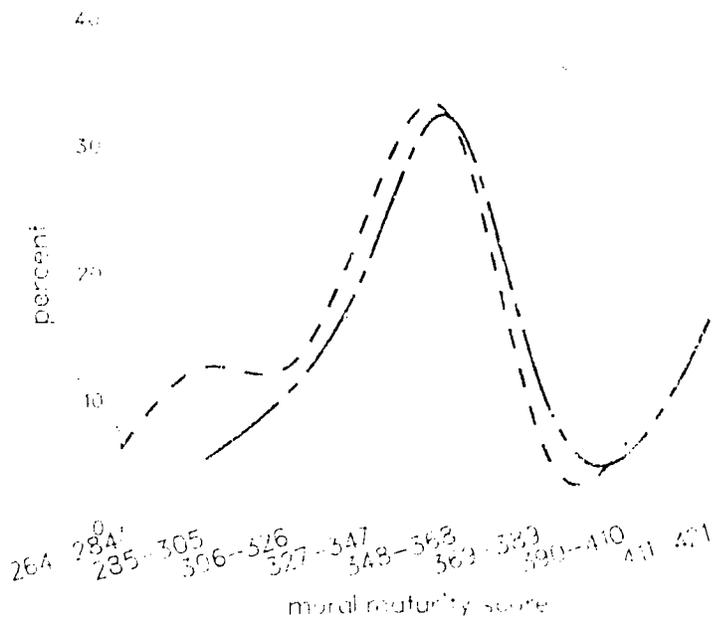


Figure 4. Moral Judgment Instrument score distributions for cross-sectional comparison of entering and graduating students.

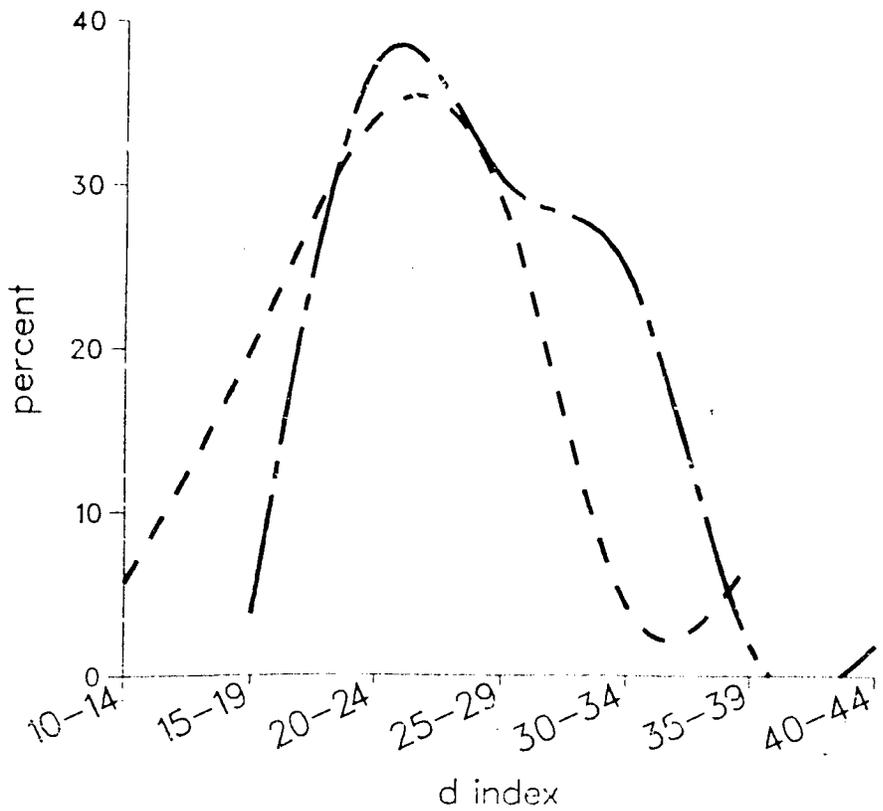
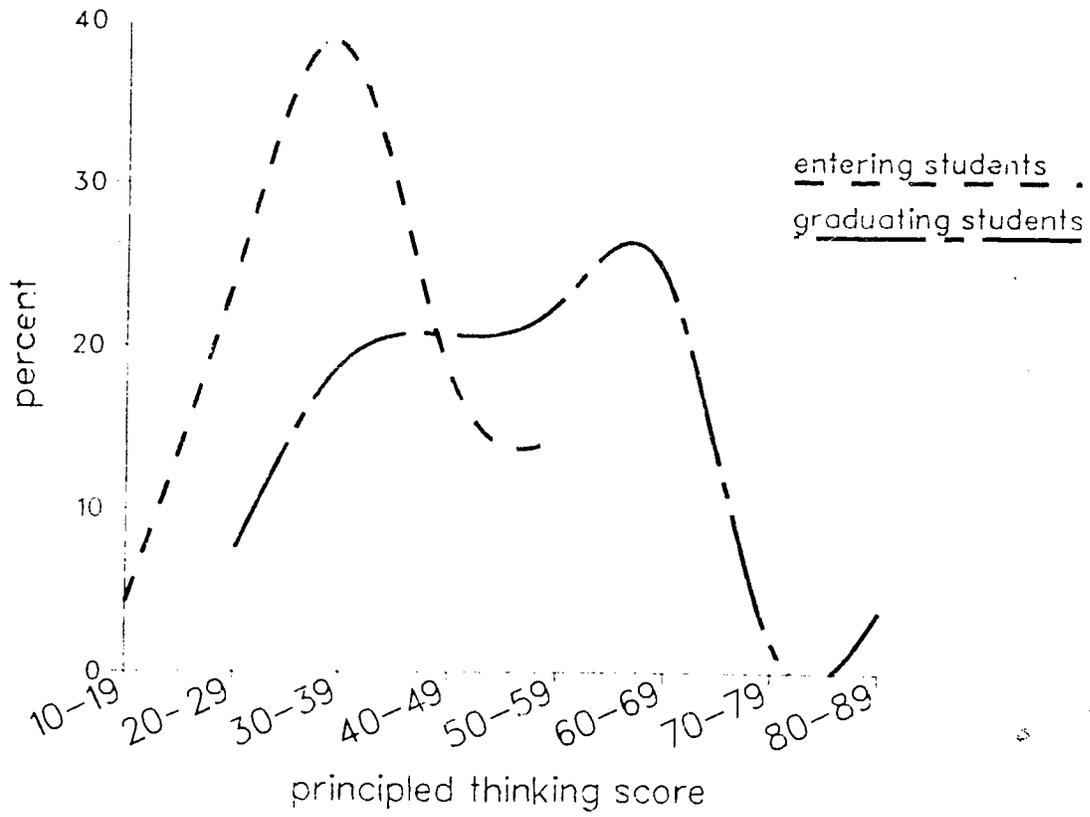


Figure 5. Defining Issues Test score distributions for cross-sectional comparison of entering and graduating students.

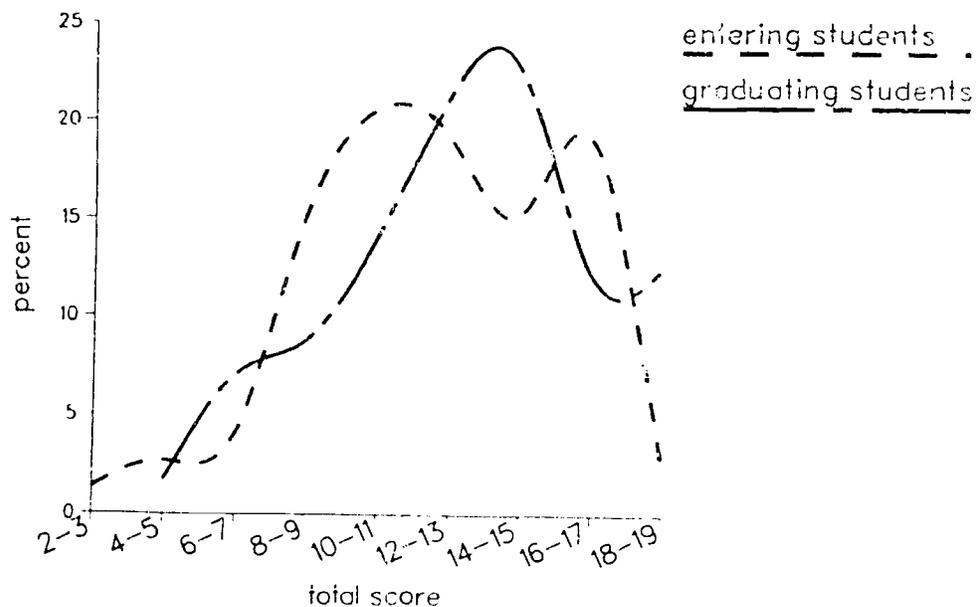


Figure 6. Test of Cognitive Development score distributions for cross-sectional comparison of entering and graduating students.

age controlled, there were no main effects of group on Kohlberg's Moral Judgment Instrument. But there were significant main effects for group on both indices derived from Rest's Defining Issues Test. Scores on the Test of Cognitive Development were correlated not with age, but with high school grade point average, and main effects for group were not statistically significant.

It is beyond the scope of this report to present more detailed analysis and discussion of outcomes on individual instruments. As stated at the beginning of this section, our focus is on the general or overall weight of evidence provided by both cross-sectional and longitudinal data.

#### Generic Ability Measures

Figures 7 through 9 show distributions of scores derived from the Picture Story Exercise. The measure of Stages of Adaptation is based on a psychosexual development model, and the Self-Definition score and Motive scores are not overtly developmental in character. For the purposes of depicting the distributions, the horizontal axes are marked off according to the simple range of the respective scoring systems. Percentages are in terms of average scores across the six stories written by each student. Statistical analyses of measures taken from the Picture Story Exercise were conducted on total scores corrected for story length and standardized to a mean of 50 and a standard deviation of 10. The latter scores appear in the summaries of

analysis of variance in Appendix I, Table D. To facilitate comparison across cross-sectional and longitudinal data, word length corrections and standardization of residuals were computed on pooled data.

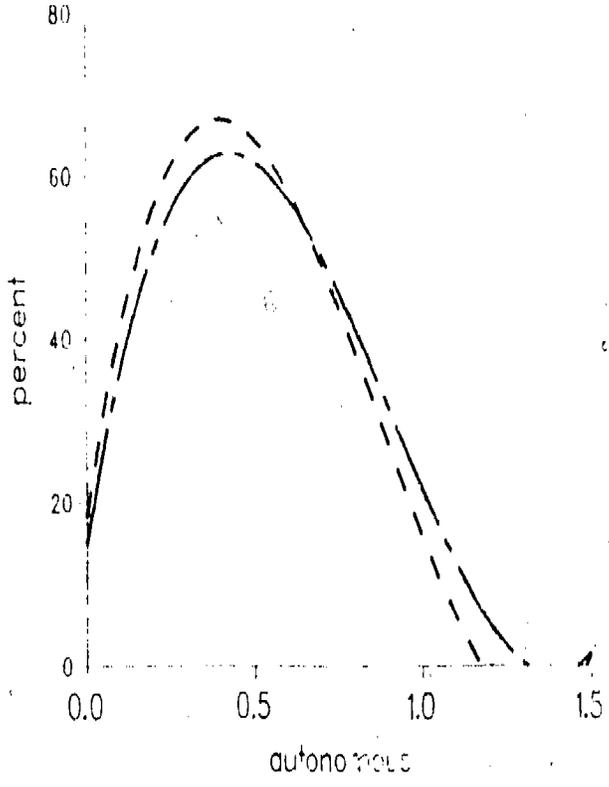
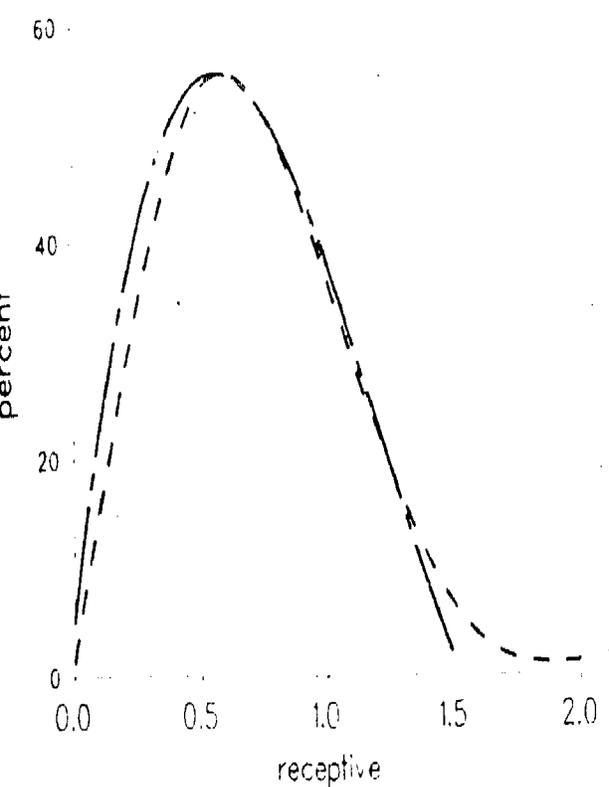
As can be observed in Figure 7, there appears to be little difference in the average score distribution of entering and graduating groups on the four Stages of Adaptation. Statistical tests for group differences (on corrected and standardized total scores) resulted in significant main effects for group only on the Integrative score. Contrary to our expectations, the entering group average was higher than that of graduating students.

Figure 8 shows the distributions of scores on the measure of Self-Definition for entering and graduating students. Although the graphic of the raw score distributions makes it appear that there were group differences, the analysis of variance test gave only a non-significant indication of group differences ( $p < .10$ ). The distributions of motive scores in Figure 9 show average differences on the Achievement Motive score and the Power Motive score, but not the Affiliation Motive score. The graduating group appears lower on the Achievement Motive and higher on the Power Motive. In the statistical analysis, the former difference between groups was significant and the latter nearly so ( $p < .10$ ). (Statistical analysis of uncorrected total scores, by the way, showed no outstanding contradiction of these results.)

The cross-sectional results from Kolb's Learning Style Inventory are presented in Figures 10 and 11. It was mentioned in the section describing the measures that there was a "built-in" correlation between the Concrete Experience score and the Abstract Conceptualization score, and between the Reflective Observation score and the Active Experimentation score (since to some extent, preference for one of the pair precludes a preference for the other in the way the instrument is designed). First, looking at the subscores in Figure 10, the graduating group shows less preference for Concrete Experience and for Reflective Observation, and a greater preference for Abstract Conceptualization and Active Experimentation. The largest discrepancies are in preferences for Reflective Observation and Abstract Conceptualization. Indeed, group differences on these two subscales were highly significant, while group differences on the Concrete Experience score and the Active Experimentation score were not significant.

Figure 11 shows the distributions of composite scores, the Abstract/Concrete Learning orientation and the Active/Reflective Learning orientation. Again, these composite scores are derived by subtracting the second subscale score from the first. There is a clear difference in the preference of graduating students for Abstract Conceptualization over Concrete Experience, and Active Experimentation over Reflective Observation. Both group differences were statistically significant. Kolb's Adaptive Style Inventory was not administered to the graduating group, so a cross-sectional comparison was not possible on this measure.

Three external criterion measures were used which reflect different aspects of generic critical thinking abilities: the



entering students  
graduating students

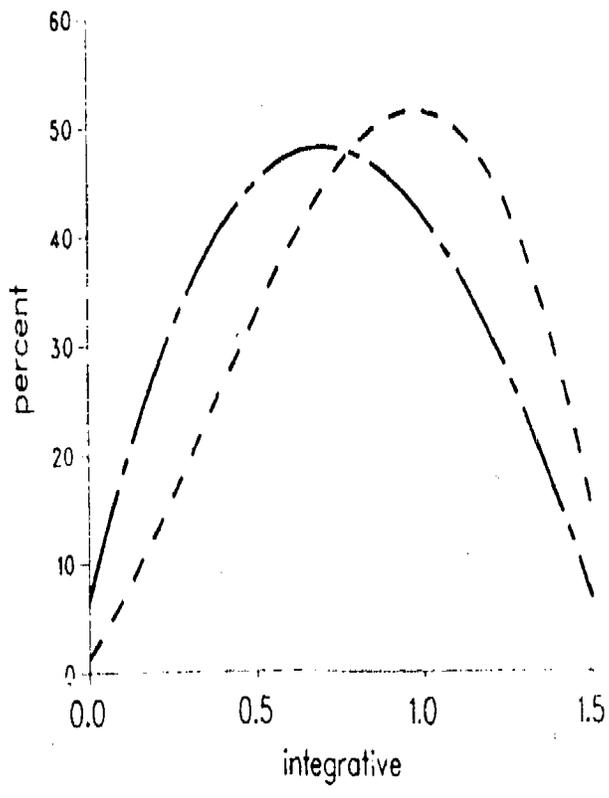
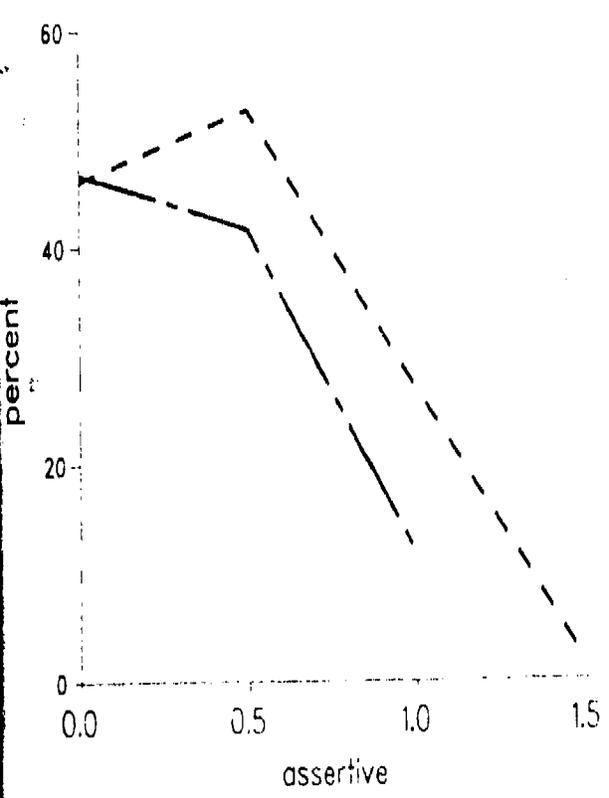


Figure 7. Picture Story Exercise/Stages of Adaptation score distributions for cross-sectional comparison of entering and graduating students.

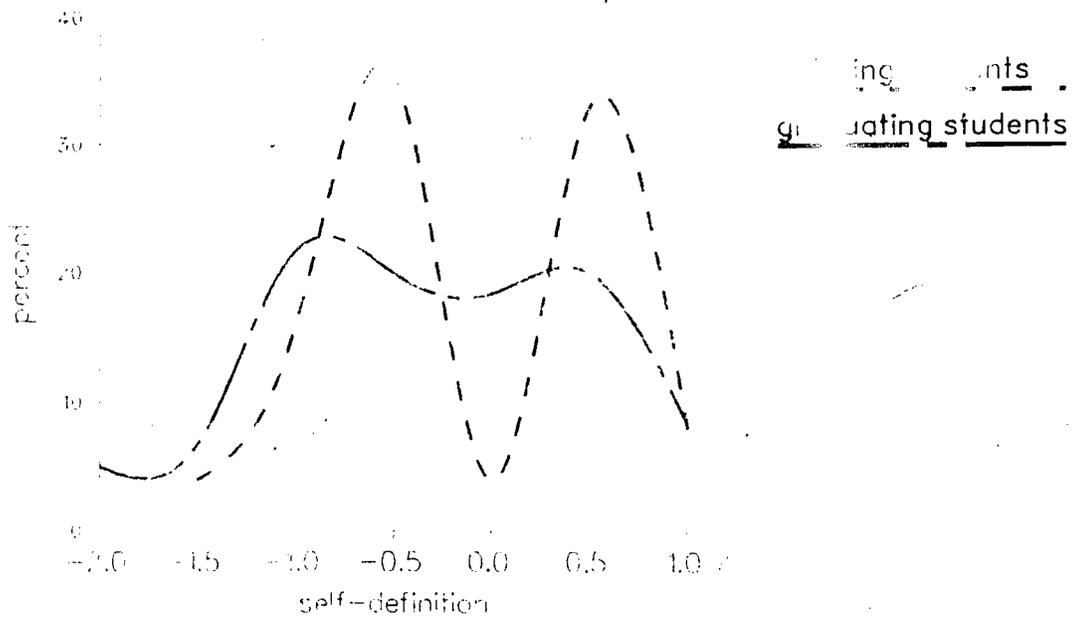


Figure 8. Picture Story Exercise/Self-definition score distributions for cross-sectional comparison of entering and graduating students.

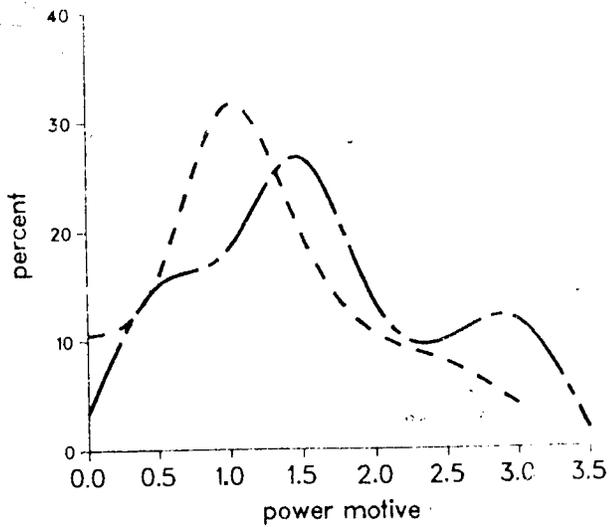
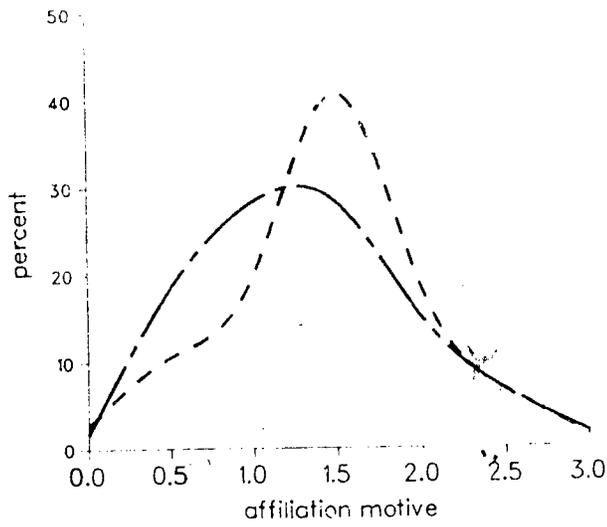
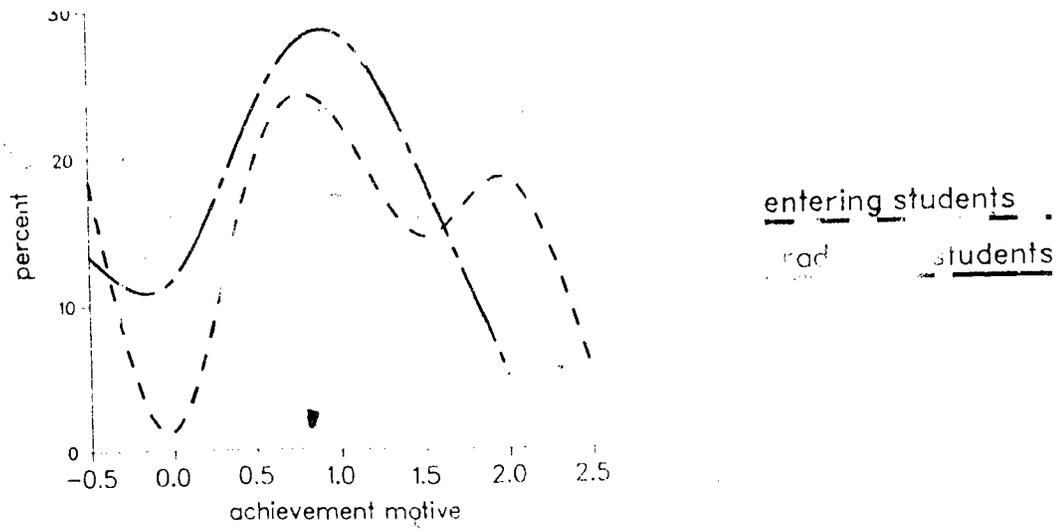
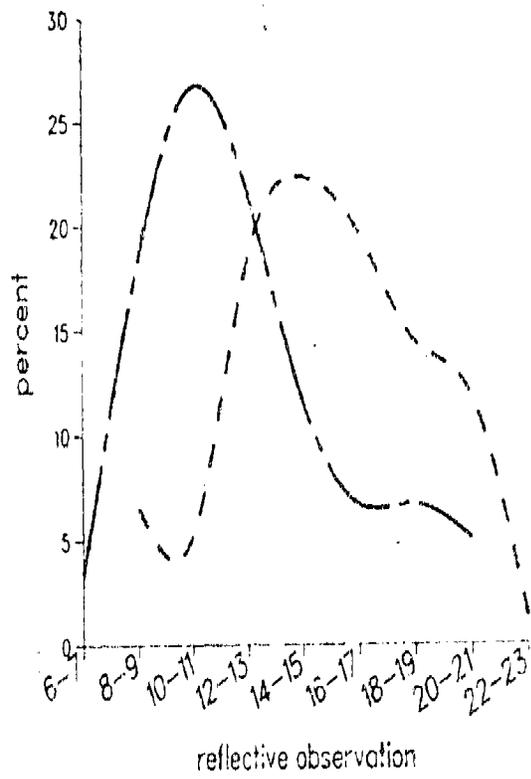
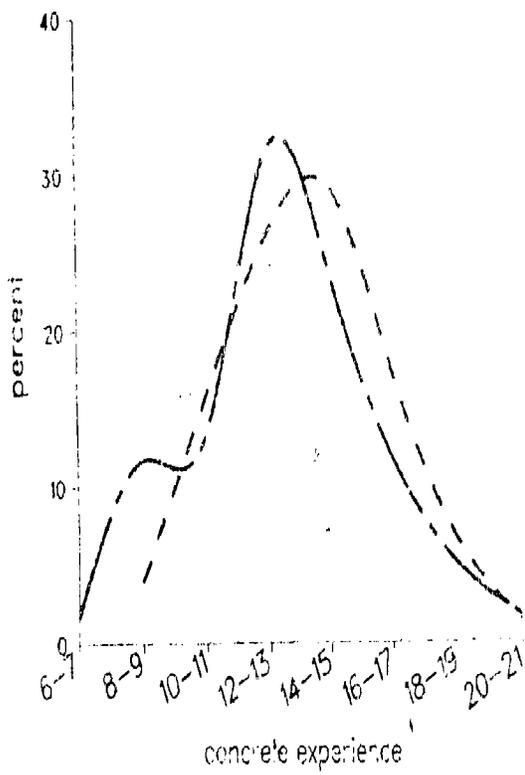


Figure 9. Picture Story Exercise/Motive score distributions for cross-sectional comparison of entering and graduating students.



entering students

graduating students

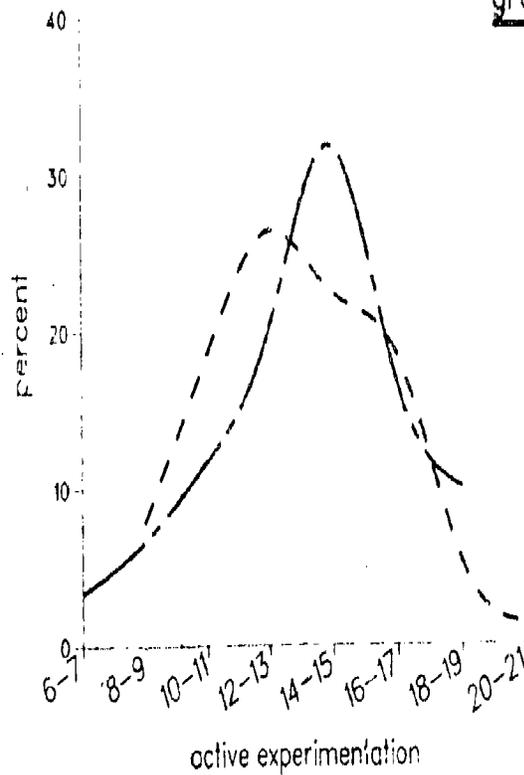
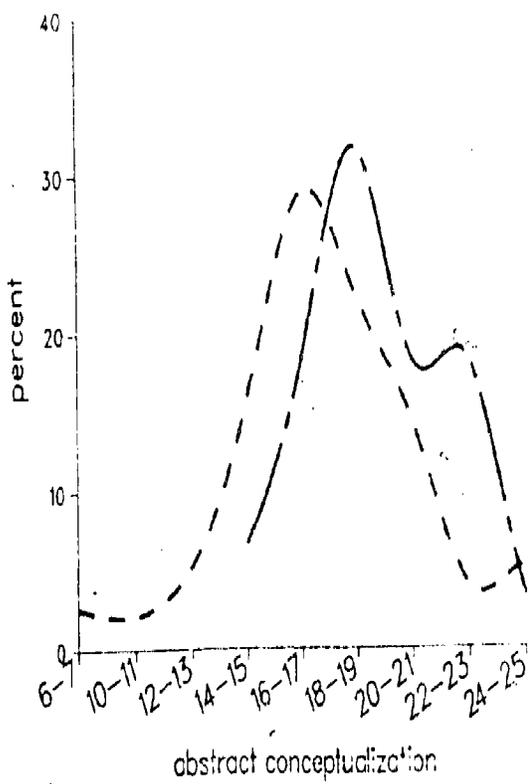


Figure 10. Learning Style Inventory score distributions for cross-sectional comparison of entering and graduating students.

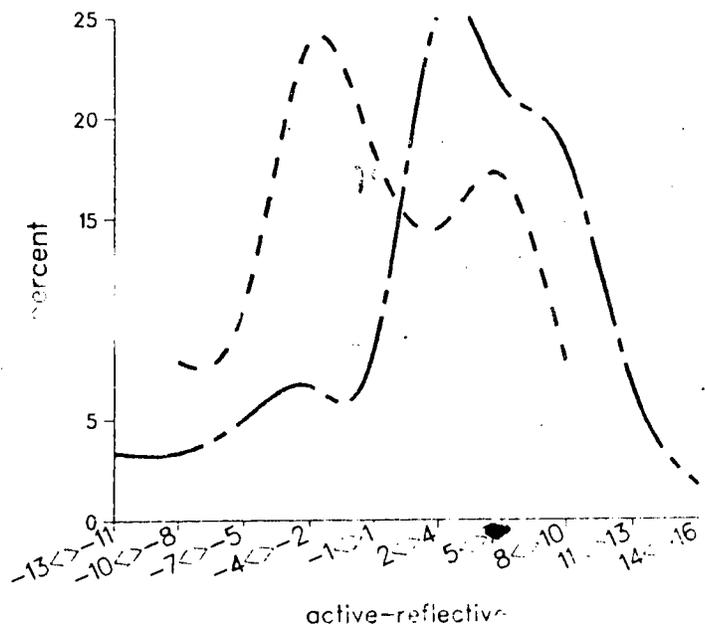
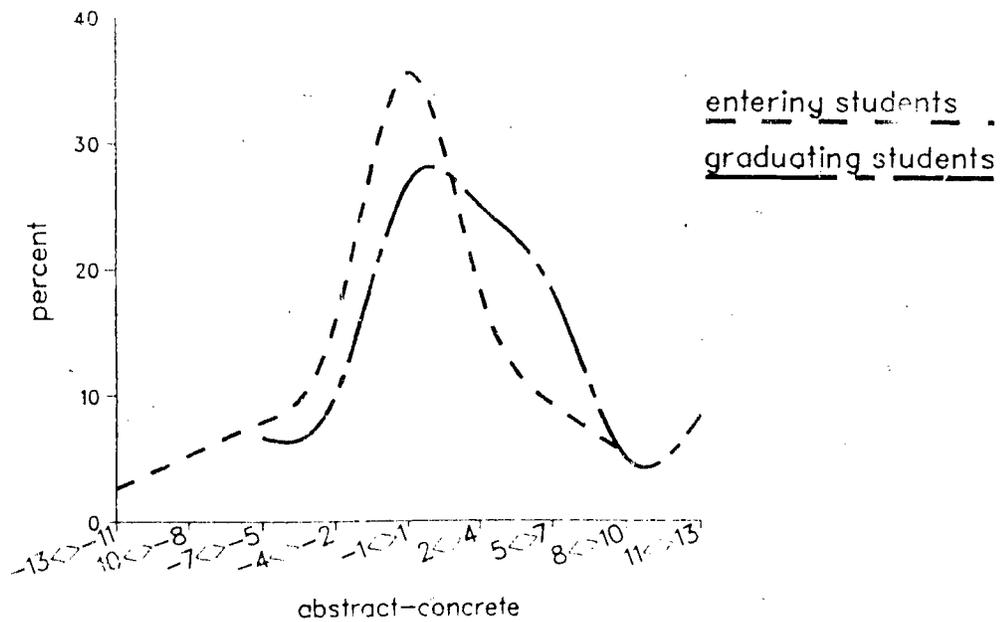


Figure 11. Learning Style Inventory/Composite score distributions for cross-sectional comparison of entering and graduating students.

Test of Thematic Analysis, Analysis of Argument, and the Critical Thinking Appraisal. The cross-sectional distributions for these measures are presented in Figures 12 through 14. For the Test of Thematic Analysis, shown in Figure 12, there was little observable difference in distributions. The test of main effects of group was not significant. Attack and Defense scores from the Analysis of Argument are shown in Figure 13. The difference between groups was significant for the Defense score, but not the Attack score. The graduating students were apparently better able to switch perspectives and defend a position they had just attacked. The three subscores of the Critical Thinking Appraisal are presented in Figure 14. Although it appears that graduating students performed better on the Induction tasks, this difference was erased when high school grade was introduced as a covariate. Likewise, differences on Deduction task were significantly correlated with high school grades, and there was no significant main effect for group.

The last of the external criterion measures introduced earlier, the Life History Exercise, was not administered to the group of graduating students.

#### Cross-Sectional Summary

Summarizing the cross-sectional results, the graduating group had a significantly higher average on three of the five cognitive-developmental measures. With the exception of an unexpected higher average Integrative score for entering students, there were no significant differences between groups on Stages of Adaptation derived from the Picture Story Exercise. Nearly significant differences were found on Self-Definition scores and Power Motive scores, with the graduating group showing a lower mean score on Self-Definition and a higher mean score on the Power Motive. The graduating group scored significantly lower on the Achievement Motive, and there was no difference in Affiliation Motive scores. The graduating group showed a significantly greater preference for Abstract Conceptualization and a significantly lower preference for Reflective Observation on the Learning Style Inventory. The only significant group difference on the critical thinking measures was a higher Defense score for graduating students on the Analysis of Argument.

Table 21 presents this summary of significant differences between groups for the cross-sectional study. To the left of the list of measures are shown the two test characteristics discussed earlier. (This table format will be repeated in the longitudinal results section to facilitate cross-reference.) To the right of the measures is the column indicating whether the graduating group was significantly higher or lower than the entering group. A blank indicates no difference; a question mark appears where the probability value was greater than .05 but less than .10. Grey areas indicate that the measure was not administered to one or both groups.

With respect to the distinction noted between production and recognition tests, while there is no clear difference simply in

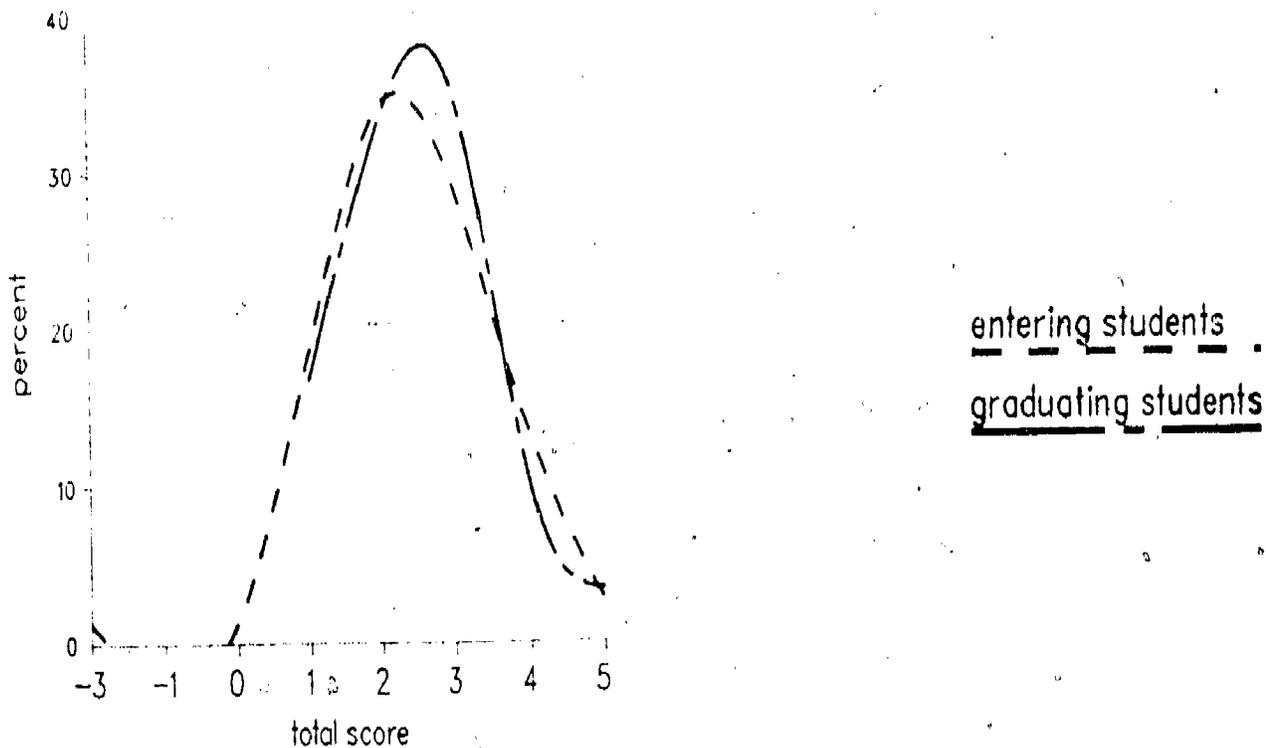


Figure 12. Test of Thematic Analysis score distributions for cross-sectional comparison of entering and graduating students.

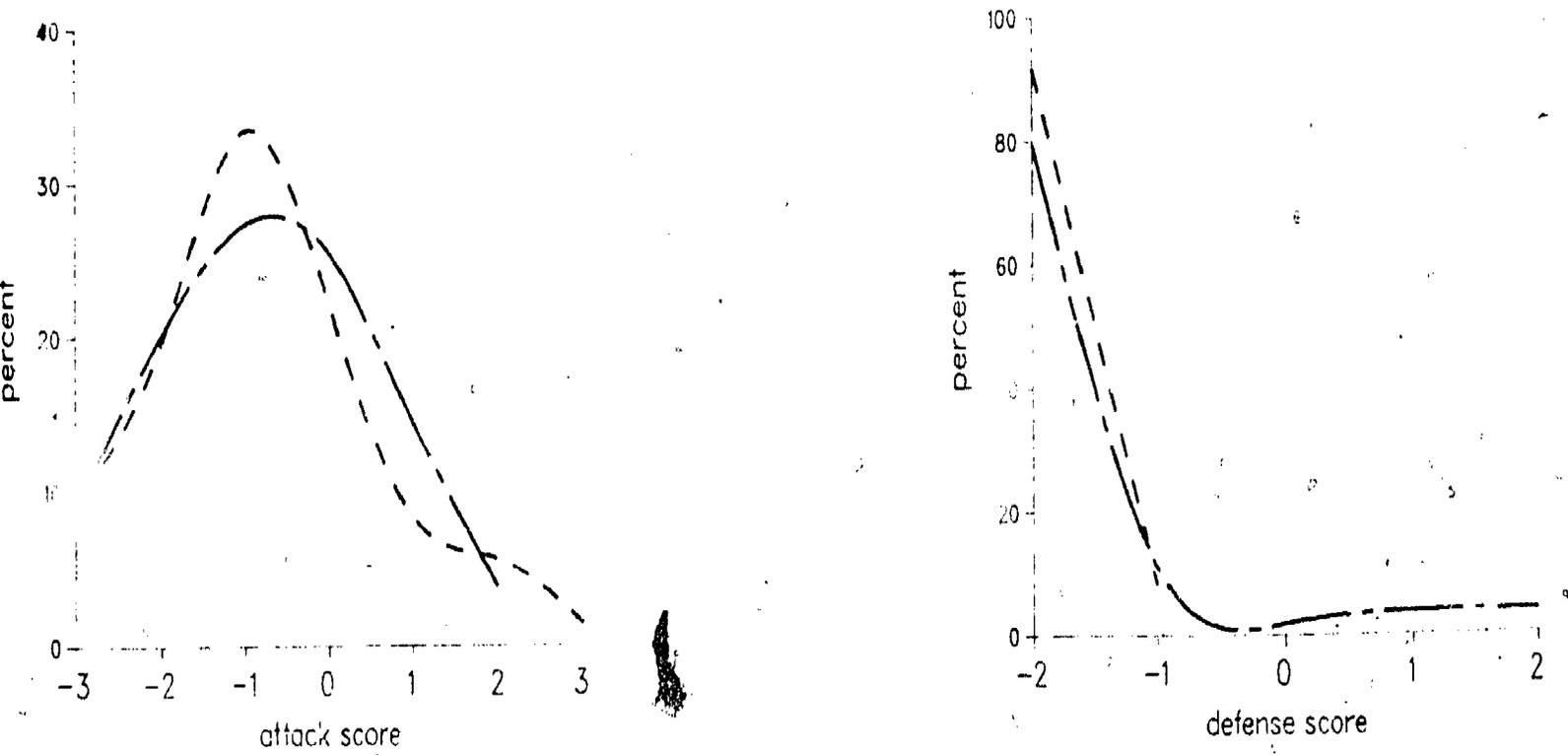


Figure 13. Analysis of Argument score distributions for cross-sectional comparison of entering and graduating students.

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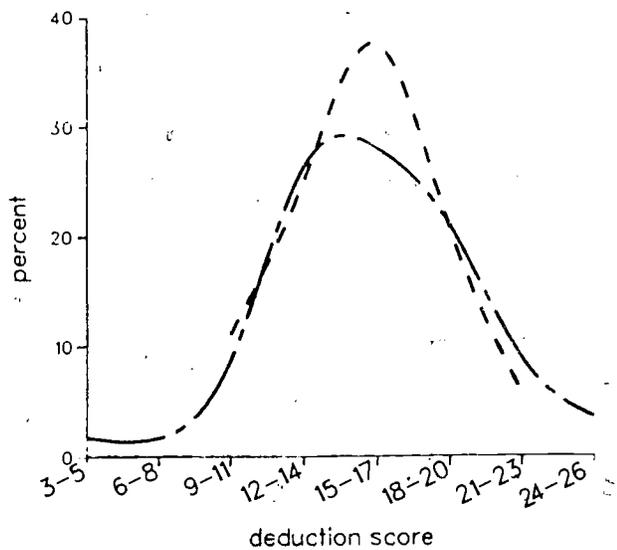
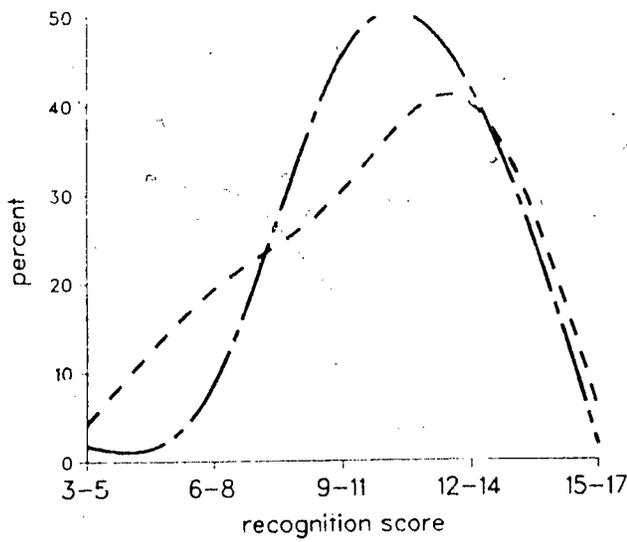
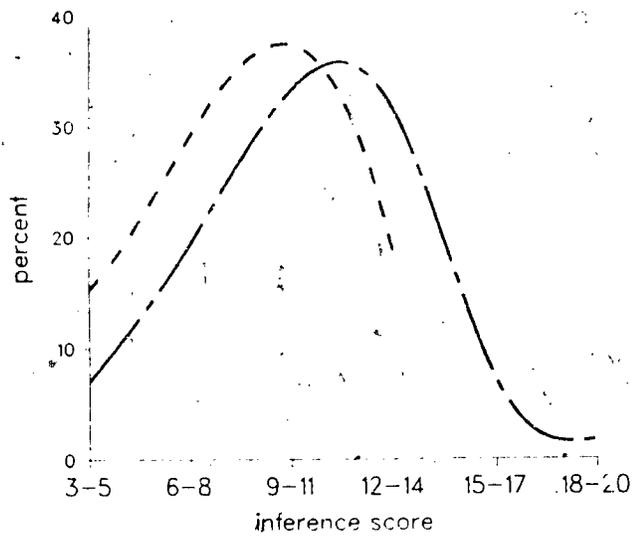


Figure 14. Critical Thinking Appraisal score distributions for cross-sectional comparison of entering and graduating students.

Table 21.

Significant Differences Between Groups For  
the Cross-sectional Study

		Covariate	Group Having Significantly Higher Mean Score
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay		
	"Decision" Essay		Graduating
	"Career" Essay		Graduating
Sentence Completion Test			Graduating
Moral Judgment Instrument		Age	
Defining Issues Test	P% Score	Age	Graduating
	D Score	Age	Graduating
Test of Cognitive Development		GPA	
Picture Story Exercise	Stages of Adaptation		
	Receptive		
	Autonomous		
	Assertive		Entering
	Integrative		Entering?
	Self-Definition		Entering
Learning Style Inventory	Achievement Motive		Graduating?
	Affiliation Motive		
	Power Motive		
Test of Thematic Analysis	Concrete Experience		Entering
	Reflective Observation		Graduating
	Abstract Conceptualization		
	Active Experimentation		
Analysis of Argument	Abstract/Concrete Learning Orientation		Graduating
	Active/Reflective Learning Orientation		Graduating
Critical Thinking Appraisal	Attack		
	Defense		Graduating
Critical Thinking Appraisal	Inference	GPA	
	Recognition	GPA	
	Deduction		

terms of significant results, the quantitative data analysis summary presented in Table D in Appendix I does show a clear difference in the order of magnitude of differences recorded by production versus recognition tests. The  $F$  ratios obtained on recognition tests were distinctly higher than on production tests. With respect to the working hypothesis concerning the developmental character of the measures, the pattern of results shown in Table 21 seems to support the contrast of the cognitive-developmental measures and less developmental measures.

Specifically, age was found to be a significant covariate only on the measures of moral development while high school grade was a significant covariate of two subtests of the Critical Thinking Appraisal. The Test of Cognitive Development was also related to academic achievement however, which contradicted our expectation of the instrument as a developmental measure. The relationship signals the possibility that the kinds of problems chosen to measure formal operations are too sensitive to academic experiences. The results give multiple indications of cognitive-developmental differences between groups and multiple indications of no difference in generic critical thinking ability.

#### Longitudinal Results: Change Over Occasions

##### Change as a Function of Time

We now turn to the longitudinal data for answers to the basic question: did the instruments record difference and change? Figures 15 through 30 present, for each instrument, graphic representation of outcomes as a function of time of assessment, and also display differences for four subpopulations defined by age cohort and cumulative achievement in the competence based assessment process. A straight line sloping up from left to right indicates a positive linear correlation between outcome and time of assessment. The horizontal axis represents time; the vertical axis represents the particular metric of each measure. The unequal intervals between assessments accurately represent the unequal time between assessments, i.e., the second assessment was two years after entrance and the third assessment was one and one-half years after the second.

The four lines give additional information on the relative level of performance of subgroups defined by membership in two dichotomous categories. Age cohort divides the population into traditional and older age groups. Traditional age students were 17-19 years old at entrance; older students were 20-55 years of age at entrance. The second dichotomy pertains to educational achievement in the competence based learning environment, indexed by number of competence level units accumulated during the course of the study. These units are analogous to credit hours, but are earned by demonstration of levels of competences defined in the Alverno curriculum. This four-way breakdown, while ignoring the variable influence of other background and program information,

provides a comparison of the relative importance of age and achievement across all measures. Summary data for these analyses are provided in Table E of Appendix I.

The figures illustrating change over time display regression lines computed independently for each subsample created by the four-way breakdown. This allows the slope of each line to depict the rate of change for each subgroup separately. The statistical analysis summarized in Table E and presented in the text were conducted on pooled data. A result indicating significant change over time means there was significant overall change, though the figure may make it appear that one or more subgroups changed more than others.

### Cognitive Developmental Measures

Figure 15 shows the three essay ratings of the Measure of Vocational, Educational, and Personal Issues. The two lines representing membership in the older age group are above those representing the traditional age group, and they are closer to each other than the pair is to the lower pair of traditional age subgroups. This shows that, on average, age was a more important factor in ratings on this cognitive-developmental measure than was achievement, and that older students received higher ratings.

For the "Best Class" essay, the upward slope of the lines from first to third assessment indicates an average improvement in ratings over time. For the "Best Class" essay, both the relationship between overall outcomes and time, and the mean difference between older and traditional age students, were statistically significant. Differences in cumulative achievement level were not significant. As measured by this essay, the population as a whole showed development in perspective on classroom learning over the study period. Older students showed a generally higher level of development than traditional age students. In terms of Perry's (1970) scheme, the older student enters college with a multiplicitic perspective while the traditional age student still exhibits some dualistic thinking.

On the "Decision" essay, a slightly different picture emerges. The slope for traditional age students shows a curvilinear relationship between outcomes and time of assessment. The ratings increased slightly from first to second assessment, but then decreased from second to third assessment. As with the "Best Class" essay, the relationship between outcome and time of assessment was statistically significant. In this case, however, both age and achievement level make a statistically significant difference in mean level of rated development. Older students are rated higher than traditional age students with achievement controlled, and higher achieving students are rated higher than lower achieving students with age controlled. This pattern is difficult to interpret from the numbers alone, since the content of the "Decision" essay is not constrained by the instrument instructions. Qualitative analysis of the protocols will be necessary to determine the referents of these apparent shifts in perspective.

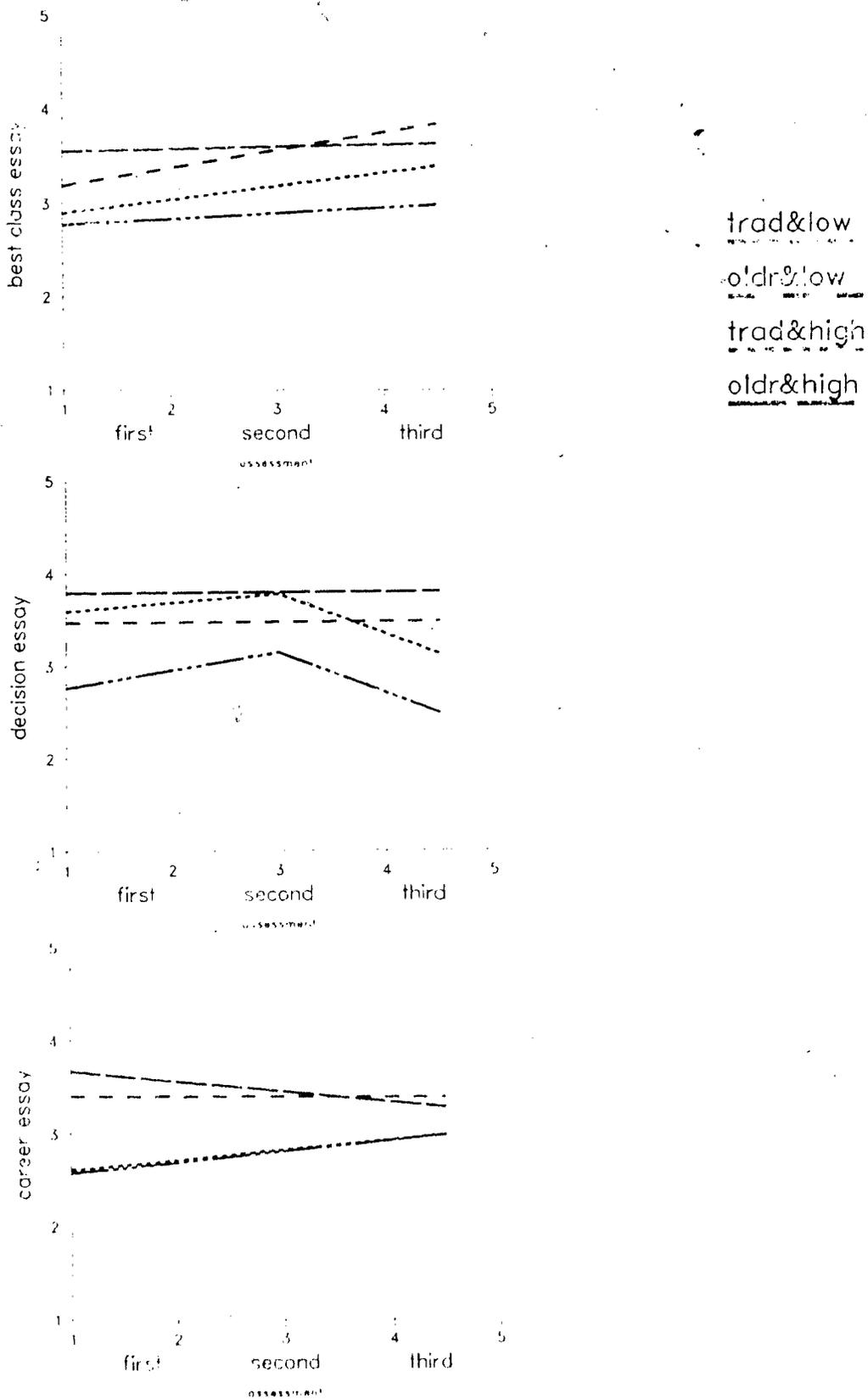


Figure 15. Measure of Vocational, Educational, and Personal Issues scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

For the "Career" essay, the small positive correlation between outcomes and time of assessment was not statistically significant. There was a clear and significant mean difference in the ratings given to older students versus traditional age students, while there was just as clearly no difference between groups classed by cumulative achievement. The older students began with and maintain a more multiplistic perspective on career issues as measured by this instrument.

Results from the Washington University Sentence Completion Test of Ego Development, presented in Figure 16, show very little overall differentiation related to the variables of this analysis. Neither the correlation between outcomes and time of assessment for the three entrance cohorts combined, nor the mean difference related to the two dichotomous variables of age cohort and achievement were significant. The overall population mean falls between the Conformist/Conscientious transition and the Conscientious stage of Ego Development.

Figures 17 and 18 present the longitudinal data from the two measures based upon Kohlberg's Moral Development theory. For the Moral Maturity Score from Kohlberg's Moral Judgment Instrument, there was no relationship between outcomes and time of assessment for the small sample assessed. Mean differences between older and traditional age cohorts were significant, with older students scoring higher on the index (i.e., exhibiting more Post-Conventional thinking). Means of subgroups divided on achievement were not statistically significant. In contrast, both P% and D indices from Rest's Defining Issues Test were linearly related to time of assessment. The Principled Thinking index (P%) indicated a somewhat greater rate of change over time. Mean differences between age cohorts were significant for both indices. The achievement dichotomy also accounts for significant mean differences in the case of the Principled Thinking index, but not on Davison's D score. Common sense could suggest that improvement in recognition of more principled value positions in some areas might occur before, or without, change occurring "across the board."

The Test of Cognitive Development results are shown in Figure 19. The overall improvement in scores across assessments was statistically significant, but mean differences for age and achievement cohorts were not.

The longitudinal results on the five cognitive-developmental measures generally support and extend the findings from the cross-sectional results. Statistically significant improvements in outcome over time were found on the Measure of Vocational, Educational, and Personal Issues, the Defining Issues Test, and the Test of Cognitive Development. There were significant mean differences between high and low achievement subgroups on the "Decision" essay of the Measure of Vocational, Educational and Personal Issues, and on the Principled Thinking Index of the Defining Issues Test. Mean differences between traditional and older age cohorts were found on all but the Ego Development measure and the Piagetian-based Test of Cognitive Development. In all cases except the Test of Cognitive Development, the age cohort dichotomy was observed to be a more important variable

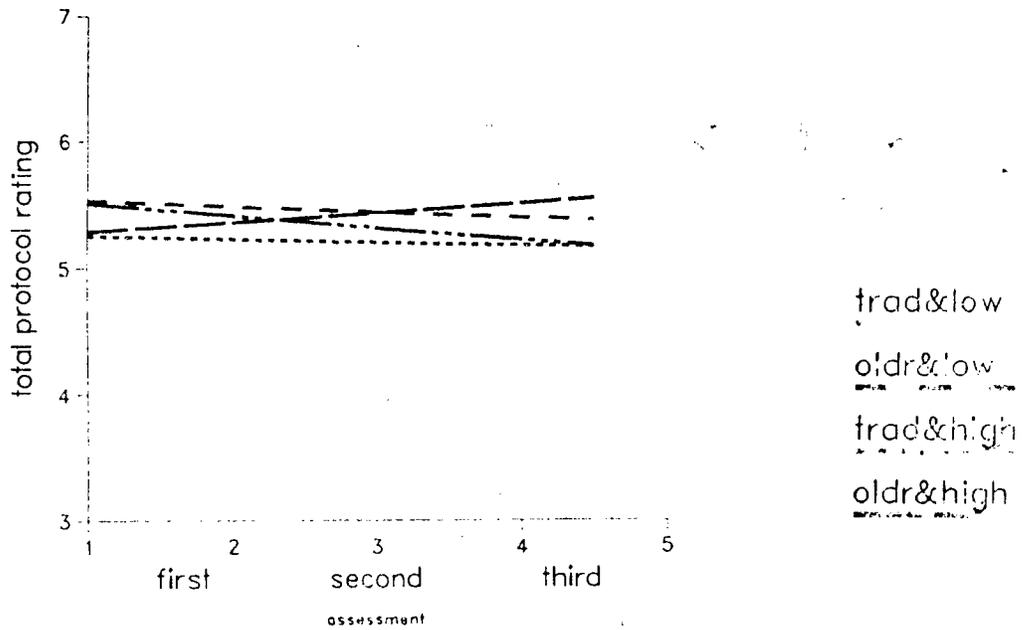


Figure 16. Sentence Completion Test scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

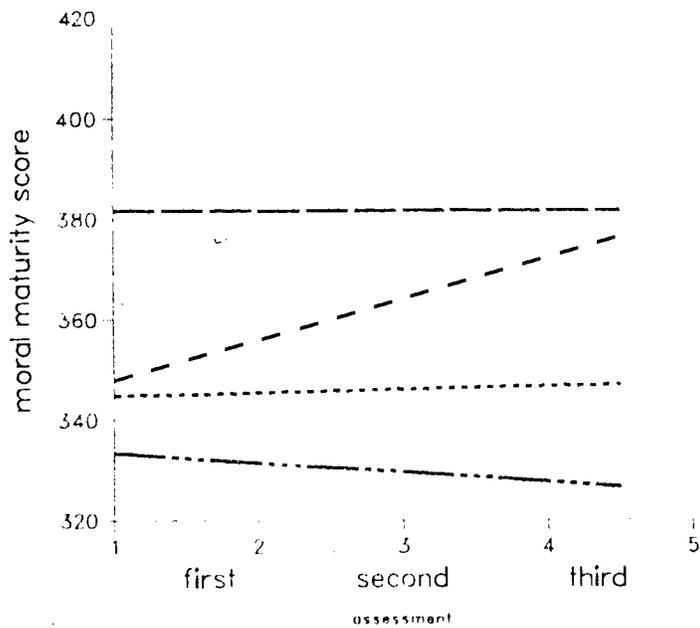


Figure 17. Moral Judgment Instrument scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

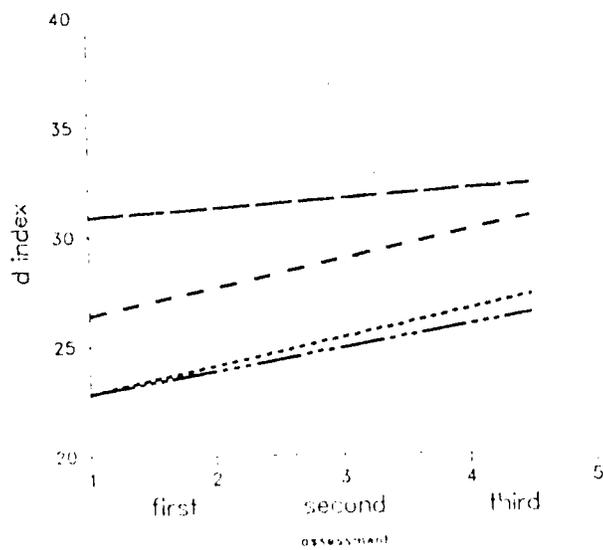
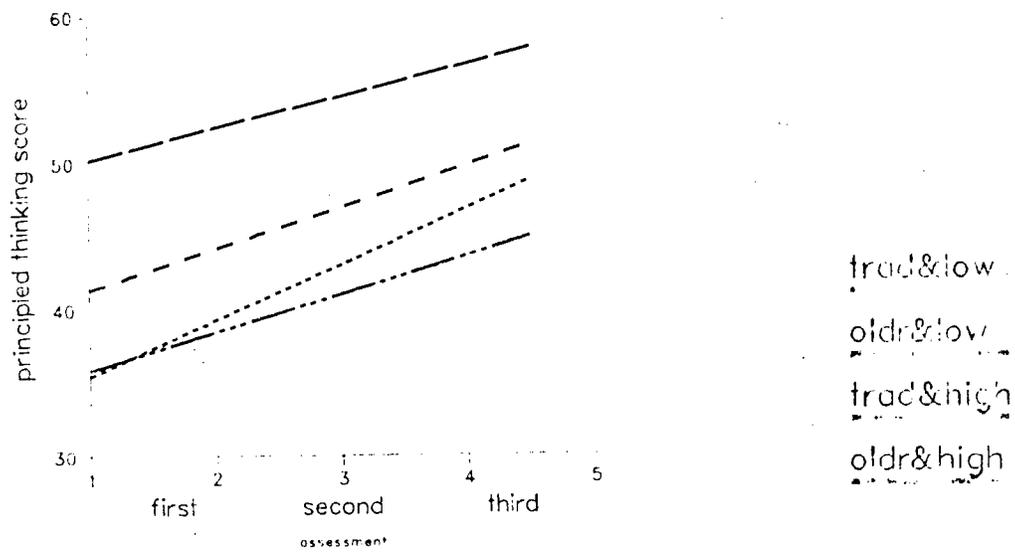


Figure 18. Defining Issues Test scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

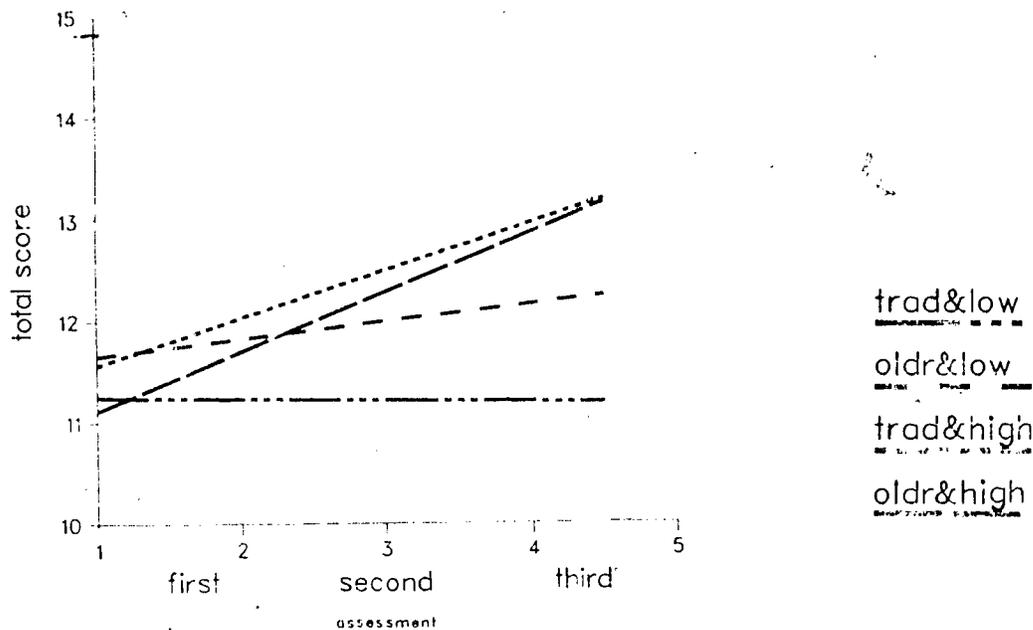


Figure 19. Test of Cognitive Development scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

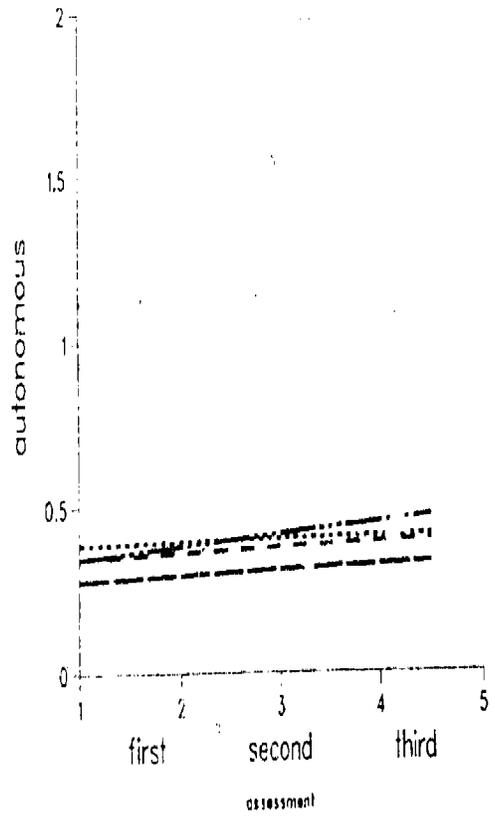
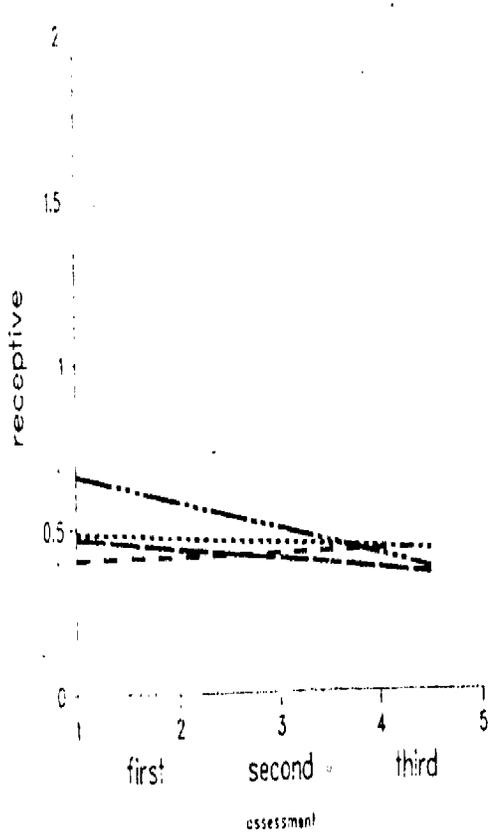
than the educational achievement dichotomy. Simple comparisons of cross-sectional and longitudinal results on each instrument are confounded by the higher proportion of older students in the longitudinal data base.

#### Generic Ability Measures

Figures 20 through 22 present longitudinal data derived from the Picture Story Exercise. Results from the Stages of Adaptation scheme are shown in Figure 20.

The overall relationship of outcome and time of assessment was statistically significant for Receptive and Integrative indices. Scores on both indices indicate an overall decline across the three assessments. The decline of a passive-receptive orientation was, in the context of this study, a positive and expected finding. The decline in the Integrative index, which matches the cross-sectional result, was unexpected. The cumulative achievement dichotomy produced no significant mean differences on the four indices of Stages of Adaptation. The age cohort difference was significant for the Receptive and Autonomous stage scores, but not the Assertive and Integrative scores.

The Self-Definition index shown in Figure 21 was not significantly related to time of assessment. There was a significant mean difference between age cohorts, with traditional age students scoring higher on the Self-Definition scale.



trad&low  
 oldr&low  
 trad&high  
 oldr&high

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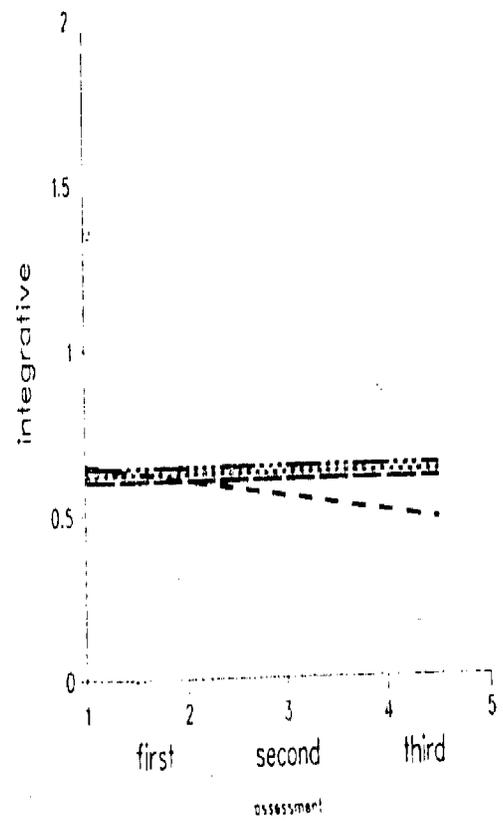
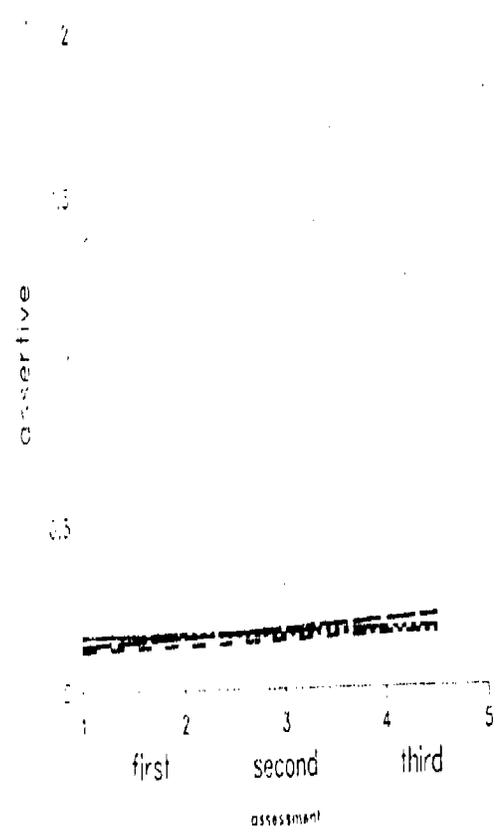


Figure 20. Picture Story Exercise/Stages of Adaptation scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

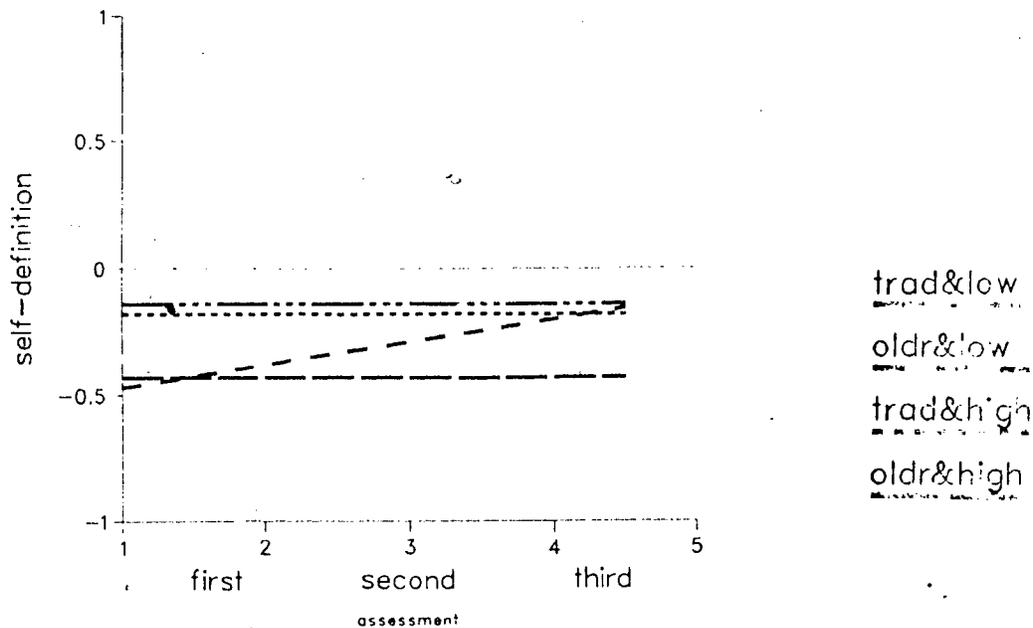


Figure 21. Picture Story Exercise/Self-Definition scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

This also matches the cross-sectional data when entering students scored higher than graduating students. None of the motive measures, shown in Figure 22, were significantly related to time of assessment, nor were mean differences between the dichotomized subgroups significant. As was the case with the graphic description of cross-sectional results, the figures showing longitudinal results from the Picture Story Exercise describe outcomes in terms of an average score across six stories, while statistical analyses were computed on total scores corrected for story length and standardized.

The Learning Style Inventory results in Figures 23 and 24 provide the only case in which the educational achievement dichotomy produced significant mean differences and the age cohort grouping did not. The structurally correlated Concrete Experience and Abstract Conceptualization subscales, presented in Figure 23, and their composite representation as Abstract/Concrete Learning orientation, presented in Figure 24, show the high cumulative achievement group had a significantly lower preference for Concrete Experience and a significantly greater preference for Abstract Conceptualization. The complimentary scales on preferences for Reflective Observation and Active Experimentation did not reveal significant mean differences based on either grouping, though in simple raw score terms, age appears to make more of a difference than achievement. All scales from the Learning Style Inventory were significantly related to time of assessment, except for the Active Experimentation subscale shown in Figure 23. Consistent with the

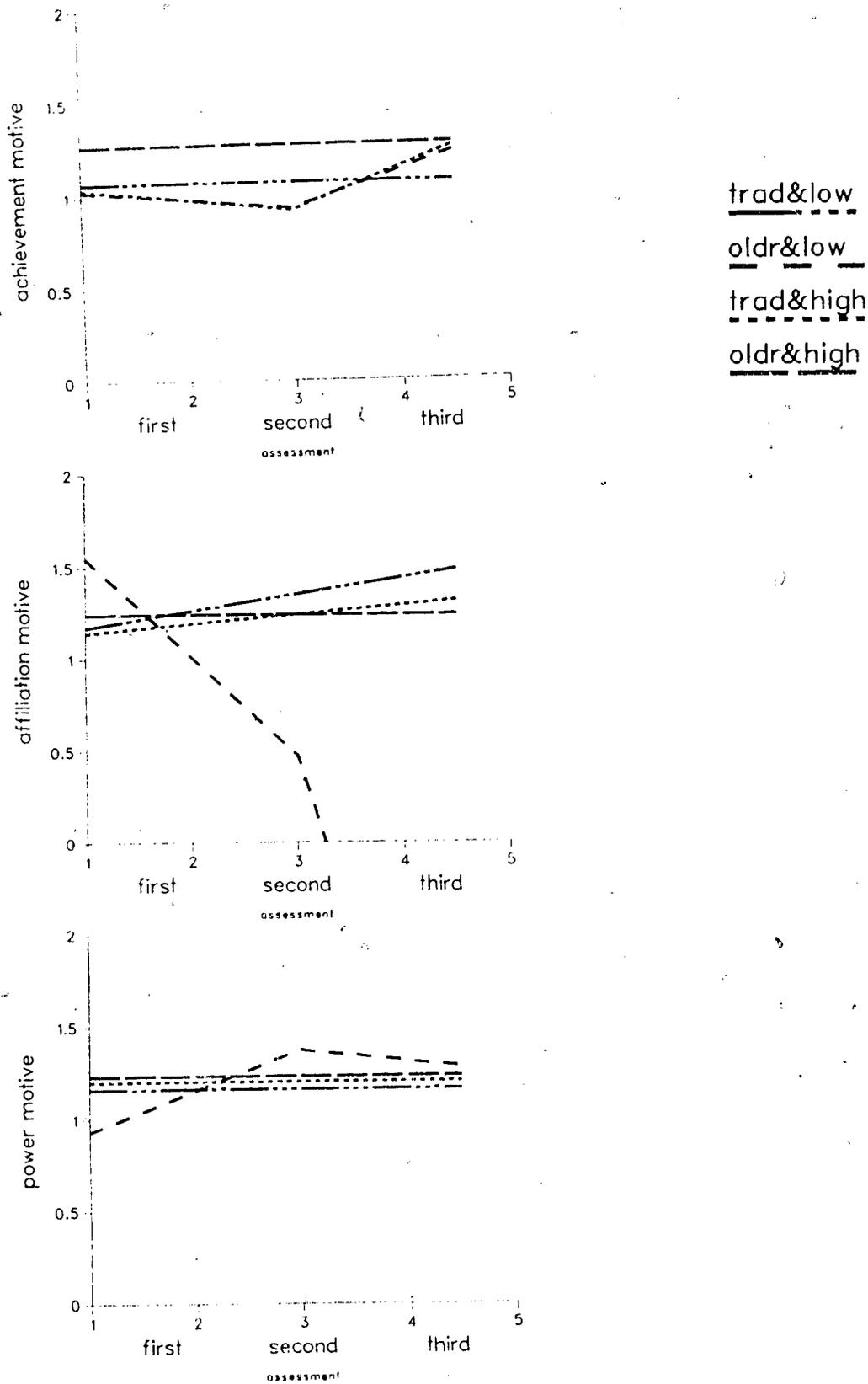


Figure 22. Picture Story Exercise/Motive scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

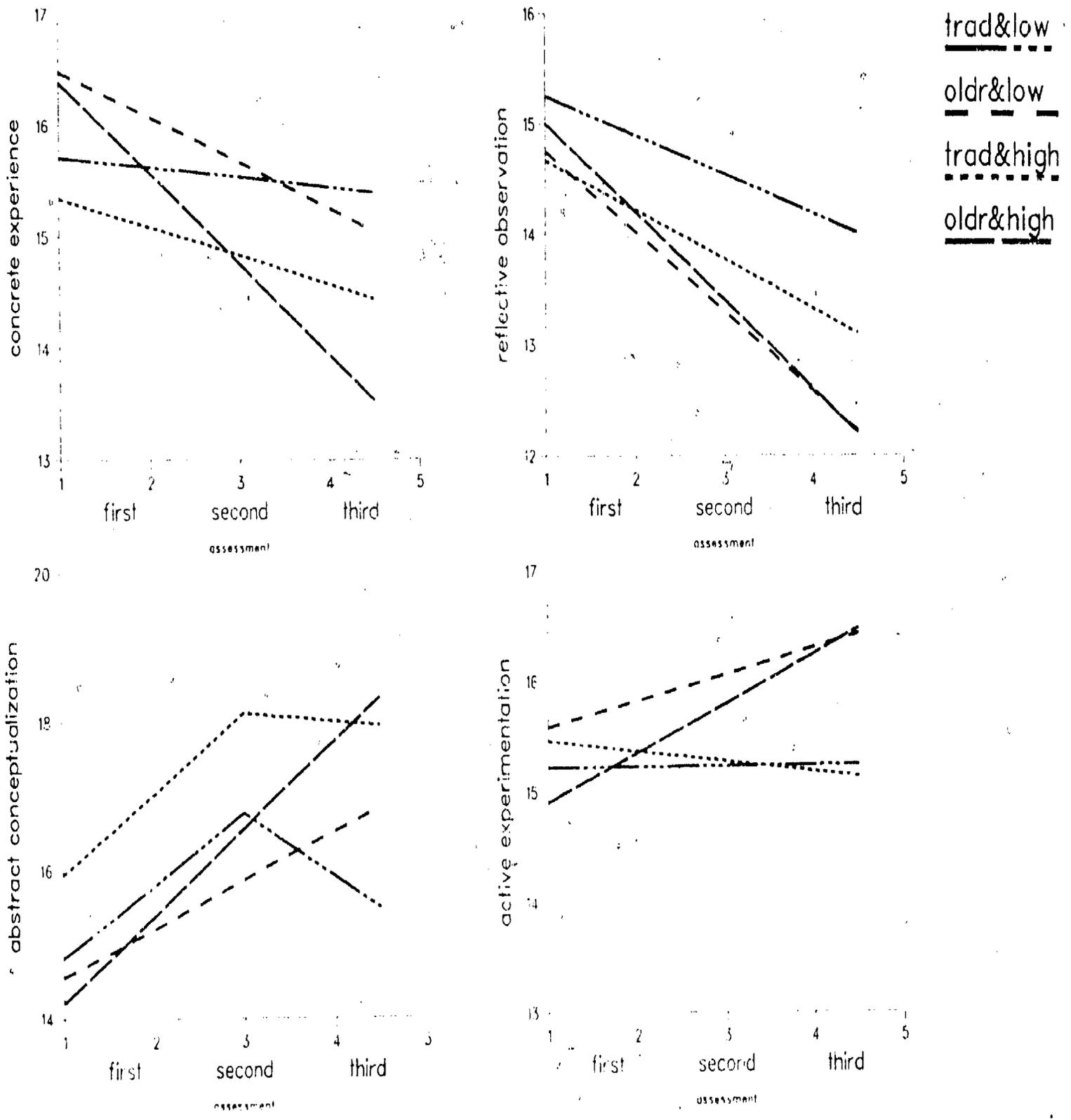


Figure 23. Learning Style Inventory scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

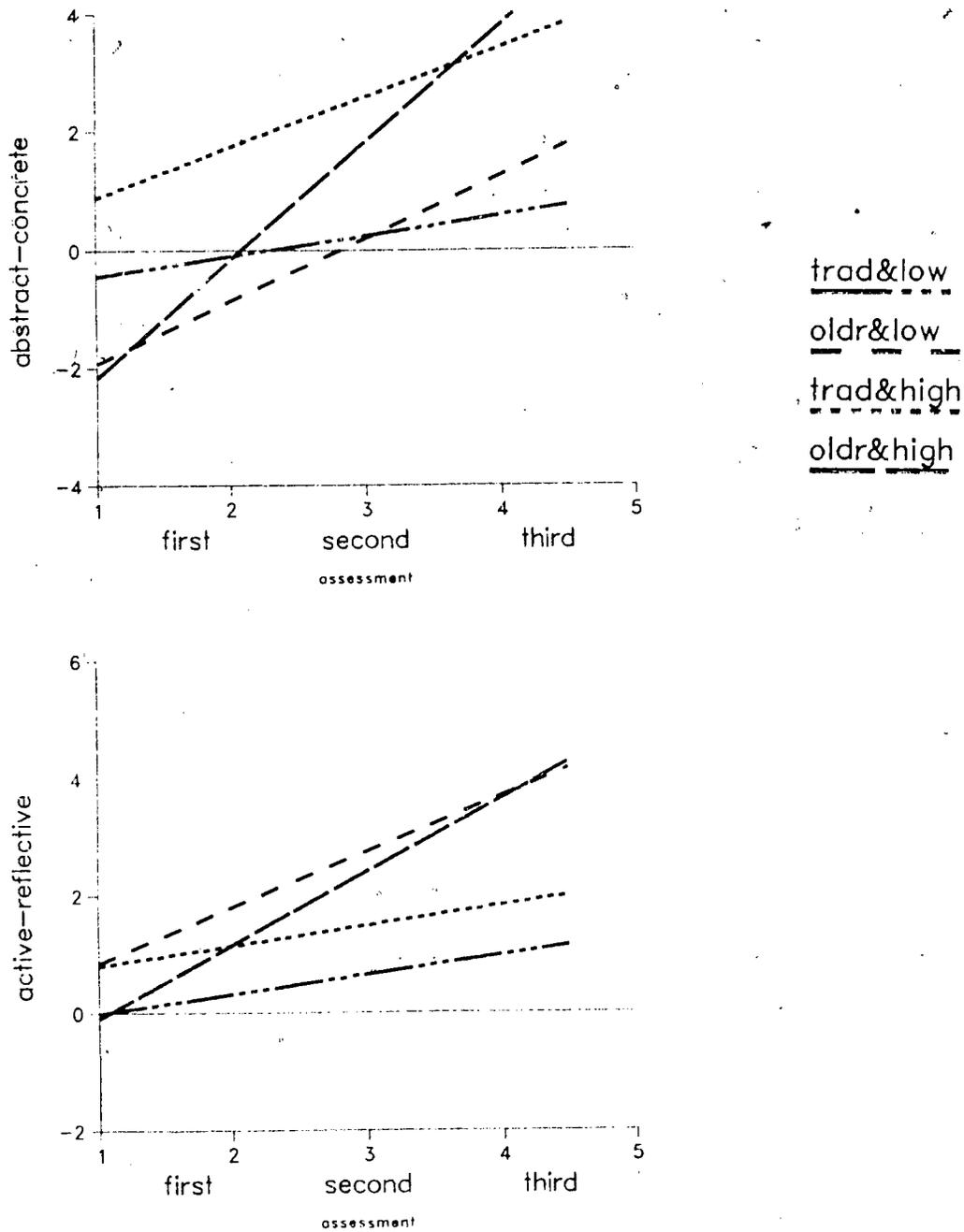


Figure 24. Learning Style Inventory/Composite scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

cross-sectional results, the dramatic changes over time seem to occur in increasing preference for Abstract Conceptualization over Concrete Experience, and a decreasing preference for Reflective Observation in relation to Active Experimentation.

The Adaptive Style Inventory was only available for administration to all three entrance cohorts for second and third assessments. The results show no significant overall change. On this measure, which was in part designed to overcome the structural limitations of the Learning Style Inventory, the total Concrete Experience scale score gives evidence of age cohort differences not found on the Learning Style Inventory, and this age cohort difference remains in the composite Abstract/Concrete Adaptation orientation. The small differences among other subgroups on Reflective Observation, Abstract Conceptualization, and Active Experimentation presented in Figure 25 were not statistically significant, nor were they significant on the Active/Reflect composite score shown in Figure 26.

Figures 24 through 26 present longitudinal data from the three measures of generic critical thinking abilities. For the Test of Thematic Analysis, in Figure 27, there was no overall change across the three assessments, but older students as a group performed significantly better than traditional age students. The difference between high and low achievement groups was not significant.

There was no relationship with time of assessment on either Attack or Defense scores from the Analysis of Argument, neither were there mean differences related to age cohort or cumulative achievement. Analysis of Argument results are shown in Figure 28.

All three subscores of the Critical Thinking Appraisal, in Figure 29, were found to be significantly related to time of assessment. Older students obtained higher scores on Inference and Recognition subtests, but there were no age differences on the Deduction subtest. The educational achievement dichotomy did not produce significant mean differences on any of the three subtests.

Life History exercise results were available for all cohorts in the second interval only. There were no significant differences found in relation to time of assessment of either age or educational cohorts.

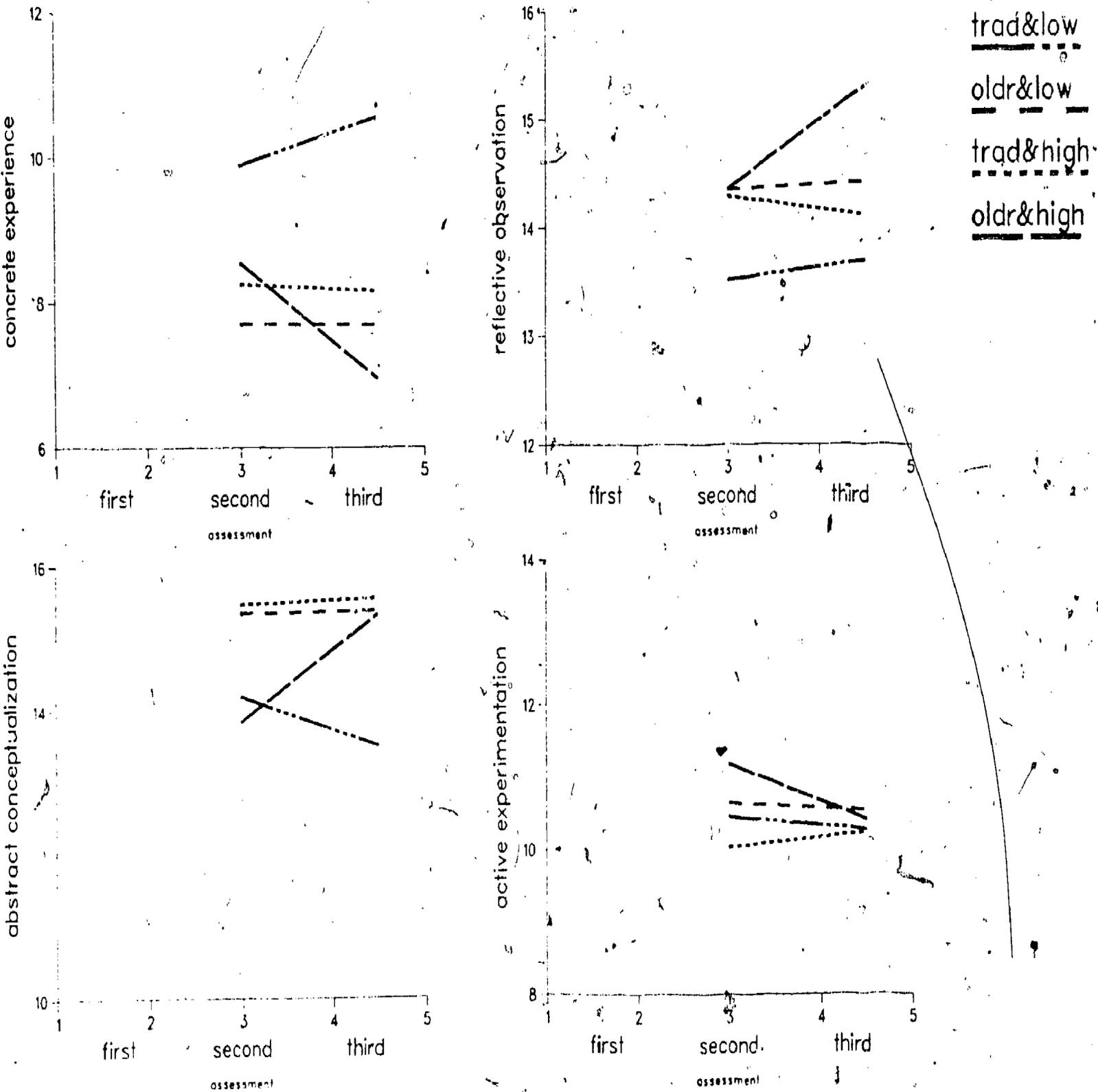


Figure 25. Adaptive Style Inventory scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

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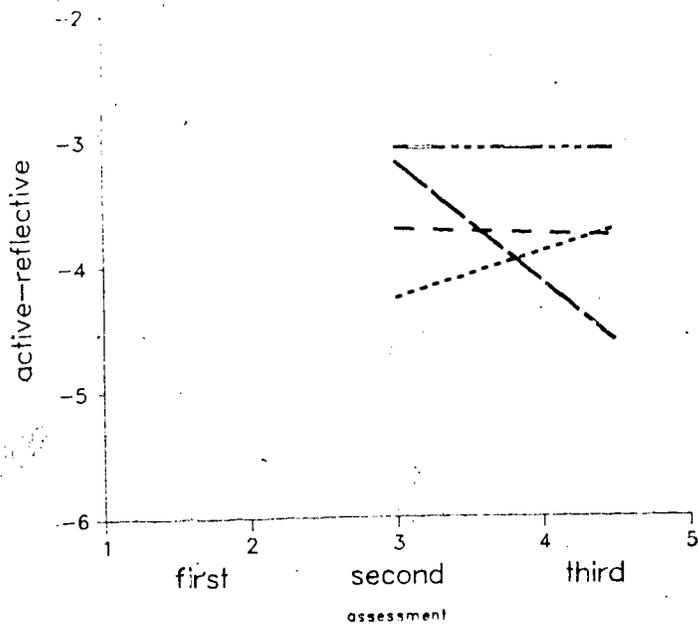
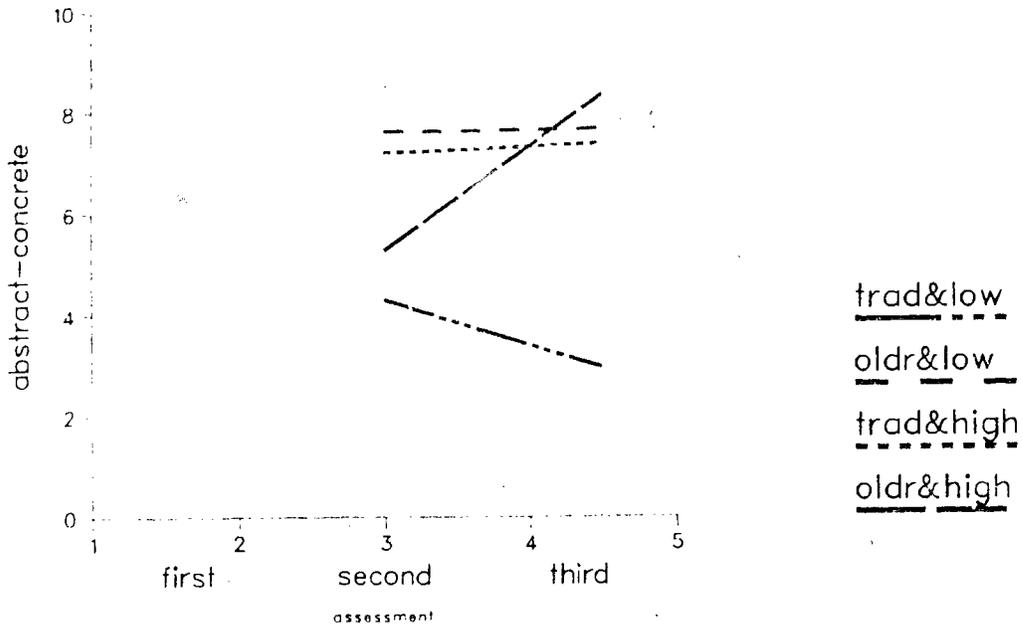


Figure 26. Adaptive Style Inventory/Composite scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

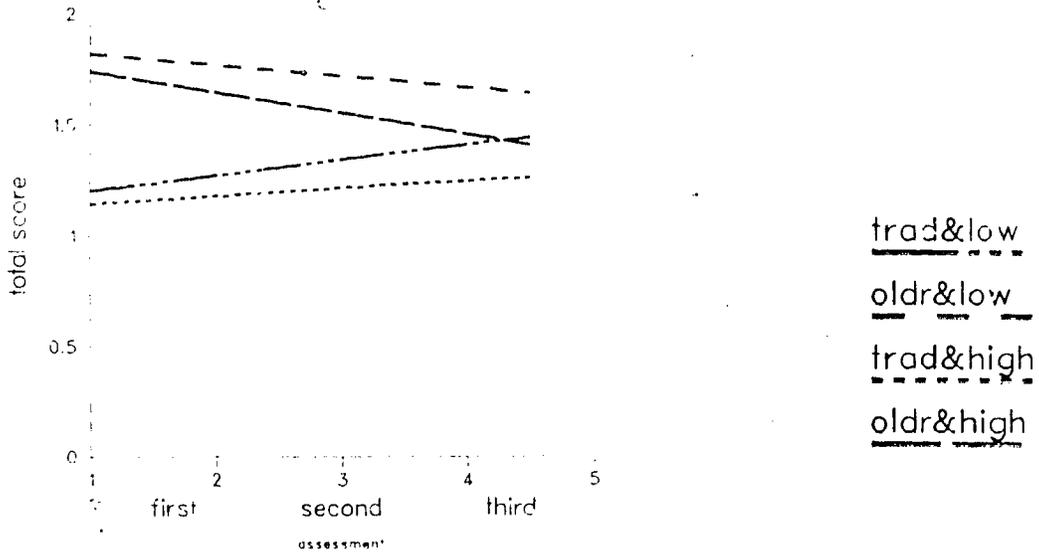


Figure 27. Test of Thematic Analysis scores as a function of time for student grouped by age cohort (traditional or older) and by college performance (high or low).

trad&low  
oldr&low  
trad&high  
oldr&high

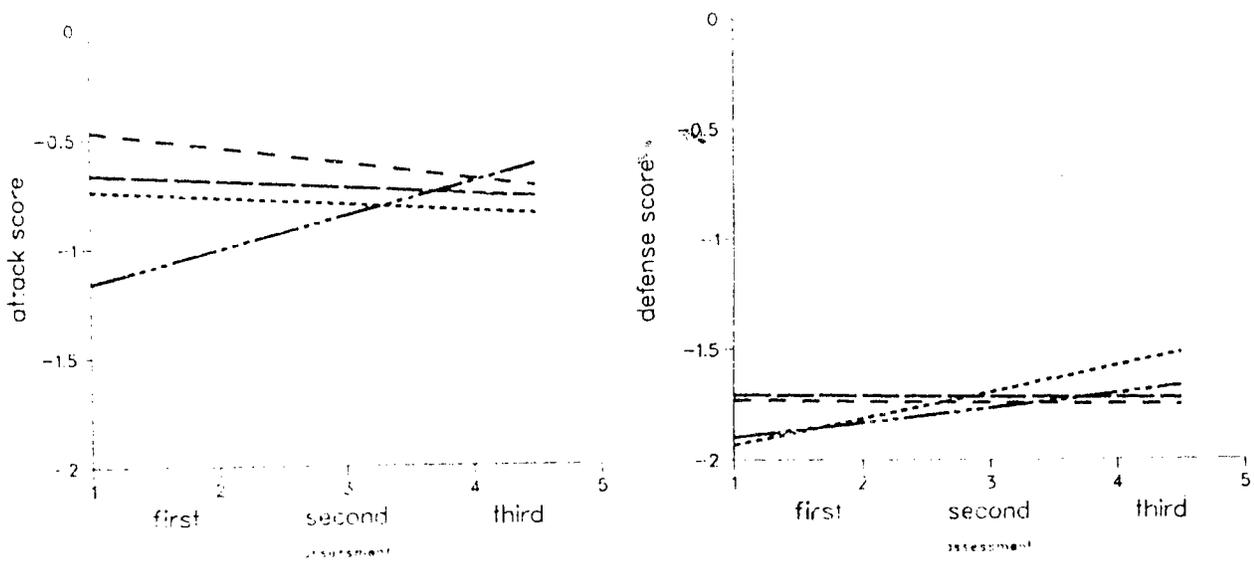


Figure 28. Analysis of Argument scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).



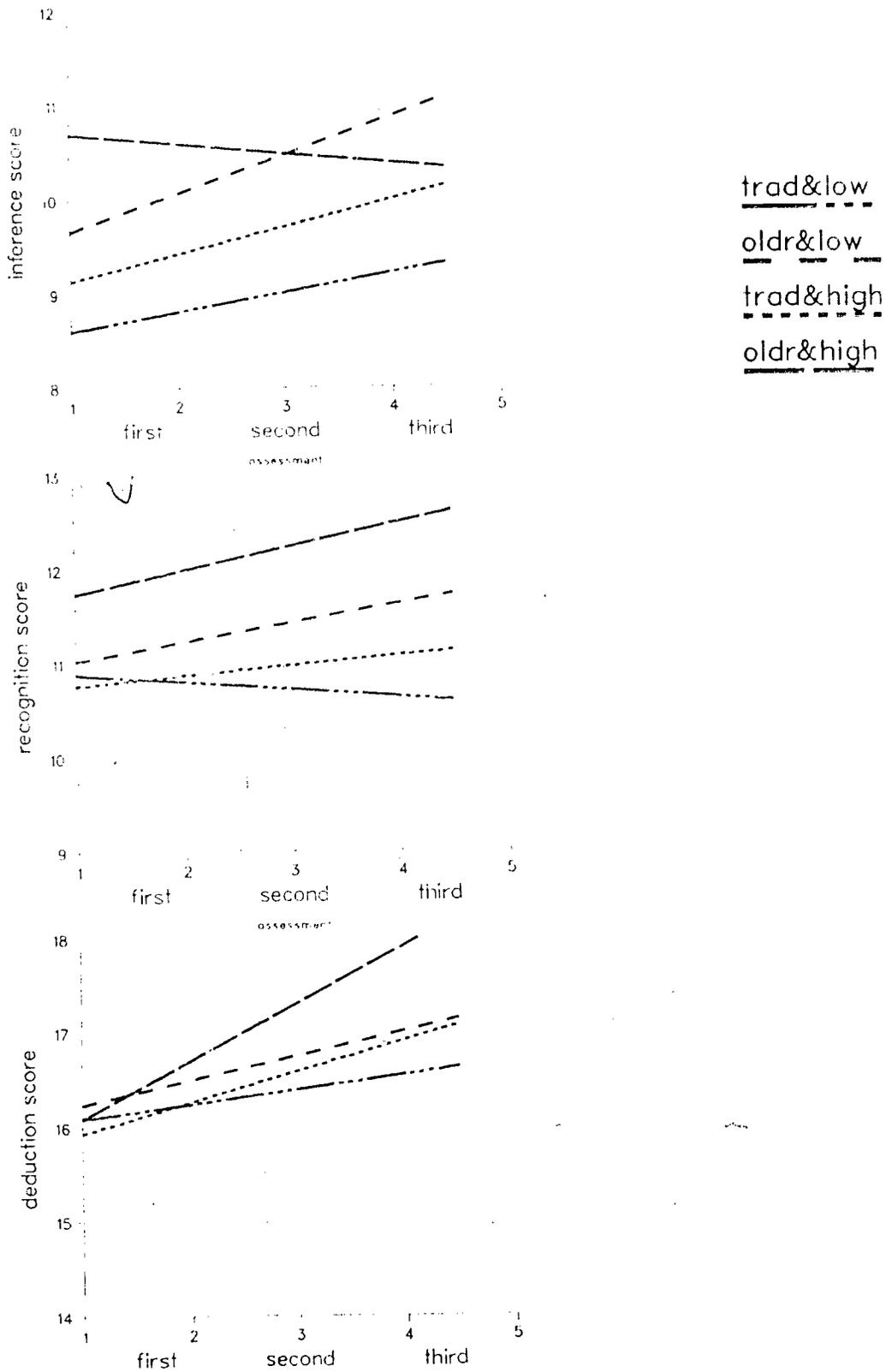


Figure 29. Critical Thinking Appraisal scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

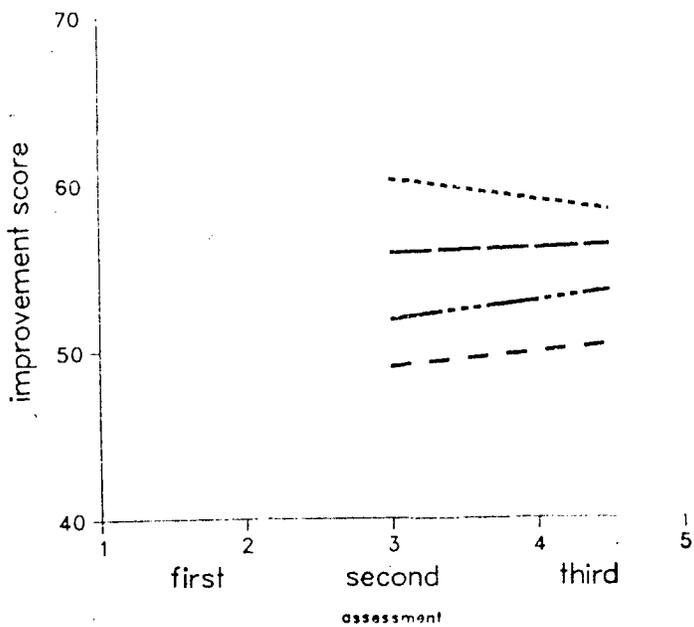
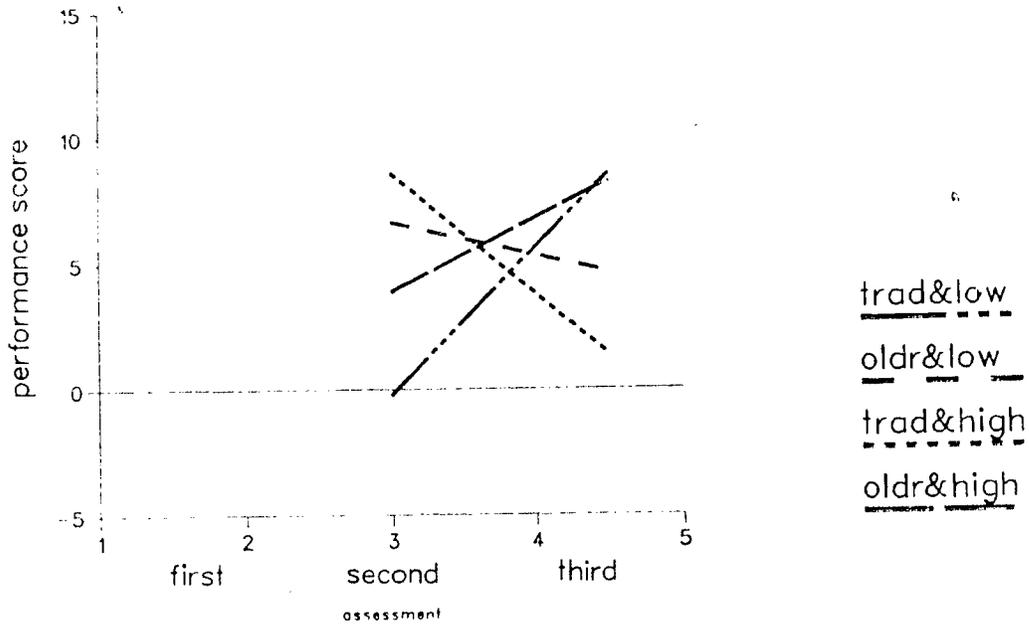


Figure 30. Life History Exercise scores as a function of time for students grouped by age cohort (traditional or older) and by college performance (high or low).

## Summary of Change as a Function of Time

The foregoing analyses of aggregate student development over time provided several indications of change, and ample evidence of differences between the two categorizations of subpopulations. In those cases where significant mean differences were found between subgroups, it was clear that age cohort made more difference than cumulative achievement in the competence based learning process. The single exception was the Abstract/Concrete learning orientation of the Learning Style Inventory--a result not replicated on the closely related Adaptive Style Inventory. There were a few instances in which both age and education categories accounted for significant differences in average performance, and instances in which neither accounted for differences. Given that there were only three occasions of assessment, the interpretation of the curved lines as growth or learning curves is very tenuous indeed. More reasonable is the suggestion that something different occurs during each of the two intervals (i.e., either there was change in one interval but not the other, or there was change in both intervals, but in opposite directions).

### Change Between Assessments

The longitudinal data were subjected to single-factor repeated measures analysis of variance separately for the two assessment intervals. Tables 22 and 23 present the results of these analyses for all students combined, and independent analyses for subgroups defined by age cohort and educational achievement. For ease of comparison, the row format for measures is the same for both tables, and identical to the format of Table 21 showing cross-sectional results. The grey areas indicate the absence of data rather than non-significant results, and an appended question mark after 'increase' or 'decrease' reflects a statistical probability level between .10 and .05. Summary data for repeated measures analyses of variance for each interval are presented in Tables F through R of Appendix I.

The separate analyses for each time interval offer a different perspective on change than that afforded by the preceding analyses of performance over all three assessment occasions. The most general impression gained is the greater overall incidence of change in the first interval compared to the second.

From the perspective of these analyses, it is evident that change occurred in opposite directions during each interval on some measures--most notably the motivation indices from the Picture Story Exercise. The results for all students combined show a significant decrease in the Affiliation Motive from first to second assessment, and a significant increase from second to third assessment; and an opposite pattern for Power Motive scores, with an increase during the first interval followed by a decrease during the second interval. There was no significant

Table 22.

Significant Differences Between First and Second Assessments  
for All Students, and for Students Grouped by  
Age and Educational Achievement Cohorts

		Measure	All Students	Age Cohort		Competence Level Units	
				Traditional	Older	Low	High
Production	Cognitive-Developmental	Measure of Vocational, Educational, and Personal Issues	Increase	Increase			
		"Best Class" Essay					
		"Decision" Essay					
Recognition	Cognitive-Developmental	Sentence Completion Test					
		Moral Judgment Instrument			Decrease?		
		Defining Issues Test	Increase	Increase	Increase	Increase	Increase
Production	More Developmental?	Picture Story Exercise	Decrease	Decrease		Decrease?	
		Stages of Adaptation	Increase		Increase	Increase?	Increase?
		Receptive	Decrease?		Decrease		
Recognition	More Developmental?	Self-Definition	Increase		Increase	Increase	
		Achievement Motive	Decrease		Decrease	Decrease?	Decrease
		Affiliation Motive	Increase	Increase	Increase	Increase	Increase
Production	More Developmental?	Learning Style Inventory	Decrease		Decrease	Decrease	
		Concrete Experience	Decrease	Decrease	Decrease	Decrease	
		Reflective Observation	Increase	Increase	Increase	Increase	
Recognition	More Developmental?	Abstract/Concrete Learning Orientation	Increase	Increase	Increase	Increase	
		Active/Reflective Learning Orientation	Increase	Increase?	Increase	Increase	
		Adaptive Style Inventory					
Production	Less Developmental?	Test of Thematic Analysis	Increase?	Increase?		Increase	
		Analysis of Argument			Decrease?		
		Attack			Decrease?		
Recognition	Less Developmental?	Critical Thinking Appraisal	Increase	Increase?	Increase?	Increase	
		Inference	Increase		Increase	Increase?	
		Deduction					
		Life History Exercise					
		Performance Improvement					

Table 23.

Significant Differences Between Second and Third Assessments  
for All Students, and for Students Grouped by  
Age and Educational Achievement Cohorts

		Measure		All Students	Age Cohort		Competence Level Units			
					Traditional	Older	Low	High		
Production	Cognitive-Developmental	Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	In ease	Increase			Increase		
			"Decision" Essay	Decrease	Decrease?	Decrease	Decrease	Decrease?		
			"Career" Essay							
		Sentence Completion Test								
		Moral Judgment Instrument		Increase?		Increase?		Increase?		
		Defining Issues Test	PZ Score	Increase	Increase?			Increase?		
			D Score		Increase			Increase?		
		Test of Cognitive Development								
		Production	More Developmental?	Picture Story Exercise	Stages of Adaptation	Decrease?				
					Receptive	Decrease	Decrease	Decrease	Decrease	Decrease
Autonomous	Decrease				Decrease	Decrease	Decrease	Decrease		
Assertive								Decrease		
Integrative								Decrease		
Self-Definition								Decrease		
Achievement Motive	Increase			Increase				Increase		
Affiliation Motive	Increase			Increase		Increase	Increase	Increase		
Power Motive	Decrease					Decrease?	Decrease?			
Learning Style Inventory	Concrete Experience			Decrease?			Decrease?			
	Reflective Observation									
	Abstract Conceptualization									
	Active Experimentation	Increase?					Increase?			
Recognition	More Developmental?	Abstract/Concrete Learning Orientation								
		Active/Reflective Learning Orientation								
Adaptive Style Inventory	Total Concrete Experience									
	Total Reflective Observation									
	Total Abstract Conceptualization									
	Total Active Experimentation									
Recognition	Less Developmental?	Abstract/Concrete Adaptive Orientation								
Production	Less Developmental?	Active/Reflective Adaptive Orientation								
Production	Less Developmental?	Test of Thematic Analysis								
		Analysis of Argument	Attack							
Recognition	Less Developmental?	Critical Thinking Appraisal	Defense							
			Inference Recognition Deduction	Increase?	Increase	Increase	Increase	Increase?		
Recognition	Less Developmental?	Life History Exercise	Performance							
			Improvement							

change in Achievement Motive scores from entrance to second assessment, but a significant increase between second and third assessments. Similar fluctuations were found for the Assertive Stage score from the Picture Story Exercise measure of Stages of Adaption. There was an overall increase in Assertive Stage scores between first and second assessment, and a significant decrease during the second interval.

In Tables 22 and 23, we see that there were only two cases of statistically significant improvement across both intervals for all students combined: the Principled Thinking Percent (P%) score from the Defining Issues Test and the Deduction score from the Critical Thinking Appraisal. Only the "Decision" essay from the MVEPI shows significant reverse change over the two intervals corresponding to the curvilinear relation holding between overall performance and time. For all other cases in which the overall relationship between performance and time was significant, the repeated measures analyses for each interval indicate overall change during one interval, but not both. A different picture is gained for the two essays from the Measure of Vocational, Educational, and Personal Issues that were significantly related to time of assessment. For the "Best Class" essay, the slope of the lines in Figure 15 indicated a gradual overall improvement in ratings across the three assessments. The repeated measures results confirm an overall improvement in ratings between second and third assessments, but not between first and second assessments. The independent repeated measures analyses of sub-populations suggests a partial explanation; between first and second assessments, the ratings of the older student cohort increased significantly while those of the traditional age cohort did not. The reverse was found for the second interval. For the "Decision" essay, the repeated measures analysis of all students combined shows the same increase followed by decrease depicted in Figure 15.

The overall relationship between the "D" score from the Defining Issues Test and time, and between the Test of Cognitive Development and time, shown in Figures 16 and 17, respectively, appear in the repeated measures analyses to be primarily due to increases between first and second assessments. The findings of no overall change across time for the Moral Judgment Instrument and the Sentence Completion Test of Ego Development, were corroborated by the repeated measures analyses, though there was a nearly significant increase in Moral Maturity scores between second and third assessments.

Changes in Learning Style preferences were found to occur between entrance and second assessments, but not between second and third assessments. The Critical Thinking Appraisal Inference score improvement occurred during the first interval, while the Recognition score improvement occurred during the second interval. There were no significant overall changes for either interval on the Analysis of Argument or the Test of Thematic Analysis. The Adaptive Style Inventory and the Life History Exercise were administered to all students in the longitudinal sample only on second and third occasions of assessment; there were no significant main effects of occasion on either measure.

## Comparison of Cross-sectional and Longitudinal Results

Considering both forms of analysis of the pooled longitudinal data, and the analyses of subgroups defined by age cohort and educational achievement, we can make some comparisons between longitudinal and cross-sectional results for cross-substantiation. In comparing cross-sectional and longitudinal results, it should be kept in mind that the cross-sectional data compared entering and graduating students principally, though not exclusively, of traditional age, whereas the pooled longitudinal data include the Weekend College cohort composed entirely of women in the older age cohort.

Table 24 lists those indices which record differences between entering and graduating students in the cross-sectional study, and change during at least one interval for students in the longitudinal study.

The strongest cross-substantiation was, not surprisingly, on two instruments more alike in form than presumed function (i.e., sharing the characteristic of requiring simple recognition): the Defining Issues Test and the Learning Style Inventory. Among the recognition-type instruments, these two probably require the least effort from the respondent. While on the one hand, the characteristics of simplicity and ease connote a more superficial measurement, from the standpoint of those who argue for "edumetric vs. psychometric" characteristics, these instruments may be seen in a more positive light. Irrespective of these issues, there is little doubt that the greatest degree of generality of effects can be claimed for the changes these instruments measure: increasing choice of more principled reasoning in the evaluation of moral dilemmas, and increasing choice of Abstract Conceptualization and Active Experimentation over Concrete Experience and Reflective Observation as preferred components of a Learning Style.

### Longitudinal Results: A Causal Analysis of Change

The second major purpose of assessment and data analysis was to examine the extent to which change over the three occasions was due to involvement in the Alverno learning process versus individual differences in age and other background characteristics, and variations in program. While the longitudinal data are defined by a time structure rather than a student classification structure (e.g., assessing students as entering Freshmen, first-semester Juniors, and graduating Seniors), the time structure was meant to correspond with the intervals of the general education sequence and the pre-professional sequence experienced by the typical student. For this reason, as well as the evident differences in magnitude and direction of change for each assessment interval, the analysis of factors contributing to change was conducted on each interval separately. In the following section, separate results

Table 24.

Comparison of Group Differences in the Cross-sectional Study  
and Change Between Assessments in the Longitudinal Study

<u>Significant Main Effects of Group Cross-sectional Study</u>	<u>Significant Main Effects of Occasion Longitudinal Study</u>
"Decision" Essay (MVEPI) "Career" Essay (MVEPI)	"Best Class" Essay (MVEPI) "Decision" Essay (MVEPI)
Total Protocol Rating (SCT)	
P % Score (DIT) D Score (DIT)	P % Score (DIT) D Score (DIT)
	Total Score (TCD)
	Receptive Stage of Adaptation (PSE) Assertive Stage of Adaptation (PSE)
Integrative Stage of Adaptation (PSE)	Integrative Stage of Adaptation (PSE)
Self-Definition? (PSE)	Self-Definition (PSE)
Achievement Motive (PSE)	Achievement Motive (PSE) Affiliation Motive (PSE)
Power Motive? (PSE)	Power Motive (PSE)
Abstract/Concrete Learning (LSI) Active/Reflective Learning (LSI)	Abstract/Concrete Learning Active/Reflective Learning
	Total Score? (TTA)
Defense Score (AA)	
	Inference Score (CTA) Recognition Score (CTA) Deduction Score (CTA)

are thus reported for the interval between entrance and second assessment, and the interval between second and third assessment.

Before examining factors contributing to change between intervals of assessment, we must look at the individual differences related to variance in the first, or entrance, assessments.

#### Relationships Between Student Characteristics and Entrance Measures

The first step of the causal analysis was to determine relationships between entrance assessments and personal and background characteristics of students. Table 25 presents the significant relationships between first assessments and the available data on student characteristics. The complete matrix of correlations is presented in Appendix I, Table S. Paired comparison t tests among all levels of each correlated variable are presented in Appendix I, Table T. In Table 25, the order of the input variables from left to right represents the order of entry employed in hierarchical regressions to eliminate redundant contributions to variance explained by the substantial intercorrelations of personal and background characteristics. Variables in parentheses showed significant zero-order correlations with the respective measures, but did not explain significant variance in that measure over and above variance explained by correlated variables of higher precedence (variables to the left in the table).

For example, the entrance ratings on the "Decision" essay of the Measure of Vocational, Educational, and Personal Issues were correlated with age, religion, father's occupation, and marital status. However, the relationships between essay ratings and both religion and father's occupation were redundant with that between essay ratings and age. Since age was assigned higher precedence for the causal analysis, the covariance between ratings and all three input variables (age, religion, father's occupation) was allocated to age. The semi-partial correlations of ratings with religion and father's occupation were not statistically significant. Marital status, on the other hand, explained a significant amount of variance in essay ratings in addition to the variance explained by age. Age and marital status together, in this instance, explain as much of the difference in individual entrance ratings on the "Decision" essay as can be explained by the entire set of personal and background characteristics when entered in the given order.

It is clear that more of the measures were correlated with age than with any other input variable. Given the relative homogeneity of the Alverno student population with respect to background characteristics, and its relative heterogeneity in age, especially with the inclusion of the 1977 Weekend College cohort, it is not surprising that many relationships between background differences and entrance measurements were largely explained by age differences. The most notable exception was marital status. On "Decision" and "Career" essays of the Measure

Table 25.

Relationships Between Entrance Assessments and Student Background Variables

Measure		Age at Entrance	Religion	Mother's Education	Father's Education	Mother's Occupation	Father's Occupation	High School Grade Level	Prior College Experience	Marital Status at Entrance
Production	Cognitive Development	Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay						PCE	
			"Decision" Essay	Age + (Rel)			(FOc)			MSt
			"Career" Essay	Age +					(PCE)	MSt
Recognition	Cognitive Development	Sentence Completion Test								
		Moral Judgment Instrument		Age +						
Production	Cognitive Development	Defining Issues Test	PZ Score							
			D Score	Age +						
Recognition	Cognitive Development	Test of Cognitive Development						GPA		
		Picture Story Exercise	Stages of Adaptation Receptive Autonomous Assertive Integrative	Age - Rel					(PCF)	
Production	More Developmental?		Self-Definition	Age - (Rel) (MEd)					(PCE)	(MSt)
			Achievement Motive Affiliation Motive Power Motive							
Recognition	More Developmental?	Learning Style Inventory	Concrete Experience Reflective Observation Abstract Conceptualization Active Experimentation	Age + Age - (Rel)		(FEd)				
			Abstract/Concrete Learning Orientation	Age - (Rel)						
Production	More Developmental?		Active/Reflective Learning Orientation							
		Adaptive Style Inventory	Total Concrete Experience Total Reflective Observation Total Abstract Conceptualization Total Active Experimentation	Age +						MSt
Recognition	More Developmental?		Abstract/Concrete Adaptive Orientation							
			Active/Reflective Adaptive Orientation	Age +						MSt
Production	Less Developmental?	Test of Thematic Analysis		Age +		FEd			(PCE)	MSt
		Analysis of Argument	Attack Defense	Age +						(MSt)
Recognition	Less Developmental?	Critical Thinking Appraisal	Inference Recognition Deduction					GPA GPA GPA		
		Life History Exercise	Performance Improvement					GPA		

of Vocational, Educational, and Personal Issues, the Active/Reflective component of the Adaptive Style Inventory, and the Test of Thematic Analysis, there were significant differences due to marital status with age controlled. Although it is outside the scope of this report to pursue the matter here, it is interesting to note that in each of the cited cases, it was the relatively small proportion of divorced or widowed women whose higher ratings or scores accounted for this additional variance component (see Table U, Appendix I).

A second noteworthy pattern in Table 25 is seen in the associations of measures with age versus high school grade level. The entrance assessment variance in the more developmental measures is in more cases related to age, while the generic ability measures are in more cases related to high school grade level. While this cannot be taken as a validation of the distinction between developmental and ability measures in any simple sense, it raises a question about the apparent contradictions found in the correlation of Test of Cognitive Development entrance scores with high school grade level, and the correlation of the Test of Thematic Analysis and Analysis of Argument Defense scores with age.

Equally interesting are those instances of no correlation between measures and input variables. Except for judgments that might be made relative to the reliability and validity of measures established in other research settings, there is little evidence at this step of the present analysis on which to base an interpretation.

#### Covariates of Change Between Assessments

The descriptions of the longitudinal data presented earlier provided general evidence of change in the population as a whole, ignoring the differential affects of background characteristics and variance due to type of college experience. Once these sources of covariance are identified, we can ask if differential involvement in the learning process contributes to development, while holding constant causally antecedent and coincident sources of variance. Tables 26 and 27 summarize the results of a series of analyses designed to identify background and program covariates in each interval.

In Table 26, the first column gives the percentage of variance in second assessment measures that can be explained by students' scores or ratings on entrance measures two years earlier. The simple correlations between first and second assessments on each measure are presented in Appendix I, Table V. Where "XXX" appears in the first column of Table 26, the correlation between first and second assessments was judged non-significant and therefore the analysis of covariance was not carried out. The lack of linear relationship between occasions of assessment, like the lack of correlation between entrance measures and student characteristics, can be a sign of unreliability of measurement, though it is not necessarily so. The significant correlations between occasions of first and

Table 26.

## Student Background and College Program Variables Related to Change Between First and Second Assessments

Measure	Percent of Variance Explained by First Assessment	Background Covariates				Percent of Variance Added	Program Covariates				Percent of Variance Added
		Age	Prior College Experience	Grade Point Average	Marital Status		Entering Cohort	Residence	Student Status	Major	
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay "Decision" Essay "Career" Essay	11.0 7.4 10.3		PCE		4.1 3.8	ECo Res			9.2 <sup>b</sup> 6.8 9.7	
Sentence Completion Test		12.9					ECo			4.4	
Moral Judgment Instrument		23.6							Maj		
Defining Issues Test	P% Score D Score	26.8 42.1	Age			2.0					
Test of Cognitive Development		22.7		GPA		4.3					
Picture Story Exercise	Stages of Adaptation Receptive Autonomous Assertive Integrative	xxx 2.2 6.3 2.4					ECo			3.7	
	Self-Definition	8.8									
	Achievement Motive Affiliation Motive Power Motive	2.2 3.4 5.1					ECo			10.7	
Learning Style Inventory	Concrete Experience Reflective Observation Abstract Conceptualization Active Experimentation	6.2 9.7 14.4 16.4	Age			4.7		Res		3.4	
	Abstract/Concrete Learning Orientation Active/Reflective Learning Orientation	11.7 18.4	Age			2.3					
Adaptive Style Inventory	Total Concrete Experience Total Reflective Observation Total Abstract Conceptualization Total Active Experimentation Abstract/Concrete Adaptive Orientation Active/Reflective Adaptive Orientation										
Test of Thematic Analysis		4.1		MSt		5.8			Maj	8.6	
Analysis of Argument	Attack Defense	xxx xxx									
Critical Thinking Appraisal	Inference Recognition Deduction	23.3 13.4 30.5 <sup>a</sup>			GPA	4.4					
Life History Exercise	Performance Improvement	23.0 xxx									

Note. <sup>a</sup>Includes significant quadratic element.  
<sup>b</sup>Includes significant interaction between PCE and ECo.

Table 27.

## Student Background and College Program Variables Related to Change Between Second and Third Assessments

Measure	Percent of Variance Explained by First Assessment	Background Covariates		Percent of Variance Added	Program Covariates			Percent of Variance Added
		Age	Prior College Experience		Grade Point Average	Marital Status	Entering Cohort	
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay 3.4 "Decision" Essay 3.1 "Career" Essay 13.7 <sup>a</sup>					ECo ECo		5.8 2.4
Sentence Completion Test	24.2							
Moral Judgment Instrument	12.2					ECo		32.4
Defining Issues Test	PZ Score 33.6 D Score 41.3							
Test of Cognitive Development	32.6 <sup>a</sup>							
Picture Story Exercise	Stages of Adaptation Receptive xxx Autonomous 3.2 Assertive 6.0 <sup>a</sup> Integrative 16.0 <sup>a</sup>							
	Self-Definition 4.2							
	Achievement Motive 6.2							
	Affiliation Motive 5.8							
	Power Motive xxx							
Learning Style Inventory	Concrete Experience 15.3 Reflective Observation 27.4 Abstract Conceptualization 13.5 <sup>a</sup> Active Experimentation 30.0					Res		3.5
	Abstract/Concrete Learning Orientation 13.4							
	Active/Reflective Learning Orientation 32.7					ECo		2.2
Adaptive Style Inventory	Total Concrete Experience 31.0 <sup>a</sup> Total Reflective Observation 18.9 Total Abstract Conceptualization 25.7 <sup>a</sup> Total Active Experimentation 20.3			MSt	4.7		SSt	4.4
	Abstract/Concrete Adaptive Orientation 34.1 <sup>a</sup>					Res		2.6
	Active/Reflective Adaptive Orientation 24.9			MSt	4.8	ECo		3.3
Test of Thematic Analysis	5.8							
Analysis of Argument	Attack xxx Defense xxx							
Critical Thinking Appraisal	Inference 29.3 Recognition 24.7 <sup>a</sup> Deduction 33.2							
Life History Exercise	Performance 17.2 Improvement xxx					ECo		3.0

Note. <sup>a</sup>Includes significant quadratic element.

second assessment ranged from a low of .148 for the Autonomous Stage of Adaption and the Achievement Motive (both from McBer's Picture Story Exercise), to a high of .649 for the D score of the Defining Issues Test. Conversely, and more meaningful for present purposes, the variance in second assessments left unexplained by entrance measurements ranged from 97.8% for the former indices, to 58.7% for the latter index. Significant polynomial terms are included in the percentage figures in the first column as indicated in the table footnote.

### Background Covariates

All student characteristics identified previously in Table 25 as contributing to variance in entrance scores in the hierarchical regression analysis were tested for contribution to second assessments over and above variance explained by entrance assessments on the given measure. Summaries of these tests are presented in Appendix I, Tables W and X. Those characteristics explaining significant amounts of variance in second assessments beyond variance explained by the respective entrance assessments are listed in the second column of Table 26. The percentage of additional variance explained is shown in the third column.

Prior college experience accounted for differences in second assessment ratings on the "Best Class" essay of the Measure of Vocational, Educational, and Personal Issue that were not related to entrance ratings. Students who had prior college experience received higher ratings on perspective classroom learning. The test for interaction between prior college experience and first assessment ratings was not significant however, indicating no differential rate of change in ratings during the two year interval.

Age had a differential affect on change for three of the measures: the "Decision" essay from the measure of Vocational, Educational, and Personal Issues; the D score from the Defining Issues Test, and the Abstract Conceptualization scale (and Abstract/Concrete composite score) from the Learning Style Inventory. The affects were not the same for all three measures however. For both cognitive-developmental measures, older students exhibited more change than younger students in the first two years. But younger students showed a greater increase in preference for Abstract Conceptualization as an element of Learning Style.

Prior academic performance, as measured by high school grade level, differentially affected scores on two measures, but again not in the same way. On the Test of Cognitive Development, students with the best and the poorest records in high school had higher scores than their counterparts in the middle range. For the Deduction score of the Critical Thinking Appraisal, students with the best high school records had the highest scores, and students with the poorest high school records had the lowest scores. As was found with prior college experience, there were no significant indications of a differential rate of change due to high school grade level.

Marital status accounted for differences during the first two years on the Test of Thematic Analysis. Married students scored higher than single students on this measure.

While each of these relationships is interesting in its own right, we have not explored them further in this report. Without a more complete analysis of sources of variance unique to each input characteristic, it would be misleading to draw conclusions about the practical significance of the differences noted between amounts of prior college experience, high school grade levels, and marital status categories. Our main interest at this point is to identify variables as covariates with entrance assessments that explain variance in second assessments two years later, so that they may be taken into account in examining the effects of the learning process on student development.

#### Program Covariates

The fourth and fifth columns of Table 26 show the results of tests for additional variance in second assessments due to differences in type of college experience (viz., entrance cohort, residence, part-time vs. full-time status, and major) coincident with involvement in the learning process (see Appendix I, Table Y). Entrance cohort was found to account for significant increments in variance on three measures. For the "Best Class" essay of the Measure of Vocational, Educational, and Personal Issues, entrance cohort not only accounts for additional variance itself, but also interacts with prior college experience to account for a total of 13.3% of the variance in second assessment ratings left unexplained by entrance ratings alone. Generally speaking, there were different affects of prior college experience among the three entrance cohorts. For the reasons already stated, these differences are not probed here. Entrance cohort differences are also detected on the Sentence Completion Test of Ego Development, and the Affiliation Motive score from the Picture Story Exercise. No interaction affects were found to suggest differential rates of change.

Differences in residence status and major were each identified as covariates on two measures. For both of these categorical variables, a switch in status between assessments was assigned a value equal to other categories. While this tack made it possible to more thoroughly evaluate sources of covariance for present purposes, it makes interpretation of the differences found more difficult. For example, differences in residence during the first two years accounted for significant variance in "Decision" essay ratings at second assessment beyond variance explained by entrance assessment ratings and age. This additional variance was related to categories defining changes in residence during the first two years (i.e., students identified as resident students at entrance, but who were identified as commuting at the time of second assessment, and visa versa. Thus this variance cannot be attributed to different experiences or characteristics of resident or commuting students, but belongs to some constellation of unknown factors which resulted in students

changing from one status to the other. The same ambiguity surrounds the significant relationships with major, for which a single category defined a group of students who changed majors between entrance and second assessment. As was true for all covariates previously noted, no significant interactions with entrance assessments were found.

### Differences Between Intervals

In most cases, Table 27 shows that the relationship between second and third assessments on each measure was stronger than between first and second assessments. That is, a higher percentage of variance in the post-interval measure was explained by the pre-interval measure. Several factors may contribute to stronger pre-post correlations in the second interval. Generally, more change, unless it happens to be uniform change across students, means lower correlations between pre-post measurements. Considering the change factor alone, the relative strength of correlations for each interval conforms, for the most part, with the results of the repeated measures analyses for each interval. Where the repeated measures analyses included overall change during the first interval, but not during the second interval, the correlation between first and second assessments was weaker than the correlation between second and third assessments. Other factors, such as test familiarity and scoring procedures, may of course also play a part.

There were several relationships between second and third assessments which included a significant quadratic element. On the "Career" essay of the Measure of Vocational, Educational, and Personal Issues, the Assertive Stage of Adaption score from the Picture Story Exercise, and the Abstract Conceptualization scale of the Adaptive Style Inventory, the quadratic contribution was negative--including a "ceiling effect," or lower third assessment scores for students on the high end of the scale at second assessment. In the remaining cases, the quadratic element functioned as part of the total equation to show the actual similarity of pre-post interval scores for students at the higher end, while the relationship of lowered scores was less predictable.

There were no instances in which background variables contributed to the relationship between second and third assessments, except for marital status on the Adaptive Style Inventory. Single students had significantly higher preference for Reflective Observation than did divorced and widowed students; the means for married students and students who changed status during the interval were closer to the means of single students.

Among differences in types of college experience, entrance cohort was found to be a significant covariate on twice as many measures the second interval. Major was not a significant covariate on any measure. There was not one case in which the same program variable acted as a significant covariate in both intervals.

For the second interval, which is equivalent to the pre-professional sequence for the typical student, program covariates were identified in five of the twelve measures (see Appendix I, Table Z). These covariates, together with second assessment performance, account for a range of 3.2% to 44.6% of the variance in third assessment performance.

### "Value Added" by Time and Performance in College

Studies of time and performance in college were introduced in a preceding section. The three variables are, (1) number of semesters enrolled, (2) number of credit hours accumulated, and (3) number of competence level units accumulated. Each variable represents a different aspect of involvement in the learning process. The purpose of the present analysis is to examine the outcomes on the human potential measures when previous level of performance, and background and program covariates, are controlled. The partialled relationships between these indices, and developmental change as recorded with the human potential measures, provide our best understanding of the "value added" to student development by involvement in the Alverno learning process.

A larger part of the variance in semesters attended, and credits and competence units accumulated, is related to differences in type of college experience. This could be particularly true of differences in part-time/full-time status, and major. Because of the difference in time-frame between Weekday and Weekend programs, entrance cohort might also be expected to account for differences in the college performer variables. Background variables may also explain differences, though it is likely that most of this variance is already accounted for in program variance in college performance.

The significant relationships of college performance in the first interval to program and background variables are shown in Table 28.

Table 28

#### Correlations of Time and Performance in the First Interval With Background and Program Covariates

---

	P/F	Major	ECo	BV, if any
Semesters		Major		
Credits	P/F	Major	ECo	
CLUs	P/F	Major		Father's Education

---

Major accounts for 10.4% of the variance in number of semesters between entrance and second assessments. Part-time/full-time status, major, and entrance cohort together account for 71.4% of the variance in number of credits accumulated in the first interval. Part-time/full-time status and major account for 44.6% of the variance in competence level units accumulated between entrance and second assessment. Interestingly, father's education explains an additional 4.1% of the variance in competence units over and above the program variables.

The involvement of students during the second interval might be expected to depend on the extent of their involvement during the first two years. Table 29 shows the relationships of involvement during the second interval to program variables, with first interval performance controlled.

Table 29

Correlations of Time and Performance in the Second Interval  
With Background and Program Covariates and Controlling  
for First Interval Differences

	Interval 1	P/F	Major	ECo
Semesters	Semesters			ECo
Credits	Credits + Credits2	P/F	Major	
CLUs	-	P/F	Major	

No background variables contribute significantly to the variance in second interval involvement beyond what is explained by first interval involvement and program differences. The number of competence level units accumulated during the second interval was not significantly related to the number accumulated during the first interval. Part-time/full-time status and major accounted for 26.0% of the variance in competence level units accumulated between second and third assessments. Credit hours accumulated during the first two years, part-time/full-time status, and major, explain 62.8% of the second interval variance in credits. The number of semesters attended between second and third assessments was related to number of semesters attended during the first interval and to entrance cohort, with these factors explaining 7.6% of the second interval variance.

## Contributions of Time and Performance to Change

By correcting the college performance indices for program-related differentials, we can obtain the most accurate picture of the unique participation of involvement in the learning process to variance in student outcomes on the human potential measures. If these differences are not controlled, the partial correlation between the college performance indices and student change on the human potential measures will in most cases appear weaker than is actually the case, although the opposite (i.e., a strong but superior relationship) may also occur.

### Between Entrance and Second Assessment

Table 30 shows the measures on which involvement in the Alverno learning process explained variance in second assessments not related to entrance measures or background and program covariates. Again, the question mark signifies a probability level between .05 and .10. Parentheses indicate significant partial correlations that were of a lower order of magnitude than the strongest relationship (shown in parentheses). In the first interval, there were only two instances in which the index of performance in the competence-based curriculum explained variance above and beyond the causally antecedent, or coincident, factors (i.e., the Test of Cognitive Development and the Reflective Observation sample of the Learning Style Inventory). Five other relationships with competences approached significance, the P% score of the Defining Issues Test, and the Abstract Conceptualization score of the Learning Style Inventory.

Student outcomes on the Test of Cognitive Development during the first two years provide an example of the most common case. Entrance scores on this measure accounted for 22.7% of the variance in scores two years later. Different levels of performance attributed to past academic scores (high school grades) accounted for an additional 4.3% of the variance in second assessments. Differences in type of college experience did not account for any significant variance in second assessments that could not be explained by entrance scores and high school grades. (These findings were presented above in Table 26.) We have just seen the extent to which number of semesters attended, number of credit hours completed, and number of competence level units accumulated, were explained by differences in types of college experience (in Table 28 above). Having established that the program variables were not related to student change on the Test of Cognitive Development, we know that the variability in college performance related to program differences cannot be related to change on the Test of Cognitive Development. When this portion of the variance is not excluded from analysis of the covariance between college performance and change in the Test of Cognitive Development, it has the effect of weakening the obtained correlations.

Table 30.

## College Performance Variables Related to Change for Each Interval of Assessment

Measure	Percent of Variance Explained by Background and Program Covariates	1st and 2nd College Performance			Percent of Variance Added	Percent of Variance Explained by Background and Program Covariates	2nd and 3rd College Performance			Percent of Variance Added
		Number of Semesters	Credit Hours	Competence Level Units			Number of Semesters	Credit Hours	Competence Level Units	
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	24.3				3.4				
	"Decision" Essay	18.0				8.9		Cre <sup>+</sup> ?		
	"Career" Essay	20.0				16.1				
Sentence Completion Test		17.3				24.2			Clu <sup>-</sup> ?	
Moral Judgment Instrument		23.6				44.6			Clu <sup>-</sup>	9.8
Defining Issues Test	PZ Score	26.8		Clu <sup>+</sup> ?		33.6			Clu <sup>+</sup> ?	
	D Score	44.1				41.3		Cre <sup>+</sup> ?		
Test of Cognitive Development		27.0		Clu <sup>+</sup>	3.4	32.6				
Picture Story Exercise	Stages of Adaptation									
	Receptive	xxx				xxx				
	Autonomous	2.2				3.2			Cre <sup>-</sup>	2.0
	Assertive	6.3				6.0		Sem <sup>-</sup>		2.7
	Integrative	6.1				16.0				
	Self-Definition	8.8				4.2				
	Achievement Motive	2.2				6.2			Clu <sup>+</sup> ?	
	Affiliation Motive	14.1				5.8				
	Power Motive	5.1				xxx				
Learning Style Inventory	Concrete Experience	6.2				16.6			Cre <sup>-</sup>	1.8
	Reflective Observation	9.7		Clu <sup>-</sup>	2.0	30.9				
	Abstract Conceptualization	19.1		Clu <sup>+</sup> ?		13.5				
	Active Experimentation	19.8				30.0				
	Abstract/Concrete Learning Orientation	14.0				13.4			Cre <sup>+</sup>	1.9
	Active/Reflective Learning Orientation	18.4		Clu <sup>+</sup>	1.7	40.0			Clu <sup>+</sup> ?	
Adaptive Style Inventory	Total Concrete Experience	N.A. <sup>a</sup>				31.0			Cre <sup>+</sup> ?	
	Total Reflective Observation	N.A. <sup>a</sup>				23.6				
	Total Abstract Conceptualization	N.A. <sup>a</sup>				25.8				
	Total Active Experimentation					24.7			Cre <sup>-</sup>	2.0
	Abstract/Concrete Adaptive Orientation					36.7				
	Active/Reflective Adaptive Orientation					33.0			Cre <sup>-</sup>	1.6
Test of Thematic Analysis		18.5		Cre <sup>-</sup> ?		5.8		Sem <sup>-</sup>		4.3
Analysis of Argument	Attack	xxx				xxx				
	Defense	xxx				xxx				
Critical Thinking Appraisal	Inference	23.3				29.3				
	Recognition	13.4				25.0				
	Deduction	34.9				33.2				
Life History Exercise	Performance Improvement	23.0				20.2				
		xxx				xxx				

Note. <sup>a</sup>N.A. = Not Applicable. Students were not given this measure at time of first assessment.

When the variance in college performance attributed to program differences was not excluded, the partial correlations of the three performance indices with variance in second assessments left unexplained by entrance assessments and high school grades were: .134 ( $p < .1$ ) for number of semesters; .120 ( $p < .1$ ) for credit hours completed, and .171 ( $p < .1$ ) for competence level units accumulated. With the variance excluded, the partial correlations were, respectively, .152 ( $p < .05$ ), .180 ( $p < .05$ ), and .228 ( $p < .001$ ).

Of course the opposite result can occur. In several scores, there was some relationship between types of college experience and human potential measure outcomes, but simply not enough to make a judgment of a significant relationship. The Principled Thinking score (P%) from the Defining Issues Test provides such an example. Residence, part-time/full-time status, and major all showed some relationship to P% scores at second assessment beyond variance explained by entrance scores. However, none of the relationships were strong enough to be identified as significant covariates. When the variability between these variables and college performance was included in computing the partial correlations between college performance indices and change on the P% score of the Defining Issues Test, the partial correlations were: .025 ( $p < .1$ ) for number of semesters; .188 ( $p < .05$ ) for credit hours completed, and .237 ( $p < .01$ ) for competence level units accumulated. With this variance excluded, the partial correlations were, respectively, .014 ( $p < .1$ ), .134 ( $p < .1$ ) and .144 ( $p < .1$ ).

Comparisons of partial correlations using raw and corrected forms of the college performance variables are presented in Appendix I, Tables AA and BB. Significant relationships, using the corrected performance variables were presented in Table 30.

#### Between Second and Third Assessment

Table 30 also presents relationships between the college performer indices and variance in third assessments unexplained by second assessments and other covariates. The number of significant or nearly significant relationships suggest that involvement in the learning process had a much broader impact on change during the second interval, though as we said earlier, there was decidedly more change occurring during the first two years.

#### Time in College

In the second interval, the number of semesters attended accounts for variance on two measures, the Assertive Stage of Adaption from the Picture Story Exercise and the Test of Thematic Analysis. In both cases, the relationship is negative, indicating that students attending more semesters in the second interval (than were predicted from the first interval attendance

and knowledge of entrance cohort) received scores at third assessment that tended to be lower than predicted by their second assessment scores. Most students attended four or more semesters in both intervals, and very few attended less. Five semesters was the maximum a student could attend in the third interval, and the fifth semester would have had to be in summer school. It would seem to follow that those students who attended Alverno constantly in the second interval, but had attended four or fewer semesters in the first two years, performed less well on the Test of Thematic Analysis, and became less assertive.

#### Performance Indexed by Credit Hours

A number of significant and nearly significant partial correlations were found between outcome measures and number of credits in the second interval. There was a large positive correlation between number of credit hours completed in the first interval and credit hours completed in the second interval. Together with knowledge of part-time/full-time status and major, first interval credits predicted 62.8% of the variance in second interval credits. The partial correlations reported in Table 30 are, again, correlations between variance in second interval credits unrelated to these predictors, and variance in third assessment outcomes unrelated to second assessment outcomes and other sources of covariance.

Nearly significant partial correlations were found between the otherwise unexplained variance in second interval credits and two cognitive-developmental indices. Both partial correlations were positive, suggesting students completing more credits (than were predicted by credits completed in the first two years, major, and student status) tended to have higher third assessment scores than were predicted by second assessments. In the case of the "Decision" essay from the MVEPI, there was an average decline in ratings from second to third assessment. The relationship between outcomes on this measure and credits completed in the second interval suggests that earning more credits in the second interval, relating to credits earned in the first two years, tended to offset this loss, if not contribute to additional development of perspective in decision-making. For the D score of the Defining Issues Test, there was no mean difference in scores between second and third assessment. In this case the relationship suggests a positive increment in moral development, as defined by the measure, for those who earned relatively more credits in the second interval.

Negative partial correlations were found between credits and two stages of Adaption indices from the PSE. The nearly significant negative relationship between credits and the Assertive Stage of Adaption may well be spurious (i.e., it can be accounted for in the stronger correlations with both semesters and competence level units). The negative relationship between credits and the Autonomous Stage of Adaption was significant, and indicates that students earning more credits, relative to the

first two years, had lower scores than were predicted by second assessment. In the context of the scheme of Stages of Adaptation, lowering scores on second and third stages could conceivably be taken as signs of positive development. If that is so, it is uncorroborated by a corresponding increase in scores on the Integrative Stage of Adaptation.

Number of credits completed in the second interval was negatively correlated with change in preference for Concrete Experience as a component of the Learning Style Inventory. The relationship holds for the composite index with Abstract Conceptualization. The relationship is positive for the Abstract/Concrete index of course, since the Concrete Experience score is subtracted from the Abstract Conceptualization score. A different set of relationships appear in the presumably cognate Adaptive Style Inventory where credits earned were positively correlated with Total Reflective Observation scores, and negatively correlated with Total Active Experimentation scores. When there are two scales combined, the relationship with credits is negative.

#### Performance Indexed\* by Competence Level

In contrast to the other college performance variables, the number of competence level units accumulated between second and third assessments was not significantly correlated with the number accumulated in the first two years. Second interval competence level units were controlled only for major and part-time/full-time status. It is interesting to note (Appendix I, Table BB) that several of the small partial correlations between the cognitive-developmental measures and competence level units in the second interval are opposite in size from the partials between cognitive-developmental measures and credits. At the same time, there was a strong positive zero-order correlation between competence level units and credits (+.595). For the Sentence Completion Test of Ego Development, there was nearly significant negative partial correlation with competence level units, and no correlation ( $p = .005$ ) with credits. The opposite was true for the correlation between the "Decision" essay of the MVEPI noted earlier. There was no correlation between the "Decision" essay ratings and competence level units ( $p = .006$ ).

For the smaller group of students who completed the Moral Judgment Instrument, the divergent effects of credits and competence level units accumulated in the second interval means lower Moral Maturity scores than were predicted by second assessments. When competence level units were controlled, the positive partial correlation with credits became significant ( $p = .461$ ,  $F(1, 36) = 9.71$ ,  $p < .01$ ).

The effects of relatively more competence level units on third assessments of the Assertive Stage of Adaptation are consistent with those reported for semesters and credits. This appears to be the only case in the second interval (as the Test

of Cognitive Development was in the first interval) where all three indices show a common effect.

Nearly significant positive partial correlations were found between the competence index and Achievement Motive scores, and the Active/Reflective composite score of the Learning Style Inventory.

### Summary of the Causal Analysis of Change

It is difficult to summarize the effects of involvement in the Alverno learning process (i.e., the value added to student development) from the analyses of individual measures. Each significant or nearly significant partial correlation suggests some value added, but the data do not, at first glance, indicate a distinctive pattern of relationships unique to one college performance variable or another. The general impression of practical significance is that involvement during the second interval, relative to the first, seems to make more of a difference in second interval outcomes, even though less overall change occurs than in the first two years.

To gain further insight, we must move to the third purpose of this section of the study, the examination of interrelationships among the human potential measures. Unfortunately, comparing relationships among all measures is rife with difficulties related to incomplete data, and a host of confounding experimental and statistical considerations. Several different kinds of judgments were necessarily imposed which must be taken into account in interpreting the results. In any event, the results reported below should be interpreted with extreme caution, and only in the context of the limitations and judgments discussed below and in the analysis plan.

## Relationships Among Human Potential Measures

### Analysis of Entrance Assessments

#### Bivariate Relationships

The correlations among human potential measures from entrance assessments afford the best view of relationships among measures, unaffected by college experiences or possible effects of familiarity with the instruments. A complete table of intercorrelations of entrance assessment measures is provided in Appendix I, Table CC. Table 31 below shows the significant correlations among entrance assessments for the cognitive-developmental measures. (The D score of the Defining Issues Test has been omitted from this table, and from the following factor-analytic results, since it is mathematically related to the Principled Thinking index from the same instrument. The Moral Maturity score is also excluded from Table 31 and from the factor analyses due to the small number of cases

involved.) Only three of the relationships among the measures in Table 31 were not significant. Consistent with psychological measurements of this sort, all of the correlations are in the low to moderate range. Casual inspection suggests two factors operating among the selected measures, distinguished by the Measure of Vocational, Educational, and Personal Issues on the one hand, and the Test of Cognitive Development on the other. The Sentence Completion Test of Ego Development and the Defining Issues Test appear to share in both. Considering the theoretical structure of these measures, the pattern of correlation suggests a separation between socio-emotional maturity and logical thought.

There were very few significant bivariate relationships between the cognitive-developmental measures and the Stages of Adaptation measure from the Picture Story Exercise. Autonomous, Assertive, and Integration stage scores were all correlated with the "Best Class" essay rating from the Measure of Vocational, Educational and Personal Issues, which may reflect the common scoring emphasis on relationships to, and attitudes towards, authority. The lack of other correlations between the cognitive-developmental measures and the Stages of Adaptation led us to question the latter's role as a developmental measure. In terms of convergent vs. divergent validity, the Stages of Adaptation would ideally show stronger correlations with other developmental measures obtained through different methods of measurement, than with less developmental measures obtained by similar methods of measurement.

Table 31.

Significant Correlations Among Entrance Assessments  
for Cognitive-Developmental Measures

Measure		1	2	3	4	5	6
MVEPI	(1) Best Class Essay	--					
	(2) Decision Essay	.311	--				
	(3) Career Essay	.203	.365	--			
SCT	(4)	.186		.278	--		
DIT	(5) P% Score		.212	.277	.325	--	
TCD	(6)	.127		.193	.243	.349	--

Table 32.

Significant Correlations Between Cognitive-Developmental  
and Generic Ability Measures

Measure	Test of Thematic Analysis	Critical Thinking Appraisal		
		Inference	Recognition	Deduction
NVEPI	Best Class Essay			
	Decision Essay		.140	.150
SCT	Career Essay	.139	.179	
		.253		.170
DIT	P% Score	.185	.351	.295
		.295	.276	.212
TCD				.352

There were few significant bivariate relationships between the cognitive-developmental measures and the other characteristics measured by the Picture Story Exercise, or with the Learning Style Inventory. Achievement Motive scores were correlated only with the "Best Class" essay ratings from the Measure of Vocational, Educational, and Personal Issues ( $r = -.154$ ,  $p < .02$ ). Affiliation Motive scores were correlated with the Sentence Completion Test of Ego Development ( $r = .193$ ,  $p < .01$ ) and with the Principled Thinking index of the Defining Issues Test ( $r = -.139$ ,  $p < .05$ ). Learning Style composites, the Abstract/Concrete scale and the Active/Reflective scale, were correlated with the Test of Cognitive Development ( $r = .131$  and  $-.149$ , respectively,  $p < .05$ ).

The bivariate relationships between cognitive-developmental measures and the generic ability measures lend support to the distinction suggested by the intercorrelations of cognitive-developmental measures. Table 32 presents the significant correlations between the cognitive-developmental measures in Table 31 and the entrance assessments from the Test of Thematic Analysis and the Critical Thinking Appraisal. (Entrance assessments on the Analysis of Argument and Life History Exercise were not available for all three cohorts.) The generic ability measures correlate most strongly with the cluster of cognitive-developmental measures more associated with logical thought. Inspection of the full correlation matrix in Table CC of Appendix I reveals a few significant but low correlations with motive, learning style, and ability measures. (All indices

excluded from this presentation because of incomplete data or mathematical interdependencies can be reviewed in the Appendix.)

### Principal Component Analysis

Table 33 presents the results of a principal component analysis of entrance measures orthogonally rotated to maximize the variance between variables on each component. Eight components were selected, based on the criterion that a component account for more of the total variance than was provided by a single variable. This analysis, presented for descriptive purposes, includes all entrance measures available across cohorts. (The D score from the Defining Issues Test and the four subscales of the Learning Style Inventory have been excluded because of their mathematical interdependence with the included indices from those instruments.)

A common rule of thumb for evaluating the significance of factor loadings is to consider loadings of  $\pm 0.3$  or more as worthy of special note. Because this is only a rule of thumb, all loadings are shown in Table 33 and the loadings exceeding this criterion have been underscored.

Ordinarily, the first component is considered the most important, with later components important in descending order. The orthogonal rotation confounds this somewhat, and shifts the focus on rank to a focus on the conceptual identification of components. With the variables given, the cognitive-developmental measures are split into more than the two clusters suggested by casual observation of their intercorrelations. The link between the logical thought aspect of the cognitive-developmental measures and the generic ability measures is evident in the first component. What appeared to have been a second cluster has been broken into Components 3 and 6.

The Stages of Adaptation indices, lacking significant bivariate correlation with variables other than those from the same instrument, each loaded on separate components (2, 4, 5 and 7). It is not clear of course how responsible these indices are for the dispersal of cognitive-developmental loadings on Components 3, 4 and 5, nor is it clear how the Self-Description, Motive scores, and Learning Style Inventory composite indices might load with cognitive-developmental or generic components apart from the influence of the Stage of Adaptation indices

Table 34 answers that question by showing the results of an identical analysis of entrance assessments with the Stages of Adaptation indices excluded.

The number of components accounting for more variance than a single variable is reduced to six. The cognitive-developmental components, 2 and 5, come much closer to matching the clustering evident in the bivariate relationships. The loadings of the Sentence Completion Test and Defining Issues Test on the second component are close to the rule of thumb criterion (.279 and .271, respectively). The loadings of the Test of Cognitive Development on Component 1 (.287), and of the critical thinking

Table 33.

## Factor Loadings from Principal Component Analysis of Entrance Assessments

Measure	1	2	3	4	5	6	7	8	
MVEPI	Best Class Essay	-.038	-.180	<u>.795</u>	.073	-.071	.073	.168	.268
	Decision Essay	.146	.058	<u>.701</u>	-.055	.035	.027	-.034	-.198
	Career Essay	.136	.146	<u>.519</u>	-.206	.106	<u>.323</u>	-.252	-.254
SCT		.065	.029	.144	-.074	-.024	<u>.799</u>	-.026	-.012
	PZ Score	<u>.451</u>	.143	.185	<u>-.412</u>	-.030	<u>.374</u>	-.053	-.017
TCD		<u>.553</u>	.110	.133	.021	.017	<u>.315</u>	-.163	.241
	Stages of Adaptation								
PSE	Receptive	.187	.009	.012	<u>.749</u>	-.113	-.042	.099	-.128
	Autonomous	.081	<u>.315</u>	.147	-.044	-.137	-.037	<u>.735</u>	.113
	Assertive	-.160	<u>.767</u>	-.093	-.087	.039	-.011	-.027	.009
	Integrative	.011	.058	.237	.187	<u>.767</u>	.063	-.011	.073
	Self-Definition	.126	<u>.330</u>	-.051	<u>.594</u>	.258	-.093	-.192	.159
	Achievement Motive	.215	-.022	-.180	-.290	<u>.708</u>	-.182	.076	-.020
	Affiliation Motive	-.229	<u>-.416</u>	-.136	<u>.458</u>	-.040	<u>.477</u>	-.126	-.012
	Power Motive	.023	<u>.758</u>	.061	.222	-.016	.066	.200	-.043
LSI	Abstract/Concrete	.042	-.005	-.068	-.050	.048	.068	-.025	<u>.841</u>
	Learning Orientation								
	Active/Reflective	-.170	-.087	-.151	.037	<u>.334</u>	.103	<u>.631</u>	-.217
Learning Orientation									
TTA		<u>.318</u>	-.021	.004	-.026	-.050	<u>.532</u>	.242	.187
CTA	Inference	<u>.700</u>	.028	.131	-.010	.069	-.034	-.035	-.124
	Recognition	<u>.649</u>	-.179	-.128	.122	.056	-.005	.146	-.093
	Deduction	<u>.690</u>	-.065	.071	.105	.044	.135	-.060	.191

Table 34.

Factor Loadings from Revised Principal Component Analysis  
of Entrance Assessments (excluding Stages of Adaptation)

Measure		1	2	3	4	5	6
MVEPI	Best Class Essay	-.077	<u>.563</u>	.212	-.006	.143	-.254
	Decision Essay	.153	<u>.761</u>	-.053	.058	-.010	.018
	Career Essay	-.008	<u>.654</u>	-.184	-.021	.262	-.022
SCT		-.012	.279	.289	-.131	<u>.615</u>	-.058
	P% Score	.133	.271	<u>-.359</u>	-.126	<u>.601</u>	-.010
TCD		.287	.073	-.143	.181	<u>.585</u>	-.253
PSI	Self-Definition	.219	-.114	.086	<u>.744</u>	-.117	-.134
	Achievement Motive	<u>.400</u>	-.156	<u>-.454</u>	<u>-.158</u>	-.104	.291
	Affiliation Motive	<u>.074</u>	-.068	<u>.841</u>	-.100	.057	.042
	Power Motive	-.160	.135	-.162	<u>.775</u>	.117	.229
LSI	Abstract/Concrete Learning Orientation	-.074	<u>-.402</u>	-.024	.085	<u>.439</u>	-.285
	Active/Reflective Learning Orientation	-.071	-.084	.008	.070	.729	<u>.852</u>
TTA		.173	.021	.146	.010	<u>.628</u>	.132
CTA	Inference	<u>.541</u>	.161	<u>-.318</u>	.001	.205	-.138
	Recognition	<u>.799</u>	-.003	<u>.125</u>	-.022	.034	.092
	Deduction	<u>.644</u>	.070	.015	.168	<u>.329</u>	-.174

measures in Component 5 (Test of Thematic Analysis, .628; Deduction score from the Critical Thinking Appraisal, .329) indicate the linkage between critical thinking and the logical thought aspect of the cognitive-developmental measures. With Stages of Adaptation removed, we also find interesting interrelationships between the other measured characteristics and the cognitive-developmental and critical thinking measures.

#### Correlated Factors Solution

The principal component solution in Table 34, though perhaps more suggestive of interrelationships between measures than the preceding solution, is of limited value in interpreting underlying factors because of the forced independence of the components, and because the total variance is factored into components rather than just the common variance. One would expect each measure to include variance in common with other measures, plus unique variance and error variance. When just the variance each measure shares with one or more others was factored, and factors were allowed some degree of correlation, the results in Table 35 were obtained. Table 35 presents the obliquely rotated factor pattern matrix from a factoring method (Alpha factoring, Nie, et. al., 1975) which treats the included variables as a sample from the universe of variables characterizing the development and abilities of the population.

The factor pattern matrix most clearly identifies the clusters of variables measuring similar characteristics in the population. A substantive interpretation of the factors requires examination of the actual correlations between factors and the original variables, and the correlations between the factors themselves. In Table 35, the matrix of correlations of factors with variables, the factor structure, is shown to the right of the pattern matrix, and the intercorrelations among factors are shown below.

The first factor appears to be a general cognitive-developmental factor most significantly related to the four instruments underscored in the factor pattern matrix (Table 35). It is positively correlated with all of the included cognitive-developmental and critical thinking indices, and with the Abstract/Concrete dimension of the Learning Style Inventory. The second and third factors are each principally defined by the multiple indices of a single measure.

The correlations show that while both provide some measure of general cognitive development, they seem to identify different components of cognitive development that may be exhibited independently. The second and third factors are uncorrelated,  $r = -.01$ , though both are positively correlated with the first factor,  $r = .22$  and  $.24$ , respectively. The second factor indicates critical thinking, but not necessarily socio-emotional maturity while the third factor represents socio-emotional maturity without the exhibition of critical thinking.

The fourth factor, which may represent self-assertion, is defined by measures of Self-Definition and the Power Motive.

Table 35.

Oblique Factor Solution for High Entrance Measures

Measure	Pattern Matrix Factor						Structure Matrix Factor					
	1	2	3	4	5	6	1	2	3	4	5	6
Measures of Vocational, Educational and Personal Issues												
"Best Class" Essay	.14	-.10	<u>.31</u>	-.00	-.19	.11	.25	-.08	<u>.35</u>	-.02	-.25	.13
"Decision" Essay	-.05	.11	<u>.64</u>	.07	-.04	-.00	.14	.10	<u>.62</u>	.03	-.09	-.07
"Career" Essay	.15	-.00	<u>.53</u>	-.02	-.05	-.12	.28	.05	<u>.58</u>	-.03	-.12	-.15
Sentence Completion Test	<u>.45</u>	-.02	.22	-.08	.04	.19	<u>.49</u>	.03	<u>.31</u>	-.09	-.11	.19
Defining Issues Test												
PZ Score	<u>.52</u>	.06	.19	-.11	.02	-.29	<u>.55</u>	.21	<u>.34</u>	-.07	-.10	-.29
Test of Cognitive Development	<u>.48</u>	.15	.01	.13	-.22	-.13	<u>.58</u>	<u>.30</u>	.13	.20	<u>-.36</u>	-.13
Picture Story Exercise												
Self-Definition	-.09	.13	-.09	<u>.44</u>	-.10	.03	-.03	.15	-.14	<u>.46</u>	-.11	-.01
Achievement Motive	-.03	.28	-.10	-.04	.19	-.25	-.05	<u>.31</u>	-.10	-.02	.21	<u>-.31</u>
Affiliation Motive	.05	.10	-.05	-.05	.04	<u>.71</u>	.07	-.03	-.03	-.08	-.04	<u>-.70</u>
Power Motive	.08	-.16	.19	<u>.67</u>	.24	-.07	.06	-.10	.15	<u>.64</u>	.18	-.11
Learning Style Inventory												
Abstract/Concrete Learning Orientation	.22	-.01	-.19	.05	-.09	.01	.20	.05	-.14	.08	-.14	.04
Active/Reflective Learning Orientation	.04	-.01	-.04	.04	<u>.44</u>	.02	-.09	-.03	-.07	.01	<u>.43</u>	-.02
Test of Thematic Analysis	<u>.49</u>	.10	.00	-.00	.07	.09	<u>.50</u>	.19	.10	.02	-.08	.08
Critical Thinking Appraisal												
Inference	.12	<u>.30</u>	.15	.01	-.12	-.21	.27	<u>.46</u>	.19	.06	-.17	-.27
Recognition	.01	<u>.65</u>	.05	-.02	.05	.13	.16	<u>.62</u>	.03	.01	-.02	.00
Deduction	.26	<u>.49</u>	.02	.15	-.18	.02	<u>.44</u>	<u>.56</u>	.08	.21	<u>-.31</u>	-.05

Factor Correlation

	1	2	3	4	5	6
Factor 1	--					
Factor 2	.22	--				
Factor 3	.24	-.01	--			
Factor 4	.06	.07	-.07	--		
Factor 5	-.28	-.07	-.07	-.07	--	
Factor 6	.03	-.19	-.07	-.06	-.09	--

This factor is virtually independent of the other factors. The small positive correlation with the Test of Cognitive Development ( $r = .20$ ) and the Deduction score of the Critical Thinking Appraisal ( $r = .21$ ) in Table 35 suggests that the mutual occurrence of high Self-Definition and high Power Motive is associated with an element of deductive thinking ability.

The fifth and sixth factors are distinguished by their negative correlation with the first two factors. The Active/Reflective dimension of the Learning Style Inventory, which is most prominent on the fifth factor, was negatively correlated with most of the cognitive-developmental and generic ability indices. The fifth factor is thus negatively correlated with the first general factor of cognitive development. Besides the Active/Reflective Learning Style score, the only variables positively correlated with the fifth factor were the Achievement and Power Motives ( $r = .21$  and  $.18$ , respectively). The strongest negative correlations were with the Test of Cognitive Development ( $r = -.36$ ), and the Deduction score of the Critical Thinking Appraisal ( $r = -.31$ ). Factor 5 would seem to identify a characteristic that might be commonly recognized as "doing," that is unrelated to cognitive-developmental pattern.

The Affiliation Motive stands out on the sixth factor, which shows some negative correlation with the second, or logical thought factor. The impression that this factor represents a characteristic of concern with interpersonal relations is supported by the positive correlations with the "Best Class" essay rating from the Measure of Vocational, Educational, and Personal Issues ( $r = .13$ ) and the Sentence Completion Test of Ego Development ( $r = .19$ ). Both of these indices reflect, in the upper range of ratings received by the population, a growing interpersonal sensitivity.

One additional check on the interpretations of these factors is provided by inspection of the correlations of factors with human potential measures excluded from the factor analysis. Table 36 presents these correlations. Relationships between the factors and the Moral Judgment Instrument, the Analysis of Argument, and the Life History Exercise, must be considered with the important qualification of small or partial samples. Moral Maturity scores were obtained on only 42 randomly selected students. Analysis of Argument data does not include the 1976 Weekday College entrance cohort, and the Life History Exercise data was obtained for the 1977 Weekend College entrance cohort only.

The relationship between the first three factors and the two cognitive-developmental indices in Table 36 conforms fairly well to the interpretations of these factors presented above. The positive correlation of the Moral Judgment Instrument with the fifth factor ( $r = .21$ ) seems inconsistent, but may be due to the small number of cases involved. The equally positive correlations of Autonomous and Assertive Stages of Adaptation with the fourth and fifth factors lend some credence to the idea that these two factors represent two faces of assertiveness, one associated with Self-Definition and largely independent of cognitive development (in the range of this population) and the other a by-product of "doing," that is unrelated to cognitive-developmental pattern.

Table 36.

Relations Between Entrance Factors and Indices  
Excluded from Factor Analysis

Measure	Factor					
	1	2	3	4	5	6
Moral Judgment Instrument	.13	.23	.20	-.11	.21	-.27
Defining Issues Test	<u>.33</u>	<u>.31</u>	.23	-.08	-.01	-.17
Picture Story Exercise						
Stages of Adaptation						
Receptive	.07	.07	.06	.09	-.09	.15
Autonomous	.07	.06	.11	.16	.16	-.13
Assertive	-.06	-.11	.13	.23	.20	-.13
Integrative	.07	.11	.04	.11	-.10	-.04
Learning Style Inventory						
Concrete Experience	-.09	.12	.13	-.13	.02	-.01
Reflective Observation	.02	.01	.05	-.05	<u>-.43</u>	.04
Abstract Conceptualization	.20	.05	-.09	.14	<u>-.12</u>	.02
Active Experimentation	-.14	-.12	-.17	.01	<u>.47</u>	.05
Analysis of Argument						
Attack	.15	.08	.09	.04	-.08	-.04
Defense	-.04	-.13	.03	-.09	.13	.05
Life History Exercise						
Performance	.24	.16	-.11	-.17	.05	-.26
Improvement	.16	-.12	.05	-.03	-.18	-.01

## Summary of Factors Underlying Entrance Assessments

Briefly summarizing the factors underlying entrance assessments, the first three factors appear to show that all of the cognitive-developmental measures and the generic ability measures were measuring general cognitive development in part, but that one subset accounted for variance in socio-emotional maturity unrelated to logical thought while another subset accounted for variance in logical thought unrelated to socio-emotional maturity. The last three factors reflected characteristics in the population that appeared independent of, or negatively correlated with, cognitive development. Factor 4 has been interpreted as reflecting self-assertion on the basis of the significant positive loadings of Self-Definition and the Power Motive. Factor 5 was identified as a different sort of assertiveness because of the negative correlation with the general cognitive development factor. The highest loading variable was the Active/Reflective scale of the Learning Style Inventory. High scores on this scale indicate preference for Active Experimentation over Reflective Observation. Factor 6 was strongly identified with Affiliation Motive scores, and the factor was negatively correlated with the logical thought factor underlying the critical thinking measures and several of the cognitive-developmental measures.

### Change in the Factors

With this minimal framework of the relationships between measures and what they might be measuring, we examined changes across the three assessments in two ways. Factor-analytic solutions identical to those reported above for entrance assessments were conducted on second and third assessments.

### Second Assessment Factors

Table 37 presents the factor pattern matrix, factor structure, and factor correlations for the second assessment outcomes.

At second assessment, two years after entrance, the factor pattern bears a significant resemblance to the factor pattern of entrance assessments, but there are some noteworthy differences. It must of course be borne in mind that several things could have affected these changes besides actual change in the population (e.g., effects of retesting).

The first factor at second assessment shows a slightly different clustering of three indices of the Critical Thinking Appraisal cluster with the Test of Cognitive Development and the Defining Issues Test. The second factor appears to be new. Table 37 shows that it is uncorrelated with the first factor, and negatively correlated with the third factor. The third factor is substantially the same as the third factor in Table 35 for

Table 37.

Oblique Factor Solution for Eight Measures  
at Second Assessment

Measure	Pattern Matrix Factor						Structure Matrix Factor					
	1	2	3	4	5	6	1	2	3	4	5	6
Measures of Vocational, Educational and Personal Issues												
"Best Class" Essay	.15	.06	<u>.62</u>	.03	-.14	-.09	.28	-.02	<u>.62</u>	.01	-.00	-.06
"Decision" Essay	-.14	.02	<u>.62</u>	-.05	.15	-.10	.04	-.07	<u>.61</u>	-.07	.24	-.08
"Career" Essay	.00	-.13	<u>.58</u>	.09	-.07	.17	.13	-.17	<u>.59</u>	.08	.04	.16
Sentence Completion Test	.17	-.14	<u>.36</u>	-.13	.09	<u>.32</u>	.26	-.11	<u>.45</u>	-.11	.18	<u>.30</u>
Defining Issues Test												
P% Score	<u>.55</u>	.25	.21	.21	.07	.12	<u>.63</u>	.26	<u>.32</u>	.23	.21	.18
Test of Cognitive Development	<u>.55</u>	.14	-.03	-.05	.01	.11	<u>.55</u>	.18	.10	-.02	.10	.13
Picture Story Exercise												
Self-Definition	-.22	.03	-.09	.04	-.26	<u>.45</u>	-.28	.12	-.18	.02	-.32	<u>.46</u>
Achievement Motive	-.04	.29	.07	-.04	.20	<u>.49</u>	.02	<u>.38</u>	.07	-.04	.19	<u>.54</u>
Affiliation Motive	.05	-.04	-.13	-.64	-.03	.18	-.03	.04	-.10	-.63	-.08	.16
Power Motive	-.00	-.10	-.09	<u>.54</u>	.03	.14	.01	-.09	-.09	<u>.55</u>	.04	.13
Learning Style Inventory												
Abstract/Concrete Learning Orientation	.12	<u>.31</u>	-.07	.09	-.01	.11	.12	<u>.34</u>	-.08	.09	-.00	.16
Active/Reflective Learning Orientation	-.01	-.05	-.06	.06	<u>.62</u>	.01	.09	-.05	.05	.09	<u>.61</u>	-.01
Test of Thematic Analysis	.07	-.36	.01	.11	.04	.04	.07	-.36	.07	.13	.07	-.03
Critical Thinking Appraisal												
Inference	<u>.53</u>	-.02	.11	-.02	.21	-.09	<u>.59</u>	-.04	.27	.02	<u>.32</u>	-.09
Recognition	<u>.58</u>	-.12	.02	-.09	-.05	-.03	<u>.57</u>	-.10	.17	-.05	<u>.05</u>	-.05
Deduction	<u>.71</u>	-.06	-.08	.07	-.05	-.15	<u>.69</u>	-.06	.09	.11	.07	-.16

## Factor Correlation

	1	2	3	4	5	6
Factor 1	--					
Factor 2	.04	--				
Factor 3	.25	-.12	--			
Factor 4	.07	-.04	-.03	--		
Factor 5	.17	-.01	.18	.05	--	
Factor 6	.00	.19	.03	.02	-.01	--

entrance assessments. The fourth factor in second assessments is most strongly identified by inversely related Power and Affiliation Motive scores, while Self-Definition clusters with Achievement Motive scores on Factor 6. Factor 5 remains identified mainly with the Active/Reflective dimension of the Learning Style Inventory.

The factor structure for second assessments confirms that the first factor is largely unchanged from first assessment, and that the second factor is not as new as it appeared in the pattern matrix. The shifts in loadings between the first two factors involve the Concrete-Abstract learning style orientation, the Test of Thematic Analysis, and the three submeasures of the Watson-Glaser Critical Thinking Appraisal.

### Third Assessment Factors

Factoring of the third assessments produced one less factor under the criterion of contributing more than a single unit of variance. Again, in Table 38, we see the same measures loading on the first factor at third assessment. The second factor is the same as the fourth second assessment factor: a high Power/low Affiliation motive factor. The third factor is defined by the achievement motive score, and this appears to be something new vis-a-vis entrance and second assessments. The fourth factor shows only high negative loadings, on Best Class and Decision essays of the Measure of Vocational, Educational and Personal Issues, and the Abstract/Concrete orientation of the Learning Style Inventory. The fifth, and in this case last, factor appears to be like the third factor in the previous two assessments (i.e., the socio-emotional maturity factor).

### Second-Order Factors

Examination of second-order factors provides a means of getting beyond the fluctuations between variances specific to individual measures. Three second-order factors emerged from both first and second assessments, as shown in Tables 39 and 40. The first second-order factor for both assessments was most closely associated with the first primary factor, as would be expected. For the first or entrance assessment, however, the first second-order factor also shows moderately strong loadings for the second and fifth first-order factors. This effectively decides the case for the first factor in favor of the logical thought or critical thinking component. The socio-emotional maturity factor remains separate in the third second-order factor. The middle second-order factor is distinguished by the high loading for the sixth primary factor, which was itself distinguished by the affiliation motive variable.

Second assessment second-order factors were more clearly like the first assessment second-order factors. The most noticeable contrast between entrance second-order factors and second second-order factors is the opposite sign of the loading for Active/Reflective Learning Style orientation on first

Table 38.

Oblique Factor Solution for Eight Measures  
at Third Assessment

Measure	Pattern Matrix Factor					Structure Matrix Factor				
	1	2	3	4	5	1	2	3	4	5
Measures of Vocational, Educational and Personal Issues										
"Best Class" Essay	.02	-.11	-.34	-.42	.21	.24	-.12	-.36	-.47	.34
"Decision" Essay	.08	.04	.03	-.56	.20	.34	.08	.01	-.64	.35
"Career" Essay	-.09	.06	-.06	-.01	.79	.20	-.06	-.08	-.17	.75
Sentence Completion Test	.25	-.05	.07	-.05	.42	.40	-.05	.03	-.23	.52
Defining Issues Test										
P% Score	.34	.13	.14	-.05	.32	.48	.16	.11	-.24	.42
Test of Cognitive Development	.60	.09	-.03	-.00	.03	.63	.18	-.07	-.21	.23
Picture Story Exercise										
Self-Definition	-.09	-.19	.20	.06	.05	-.14	-.20	.19	.10	.02
Achievement Motive	-.02	-.05	.75	-.18	.08	.01	.01	.74	-.18	.09
Affiliation Motive	.04	-.50	.03	.17	-.02	-.11	-.51	-.00	.21	.02
Power Motive	.01	.67	.07	.19	.07	.08	.65	.12	.10	-.06
Learning Style Inventory										
Abstract/Concrete Learning Orientation	.03	.02	.11	-.45	-.09	.14	.09	.10	-.44	.02
Active/Reflective Learning Orientation	.00	.12	.18	-.01	-.08	-.02	.15	.19	-.00	-.10
Test of Thematic Analysis	.24	-.04	.04	-.01	.20	.30	-.02	.01	-.13	.29
Critical Thinking Appraisal										
Inference	.61	-.02	.04	-.09	-.06	.61	.10	-.00	-.27	.17
Recognition	.54	-.04	-.06	-.07	.02	.56	.04	-.11	-.25	.23
Deduction	.77	-.02	-.06	.10	-.07	.72	.10	-.11	-.13	.18

Factor Correlation

	1	2	3	4	5
Factor 1	--				
Factor 2	.16	--			
Factor 3	-.07	.08	--		
Factor 4	-.32	-.10	.01	--	
Factor 5	.35	-.13	-.04	-.23	--

Table 39.

Second-order Oblique Factor Solution For Six Factors  
From Entrance Assessment

HP 1	Pattern Matrix			Structure Matrix		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
Factor 1	.89	.04	.20	.90	-.08	.28
Factor 2	.47	-.24	-.10	.50	-.33	-.10
Factor 3	.12	-.13	.86	.22	-.02	.85
Factor 4	.10	-.11	-.06	.12	-.13	-.06
Factor 5	-.55	-.18	-.07	-.52	-.09	-.14
Factor 6	.11	.80	-.13	-.04	.76	.01

## Factor Correlations

	1	2	3
Factor 1	-		
Factor 2	-.17	-	
Factor 3	.08	.15	-

Table 40.

Second-order Oblique Factor Solution for Six Factors  
from Second Assessment

HP 2	Pattern Matrix			Structure Matrix		
	Factor			Factor		
	1	2	3	1	2	3
Factor 1	<u>.47</u>	.04	.17	<u>.51</u>	.04	.27
Factor 2	.02	<u>.98</u>	-.10	-.01	<u>.98</u>	-.07
Factor 3	.06	-.05	<u>1.07</u>	.28	-.02	<u>1.08</u>
Factor 4	.22	-.02	-.07	.20	-.02	-.03
Factor 5	<u>.45</u>	.01	.11	<u>.47</u>	.01	.20
Factor 6	-.01	<u>.43</u>	.02	-.01	<u>.43</u>	.03

## Factor Correlations

	1	2	3
Factor 1	-		
Factor 2	-.01	-	
Factor 3	.21	.03	-

second-order factors. Recalling the dramatic changes in learning style preferences recorded through the first interval, it stands to reason that part of what is manifest here is simply an alignment between preference and performance.

The third second-order factor for second assessment, as with entrance assessment, represents the socio-emotional maturity factor. The middle second-order factor for second assessment defies simple interpretation, since its highest loading is one of the more obscure primary factors from second assessment. Inspection of the simple correlations between second-order factors and raw variables revealed the strongest correlation to be with the achievement motive variable. It is worth mention that in both entrance and second assessments, the non-cognitive factor appears to be defined by a motivation variable, affiliation for entrance assessments and achievement for second assessment.

Only two second-order factors appeared for third assessment from the original five factors. Table 41 shows that the two cognitive factors, interpreted as logical thought and socio-emotional maturity, load together on the first second-order factor. The second factor is distinguished by the high loading of the second primary factor, which, interestingly, was identified with the power motive.

#### Summary of Factor Comparisons

The series of factor analyses included the same set of measures obtained from the same students on three occasions. This constancy is the basis for speculation that the reduction from six to five primary factors, and three to two second-order factors at third assessment, may signal integration of logical thought and socio-emotional maturity. Certainly alternative hypotheses abound, for instance the phenomenon, if not simply meaningless, may be explained by retest effects. In any case, as the goal here is more one of theory building rather than theory verification, the speculation suggests many specific tests of confirmation or disconfirmation in further analyses of the data.

Table 41.

Second-order Oblique Factor Solution for Five Factors  
from Third Assessment

HP 3	Pattern Matrix		Structure Matrix	
	Factor		Factor	
	1	2	1	2
Factor 1	<u>.75</u>	-.01	<u>.75</u>	-.06
Factor 2	<u>.13</u>	<u>.68</u>	<u>.08</u>	<u>.67</u>
Factor 3	-.05	<u>.20</u>	-.06	<u>.20</u>
Factor 4	<u>-.62</u>	-.16	<u>-.61</u>	-.12
Factor 5	<u>.59</u>	-.20	<u>.60</u>	-.24

Factor Correlations

	1	2
Factor 1	-	
Factor 2	-.07	-

## DISCUSSION

This study demonstrates a set of assumptions and values concerning college responsibilities for the nature and function of liberal education. It also sets forth assumptions, values and objectives for research and evaluation in higher education.

This study is part of a broader program validation effort designed to investigate how a college program contributes to student learning and development. It pursues the links between abilities developed in college and later career and personal performance (Mentkowski and Doherty, 1983). It argues for institutional accountability for the traditional promises of liberal arts education, namely life-long learning and development, and transfer of learning and abilities across different roles and settings.

We matched research questions to explicit goals and objectives of the institution, worked collaboratively with faculty across disciplines, and devised methods to involve students to insure representative participation. We linked external criterion measures not only to goals, but to principles of assessment broadly recognized and shared by faculty in assessing all kinds of student performance.

Putting these several commitments into action required going beyond conventional procedures and forms of instrumentation employed in most earlier studies of college outcomes. The measures used in this study vary considerably in character and length of use, and most are still experimental in application to measurement of college outcomes.

McBer's Cognitive Competence Assessment Battery (Winter, McClelland & Stewart, 1981), for example, is partly based on assessment techniques (e.g., TAT) in use for many years. Similarly, some cognitive-developmental schemes and instruments have long histories of development and refinement (Colby, 1978; Rest, 1981), while others are virtually brand new (Mentkowski, Moeser & Strait, 1983). Yet none of these instruments has much of a history as a college outcomes measure. An important outcome of this study is the record of performance of these instruments in a higher education setting; a record of mutual benefit to educators and educational researchers.

These questions determined the data analyses:

- Can change be measured with this battery of cognitive-developmental and generic ability instruments?
- Can change be attributed to a college learning process while controlling for other reasonable effects?

- Do relationships among outcomes suggest any underlying abilities and processes that could serve to explicate those abilities that should be the focus for higher education and do these relationships illumine means of student development and assessment?

These data analyses provide a base for the more specialized analyses we plan in future papers that will more directly contribute to adult learning and development theory, and to improving teaching and learning practice.

In response to the three stated questions, we found ample evidence that the selected measures could record change, and some evidence that degrees of time and performance in the learning process made a difference in the changes that occurred. Given the size and number of background and program differences controlled in the causal analysis, finding some relationship remaining between change and time and performance was quite remarkable.

We found several patterns in the data which serve as starting points for the more in-depth interpretation of the results that will follow this broad, initial look. They are discussed below.

### Patterns

#### Does Change Occur?

##### Cognitive-Developmental Measures Showed More Change Than Generic Ability Measures

In both cross-sectional and longitudinal studies, there were more instances of significant differences between groups or more significant change over time, respectively, on measures designed to test aspects of general cognitive development than on measures testing generic abilities -- particularly analytic ability.

Both studies indicated growth as measured on Perry's Scheme of Intellectual and Ethical Development and as measured by Rest's objective test of moral development (following Kohlberg). Differences were found between freshmen and seniors in the cross-sectional study of Loevinger's ego development stages, and Kohlberg's moral maturity scale; the longitudinal study revealed improvement over time on the Piagetian-based test of formal operations (Test of Cognitive Development).

The scope of this paper does not permit detailed scrutiny of the many points particular to the form and special purposes of each measure. It is important to note, however, that these measures are not used here as interchangeable indicators of a unidimensional phenomenon called cognitive development. The main support for change is not the quantitative fact that change was recorded in a majority of attempts. On the contrary, it is important to observe which instruments show what change in relation to their respective purposes and interrelationships.

For example, suppose the results we obtained with the Perry measure and the results we obtained with Loevinger's measure were reversed. Results showing more change on the ego development measure than on the Perry measure would lead us to suspect a measurement problem rather than support for student change. The Perry scheme was created to represent a series of developmental positions traversed by students during the college years. Loevinger's levels of ego development are meant to represent milestones of a broader psychosocial development across adolescence and adulthood.

Perry's scheme was instrumented with essay questions that tap related, but relatively narrow, strands of intellectual and ethical development. For example, the Best Class essay dealt with evolving epistemological sophistication. The scope of change recorded was narrow, and it was the kind of change the learning process is designed to evoke. The ego development measure deals with many strands of development at once, compressed into a composite estimate of level of core functioning. The epistemological changes recorded on the Best Class essay could be reflected in parts of the ego development measure, but the composite estimate of core functioning may not change if there is not comparable affective and interpersonal development. Change on the ego development measure like that recorded with the Perry measure would not be consistent with the concepts which guided construction of the measure.

This one example suggests the kind and level of detail which is necessary to fully explicate the findings. For now it must suffice to say that the patterns of change among the cognitive-developmental measures were not at odds with our expectations.

In contrast, three measures of analytic ability provided fewer indications of difference or change. There were improvements on the Watson-Glaser Critical Thinking Appraisal for the students in the longitudinal study of persisters in the program who participated in all three assessments. But the Test of Thematic Analysis and the Analysis of Argument measures showed very little variance between groups or across time. This does not mean that students did not improve in generic abilities other than analysis, since analysis was the only generic ability really assessed by the external criterion measures. Whether or not they improved in other aspects of analysis, or whether the instruments successfully captured change or its absence for some students, is a subject for more detailed analysis.

It is interesting to note that the pattern of change recorded among the cognitive-developmental measures suggested there was more change or growth in logical thought, or intellectual development, than in socio-emotional development. It was those measures defining the logical thought factor, especially the Defining Issues Test and the Test of Cognitive Development, which showed the most change between intervals in the longitudinal study. The Perry and Loevinger measures, more closely identified with the socio-emotional maturity factor, did not show as much change overall. Why was this pattern not echoed or supported by the analysis measures?

While unreliability is one possibility, especially with the new measures of analysis, another possibility is that the analysis measures were more difficult tasks. To the extent that the underlying capability manifest as intellectual development is the same capability required to perform analytic tasks, the results may simply reveal that the analysis measures involved a higher order of complexity than did the cognitive-developmental measures. The change registered on the developmental measures was from a low to moderate level of complexity, while the analysis measures showing no change demanded a still higher level to discriminate between performances.

Beginning Students' Performance on  
Cognitive-Developmental Measures  
Was Related to Age; Performance  
on Ability Measures Was Related  
to High School Grades

Nearly all measures showed some correlation with age, but the association of age with measures designed to test cognitive development were much stronger. This was an expected finding, and serves to confirm that measures were doing what they were supposed to do. The Sentence Completion Test of Ego Development provides a counterpoint in not being correlated with age; this was expected because this measure and theory were explicitly designed to be as independent of age as possible.

The Watson-Glaser Critical Thinking Appraisal was not related to age, but was related to high school grades, an index of academic ability, also an expected finding. The Test of Cognitive Development was also related to grade point average rather than age, which we did not expect. This suggests that this latter measure may be more sensitive to academic skills than would be desirable for a test of cognitive development, and that it may be operating more as another analysis ability measure.

On the other hand, the Test of Cognitive Development is unlike the other cognitive-developmental measures in that it does not assess a spectrum of positions or a sequence of stages; rather, it assesses "how much" evidence is present indicative of the use of formal operations in a student's work. This means that the measure's apparent function as a skill measure does not necessarily contradict its conceptual base as a developmental measure; it does highlight the issue that "a developmental measure" and "a measure of development" may not mean the same thing.

There Was More Change on  
Recognition-Type Measures  
Than on Production-Type  
Measures

Rest's Defining Issues Test and Kolb's Learning Style Inventory presented unambiguous evidence of difference and

change. Changes on the Defining Issues Test show significant increments in principled moral reasoning for both the first and the second two years of college, although change is more dramatic the first two years. Changes on the Learning Style Inventory involved significant decrements in preferences for Concrete Experience and Reflective Observation, and significant increments in preference for Abstract Conceptualization. There was no change in preference for Active Experimentation. These changes occurred in the first two years, and the net result was a more balanced set of aggregate preferences at second assessment than was true for first assessment.

What these measures share, more than intended constructs, is the incidental characteristic of being recognition-type rather than production-type tests. The general strength of recognition test results over production test results is hardly surprising. These tests require less effort to take, and changes in awareness are known to precede changes in being able to generate one's own form of an ability. The phenomenon reminds us to look closely at this attribute of the measures in weighing the magnitude of results as part of our interpretation of the substantive changes indicated. It is our expectation, based on past research (McClelland, 1980), that the comparatively smaller indications of change on production measures will loom larger in relation to long-term effects concerning careering or future learning.

#### What Causes Change?

##### Age Accounts for Difference and Change in College

Age, a variable which partially stands in for many important life influences or experiences, accounts for change during college. This is expected because of the broad age range tapped in this study of both traditional and non-traditional age students. When looking for effects of college experience or performance on broad cognitive-developmental and generic abilities, we are reminded to look for increments of change in relation to hypothesized global and forceful life experiences younger and older people undergo before, during, and after college, for which age is a partial indicator.

This shows how critical it is that college programs build on and anticipate student experience outside the classroom. New learning must be relevant to old learning. It is a critical link that assists students to see the value of liberal arts learning goals as well as career goals (Much & Mentkowski, 1982). We suggest that future research direct attention to identifying the kinds of experiences that lead to change in performance in cognitive-developmental and generic abilities.

Students Change More in the First Two Years, But Smaller Amounts of Change in the Last Period Are More Closely Related to College Performance

Most of the relatively dramatic changes over time in our longitudinal study occurred during the first two year period. These changes during the first period were not replicated in the second year and one half period.

However, in the causal analysis of these changes, after controlling for all other measured contributing factors (pre-test score, and background and program covariates), there were actually more instances in the second interval where college performance variables accounted for additional variance in post-test scores.

These results suggest that the many changes in life circumstances brought on by or accompanying going to college have a greater impact on student development than does the level of performance in college during the first two years. After life adjustments have been made, and related growth has occurred, further development may be more dependent on college performance during the later period. Then the student begins to specialize in a major, and may extend earlier gains to new content areas, and focus on discipline-related goals not tapped by broad outcome measures. One general statement we can make about change as a function of college performance in the second interval is that change is dependent on college performance in the first interval. Some relationships between change in the second interval and performance in the second interval indicate that students who did not achieve a lot in the first two years suffered negative changes during the second two years.

What Relationships Among Abilities Emerge?

Beginning Students' Performance on the External Criterion Measures Involves Two Major Factors, Intellectual Ability and Socio-Emotional Maturity. The Two Factors Were Integrated by the End of College.

Factor analyses of results of first and second assessments were conducted to derive first and second-order factors. Based on correlations with first-order factors and raw variables, the second-order factors from both assessments reflect two dimensions of cognitive development: intellectual ability and socio-emotional maturity. In the final assessment analysis, a single second-order factor appeared in place of the two found on first and second assessments. Our interpretation is that these dimensions of development might actually merge into a single integrated or harmonious factor during college. (This is not

attributable to performance variables over others in the present form of the analysis.)

Taking into account the patterns of results on individual measures as well as the intercorrelations among measures, it is our judgment that this integration of factors probably occurs in the Alverno population through intellectual development "catching up" as it were, to socio-emotional maturity. To the extent this may accurately reflect the general case, what implications might it have for designing liberal education curricula for the non-traditional student? We will have more to say about this issue as we probe the differences in our data between traditional and older students.

This finding argues for careful attention by educators to develop ways to stimulate integration of these abilities, rather than to foster their separation by exclusive attention to one or the other.

### Implications

The first implication is that the results are promising and suggest further interpretation and analysis. These findings barely scratch the surface of the data. The results reported in this paper served the primary purpose of confirmation of student change and development on external criterion measures, as part of a much broader program validation design. The potential use of the database for purposes of curriculum development and contribution to theory and research in adult learning and development has yet to be exploited. Results so far suggest further investment in this database toward that goal.

The issues related to curriculum development which could benefit from further analysis of the database are literally without number. One area of specific application already begun at Alverno is the use of data from essays rated according to Perry's scheme of development in communications assessment and instruction. The most frequently cited criteria used in rating essays at a range of positions are being tested in the classroom as stimuli to increase student awareness of the range of perspectives they and others may employ. The Learning Style Inventory is used in the New Student Seminar to prompt discussion of various learning styles. These are two brief examples of the immediate utility being derived from a more detailed level of analysis on a single measure.

For now, we have shown that the learning process, through a gross performance measure, contributes to change. In seeking to relate measured change to the Alverno learning process only cumulative indices of student performance in college were used. While none of the external measures employed could serve as exact validation measures for the competences defined by Alverno faculty, the relationships between specific measures and performance in specific subject matter areas and specific competences areas will provide valuable information about both the curriculum and the external measures. For example, can performance in natural science coursework and performance in humanities coursework

predict change in measures of analysis ability, or conversely, are different levels of analysis ability determinative of performance patterns in these areas? The present study did not ask if change in analysis on the external criterion measures was related specifically to performance on levels of the analysis competence as defined by Alverno faculty (Alverno, in press). There are relationships to be explored here as well. Future studies intended to contribute to curriculum development must of course occur at the behest of faculty responsible for curricular change, as they are ready and able to modify programs. And the relationships grounded in this database can stimulate faculty involvement in particular problems that need attention.

In the course of presenting measures and aggregate results, we have already indicated ways in which the present study is contributing to theory and research practice. Several of the measures we used are in different phases of development or refinement based on the results of our study. Most notably, the Perry measure, now called the Measure of Intellectual Development (Mincs, 1982; Moore, 1982), Kolb's Adaptive Style Inventory, and several of the indices of McBer's Cognitive Competence Assessment battery, have been validated partly on the Alverno data.

As with the issues pertaining to curriculum development, the possible areas for further analysis contributing to adult learning and development are limitless. Many indepth comparisons of specific results are suggested by the supporting theories. For example, are the perspectives of dualism, multiplicity and relativism describing different stages in the Perry scheme actually manifest in other production instruments? To the extent they are, does this help validate either instrument, or more importantly, do they show different areas of common underlying patterns of student thought and change?

Many explicit conceptual links have been drawn by the instrument designers and theorists themselves concerning the relationships between measures included in our study. For example, Winter et al, (1981) describes the intellectual flexibility they wish to assess with the Analysis of Argument instrument in terms of the Perry scheme's notion of developing relativism. Is this conceptual link supported?

In many cases, the results themselves have pointed to interesting questions, as indicated above in the summary of some major findings. But specific questions of importance have arisen as well as general ideas of trends and patterns worth future research effort. One instance is the relationship between the academic achievement index, high school grade, and the Test of Cognitive Development score. What sense can be made of this in terms of the relative importance age and ability might be suspected of playing in relation to cognitive development?

Relationships among the broader cognitive-developmental measures, particularly those based on ego and moral development, have been reported in many other studies. But there have been few opportunities to examine multiple measures over several occasions of repeated measurement. Our study of change in future research reports will focus on relationships between change on one or more measures to change on other measures. The range of

age represented in our study will be particularly illuminating in this regard.

Relationships of the more developmental measures to the ability and style measures are equally intriguing for most educators. We will investigate the stable and transitional states of cognitive development in relation to learning style changes and improvement in analytic and human relations abilities.

As these few questions and examples attest, our study of change in a specific college population over a specific period of time may be completed, but our study of change in every other respect has just begun. We have confirmed that change in cognitive development and other characteristics important to learning can be successfully recorded, that relationships between student change and student performance at this level can be studied. We have seen the possibility, in the factor analyses, that change at the broadest level may be towards balance and integration rather than some linear upward movement. In following studies, we will explore the detailed implications of these findings which we think will have more direct implications for practice.

#### SUMMARY

This study describes changes in abilities learned in college and examines change as a function of a college learning process. It also explores relationships and patterns among these abilities. The measures used are, for the most part, newly developed and new to use as college outcomes measures.

Results showed change on most measures, and controlled for a range of background and program differences. Causal analyses linked some changes to performance in the college learning process. There is some evidence that students demonstrate two dimensions of cognitive development, intellectual ability and socio-emotional maturity on entry to college and that these are integrated by graduation.

Future interpretations of results specific to the several instruments and their interrelationships will more directly contribute to our understanding of the development of abilities learned in college. Implications for practice are that change is measurable and that the broad outcomes of higher education can be specified and assessed.

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APPENDIX I

Table A

Data Summary for t Tests of Mean Differences at Entrance  
Between Students Included and Not Included

		Included			Not Included			df	t	
		n	M	SD	n	M	SD			
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	196	3.08	1.15	364	3.02	1.16	558	0.53	
	"Decision" Essay	197	3.26	1.11	361	3.36	1.10	556	-0.96	
	"Career" Essay	180	3.01	1.18	341	3.02	1.23	519	-0.11	
Sentence Completion Test		199	5.41	0.79	476	5.32	0.98	457.2	1.16 <sup>1</sup>	
Moral Judgment Instrument		42	347.40	30.81	30	337.70	37.00	70	1.21	
Defining Issues Test	P% Score	174	38.51	13.39	376	40.07	13.79	548	-1.25	
	D Score	174	24.78	6.87	375	25.64	6.48	547	-1.59	
Test of Cognitive Development		191	11.45	3.38	484	10.75	3.80	673	2.23*	
Picture Story Exercise	Stages of Adaptation									
	Receptive	199	2.86	1.87	478	2.48	1.61	325.6	2.53 <sup>1</sup>	
	Autonomous	199	2.14	1.56	478	2.15	1.49	675	-0.10	
	Asse:itive	199	0.80	1.01	478	0.72	0.92	675	1.00	
	Integrative	199	3.86	1.99	478	3.49	1.95	675	2.26*	
	Self-Definition	199	-2.14	3.45	478	-2.58	3.80	675	1.42	
	Achievement Motive	199	6.21	5.17	478	6.96	5.08	675	-1.76	
	Affiliation Motive	199	7.14	3.46	478	7.03	3.61	675	0.37	
	Power Motive	199	6.24	4.20	478	5.94	3.55	321.8	0.90 <sup>1</sup>	
	Learning Style Inventory	Concrete Experience	202	15.97	2.79	478	16.00	2.97	678	-0.12
Reflective Observation		202	15.04	3.32	478	14.56	3.51	678	1.66	
Abstract Conceptualization		202	14.99	3.33	478	15.44	3.31	678	-1.61	
Active Experimentation		202	15.49	2.64	478	15.58	2.74	678	-0.40	
Abstract/Concrete Learning Orientation		202	-0.98	5.01	478	-0.56	5.29	678	-0.96	
Active/Reflective Learning Orientation		202	0.45	5.18	478	1.01	5.34	678	-1.27	
Adaptive Style Inventory		Total Concrete Experience	NA <sup>2</sup>							
		Total Reflective Observation	NA <sup>2</sup>							
		Total Abstract Conceptualization	NA <sup>2</sup>							
		Total Active Experimentation	NA <sup>2</sup>							
	Abstract/Concrete Adaptive Orientation	NA <sup>2</sup>								
	Active/Reflective Adaptive Orientation	NA <sup>2</sup>								
Test of Thematic Analysis		194	1.41	1.16	410	1.10	1.24	602	2.94**	
Analysis of Argument	Attack	133 <sup>3</sup>	-0.63	1.48	249 <sup>3</sup>	-0.55	1.61	380	-0.48	
	Defense	134 <sup>3</sup>	-1.77	0.79	251 <sup>3</sup>	-1.63	1.01	331.6	-1.53 <sup>1</sup>	
Critical Thinking Appraisal	Inference	131	9.38	3.08	406	9.07	3.05	585	1.14	
	Recognition	181	11.13	2.49	406	10.91	2.59	585	0.95	
	Deduction	180	16.10	3.23	404	15.83	3.31	582	0.91	
Life History Exercise	Performance	57 <sup>4</sup>	59.09	6.40	134 <sup>4</sup>	57.46	6.48	189	1.60	
	Improvement	57 <sup>4</sup>	7.98	23.36	134 <sup>4</sup>	5.54	21.35	189	0.70	

<sup>1</sup> Separate Variance Estimate used.  
<sup>2</sup> Not Applicable. Students were not given this measure at time of first assessment.

<sup>3</sup> Students entering in 1977 only.  
<sup>4</sup> Weekend Students only.  
 \*p < .05  
 \*\*p < .01



Table B

Data Summary for t Tests of Second Assessment Differences  
Between Students Included and Not Included

		Included			Not Included			df	t	
		n	M	SD	n	M	SD			
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	196	3.23	1.23	135	3.52	1.26	329	-2.08*	
	"Decision" Essay	197	3.46	1.13	134	3.61	1.09	329	-1.20	
	"Career" Essay	195	3.11	1.15	135	3.57	1.18	328	-3.56***	
Sentence Completion Test		199	5.34	0.99	134	5.25	1.18	251.4	0.73 <sup>1</sup>	
Moral Judgment Instrument		43	340.67	43.80	37	337.68	41.42	78	0.31	
Defining Issues Test	PZ Score	176	46.26	13.97	117	46.46	13.51	291	-0.12	
	D Score	176	27.56	6.87	117	27.85	5.47	281.5	-0.40 <sup>1</sup>	
Test of Cognitive Development		191	12.24	3.11	139	11.89	3.62	269.7	0.93 <sup>1</sup>	
Picture Story Exercise	Stages of Adaptation									
	Receptive	199	2.66	1.66	137	2.61	1.53	334	0.25	
	Autonomous	199	2.32	1.55	137	2.42	1.58	334	-0.59	
	Assertive	199	1.11	1.13	137	0.86	1.07	334	1.99*	
	Integrative	199	3.75	1.79	137	4.11	1.81	334	-1.78	
	Self-Definition	199	-1.05	3.65	137	-1.53	3.69	334	1.19	
	Achievement Motive	199	5.69	4.29	137	6.19	4.23	334	-1.06	
	Affiliation Motive	199	6.81	3.43	137	7.47	3.71	334	-1.66	
	Power Motive	199	7.70	4.25	137	7.36	4.15	334	0.73	
	Learning Style Inventory	Concrete Experience	202	15.19	2.92	133	15.12	3.01	333	0.22
Reflective Observation		202	13.13	3.51	133	13.04	3.40	333	0.24	
Abstract Conceptualization		202	17.05	3.56	133	16.77	3.53	333	0.73	
Active Experimentation		202	15.48	3.35	133	15.92	3.03	333	-1.21	
Abstract/Concrete Learning Orientation		202	1.88	5.78	133	1.65	5.82	333	0.36	
Active/Reflective Learning Orientation		202	2.35	6.11	133	2.88	5.59	333	-0.80	
Adaptive Style Inventory		Total Concrete Experience	199	8.28	4.08	130	7.13	4.07	327	2.44 <sup>1</sup>
		Total Reflective Observation	199	14.21	3.10	130	15.22	2.83	327	-2.99**
		Total Abstract Conceptualization	199	15.08	3.62	130	15.39	3.75	327	-0.77
		Total Active Experimentation	199	10.43	3.02	130	10.24	2.64	327	0.60
	Abstract/Concrete Adaptive Orientation	199	6.80	7.07	130	8.26	7.30	327	-1.81	
	Active/Reflective Adaptive Orientation	199	-3.77	5.29	130	-4.98	4.69	327	2.11*	
Test of Thematic Analysis		194	1.57	1.09	141	1.38	1.16	333	1.52	
Analysis of Argument	Attack	135	-0.76	1.35	198	-0.93	1.33	331	1.15	
	Defense	133	-1.82	0.61	189	-1.83	0.61	320	0.16	
Critical Thinking Appraisal	Inference	182	9.97	3.06	147	9.93	2.77	327	0.15	
	Recognition	182	10.90	2.58	147	11.38	2.36	327	-1.74	
	Deduction	182	16.64	3.29	147	17.03	3.10	327	-1.08	
Life History Exercise	Performance	194	60.61	7.30	137	60.69	7.75	329	-0.10	
	Improvement	194	6.92	23.22	137	7.19	19.05	321.6	-0.11 <sup>1</sup>	

<sup>1</sup>Separate Variance Estimate used.

\*p < .05  
\*\*p < .01  
\*\*\*p < .001

Table C

Data Summary for  $t$  Tests of Third Assessment Differences  
Between Students Included and Not Included

		Included			Not Included			df	$t$	
		$n$	$M$	$SD$	$n$	$M$	$SD$			
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	197	3.50	1.33	28	3.56	1.25	223	0.54	
	"Decision" Essay	195	3.02	1.45	28	3.04	1.26	221	-0.05	
	"Career" Essay	194	3.12	1.39	28	3.18	1.31	220	-0.20	
Science Completion Test		200	5.28	1.00	33	5.39	0.97	231	-0.64	
Moral Judgment Instrument		43	353.02	37.67	17	349.24	41.60	58	0.34	
Defining Issues Test	PX Score	174	49.21	14.54	27	46.23	11.28	199	1.02	
	D Score		28.72	6.77	27	26.80	5.28	199	1.40	
Test of Cognitive Development		1	12.37	3.23	32	11.28	3.51	221	1.74	
Picture Story Exercise	Stages of Adaptation									
	Receptive	198	2.46	1.47	31	2.58	1.75	227	-0.40	
	Autonomous	198	2.47	1.66	31	1.87	1.98	227	1.83	
	Assertive	198	0.96	1.04	31	1.22	1.40	35.3	-1.39 <sup>1</sup>	
	Integrative	198	3.13	1.72	31	3.15	1.76	227	0.09	
	Self-Definition	199	-1.28	3.83	31	-0.87	3.77	228	-0.56	
	Achievement Motive	199	7.24	4.55	31	6.34	6.02	35.5	0.36 <sup>1</sup>	
	Affiliation Motive	199	7.93	3.63	31	9.00	3.43	228	-1.53	
	Power Motive	199	7.41	3.97	31	7.26	4.58	228	0.19	
	Learning Style Inventory	Concrete Experience	202	14.77	3.24	27	15.74	3.37	227	-1.45
Reflective Observation		202	13.10	3.51	27	13.04	3.41	227	0.09	
Abstract Conceptualization		202	17.06	3.42	27	16.67	3.73	227	0.56	
Active Experimentation		202	15.87	3.18	27	15.74	3.50	227	0.19	
Abstract/Concrete Learning Orientation		202	2.29	5.78	27	0.93	6.44	227	1.14	
Active/Reflective Learning Orientation		202	2.75	5.91	27	2.70	5.97	227	0.04	
Adaptive Style Inventory		Total Concrete Experience	199	8.20	4.17	30	7.90	3.70	227	0.37
		Total Reflective Observation	199	14.27	2.90	30	15.10	2.77	227	-1.47
		Total Abstract Conceptualization	199	15.14	3.52	30	14.63	3.83	227	0.72
		Total Active Experimentation	199	10.38	2.75	30	10.37	2.66	227	0.02
	Abstract/Concrete Adaptive Orientation	199	6.94	7.10	30	6.73	6.70	227	0.15	
Active/Reflective Adaptive Orientation	199	-3.89	4.77	30	-4.73	4.21	227	0.91		
Test of Thematic Analysis		25	1.48	1.06	37	1.70	1.47	43.4	-0.87 <sup>1</sup>	
Analysis of Argument	Attack	135	-0.73	1.32	93	-1.00	1.20	226	1.60	
	Defense	130	-1.62	0.88	91	-1.84	0.60	218.9	2.20* <sup>1</sup>	
Critical Thinking Appraisal	Inference	182	10.36	3.05	40	9.68	2.72	220	1.31	
	Recognition	182	11.57	2.68	40	11.08	2.66	220	1.05	
	Deduction	182	17.16	3.08	40	16.68	2.70	220	0.92	
Life History Exercise	Personal	191	60.73	7.94	29	59.55	7.66	218	0.75	
	Impersonal	191	5.17	21.01	29	11.55	41.69	30.2	-0.81 <sup>1</sup>	

<sup>1</sup>Separate Variance Estimate used.

\* $p < .05$

Table D

Data Summary for Analyses of Variance Between Groups  
of Entering and Graduating Students  
in the Cross-sectional Study

		1976 Weekday Graduating Students			1977 Weekday Entering Students		
		<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	58	3.31	1.17	71	3.20	1.25
	"Decision" Essay	57	3.95	1.22	72	3.38	1.33
	"Career" Essay	57	3.53	1.36	71	3.09	1.14
Sentence Completion Test		58	5.91	1.14	74	5.50	0.78
Moral Judgment Instrument		19	359.00	35.26	16	338.88	33.35
Defining Issues Test	P% Score	53	49.15	14.56	70	35.24	10.56
	D Score	53	27.07	4.74	70	23.87	5.84
Test of Cognitive Development		57	12.98	3.56	73	12.08	3.48
Picture Story Exercise	Stages of Adaptation						
	Receptive	60	52.32	10.05	76	54.87	11.62
	Autonomous	60	50.70	11.05	76	49.05	9.75
	Assertive	60	51.92	13.25	76	49.82	11.21
	Integrative	60	49.43	9.85	76	54.68	10.36
	Self-Definition	60	49.18	10.65	76	52.03	8.63
	Achievement Motive	60	43.88	7.95	76	48.18	11.29
	Affiliation Motive	60	48.90	10.43	76	51.24	9.58
Power Motive	60	52.07	10.97	76	48.62	9.89	
Learning Style Inventory	Concrete Experience	60	15.02	2.90	76	15.68	2.58
	Reflective Observation	60	12.33	3.59	76	15.25	3.34
	Abstract Conceptualization	60	17.48	2.80	76	15.54	3.21
	Active Experimentation	60	15.77	2.98	76	15.36	2.77
	Abstract/Concrete Learning Orientation	60	2.47	4.83	76	-0.14	4.59
	Active/Reflective Learning Orientation	60	3.43	5.97	76	0.11	5.35
	Test of Thematic Analysis		57	1.63	1.06	76	1.37
Analysis of Argument	Attack	55	-0.73	1.30	72	-0.78	1.36
	Defense	54	-1.59	0.98	73	-1.92	0.28
Critical Thinking Appraisal	Inference	57	10.63	3.06	72	8.79	2.78
	Recognition	57	11.19	2.02	72	10.72	2.76
	Deduction	57	15.93	4.13	72	15.53	3.09

Table D continued

Measure	Source	df	MS	F
Measure of Vocational, Educational, and Personal Issues				
"Best Class" Essay	Group	1	0.409	0.28
	Residual	127	1.478	
"Decision" Essay	Group	1	10.422	6.37*
	Residual	127	1.636	
"Career" Essay	Group	1	6.172	3.97*
	Residual	126	1.553	
Sentence Completion Test				
Total Protocol Rating	Group	1	5.567	6.08*
	Residual	130	0.916	
Moral Judgment Instrument				
Moral Maturity Score	Age	1	6326.414	5.65*
	Group	1	389.421	0.35
	Residual	32	1120.680	
Defining Issues Test				
P% Score	Age	1	1829.648	11.97***
	Group	1	4376.703	28.64***
	Residual	120	152.835	
D Score	Age	1	212.102	7.42**
	Group	1	186.178	6.51*
	Residual	120	28.596	

\*p < .05  
 \*\*p < .01  
 \*\*\*p < .001

Table D continued

	Source	df	MS	F
Test of Cognitive Development				
	GPA	1	134.694	9.84 **
	Group	1	8.389	0.61
	Residual	63	13.690	
Picture Story Exercise				
Stage of Adaptation				
Receptive	Group	1	218.325	1.82
	Residual	134	120.147	
Autonomous	Group	1	90.993	0.85
	Residual	134	106.913	
Assertive	Group	1	147.988	1.00
	Residual	134	147.642	
Integrative	Group	1	924.463	8.99 **
	Residual	134	102.800	
Self Definition	Group	1	271.003	2.96 (p < .1)
	Residual	134	91.604	
Achievement Motive	Group	1	620.212	6.25 *
	Residual	134	99.176	
Affiliation Motive	Group	1	183.098	1.85
	Residual	134	99.247	
Power Motive	Group	1	398.678	3.70 (p < .1)
	Residual	134	107.684	
Learning Style Inventory				
Concrete Experience	Group	1	14.941	2.02
	Residual	134	7.413	
Reflective Observation	Group	1	285.233	23.98 ***
	Residual	134	11.892	

\*p &lt; .05

\*\*p &lt; .01

Table D continued

	Source	df	MS	F
Learning Style Inventory (continued)				
Abstract Conceptualization	Group	1	126.694	13.78 ***
	Residual	134	9.193	
Active Experimentation	Group	1	5.675	0.69
	Residual	134	8.180	
Abstract/Concrete learning orientation	Group	1	228.651	10.35 **
	Residual	134	22.092	
Active/Reflective learning orientation	Group	1	371.373	11.72 ***
	Residual	134	31.686	
Test of Thematic Analysis				
	Group	1	2.256	1.77
	Residual	131	1.274	
Analysis of Argument				
Attack	Group	1	0.080	0.05
	Residual	125	1.771	
Defense	Group	1	3.283	7.26 **
	Residual	125	0.452	
Critical Thinking Appraisal				
Inference	GPA	1	72.250	8.80 **
	Group	1	17.485	
	Residual	61	8.208	
Recognition	Group	1	7.050	1.16
	Residual	127	6.073	
Deduction		1	95.063	7.52 **
	Group	1	5.018	
	Residual	61	12.650	

\*\*p &lt; .01

\*\*\*p &lt; .001

Table E

Data Summary for Regressions on Time of Assessment,  
and Age and Educational Achievement Cohorts

Index	n	M	SD	F				Beta	F
				1	2	3	4		
Measure of Vocational, Educational, and Personal Issues									
1. "Best Class" Essay	589	3.29	1.31	--	--	--	--	.145	8.10 **
2. Linear Time	589	1.84	1.44	.145	--	--	--	.216	14.81 **
3. Older (vs. Traditional)	589	0.48	0.50	.176	-.002	--	--	.073	1.43
4. Above Median (vs Below) Competence Level Units	589	0.45	0.50	-.045	.002	-.548	--	(constant 2.690)	
1. "Decision" Essay	589	3.27	1.31	--	--	--	--	.359	6.62 **
2. Linear Time	589	1.83	1.43	-.063	--	--	--	-.441	23.54 **
3. Quadratic Time	589	5.39	5.10	-.094	.961	--	--	.257	5.82 *
4. Older (vs Traditional)	589	0.48	0.50	.188	.004	.004	--	.124	
5. Above Median (vs Below) Competence Level Units	589	0.45	0.50	-.018	.004	.004	-.554	(constant 2.803)	
1. "Career" Essay	569	3.09	1.27	--	--	--	--	.047	0.74
2. Linear Time	569	1.88	1.42	.043	--	--	--	.241	16.50 **
3. Older (vs Traditional)	569	0.48	0.50	.234	-.016	--	--	.012	0.02
4. Above Median (vs Below) Competence Level Units	569	0.45	0.50	-.119	.026	-.550	--	(constant 2.701)	
Sentence Completion Test									
1. Total Protocol Rating	597	5.34	0.93	--	--	--	--	-.057	1.60
2. Linear Time	597	1.83	1.43	-.057	--	--	--	.082	1.58
3. Older (vs Traditional)	597	0.48	0.50	.108	.000	--	--	-.048	0.54
4. Above Median (vs Below) Competence Level Units	597	0.45	0.50	-.093	.000	-.556	--	(constant 5.276)	
Moral Judgment Instrument									
1. Moral Maturity Score	128	347.03	37.89	--	--	--	--	.052	0.27
2. Linear Time	128	1.85	1.44	.051	--	--	--	.402	13.50 **
3. Older (vs Traditional)	128	0.28	0.45	.337	-.006	--	--	.220	3.30
4. Above Median (vs Below) Competence Level Units	128	0.48	0.50	.103	.010	-.293	--	(constant 326.957)	
Defining Issues Test									
1. P% Score	420	45.05	14.63	--	--	--	--	.285	37.13 **
2. Linear Time	420	1.83	1.44	.285	--	--	--	.252	11.41 **
3. Older (vs Traditional)	420	0.50	0.50	.175	.000	--	--	.152	4.13 *
4. Above Median (vs Below) Competence Level Units	420	0.41	0.49	.023	.000	-.509	--	(constant 34.212)	
1. "D" Score	420	27.40	6.99	--	--	--	--	.221	27.11 **
2. Linear Time	420	1.83	1.44	.221	--	--	--	.344	19.81 **
3. Older (vs Traditional)	420	0.50	0.50	.287	.000	--	--	.111	2.07
4. Above Median (vs Below) Competence Level Units	420	0.41	0.49	-.064	.000	-.509	--	(constant 22.382)	

\*p &lt; .05

\*\*p &lt; .01

Table E continued

Index	n	M	SD	F				Beta	F
				1	2	3	4		
Test of Cognitive Development									
1. Score	573	12.02	3.26	--	--	--	--	.118	8.21**
2. Linear Time	573	2.83	1.44	.118	--	--	--	.061	0.73
3. Older (vs Traditional)	573	0.47	0.50	-.007	.000	--	--	.121	2.91
4. Above Median (vs Below) Competence Level Units	573	0.47	0.50	.037	.000	-.557	--	(constant 10.706)	
Picture Story Exercise									
1. Receptive	596	0.49	0.51	--	--	--	--	-.090	6.68*
2. Linear Time	596	1.83	1.43	-.090	--	--	--	-.124	8.02**
3. Older (vs Traditional)	596	0.49	0.50	-.087	-.002	--	--	-.067	2.25
4. Above Median (vs Below) Competence Level Units	596	0.45	0.50	.001	-.002	-.546	--	(constant 0.637)	
1. Autonomous	596	0.41	0.49	--	--	--	--	.107	0.55
2. Linear Time	596	1.83	1.43	.108	--	--	--	-.161	4.65*
3. Older (vs Traditional)	596	0.49	0.50	-.138	-.002	--	--	-.043	1.50
4. Above Median (vs Below) Competence Level Units	596	0.45	0.50	.005	-.002	-.546	--	(constant 0.443)	
1. Assertive	596	0.07	0.26	--	--	--	--	.013	0.57
2. Linear Time	596	1.83	1.43	.013	--	--	--	-.021	0.36
3. Older (vs Traditional)	596	0.47	0.50	-.012	-.002	--	--	-.017	0.09
4. Above Median (vs Below) Competence Level Units	596	0.45	0.50	-.005	-.002	-.546	--	(constant 0.077)	
1. Integrative	596	0.70	0.46	--	--	--	--	.213	12.42**
2. Linear Time	596	1.83	1.43	-.084	--	--	--	-.309	
3. Quadratic Time	596	5.41	5.10	-.104	.961	--	--	-.053	2.12
4. Older (vs Traditional)	596	0.49	0.50	-.072	-.002	-.002	--	.036	0.01
5. Above Median (vs Below) Competence Level Units	596	0.45	0.50	.065	-.002	-.002	-.546	(constant 0.737)	
1. Self-Definition	597	-0.30	0.75	--	--	--	--	.425	
2. Linear Time	597	1.83	1.43	.101	--	--	--	-.337	2.65
3. Quadratic Time	597	5.42	5.10	.071	.961	--	--	-.173	8.31**
4. Older (vs Traditional)	597	0.49	0.50	-.135	.000	.000	--	-.069	1.20
5. Above Median (vs Below) Competence Level Units	597	0.45	0.50	.025	.000	.000	-.543	(constant -0.264)	
1. Achievement Motive	597	1.13	0.85	--	--	--	--	-.239	
2. Linear Time	597	1.83	1.43	.082	--	--	--	.335	0.84
3. Quadratic Time	597	5.42	5.10	.105	.961	--	--	.058	0.38
4. Older (vs Traditional)	597	0.49	0.50	.034	.000	.000	--	.044	0.55
5. Above Median (vs Below) Competence Level Units	597	0.45	0.50	.013	.000	.000	-.543	(constant 1.009)	
1. Affiliation Motive	597	1.29	0.66	--	--	--	--	-.357	
2. Linear Time	597	1.83	1.43	.067	--	--	--	.441	1.30
3. Quadratic Time	597	5.42	5.10	.099	.961	--	--	-.066	3.66
4. Older (vs Traditional)	597	0.49	0.50	-.062	.000	.000	---	-.006	0.07
5. Above Median (vs Below) Competence Level Units	597	0.45	0.50	.029	.000	.000	-.543	(constant 1.328)	
1. Power Motive	597	1.24	-0.79	--	--	--	--	.426	
2. Linear Time	597	1.83	1.43	.112	--	--	--	-.316	2.02
3. Quadratic Time	597	5.42	5.10	.083	.961	--	--	-.041	0.07
4. Older (vs Traditional)	597	0.49	0.50	-.022	.000	.000	--	-.035	0.33
5. Above Median (vs Below) Competence Level Units	597	0.45	0.50	-.013	.000	.000	-.543	(constant 1.147)	

\*p &lt; .05

\*\*p &lt; .01

Table E continued

Index	n	M	SD	r				Beta	F
				1	2	3	4		
<b>Learning Style Inventory</b>									
<b>Concrete Experience</b>									
1. Concrete Experience	606	15.31	3.03	--	--	--	--	--	
2. Linear Time	606	1.83	1.43	-.163	--	--	--	-.163	11.79 **
3. Older (vs Traditional)	606	0.49	0.50	.085	.000	--	--	.020	0.11
4. Above Median (vs Below) Competence Level Units	606	0.46	0.50	-.133	.000	-.539	--	-.122	4.21
								(constant 16.223)	
<b>Reflective Observation</b>									
1. Reflective Observation	606	13.76	3.56	--	--	--	--	--	
2. Linear Time	606	1.83	1.43	-.232	--	--	--	-.601	32.67 **
3. Quadratic Time	606	5.42	5.10	-.193	.961	--	--	.385	
4. Older (vs Traditional)	606	0.49	0.50	-.086	.000	.000	--	-.116	3.62
5. Above Median (vs Below) Competence Level Units	606	0.46	0.50	.007	.000	.000	-.539	-.055	0.82
								(constant 15.623)	
<b>Abstract Conceptualization</b>									
1. Abstract Conceptualization	606	16.37	3.57	--	--	--	--	--	
2. Linear Time	606	1.83	1.43	.248	--	--	--	.651	36.95 **
3. Quadratic Time	606	5.42	5.10	.206	.961	--	--	-.419	
4. Older (vs Traditional)	606	0.49	0.50	-.141	.000	.000	--	-.051	0.78
5. Above Median (vs Below) Competence Level Units	606	0.46	0.50	-.193	.000	.000	-.539	.166	8.13 **
								(constant 14.629)	
<b>Active Experimentation</b>									
1. Active Experimentation	606	15.61	3.07	--	--	--	--	--	
2. Linear Time	606	1.83	1.43	.047	--	--	--	.047	1.13
3. Older (vs Traditional)	606	0.49	0.50	.113	.000	--	--	.105	2.68
4. Above Median (vs Below) Competence Level Units	606	0.46	0.50	-.071	.000	-.539	--	-.014	0.05
								(constant 15.150)	
<b>Abstract/Concrete Learning Orientation</b>									
1. Abstract/Concrete L.O.	606	1.06	5.72	--	--	--	--	--	
2. Linear Time	606	1.83	1.43	.241	--	--	--	.519	32.34 **
3. Quadratic Time	606	5.42	5.10	.210	.961	--	--	-.289	
4. Older (vs Traditional)	606	0.49	0.50	-.133	.000	.000	--	-.243	0.52
5. Above Median (vs Below) Competence Level Units	606	0.46	0.50	.191	.000	.000	-.539	.168	8.07 **
								(constant -1.620)	
<b>Active/Reflective Learning Orientation</b>									
1. Active/Reflective L.O.	606	1.85	5.82	--	--	--	--	--	
2. Linear Time	606	1.83	1.43	.167	--	--	--	.167	15.11 **
3. Older (vs Traditional)	606	0.49	0.50	.112	.000	--	--	.126	3.85
4. Above Median (vs Below) Competence Level Units	606	0.46	0.50	-.042	.000	-.539	--	.026	0.16
								(constant -0.244)	
<b>Adaptive Style Inventory</b>									
<b>Total Concrete Experience</b>									
1. Concrete Experience	398	8.24	4.12	--	--	--	--	--	
2. Linear Time	398	2.75	0.75	-.010	--	--	--	-.010	0.08
3. Older (vs Traditional)	398	0.49	0.50	-.129	.000	--	--	-.206	7.95 **
4. Above Median (vs Below) Competence Level Units	398	0.45	0.50	-.030	.000	-.543	--	-.142	3.77
								(constant 9.743)	
<b>Total Reflective Observation</b>									
1. Reflective Observation	398	14.24	3.00	--	--	--	--	--	
2. Linear Time	398	2.75	0.75	.011	--	--	--	.011	0.08
3. Older (vs Traditional)	398	0.49	0.50	.072	.000	--	--	.120	2.81
4. Above Median (vs Below) Competence Level Units	398	0.45	0.50	.024	.000	-.543	--	.089	1.54
								(constant 13.528)	
<b>Total Abstract Observation</b>									
1. Abstract Observation	398	15.11	3.57	--	--	--	--	--	
2. Linear Time	398	2.75	0.75	.008	--	--	--	.008	0.08
3. Older (vs Traditional)	398	0.49	0.50	.026	.000	--	--	.077	1.13
4. Above Median (vs Below) Competence Level Units	398	0.45	0.50	.052	.000	-.543	--	.094	1.68
								(constant 14.420)	

\*p &lt; .05

\*\*p &lt; .01

Table E continued

Index	n	M	SD	1	2	3	4	Beta	F
Adaptive Style Inventory continued									
<u>Total Active Experimentation</u>									
1. Active Experimentation	398	10.40	2.88	--	--	--	--		
2. Linear Time	398	2.75	0.75	-.010	--	--	--	-.010	0.08
3. Older (vs Traditional)	398	0.49	0.50	.074	.000	--	--	.069	0.92
4. Above Median (vs Below) Competence Level Units	398	0.45	0.50	-.047	.000	-.543	--	-.010 (constant 10.537)	0.02
<u>Abstract/Concrete</u>									
<u>Adaptive Orientation</u>									
1. Abstract/Concrete A.O.	398	6.87	7.08	--	--	--	--		
2. Linear Time	398	2.75	0.75	.010	--	--	--	.010	0.10
3. Older (vs Traditional)	398	0.49	0.50	.088	.000	--	--	.159	4.61 *
4. Above Median (vs Below) Competence Level Units	398	0.45	0.50	-.044	.000	-.543	--	.130 (constant 4.677)	3.09
<u>Active/Reflective</u>									
<u>Adaptive Orientation</u>									
1. Active/Reflective A.O.	398	-3.83	5.03	--	--	--	--		
2. Linear Time	398	2.75	0.75	-.012	--	--	--	-.012	0.12
3. Older (vs Traditional)	398	0.49	0.50	-.060	.000	--	--	-.032	0.19
4. Above Median (vs Below) Competence Level Units	398	0.45	0.50	-.041	.000	-.543	--	-.058 (constant -3.191)	0.63
Test of Thematic Analysis									
1. Score	582	1.49	1.11	--	--	--	--		
2. Linear Time	582	1.83	1.44	.035	--	--	--	.035	0.44
3. Older (vs Traditional)	582	0.46	0.50	.224	.000	--	--	.184	10.91 **
4. Above Median (vs Below) Competence Level Units	582	0.47	0.50	-.174	.000	-.543	--	-.074 (constant 1.528)	1.75
Analysis of Argument									
1. Attack	403	-0.71	1.38	--	--	--	--		
2. Linear Time	403	1.84	1.43	-.030	--	--	--	-.030	0.19
3. Older (vs Traditional)	403	0.38	0.49	.072	-.001	--	--	.070	1.20
4. Above Median (vs Below) Competence Level Units	403	0.38	0.49	-.042	.002	-.554	--	-.003 (constant -0.764)	0.02
1. Defense	397	-1.74	0.77	--	--	--	--		
2. Linear Time	397	1.82	1.43	.073	--	--	--	.073	1.00
3. Older (vs Traditional)	397	0.38	0.49	-.001	-.004	--	--	.016	0.02
4. Above Median (vs Below) Competence Level Units	397	0.38	0.49	.021	.003	-.556	--	.029 (constant -1.840)	0.10
Critical Thinking Appraisal									
1. Inference	546	9.91	3.08	--	--	--	--		
2. Linear Time	546	1.83	1.44	.130	--	--	--	.130	9.75 **
3. Older (vs Traditional)	546	0.46	0.50	.153	.000	--	--	.192	7.44 *
4. Above Median (vs Below) Competence Level Units	546	0.48	0.50	-.029	.000	-.533	--	.073 (constant 8.629)	1.08
1. Recognition	546	11.19	2.60	--	--	--	--		
2. Linear Time	546	1.83	1.44	.067	--	--	--	.225	5.23 *
3. Quadratic Time (vs Traditional)	546	5.42	5.11	.087	.961	--	--	.304	6.62 *
4. Above Median (vs Below) Competence Level Units	546	0.48	0.50	-.005	.000	.000	-.533	.171 (constant 10.471)	1.70
1. Deduction	545	16.64	3.22	--	--	--	--		
2. Linear Time	545	1.84	1.43	.133	--	--	--	.133	10.53 **
3. Older (vs Traditional)	545	0.46	0.50	.049	.007	--	--	.074	1.06
4. Above Median (vs Below) Competence Level Units	545	0.48	0.50	.017	-.002	-.532	--	.346 (constant 15.726)	9.40

\*p < .05  
\*\*p < .01

Table E continued

Index	n	M	SD	r				Beta	F
				1	2	3	4		
Life History Exercise									
1. Performance	370	60.62	7.58	--					
2. Linear Time	370	2.75	0.75	.006	--		.007		0.00
3. Older (vs Traditional)	370	0.45	0.50	-.017	.000	--	.038		0.30
4. Above Median (vs Below) Competence Level Units	370	0.48	0.50	.083	-.005	-.535	.103 (constant 59.41?)		1.86
1. Improvement	370	5.86	22.18	--					
2. Linear Time	370	2.75	0.75	-.044	--		-.044		0.70
3. Older (vs Traditional)	370	0.45	0.50	.039	.000	--	.041		0.57
4. Above median (vs Below) Competence Level Units	370	0.48	0.50	-.018	-.005	-.535	.004 (constant 8.472)		0.07

Table F

Sample Size, Means and Standard Deviations for Repeated  
Measures Analyses Including All Students

	First Assessment			Second Assessment			Third Assessment		
	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>
<b>Measure of Vocational, Educational and Personal Issues</b>									
"Best Class" Essay	195	3.08	1.18	196	3.24	1.25	196	3.55	1.44
"Decision" Essay	197	3.28	1.16	197	3.48	1.18	195	3.05	1.52
"Career" Essay	178	3.01	1.21	192	3.11	1.15	192	3.16	1.44
Sentence Completion Test	199	5.41	0.79	199	5.34	0.99	199	5.28	1.00
Moral Judgment Instrument	42	347.40	30.80	43	340.67	43.79	43	353.02	37.67
<b>Defining Issues Test</b>									
P %	140	39.24	13.61	140	46.61	13.85	140	48.94	14.53
D Score	140	25.13	7.11	140	28.21	6.73	140	28.80	6.54
Test of Cognitive Development	191	11.45	3.38	191	12.24	3.11	191	12.37	3.23
<b>Picture Story Exercise</b>									
Stages of Adaptation									
Receptive	199	51.53	11.18	199	50.07	10.09	198	47.90	8.79
Autonomous	199	49.26	9.70	199	50.27	9.79	198	50.20	10.19
Assertive	199	48.56	9.12	199	51.17	10.23	198	49.28	9.33
Integrative	199	51.78	10.74	199	51.15	9.52	198	47.29	9.20
Self-Definition	199	48.42	9.45	199	51.38	9.88	199	50.33	10.51
Achievement Motive	199	50.74	11.24	199	49.46	9.44	199	52.12	10.04
Affiliation Motive	199	49.90	9.79	199	48.89	9.57	199	51.52	10.33
Power Motive	199	47.96	9.70	199	51.22	9.80	199	49.49	8.86

Table F continued

	First Assessment			Second Assessment			Third Assessment		
	<u>n</u>	<u>M</u>	<u>SD</u>		<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>
<b>Learning Style Inventory</b>									
Concrete Experience	202	15.97	2.79	202	15.19	2.92	202	14.77	3.24
Reflective Observation	202	15.04	3.32	202	13.13	3.51	202	13.10	3.51
Abstract Conceptualization	202	14.99	3.33	202	17.05	3.56	202	17.06	3.42
Active Experimentation	202	15.49	2.64	202	15.48	3.35	202	15.87	3.18
Abstract/Concrete Learning Orientation	202	-0.98	5.01	202	1.86	5.79	202	2.29	5.78
Active/Reflective Learning Orientation	202	0.45	5.18	202	2.35	6.11	202	2.76	5.90
<b>Adaptive Style Inventory</b>									
Total Concrete Experience	NA <sup>1</sup>			199	8.28	4.08	199	8.20	4.17
Total Reflective Observation	NA <sup>1</sup>			199	14.21	3.10	199	14.27	2.90
Total Abstract Conceptualization	NA <sup>1</sup>			199	15.08	3.62	199	15.14	3.52
Total Active Experimentation	NA <sup>1</sup>			199	10.43	3.02	199	10.38	2.75
Abstract/Concrete Adaptive Orientation	NA <sup>1</sup>			199	6.80	7.07	199	6.94	7.10
Active/Reflective Adaptive Orientation	NA <sup>1</sup>			199	-3.77	5.29	199	-3.89	4.77
Test of Thematic Analysis	196	1.40	1.16	196	1.57	1.09	196	1.50	1.09
<b>Analysis of Argument<sup>2</sup></b>									
Attack	133	-0.63	1.48	189	0.34		189	-0.84	1.28
Defense	132	-1.77	0.80	179	0.60		179	-1.70	0.7
<b>Critical Thinking Appraisal</b>									
Inference	182	9.38	3.07	182	9.7	3.06	182	10.36	3.05
Recognition	182	11.10	2.51	182	10.90	2.58	182	11.57	2.68
Deduction	181	16.10	3.22	182	16.64	3.29	182	17.15	3.08
<b>Life History Exercise</b>									
Performance	NA <sup>1</sup>			184	60.51	7.19	184	60.67	7.96
Improvement	NA <sup>1</sup>			184	6.81	23.22	184	4.78	21.15

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

<sup>2</sup>Not administered to 1976 Weekday College students.

Table G

Data Summary for Repeated Measures Analyses of Variance  
Between Entrance and Second Assessment  
for All Students

	Group	df		F	
Measure of Vocational, Educational, and Personal Issues					
	"Best Class" Essay	Between People Within People Between Measures Residual	194 195 1 194	1.952 0.985 2.010 0.979	2.05
	"Decision" Essay	Between People Within People Between Measures Residual	196 197 1 196	1.734 1.030 4.061 1.015	4.00*
	"Career" Essay	Between People Within People Between Measures Residual	177 178 1 177	1.799 0.952 0.632 0.954	0.66
Sentence Completion Test					
		Between People Within People Between Measures Residual	198 199 1 198	1.086 0.523 0.492 0.523	0.94
	Moral Judgment Instrument	Between People Within People Between Measures Residual	41 42 1 41	2053.052 776.333 1425.190 760.508	1.87
	Defining Issues Test				
PZ Score					
		Between People Within People Between Measures Residual	139 140 1 139	284.133 119.558 3797.763 93.096	40.79***
	D Score	Between People Within People Between Measures Residual	139 140 1 139	79.037 21.469 661.420 16.865	39.22**
	Test of Cognitive Development	Between People Within People Between Measures Residual	190 191 1 190	15.560 5.819 59.688 5.536	10.78**
Picture Story Exercise					
	Stages of Adaptation Receptive	Between People Within People Between Measures Residual	198 199 1 198	108.762 118.698 211.307 118.231	1.79
	Autonomous	Between People Within People Between Measures Residual	198 199 1 198	109.151 80.957 101.510 80.853	1.26
	Assertive	Between People Within People Between Measures Residual	198 199 1 198	116.721 74.181 674.181 71.151	9.475**

\*p &lt; .05

\*\*p &lt; .01

\*\*\*p &lt; .001

Table G continued

	Group	df	MS	F
<b>Picture Story Exercise (cont.)</b>				
Integrative	Between People	198	118.856	
	Within People	199	86.962	
	Between Measures	1	40.525	0.46
	Residual	198	87.197	
Self-Definition	Between People	198	121.167	
	Within People	199	69.784	
	Between Measures	1	868.704	13.21***
	Residual	198	65.749	
Achievement Motive	Between People	198	123.468	
	Within People	199	92.244	
	Between Measures	1	163.379	1.78
	Residual	198	91.884	
Affiliation Motive	Between People	198	110.867	
	Within People	199	76.701	
	Between Measures	1	101.510	1.33
	Residual	198	76.576	
Power Motive	Between People	198	116.561	
	Within People	199	78.457	
	Between Measures	1	1055.035	14.35***
	Residual	198	73.525	
<b>Learning Style Inventory</b>				
Concrete Experience	Between People	201	10.203	
	Within People	202	6.413	
	Between Measures	1	61.012	9.93**
	Residual	201	6.142	
Reflective Observation	Between People	201	15.294	
	Within People	202	9.837	
	Between Measures	1	368.802	45.81***
	Residual	201	8.051	
Abstract Conceptualization	Between People	201	16.390	
	Within People	202	9.478	
	Between Measures	1	430.418	58.29***
	Residual	201	7.383	
Active Experimentation	Between People	201	12.691	
	Within People	202	5.495	
	Between Measures	1	0.010	0.00
	Residual	201	5.522	
Abstract/Concrete Learning Orientation	Between People	201	39.222	
	Within People	202	23.337	
	Between Measures	1	815.535	42.05***
	Residual	201	19.395	
Active/Reflective Learning Orientation	Between People	201	45.697	
	Within People	202	20.218	
	Between Measures	1	364.990	19.73***
	Residual	201	18.503	
<b>Adaptive Style Inventory</b>				
Total Concrete Experience		NA <sup>1</sup>		

\*\*p < .01  
 \*\*\*p < .001

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

Table G continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Adaptive Style Inventory (cont.)				
Total Reflective Observation		NA <sup>1</sup>		
Total Abstract Conceptualization		NA <sup>1</sup>		
Total Active Experimentation		NA <sup>1</sup>		
Abstract/Concrete Adaptive Orientation		NA <sup>1</sup>		
Active/Reflective Adaptive Orientation		NA <sup>1</sup>		
Test of Thematic Analysis	Between People	195	1.517	
	Within People	196	1.020	
	Between Measures	1	2.949	2.92 (p < .1)
	Residual	195	1.011	
Analysis of Argument <sup>2</sup>				
Attack	Between People	132	2.115	
	Within People	133	1.861	
	Between Measures	1	1.658	0.89
	Residual	132	1.862	
Defense	Between People	131	0.542	
	Within People	132	0.473	
	Between Measures	1	0.186	0.39
	Residual	131	0.476	
Critical Thinking Appraisal				
Inference	Between People	181	13.933	
	Within People	182	5.019	
	Between Measures	1	31.453	6.
	Residual	181	4.873	
Recognition	Between People	181	8.901	
	Within People	182	4.049	
	Between Measures	1	3.560	0.88
	Residual	181	4.052	
Deduction	Between People	180	16.033	
	Within People	181	5.287	
	Between Measures	1	26.530	5.13*
	Residual	180	5.169	
Life History Exercise				
Performance		NA <sup>1</sup>		
Assessment		NA <sup>1</sup>		

\*p < .05

<sup>1</sup>NA - not applicable - Students were not given this measure at time of First assessment.  
<sup>2</sup>Not administered to 1976 Weekday College students.

Table H

Data Summary for Repeated Measures Analyses of Variance  
Between Second and Third Assessment  
for All Students

Measure of	Group	df	MS	F
Vocational, Educational, and Personal Issues	"Best Class" Essay	195	2.160	
	Between People	196	1.533	
	Within People	1	9.492	6.36*
	Residual	195	1.492	
"Decision" Essay	Between People	194	2.171	
	Within People	195	1.628	
	Between Measures	1	19.408	12.63***
	Residual	194	1.537	
"Career" Essay	Between People	191	2.250	
	Within People	192	1.138	
	Between Measures	1	0.211	0.18
	Residual	191	1.143	
Sentence Completion Test	Between People	198	1.478	
	Within People	199	0.503	
	Between Measures	1	0.362	0.72
	Residual	198	0.503	
Moral Judgment Instrument	Between People	42	2297.703	
	Within People	43	1091.151	
	Between Measures	1	3278.616	3.16 (p < .1)
	Residual	42	1039.069	
Defining Issues Test	P% Score	139	317.592	
	Between People	140	87.509	
	Within People	1	382.590	4.48*
	Residual	139	85.386	
D Score	Between People	139	72.400	
	Within People	140	1	
	Between Measures	1	11.600	1.57
	Residual	139	15.713	
Test of Cognitive Development	Between People	190	15.604	
	Within People	191	4.492	
	Between Measures	1	1.508	0.33
	Residual	190	4.508	
Picture Story Exercise	Stages of Adaptation	197	100.904	
	Receptive	198	79.763	
	Between Measures	1	437.010	5.61*
	Residual	197	77.949	
Autonomous	Between People	197	117.877	
	Within People	198	81.795	
	Between Measures	1	0.730	0.01
	Residual	197	82.207	
Assertive	Between People	197	114.521	
	Within People	198	78.919	
	Between Measures	1	368.495	4.76*
	Residual	197	77.449	

\*p < .05  
\*\*\*p < .001

Table II continued

	Group	df	MS	F
Picture Story Exercise (cont.)				
Integrative	Between People	197	119.226	
	Within People	198	63.671	
	Between Measures	1	1481.707	26.24***
	Residual	197	56.474	
Self-Definition	Between People	198	125.170	
	Within People	199	82.937	
	Between Measures	1	109.751	1.33
	Residual	198	82.801	
Achievement Motive	Between People	198	118.446	
	Within People	199	74.734	
	Between Measures	1	705.779	9.86**
	Residual	198	71.547	
Affiliation Motive	Between People	198	122.803	
	Within People	199	78.701	
	Between Measures	1	687.259	9.09**
	Residual	198	75.627	
Power Motive	Between People	198	97.668	
	Within People	199	77.995	
	Between Measures	1	297.327	3.87 (p < .1)
	Residual	198	76.887	
Learning Style Inventory				
Concrete Experience	Between People	201	13.246	
	Within People	202	5.884	
	Between Measures	1	17.884	3.97 (p < .1)
	Residual	201		
Reflective	Between People	201	18.801	
	Within People	202	5.854	
	Between Measures	1	0.062	0.01
	Residual	201	5.883	
Abstract Conceptualization	Between People	201	16.331	
	Within People	202	8.000	
	Between Measures	1	0.010	0.00
	Residual	201	8.040	
Active Experimentation	Between People	201	16.537	
	Within People	202	4.896	
	Between Measures	1	15.059	3.11 (p < .1)
	Residual	201	4.845	
Abstract/Concrete Learning Orientation	Between People	201	45.687	
	Within People	202	21.186	
	Between Measures	1	18.735	0.88
	Residual	201	21.198	
Active/Reflective Learning Orientation	Between People	201	56.727	
	Within People	202	15.463	
	Between Measures	1	17.052	1.10
	Residual	201	15.455	
Adaptive Style Inventory				
Total Concrete Experience	Between People	198	26.262	
	Within People	199	7.809	
	Between Measures	1	0.643	0.08
	Residual	198	7.845	

\*\*p < .01  
 \*\*\*p < .001

Table II continued

	Group	df	MS	F
Adaptive Style Inventory (cont.)				
Total Reflective Observation	Between People	198	12.928	
	Within People	199	5.078	
	Between Measures	1	0.425	0.08
	Residual	198	5.101	
Total Abstract Conceptualization	Between People	198	18.942	
	Within People	199	6.518	
	Between Measures	1	0.362	0.06
	Residual	198	6.549	
Total Active Experimentation	Between People	198	12.088	
	Within People	199	4.575	
	Between Measures	1	0.304	0.07
	Residual	198	4.597	
Abstract/Concrete Adaptive Orientation	Between People	198	78.228	
	Within People	199	22.030	
	Between Measures	1	1.970	0.09
	Residual	198	22.131	
Active/Reflective Adaptive Orientation	Between People	198	37.919	
	Within People	199	12.698	
	Between Measures	1	1.4	0.11
	Residual	198	12.7	
Test of Thematic Analysis	Between People	195	1.469	
	Within People	196	0.893	
	Between Measures	1	0.500	0.56
	Residual	195	0.895	
Analysis of Argument <sup>2</sup>				
Attack	Between People	188	1.862	
	Within People	189	1.563	
	Between Measures	1	0.955	0.61
	Residual	188	1.567	
Defense	Between People	178	0.496	
	Within People	179	0.444	
	Between Measures	1	1.478	3.37 (p < .1)
	Residual	178	0.438	
Critical Thinking Appraisal				
Inference	Between People	181	14.455	
	Within People	182	4.288	
	Between Measures	1	13.849	3.27 (p < .1)
	Residual	181	4.236	
Recognition	Between People	181	10.031	
	Within People	182	3.997	
	Between Measures	1	40.222	10.59**
	Residual	181	3.797	
Deduction	Between People	181	16.002	
	Within People	182	4.396	
	Between Measures	1	24.275	5.66*
	Residual	181	4.286	

\*p < .05  
\*\*p < .01

<sup>2</sup> Not administered to 1976 Weekday College students.

Table H continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Life History Exercise				
Performance	Between People	183	81.253	
	Within People	184	33.663	
	Between Measures	1	2.446	0.07
	Residual	183	33.834	
Improvement	Between People	183	494.330	
	Within People	184	492.228	
	Between Measures	1	380.098	0.77
	Residual	183	492.841	

Table I

Sample Size, Means and Standard Deviations for Repeated  
Measures Analyses of Traditional and  
Older Age Cohorts

	TRADITIONAL									OLDER								
	First Assessment			Second Assessment			Third Assessment			First Assessment			Second Assessment			Third Assessment		
	n	M	SD	n	M	SD	n	M	SD	n	M	SD	n	M	SD	n	M	SD
Measure of Vocational, Educational and Personal Issues																		
"Best Class" Essay	100	2.94	1.20	101	2.90	1.15	101	3.36	1.38	95	3.23	1.14	95	3.60	1.26	95	3.76	1.49
"Decision" Essay	102	2.98	1.19	102	3.20	1.18	100	2.92	1.38	95	3.60	1.04	95	3.79	1.12	95	3.18	1.64
"Career" Essay	90	2.59	1.22	101	2.83	1.22	101	2.96	1.39	88	3.44	1.04	91	3.42	0.98	91	3.37	1.47
Sentence Completion Test	104	5.33	0.73	104	5.24	1.07	104	5.16	1.05	95	5.49	0.85	95	5.44	0.88	95	5.40	0.93
Moral Judgment Instrument	30	341.80	30.60	31	334.58	43.10	31	340.90	30.10	12	361.42	27.73	12	356.42	43.39	12	384.33	38.25
Defining Issues Test																		
P %	70	35.56	11.53	70	44.49	12.08	70	47.43	14.17	70	42.85	14.53	70	49.01	15.24	70	50.94	14.91
D Score	70	23.08	6.22	70	25.87	6.21	70	27.24	6.14	70	27.23	7.41	70	30.55	6.46	70	30.43	6.65
Test of Cognitive Development	102	11.35	3.30	102	12.42	3.06	102	12.34	3.50	89	11.56	3.48	89	12.03	3.18	89	12.39	2.91
Picture Story Exercise																		
Stages of Adaptation																		
Receptive	102	53.34	12.07	102	50.68	9.85	102	48.43	9.40	97	49.62	9.87	97	49.43	10.36	96	47.34	8.10
Autonomous	102	49.62	9.57	102	50.70	9.27	102	51.70	9.96	97	48.88	9.88	97	49.81	10.33	96	48.61	10.24
Assertive	102	49.26	8.98	102	51.70	10.40	102	49.27	9.24	97	47.82	9.25	97	50.61	10.07	96	49.28	9.48
Integrative	102	52.09	10.77	102	52.25	9.18	102	48.50	9.82	97	51.46	10.76	97	49.99	9.78	96	46.00	8.34
Self-Definition	102	50.78	10.04	102	52.61	9.65	102	50.47	10.83	97	45.94	8.13	97	50.08	10.00	97	50.18	10.22
Achievement Motive	102	49.83	12.47	102	49.32	8.85	102	52.23	9.92	97	51.69	9.75	97	49.60	10.07	97	52.01	10.23
Affiliation Motive	102	49.34	9.91	102	50.63	9.46	102	53.26	10.14	97	50.48	9.67	97	47.06	9.40	97	49.68	10.27
Power Motive	102	48.61	10.17	102	50.26	9.43	102	49.88	9.17	97	47.29	9.18	97	52.23	10.13	97	49.08	8.55

Table I  
Table I continued

	TRADITIONAL									OLDER									
	First Assessment			Second Assessment			Third Assessment			First Assessment			Second Assessment			Third Assessment			
	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	
Learning Style Inventory																			
Concrete Experience	103	15.48	2.61	103	14.95	2.79	103	14.75	2.94	99	16.48	2.90	99	15.44	3.05	99	14.80	3.55	
Reflective Observation	103	15.06	3.20	103	13.46	3.27	103	13.66	3.48	99	15.02	3.45	99	12.79	3.74	99	12.53	3.47	
Abstract Conceptualization	103	15.62	3.29	103	17.72	3.26	103	17.24	3.47	99	14.33	3.26	99	16.36	3.74	99	16.88	3.37	
Active Experimentation	103	15.53	2.70	103	14.93	3.02	103	15.35	2.87	99	15.44	2.59	99	16.05	3.59	99	16.40	3.41	
Abstract/Concrete Learning Orientation	103	0.15	4.73	103	2.77	5.35	103	2.50	5.53	99	-2.15	5.04	99	0.92	6.10	99	2.08	6.04	
Active/Reflective Learning Orientation	103	0.48	5.08	103	1.48	5.47	103	1.69	5.52	99	0.42	5.31	99	3.26	6.63	99	3.88	6.01	
Adaptive Style Inventory																			
Total Concrete Experience	NA <sup>1</sup>			102	8.70	4.23	102	8.81	4.20	NA <sup>1</sup>			97	7.84	3.90	97	7.55	4.06	
Total Reflective Observation	NA <sup>1</sup>			102	14.07	3.14	102	13.99	2.70	NA <sup>1</sup>			97	14.35	3.07	97	14.57	3.09	
Total Abstract Conceptualization	NA <sup>1</sup>			102	15.09	3.55	102	14.94	3.66	NA <sup>1</sup>			97	15.06	3.70	97	15.34	3.38	
Total Active Experimentation	NA <sup>1</sup>			102	10.15	2.84	102	10.25	2.65	NA <sup>1</sup>			97	10.73	3.18	97	10.52	2.86	
Abstract/Concrete Adaptive Orientation	NA <sup>1</sup>			102	6.39	7.21	102	6.13	7.22	NA <sup>1</sup>			97	7.23	6.93	97	7.79	6.90	
Active/Reflective Adaptive Orientation	NA <sup>1</sup>			102	-3.92	5.18	102	-3.75	4.31	NA <sup>1</sup>			97	-3.62	5.41	97	-4.05	5.23	
Test of Thematic Analysis	104	1.12	1.14	104	1.36	1.03	104	1.31	1.04	90	1.74	1.10	90	1.82	1.11	90	1.70	1.04	
Analysis of Argument <sup>2</sup>																			
Attack	56	-0.91	1.31	101	-0.72	1.30	101	-0.98	1.22	77	-0.43	1.57	88	-0.75	1.39	88	-0.67	1.33	
Defense	54	-1.91	0.29	96	-1.81	0.62	96	-1.74	0.68	78	-1.67	1.00	83	-1.86	0.59	83	-1.66	0.83	
Critical Thinking Appraisal																			
Inference	98	8.97	3.10	98	9.56	3.12	98	9.88	3.07	84	9.87	2.98	84	10.45	2.93	84	10.93	2.95	
Recognition	98	10.96	2.61	98	10.52	2.81	98	11.18	2.85	84	11.26	2.40	84	11.35	2.21	84	12.01	2.41	
Deduction	98	16.03	3.18	98	16.42	3.40	98	17.02	3.20	83	16.19	3.27	84	16.90	3.15	84	17.32	2.95	
Life History Exercise																			
Performance	NA <sup>1</sup>			100	61.10	7.33	100	60.26	7.22	NA <sup>1</sup>			84	59.80	7.00	84	61.15	8.78	
Improvement	NA <sup>1</sup>			100	6.38	22.63	100	3.50	21.13	NA <sup>1</sup>			84	7.32	24.05	84	6.30	21.20	

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

<sup>2</sup>Not administered to 1976 Weekday College students.

Table J

Data Summary for Repeated Measures Analyses of Variance  
Between Entrance and Second Assessment  
for Traditional Age Students

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>	
Measure of Vocational, Educational, and Personal Issues					
	"Best Class" Essay	Between People Within People	99 100	1.906 0.785	
		Between Measures Residual	1 99	0.245 0.790	0.31
"Decision" Essay	Between People Within People	101 102	1.687 1.137		
	Between Measures Residual	1 101	2.373 1.125	2.11	
	"Career" Essay	Between People Within People	89 90	2.033 0.961	
	Between Measures Residual	1 89	2.450 0.944	2.59	
Sentence Completion Test	Between People Within People	103 104	1.085 0.601		
	Between Measures Residual	1 103	0.389 0.603	0.65	
	Moral Judgment Instrument	Between People Within People	29 30	1878.653 825.633	
Between Measures Residual		1 29	1363.267 807.094	1.69	
Defining Issues Test					
	P% Score	Between People Within People	69 70	171.962 145.214	
		Between Measures Residual	1 69	2786.609 106.933	26.06***
	D Score	Between People Within People	69 70	57.709 23.245	
	Between Measures Residual	1 69	273.571 19.617	13.95***	
Test of Cognitive Development	Between People Within People	101 102	15.098 5.662		
	Between Measures Residual	1 101	58.240 5.141	11.33**	
	Picture Story Exercise				
Stages of Adaptation		Between People Within People	10 102	109.624 135.392	
Receptive		Between Measures Residual	1 101	362.667 133.142	2.72
	Autonomous	Between People Within People	101 102	98.782 78.647	
	Between Measures Residual	1 101	59.314 78.838	0.75	
	Assertive	Between People Within People	101 102	122.732 68.520	
	Between Measures Residual	1 101	301.490 66.213	4.55*	

\*p < .05  
\*\*p < .01  
\*\*\*p < .001

Table J continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Picture Story Exercise (cont.)</b>				
Integrative	Between People	101	121.508	0.02
	Within People	102	77.922	
	Between Measures	1	1.255	
	Residual	101	78.681	
Self-Definition	Between People	101	127.031	2.54
	Within People	102	67.873	
	Between Measures	1	169.588	
	Residual	101	66.865	
Achievement Motive	Between People	101	137.829	0.14
	Within People	102	95.029	
	Between Measures	1	13.255	
	Residual	101	95.839	
Affiliation Motive	Between People	101	110.222	1.09
	Within People	102	77.515	
	Between Measures	1	84.123	
	Residual	101	77.449	
Power Motive	Between People	101	112.076	1.74
	Within People	102	80.907	
	Between Measures	1	140.005	
	Residual	101	80.322	
<b>Learning Style Inventory</b>				
Concrete Experience	Between People	102	8.849	2.47
	Within People	103	5.806	
	Between Measures	1	14.155	
	Residual	102	5.724	
Reflective Observation	Between People	102	12.969	16.68***
	Within People	103	9.131	
	Between Measures	1	132.160	
	Residual	102	7.925	
Abstract Conceptualization	Between People	102	14.633	33.17***
	Within People	103	8.961	
	Between Measures	1	226.485	
	Residual	102	6.829	
Active Experimentation	Between People	102	11.861	4.08*
	Within People	103	4.709	
	Between Measures	1	18.660	
	Residual	102	4.572	
Abstract/Concrete Learning Orientation	Between People	102	33.315	20.02***
	Within People	103	20.942	
	Between Measures	1	353.884	
	Residual	102	17.678	
Active/Reflective Learning Orientation	Between People	102	39.406	3.47 (p < .1)
	Within People	103	16.578	
	Between Measures	1	51.500	
	Residual	102	16.235	
<b>Adaptive Style Inventory</b>				
Total Concrete Experience		NA <sup>1</sup>		

\*p < .05  
 \*\*\*p < .001

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

Table J continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Adaptive Style Inventory (cont.)</b>				
Total Reflective Observation		NA <sup>1</sup>		
Total Abstract Conceptualization		NA <sup>1</sup>		
Total Active Experimentation		NA <sup>1</sup>		
Abstract/Concrete Adaptive Orientation		NA <sup>1</sup>		
Active/Reflective Adaptive Orientation		NA <sup>1</sup>		
Test of Thematic Analysis	Between People	103	1.349	2.93 (p < .1)
	Within People	104	1.043	
	Between Measures	1	3.005	
	Residual	103	1.024	
<b>Analysis of Argument<sup>2</sup></b>				
Attack	Between People	55	1.496	0.40
	Within People	56	1.777	
	Between Measures	1	0.723	
	Residual	55	1.796	
Defense	Between People	53	0.305	2.69
	Within People	54	0.287	
	Between Measures	1	0.750	
	Residual	53	0.278	
<b>Critical Thinking Appraisal</b>				
Inference	Between People	97	14.507	3.51 (p < .1)
	Within People	98	5.010	
	Between Measures	1	17.163	
	Residual	97	4.885	
Recognition	Between People	97	9.765	1.91
	Within People	98	4.985	
	Between Measures	1	9.434	
	Residual	97	4.939	
Deduction	Between People	97	15.702	1.23
	Within People	98	6.010	
	Between Measures	1	7.367	
	Residual	97	5.996	
<b>Life History Exercise</b>				
Performance		NA <sup>1</sup>		
Improvement		NA <sup>1</sup>		

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

<sup>2</sup>Not administered to 1976 Weekday College students.

Table K

Data Summary for Repeated Measures Analyses of Variance  
Between Second and Third Assessment  
for Traditional Age Students

Measure of Vocational, Educational, and Personal Issues	Group	df	MS	F
"Best Class" Essay	Between People	100	1.907	
	Within People	101	1.426	
	Between Measures	1	10.475	7.85**
	Residual	100	1.335	
"Decision" Essay	Between People	99	1.825	
	Within People	100	1.515	
	Between Measures	1	4.205	2.83 (p < .1)
	Residual	99	1.488	
"Career" Essay	Between People	100	2.243	
	Within People	101	1.173	
	Between Measures	1	0.837	0.71
	Residual	100	1.177	
Sentence Completion Test	Between People	103	1.714	
	Within People	104	0.548	
	Between Measures	1	0.308	0.56
	Residual	103	0.550	
Moral Judgment Instrument	Between People	30	1789.396	
	Within People	31	962.516	
	Between Measures	1	619.613	0.64
	Residual	30	973.946	
Defining Issues Test				
F% Score	Between People	69	266.562	
	Within People	70	83.295	
	Between Measures	1	303.114	3.78 (p < .1)
	Residual	69	80.110	
D Score	Between People	69	59.833	
	Within People	70	17.108	
	Between Measures	1	65.475	3.99*
	Residual	69	16.407	
Test of Cognitive Development	Between People	101	16.784	
	Within People	102	4.775	
	Between Measures	1	0.314	0.07
	Residual	101	4.819	
Picture Story Exercise				
Stages of Adaptation				
Receptive	Between People	101	98.455	
	Within People	102	88.613	
	Between Measures	1	257.064	2.96 (p < .1)
	Residual	101	86.945	
Autonomous	Between People	101	102.912	
	Within People	102	82.000	
	Between Measures	1	51.000	0.62
	Residual	101	82.307	
Assertive	Between People	101	105.193	
	Within People	102	90.495	
	Between Measures	1	299.064	3.38 (p < .1)
	Residual	101	88.430	

\*p &lt; .05

\*\*p &lt; .01

Table K continued

	Group	df	MS	F
Picture Story Exercise (cont.)				
Integrative	Between People	101	122.987	
	Within People	102	64.216	
	Between Measures	1	715.314	12.38***
	Residual	101	57.769	
Self-Definition	Between People	101	120.551	
	Within People	102	91.108	
	Between Measures	1	232.961	2.60
	Residual	101	89.703	
Achievement Motive	Between People	101	108.422	
	Within People	102	71.696	
	Between Measures	1	429.490	6.30*
	Residual	101	68.154	
Affiliation Motive	Between People	101	117.039	
	Within People	102	77.936	
	Between Measures	1	354.711	4.72*
	Residual	101	75.196	
Power Motive	Between People	101	92.776	
	Within People	102	79.523	
	Between Measures	1	7.456	0.09
	Residual	101	80.337	
Learning Style Inventory				
Concrete Experience	Between People	102	10.793	
	Within People	103	5.568	
	Between Measures	1	2.141	0.38
	Residual	102	5.602	
Reflective Observation	Between People	102	16.513	
	Within People	103	6.218	
	Between Measures	1	2.141	0.34
	Residual	102	6.258	
Abstract Conceptualization	Between People	102	14.646	
	Within People	103	8.053	
	Between Measures	1	11.655	1.45
	Residual	102	8.018	
Active Experimentation	Between People	102	13.935	
	Within People	103	3.490	
	Between Measures	1	8.976	2.61
	Residual	102	3.437	
Abstract/Concrete Learning Orientation	Between People	102	38.500	
	Within People	103	20.515	
	Between Measures	1	3.806	0.18
	Residual	102	20.678	
Active/Reflective Learning Orientation	Between People	102	46.962	
	Within People	103	14.369	
	Between Measures	1	2.350	0.16
	Residual	102	14.487	
Adaptive Style Inventory				
Total Concrete Experience	Between People	101	26.235	
	Within People	102	9.235	
	Between Measures	1	0.706	0.08
	Residual	101	9.320	

\*p &lt; .05.

\*\*p &lt; .01

Table K continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Adaptive Style Inventory (cont.)</b>				
Total Reflective Observation	Between People	101	12.048	
	Within People	102	5.049	
	Between Measures	1	0.314	0.06
	Residual	101	5.096	
Total Abstract Conceptualization	Between People	101	19.826	
	Within People	102	6.142	
	Between Measures	1	1.103	0.18
	Residual	101	6.192	
Total Active Experimentation	Between People	101	10.784	
	Within People	102	4.265	
	Between Measures	1	0.490	0.11
	Residual	101	4.302	
Abstract/Concrete Adaptive Orientation	Between People	101	80.710	
	Within People	102	23.191	
	Between Measures	1	3.574	0.15
	Residual	101	23.385	
Active/Reflective Adaptive Orientation	Between People	101	34.221	
	Within People	102	11.098	
	Between Measures	1	1.588	0.14
	Residual	101	11.192	
Test of Thematic Analysis	Between People	103	1.326	
	Within People	104	0.822	
	Between Measures	1	0.120	0.15
	Residual	103	0.829	
<b>Analysis of Argument<sup>2</sup></b>				
Attack	Between People	100	1.515	
	Within People	101	1.683	
	Between Measures	1	3.347	2.01
	Residual	101	1.667	
Defense	Between People	95	0.399	
	Within People	96	0.453	
	Between Measures	1	0.255	0.56
	Residual	95	0.455	
<b>Critical Thinking Appraisal</b>				
Inference	Between People	97	14.908	
	Within People	98	4.301	
	Between Measures	1	4.903	1.14
	Residual	97	4.295	
Recognition	Between People	97	11.662	
	Within People	98	4.505	
	Between Measures	1	21.556	4.93*
	Residual	97	4.329	
Deduction	Between People	97	17.908	
	Within People	98	4.026	
	Between Measures	1	17.760	4.57*
	Residual	97		

\*p &lt; .05

<sup>2</sup>Not administered to 1976 Weekday College students.

Table K continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Life History Exercise</b>				
Performance	Between People	99	71.884	
	Within People	100	33.970	
	Between Measures	1	35.280	1.04
	Residual	99	33.957	
Improvement	Between People	99	533.508	
	Within People	100	425.100	
	Between Measures	1	414.720	0.98
	Residual	99	425.205	

Table L  
Data Summary for Repeated Measures Analyses of Variance  
Between Entrance and Second Assessment  
for Older Students

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Measure of Vocational, Educational, and Personal Issues				
"Best Class" Essay	Between People	94	1.752	
	Within People	95	1.195	
	Between Measures	1	6.447	5.66*
	Residual	94	1.139	
"Decision" Essay	Between People	94	1.418	
	Within People	95	0.916	
	Between Measures	1	1.705	1.88
	Residual	94	0.907	
"Career" Essay	Between People	87	1.075	
	Within People	88	0.943	
	Between Measures	1	0.205	0.21
	Residual	87	0.952	
Sentence Completion Test	Between People	94	1.062	
	Within People	95	0.437	
	Between Measures	1	0.132	0.30
	Residual	94	0.440	
Moral Judgment Instrument	Between People	11	1953.167	
	Within People	12	653.083	
	Between Measures	1	150.000	0.21
	Residual	11	698.818	
Defining Issues Test				
P% Score	Between People	69	369.017	
	Within People	70	92.402	
	Between Measures	1	1330.561	17.87***
	Residual	69	74.458	
D Score	Between People	69	82.202	
	Within People	70	19.756	
	Between Measures	1	385.499	26.67***
	Residual	69	14.456	
Test of Cognitive Development	Between People	88	16.258	
	Within People	89	6.000	
	Between Measures	1	9.910	1.66
	Residual	88	5.956	
Picture Story Exercise				
Stages of Adaptation				
Receptive	Between People	96	102.598	
	Within People	97	101.144	
	Between Measures	1	1.670	0.02
	Residual	96	102.181	
Autonomous	Between People	96	120.514	
	Within People	97	83.387	
	Between Measures	1	42.686	0.51
	Residual	96	83.811	
Assertive	Between People	96	109.957	
	Within People	97	80.134	
	Between Measures	1	375.773	4.88*
	Residual	96	77.054	

\*p < .05  
\*\*\*p < .001

Table L continued

	Group	df	MS	F
<b>Picture Story Exercise (cont.)</b>				
Integrative	Between People	96	115.156	
	Within People	97	96.469	
	Between Measures	1	105.407	1.09
	Residual	96	96.376	
Self-Definition	Between People	96	102.187	
	Within People	97	71.794	
	Between Measures	1	833.010	13.04***
	Residual	96	63.864	
Achievement Motive	Between People	96	108.468	
	Within People	97	89.314	
	Between Measures	1	212.416	2.41
	Residual	96	88.032	
Affiliation Motive	Between People	96	111.177	
	Within People	97	75.845	
	Between Measures	1	568.165	8.03**
	Residual	96	70.717	
Power Motive	Between People	96	122.387	
	Within People	97	75.881	
	Between Measures	1	1182.686	18.38***
	Residual	96	64.352	
<b>Learning Style Inventory</b>				
Concrete Experience	Between People	98	11.135	
	Within People	99	7.045	
	Between Measures	1	53.581	8.15**
	Residual	98	6.571	
Reflective Observation	Between People	98	17.742	
	Within People	99	10.571	
	Between Measures	1	246.672	30.22***
	Residual	98	8.162	
Abstract Conceptualization	Between People	98	16.586	
	Within People	99	10.015	
	Between Measures	1	204.045	25.39***
	Residual	98	8.035	
Active Experimentation	Between People	98	13.412	
	Within People	99	6.313	
	Between Measures	1	18.182	2.94 (p < .1)
	Residual	98	6.192	
Abstract/Concrete Learning Orientation	Between People	98	41.345	
	Within People	99	25.828	
	Between Measures	1	466.747	11.88***
	Residual	98	21.329	
Active/Reflective Learning Orientation	Between People	98	51.935	
	Within People	99	24.005	
	Between Measures	1	398.793	19.76***
	Residual	98	20.181	
<b>Adaptive Style Inventory</b>				
Total Concrete Experience		NA <sup>1</sup>		

\*\*p < .01  
\*\*\*p < .001

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

Table L continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Adaptive Style Inventory (cont.)</b>				
Total Reflective Observation		NA <sup>1</sup>		
Total Abstract Conceptualisation		NA <sup>1</sup>		
Total Active Experimentation		NA <sup>1</sup>		
Abstract/Concrete Adaptive Orientation		NA <sup>1</sup>		
Active/Reflective Adaptive Orientation		NA <sup>1</sup>		
Test of Thematic Analysis	Between People	89	1.428	
	Within People	90	0.994	
	Between Measures	1	0.272	0.27
	Residual	89	1.003	
<b>Analysis of Argument<sup>2</sup></b>				
Attack	Between People	76	2.555	
	Within People	77	1.922	
	Between Measures	1	5.844	3.12 (p < .1)
	Residual	76	1.870	
Defense	Between People	77	0.710	
	Within People	78	0.603	
	Between Measures	1	1.641	2.79 (p < .1)
	Residual	77	0.589	
<b>Critical Thinking Appraisal</b>				
Inference	Between People	83	12.556	
	Within People	84	5.030	
	Between Measures	1	14.292	2.91 (p < .1)
	Residual	83	4.918	
Recognition	Between People	83	7.651	
	Within People	84	2.958	
	Between Measures	1	0.292	0.10
	Residual	83	2.990	
Deduction	Between People	82	16.500	
	Within People	83	4.434	
	Between Measures	1	21.687	5.13*
	Residual	82	4.223	
<b>Life History Exercise</b>				
Performance		NA <sup>1</sup>		
Improvement		NA <sup>1</sup>		

\*p &lt; .05

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.<sup>2</sup>Not administered to 1976 Weekday College students.

Table M

Data Summary for Repeated Measures Analyses of Variance  
Between Second and Third Assessment  
for Older Students

	Group	df	MS	F	
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	Between People	94	2.137	0.72
		Within People	95	1.647	
		Between Measures	1	1.184	
		Residual	94	1.652	
	"Decision" Essay	Between People	94	2.377	11.22**
		Within People	95	1.747	
		Between Measures	1	17.705	
		Residual	94	1.578	
	"Career" Essay	Between People	90	2.017	0.08
		Within People	91	1.099	
		Between Measures	1	0.088	
		Residual	90	1.110	
Sentence Completion Test	Between People	94	1.184	0.18	
	Within People	95	0.453		
	Between Measures	1	0.084		
	Residual	94	0.457		
Moral Judgment Instrument	Between People	11	2217.830	4.15 (p < .1)	
	Within People	12	1423.458		
	Between Measures	1	4676.042		
	Residual	11	1127.769		
Defining Issues Test	P% Score	Between People	69	362.732	1.41
		Within People	70	92.358	
		Between Measures	1	129.408	
		Residual	69	91.821	
	D Score	Between People	69	70.976	0.03
		Within People	70	14.707	
		Between Measures	1	0.471	
		Residual	69	14.913	
	Test of Cognitive Development	Between People	88	14.396	1.39
		Within People	89	4.169	
		Between Measures	1	5.753	
		Residual	88	4.151	
Picture Story Exercise	Stages of Adaptation Receptive	Between People	95	102.980	2.63
		Within People	96	70.359	
		Between Measures	1	182.130	
		Residual	95	69.183	
	Autonomous	Between People	95	131.021	0.90
		Within People	96	81.578	
		Between Measures	1	73.755	
		Residual	95	81.660	
	Assertive	Between People	95	125.384	1.43
		Within People	96	66.620	
		Between Measures	1	94.922	
		Residual	95	66.322	

\*\*p &lt; .01

Table M continued

		<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Picture Story Exercise (cont.)</b>					
Integrative	Between People		95	110.621	
	Within People		96	63.094	
	Between Measures		1	768.000	13.79***
	Residual		95	55.674	
Self-Definition	Between People		96	129.274	
	Within People		97	74.345	
	Between Measures		1	7.418	0.01
	Residual		96	75.115	
Achievement Motive	Between People		96	130.225	
	Within People		97	77.928	
	Between Measures		1	282.247	3.72 (p < .01)
	Residual		96	75.800	
Affiliation Motive	Between People		96	116.909	
	Within People		97	79.505	
	Between Measures		1	332.557	4.33*
	Residual		96	76.869	
Power Motive	Between People		96	103.483	
	Within People		97	76.284	
	Between Measures		1	479.510	6.65*
	Residual		96	72.083	
<b>Learning Style Inventory</b>					
Concrete Experience	Between People		98	15.858	
	Within People		99	6.212	
	Between Measures		1	20.687	3.41 (p < .1)
	Residual		98	6.064	
Reflective Observation	Between People		98	20.537	
	Within People		99	5.475	
	Between Measures		1	3.414	0.62
	Residual		98	5.496	
Abstract Conceptualization	Between People		98	17.491	
	Within People		99	7.944	
	Between Measures		1	13.136	1.66
	Residual		98	7.891	
Active Experimentation	Between People		98	18.197	
	Within People		99	6.359	
	Between Measures		1	6.187	0.97
	Residual		98	6.360	
Abstract/Concrete Learning Orientation	Between People		98	52.316	
	Within People		99	21.884	
	Between Measures		1	66.793	3.12 (p < .1)
	Residual		98	21.426	
Active/Reflective Learning Orientation	Between People		98	63.398	
	Within People		99	16.601	
	Between Measures		1	18.793	1.13
	Residual		98	16.579	
<b>Adaptive Style Inventory</b>					
Total Concrete Experience	Between People		96	25.390	
	Within People		97	6.309	
	Between Measures		1	4.041	0.64
	Residual		96	6.333	

\*p < .05  
 \*\*\*p < .001

Table M continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Adaptive Style Inventory (cont.)</b>				
Total Reflective Observation	Between People	96	13.799	
	Within People	97	5.108	
	Between Measures	1	2.273	0.44
	Residual	96	5.138	
Total Abstract Conceptualization	Between People	96	18.174	
	Within People	97	6.912	
	Between Measures	1	3.758	0.54
	Residual	96	6.945	
Total Active Experimentation	Between People	96	13.396	
	Within People	97	4.902	
	Between Measures	1	2.273	0.46
	Residual	96	4.929	
Abstract/Concrete Adaptive Orientation	Between People	96	74.812	
	Within People	97	20.809	
	Between Measures	1	15.593	0.75
	Residual	96	20.864	
Active/Reflective Adaptive Orientation	Between People	96	42.205	
	Within People	97	14.381	
	Between Measures	1	9.093	0.63
	Residual	96	14.437	
Test of Thematic Analysis	Between People	89	1.373	
	Within People	90	0.939	
	Between Measures	1	0.672	0.71
	Residual	89	0.942	
<b>Analysis of Argument<sup>2</sup></b>				
Attack	Between People	87	2.261	
	Within People	88	1.426	
	Between Measures	1	0.278	0.19
	Residual	87	1.439	
Defense	Between People	82	0.614	
	Within People	83	0.434	
	Between Measures	1	1.542	3.67 (p .1)
	Residual	82	0.420	
<b>Critical Thinking Appraisal</b>				
Inference	Between People	83	13.071	
	Within People	84	4.274	
	Between Measures	1	9.524	2.26
	Residual	83	4.211	
Recognition	Between People	83	7.502	
	Within People	84	3.405	
	Between Measures	1	18.667	5.80*
	Residual	83	3.221	
Deduction	Between People	83	13.799	
	Within People	84	4.827	
	Between Measures	1	7.292	1.52
	Residual	83	4.798	

\*p &lt; .05

<sup>2</sup>Not administered to 1976 Weekday College students.

Table M continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>	
Life History Exercise	Performance	Between People	83	93.360	
		Within People	84	33.298	
		Between Measures	1	77.357	2.36
		Residual	83	32.767	
	Improvement	Between People	83	449.710	
		Within People	84	572.143	
		Between Measures	1	44.024	0.08
		Residual	83	578.506	

Table II

Sample Size, Means and Standard Deviations for Repeated  
Measures Analyses of High and Low  
Educational Achievement Cohorts

	<u>LOW CLU</u>									<u>HIGH CLU</u>								
	<u>First Assessment</u>			<u>Second Assessment</u>			<u>Third Assessment</u>			<u>First Assessment</u>			<u>Second Assessment</u>			<u>Third Assessment</u>		
	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>
Measure of Vocational, Educational and Personal Issues																		
"Best Class" Essay	92	3.09	1.08	96	3.27	1.24	96	3.54	1.49	103	3.08	1.27	103	3.22	1.27	100	3.56	1.40
"Decision" Essay	93	3.25	1.19	95	3.65	1.16	95	3.05	1.47	104	3.31	1.14	104	3.50	1.25	100	3.04	1.57
"Career" Essay	85	3.12	1.16	94	3.18	1.20	94	3.21	1.38	93	2.91	1.25	98	3.04	1.09	98	3.10	1.50
Sentence Completion Test	93	5.48	0.80	99	5.26	0.92	99	5.23	0.87	106	5.34	0.78	106	5.33	1.10	100	5.32	1.12
Moral Judgment Instrument	13	332.31	33.92	21	349.43	31.59	21	370.67	33.65	29	354.17	27.26	29	350.31	42.68	22	336.18	33.92
Defining Issues Test																		
P %	69	38.50	12.46	74	48.61	13.80	74	51.28	14.97	71	39.89	14.63	71	49.26	13.32	66	46.83	13.91
D Score	69	24.09	6.61	74	29.44	6.02	74	29.51	7.03	71	26.19	7.51	71	28.39	6.03	66	28.08	5.99
Test of Cognitive Development	88	11.28	3.46	93	12.27	2.87	93	12.33	3.23	103	11.59	3.31	103	12.79	2.93	98	12.40	3.25
Picture Story Exercise																		
Stages of Adaptation																		
Receptive	92	50.64	11.47	101	48.76	9.13	101	47.60	8.09	107	52.29	10.93	107	50.04	9.71	97	48.22	9.50
Autonomous	92	49.39	9.17	101	50.54	9.72	101	49.96	10.55	107	49.14	10.18	107	50.18	8.94	97	50.45	9.85
Assertive	92	47.90	9.87	101	51.27	10.45	101	50.35	10.40	107	49.13	8.43	107	51.75	10.63	97	48.16	7.97
Integrative	52	51.64	11.20	101	51.02	9.86	101	46.94	9.20	107	51.91	10.39	107	52.56	8.95	97	47.65	9.23
Self-Definition	92	48.51	9.42	102	49.91	10.05	102	51.35	10.17	107	48.35	9.53	107	50.24	9.93	97	49.25	10.80
Achievement Motive	92	49.58	10.60	102	48.95	9.73	102	51.00	10.03	107	51.74	11.71	107	50.07	9.72	97	53.30	9.98
Affiliation Motive	92	49.32	9.36	102	48.50	9.50	102	51.38	10.39	107	50.40	9.75	107	49.21	9.78	97	51.66	10.33
Power Motive	92	47.58	9.85	102	51.57	10.95	102	49.33	8.42	107	48.30	9.60	107	51.16	10.15	97	49.66	9.34

Table 8 continued

	LOW CLU									HIGH CLU									
	First Assessment			Second Assessment			Third Assessment			First Assessment			Second Assessment			Third Assessment			
	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>n</u>	<u>M</u>	<u>SD</u>	
Learning Style Inventory																			
Concrete Experience	94	16.36	2.88	100	14.93	3.03	100	14.41	3.21	108	15.63	2.68	108	14.99	2.99	102	15.13	3.25	
Reflective Observation	94	15.03	3.24	100	12.69	3.43	100	12.75	3.45	108	15.05	3.39	108	12.69	3.33	102	13.45	3.56	
Abstract Conceptualization	94	14.63	3.12	100	17.11	3.68	100	17.43	3.40	108	15.31	3.48	108	17.64	3.32	102	16.71	3.41	
Active Experimentation	94	15.63	2.37	100	15.91	3.38	100	16.18	3.37	108	15.37	2.86	108	15.48	3.11	102	15.56	2.97	
Abstract/Concrete Learning Orientation	94	-1.73	4.78	100	2.18	6.05	100	3.02	5.70	108	0.32	5.13	108	2.65	5.64	102	1.58	5.79	
Active/Reflective Learning Orientation	94	0.60	4.80	100	3.22	6.03	100	3.43	5.95	108	0.32	5.51	108	2.80	5.59	102	2.11	5.80	
Adaptive Style Inventory																			
Total Concrete Experience	NA <sup>1</sup>			98	8.00	4.12	98	7.62	4.08	NA <sup>1</sup>			101	8.54	4.05	101	8.75	4.21	
Total Reflective Observation	NA <sup>1</sup>			98	14.11	2.88	98	14.21	2.83	NA <sup>1</sup>			101	14.30	3.31	101	14.33	2.98	
Total Abstract Conceptualization	NA <sup>1</sup>			98	15.15	3.63	98	15.45	3.51	NA <sup>1</sup>			101	15.00	3.62	101	14.83	3.52	
Total Active Experimentation	NA <sup>1</sup>			98	10.71	3.05	98	10.68	2.68	NA <sup>1</sup>			101	10.16	2.98	101	10.08	2.80	
Abstract/Concrete Adaptive Orientation	NA <sup>1</sup>			98	7.15	7.15	98	7.83	6.96	NA <sup>1</sup>			101	6.46	7.01	101	6.08	7.16	
Active/Reflective Adaptive Orientation	NA <sup>1</sup>			98	-3.40	5.11	98	-3.53	4.57	NA <sup>1</sup>			101	-4.14	5.45	101	-4.25	4.95	
Test of Thematic Analysis	87	1.46	1.23	98	1.60	1.08	98	1.51	1.05	107	1.36	1.11	107	1.36	1.04	96	1.47	1.08	
Analysis of Argument <sup>2</sup>																			
Attack	64	-0.47	1.51	94	-0.83	1.32	94	-0.83	1.37	69	-0.78	1.44	95	-0.64	1.36	95	-0.84	1.19	
Defense	65	-1.75	0.87	89	-1.85	0.58	89	-1.73	0.70	67	-1.78	0.73	90	-1.81	0.63	90	-1.68	0.80	
Critical Thinking Appraisal																			
Inference	80	8.66	2.77	90	10.64	3.02	90	10.69	3.15	102	9.55	3.19	102	10.25	3.21	92	10.04	2.93	
Recognition	80	10.78	2.56	90	11.07	2.62	90	11.89	2.73	102	11.35	2.46	102	11.11	2.71	92	11.25	2.60	
Deduction	79	15.62	3.15	90	16.94	3.35	90	17.58	2.98	102	16.48	3.24	102	16.87	3.54	92	16.75	3.14	
Life History Exercise																			
Performance	NA <sup>1</sup>			88	60.20	7.36	88	59.73	8.52	NA <sup>1</sup>			96	60.78	7.06	96	61.53	7.35	
Improvement	NA <sup>1</sup>			88	4.23	20.82	88	4.77	22.29	NA <sup>1</sup>			96	9.18	25.12	96	4.78	20.17	

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

<sup>2</sup>Not administered to 1976 Weekday College students.

Table 0

Data Summary for Repeated Measures Analyses of Variance Between  
Entrance and Second Assessment for Students in Low  
Educational Achievement Cohort

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	91	1.637	
	Within People	92	0.995	
	Between Measures	1	0.918	0.92
	Residual	91	0.995	
"Decision" Essay	Between People	92	1.474	
	Within People	93	1.194	
	Between Measures	1	2.151	1.82
	Residual	92	1.183	
"Career" Essay	Between People	84	1.564	
	Within People	85	0.994	
	Between Measures	1	0.053	0.05
	Residual	84	1.005	
Sentence Completion Test	Between People	92	0.996	
	Within People	93	0.382	
	Between Measures	1	0.909	2.42
	Residual	92	0.376	
Moral Judgment Instrument	Between People	12	1742.545	
	Within People	13	677.000	
	Between Measures	1	2106.000	3.77 (p < .1)
	Residual	12	557.917	
Defining Issues Test	P% Score	68	259.862	
	Within People	69	108.417	
	Between Measures	1	1107.833	11.82***
	Residual	68	93.720	
D Score	Between People	68	83.208	
	Within People	69	23.173	
	Between Measures	1	533.246	34.03***
	Residual	68	15.672	
Test of Cognitive Development	Between People	87	15.867	
	Within People	88	6.443	
	Between Measures	1	4.455	0.69
	Residual	87	6.466	
Picture Story Exercise	Stages of Adaptation			
	Receptive	91	105.271	
	Within People	92	136.625	
	Between Measures	1	13.049	0.09
Residual	91	137.983		
Autonomous	Between People	91	112.916	
	Within People	92	86.022	
	Between Measures	1	44.022	0.51
	Residual	91	86.483	
Assertive	Between People	91	115.538	
	Within People	92	79.663	
	Between Measures	1	307.848	3.99*
	Residual	91	77.156	

\*p &lt; .05

\*\*p &lt; .001

Table 0 continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Picture Story Exercise (cont.)</b>				
Integrative	Between People	91	121.061	
	Within People	92	104.310	
	Between Measures	1	210.918	2.05
	Residual	91	103.138	
Self-Definition	Between People	91	120.643	
	Within People	92	70.408	
	Between Measures	1	805.571	12.92***
	Residual	91	62.329	
Achievement Motive	Between People	91	108.661	
	Within People	92	86.054	
	Between Measures	1	31.391	0.36
	Residual	91	86.655	
Affiliation Motive	Between People	91	103.479	
	Within People	92	80.826	
	Between Measures	1	29.761	0.37
	Residual	91	81.387	
Power Motive	Between People	91	109.035	
	Within People	92	83.076	
	Between Measures	1	635.674	8.26**
	Residual	91	77.004	
<b>Learning Style Inventory</b>				
Concrete Experience	Between People	93	8.579	
	Within People	94	8.191	
	Between Measures	1	41.191	5.26*
	Residual	93	7.837	
Reflective Observation	Between People	93	16.445	
	Within People	94	8.410	
	Between Measures	1	91.282	12.14***
	Residual	93	7.518	
Abstract Conceptualization	Between People	93	15.371	
	Within People	94	9.782	
	Between Measures	1	144.814	17.38***
	Residual	93	8.330	
Active Experimentation	Between People	93	13.747	
	Within People	94	5.021	
	Between Measures	1	1.043	0.21
	Residual	93	5.064	
Abstract/Concrete Learning Orientation	Between People	93	33.647	
	Within People	94	26.867	
	Between Measures	1	340.473	14.49***
	Residual	93	23.495	
Active/Reflective Learning Orientation	Between People	93	50.662	
	Within People	94	17.261	
	Between Measures	1	72.814	4.37*
	Residual	93	16.663	
<b>Adaptive Style Inventory</b>				
Total Concrete Experiences		NA <sup>1</sup>		

\*p < .05  
 \*\*p < .01  
 \*\*\*p < .001

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

Table O continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Adaptive Style Inventory (cont.)				
Total Reflective Observation		NA <sup>1</sup>		
Total Abstract Conceptualization		NA <sup>1</sup>		
Total Active Experimentation		NA <sup>1</sup>		
Abstract/Concrete Adaptive Orientation		NA <sup>1</sup>		
Active/Reflective Adaptive Orientation		NA <sup>1</sup>		
Test of Thematic Analysis	Between People	86	1.825	
	Within People	87	0.954	
	Between Measures	1	5.885	6.56*
	Residual	86	0.897	
Analysis of Argument <sup>2</sup>				
Attack	Between People	63	1.887	
	Within People	64	2.250	
	Between Measures	1	4.500	2.03
	Residual	63	2.214	
Defense	Between People	64	0.460	
	Within People	65	0.515	
	Between Measures	1	0.623	1.21
	Residual	64	0.514	
Critical Thinking Appraisal				
Inference	Between People	79	10.927	
	Within People	80	5.231	
	Between Measures	1	37.056	7.67**
	Residual	79	4.828	
Recognition	Between People	79	8.427	
	Within People	80	3.769	
	Between Measures	1	0.756	0.20
	Residual	79	3.807	
Deduction	Between People	78	13.166	
	Within People	79	5.582	
	Between Measures	1	21.291	3.96 (p < .1)
	Residual	78	5.381	
Life History Exercise				
Performance		NA <sup>1</sup>		
Improvement		NA <sup>1</sup>		

\*p < .05  
\*\*p < .01

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.  
<sup>2</sup>Not administered to 1976 Weekday College students.

Table P

Data Summary for Repeated Measures Analyses of Variance Between  
Second and Third Assessment for Students in Low  
Educational Achievement Cohort

Measure of	Group	df	MS	F	
Vocational, Educational, and Personal Issues	"Best Class" Essay	Between People	95	2.266	
		Within People	96	1.510	
		Between Measures	1	3.521	2.36
		Residual	95	1.489	
"Decision" Essay	Between People	94	1.892		
	Within People	95	1.784		
	Between Measures	1	17.100	10.55**	
	Residual	94	1.621		
"Career" Essay	Between People	93	2.357		
	Within People	94	0.984		
	Between Measures	1	0.048	0.05	
	Residual	93	0.994		
Sentence Completion Test	Between People	98	1.106		
	Within People	99	0.190		
	Between Measures	1	0.045	0.09	
	Residual	98	0.494		
Moral Judgment Instrument	Between People	20	974.995		
	Within People	21	1326.190		
	Between Measures	1	4736.095	4.10 (p < .1)	
	Residual	20	1155.695		
Defining Issues Test	PZ Score	Between People	73	329.312	
		Within People	74	87.627	
		Between Measures	1	264.624	3.11 (p < .1)
		Residual	73	85.203	
D Score	Between People	73	69.155		
	Within People	74	16.270		
	Between Measures	1	0.151	0.01	
	Residual	73	16.491		
Test of Cognitive Development	Between People	92	14.067		
	Within People	93	4.570		
	Between Measures	1	0.194	0.04	
	Residual	92	4.617		
Picture Story Exercise	Stages of Adaptation	Between People	100	92.967	
	Receptive	Within People	101	56.015	
		Between Measures	1	67.767	1.21
		Residual	100	55.897	
Autonomous	Between People	100	127.466		
	Within People	101	77.599		
	Between Measures	1	17.233	0.22	
	Residual	100	78.203		
Assertive	Between People	100	141.550		
	Within People	101	75.668		
	Between Measures	1	42.817	0.56	
	Residual	100	75.997		

\*\*p &lt; .01

Table P continued

	Group	df	MS	F
<b>Picture Story Exercise (cont.)</b>				
Integrative	Between People	100	124.239	
	Within People	101	71.208	
	Between Measures	1	340.317	14.63***
	Residual	100	57.457	
Self-Definition	Between People	101	130.742	
	Within People	102	74.123	
	Between Measures	1	105.926	1.44
	Residual	101	73.808	
Achievement Motive	Between People	101	125.538	
	Within People	102	71.113	
	Between Measures	1	214.123	3.07 (p < .1)
	Residual	101	69.697	
Affiliation Motive	Between People	101	130.181	
	Within People	102	71.500	
	Between Measures	1	423.706	6.23*
	Residual	101	68.013	
Power Motive	Between People	101	102.876	
	Within People	102	89.510	
	Between Measures	1	254.824	2.90 (p < .1)
	Residual	101	87.873	
<b>Learning Style Inventory</b>				
Concrete Experience	Between People	99	13.558	
	Within People	100	6.020	
	Between Measures	1	13.520	2.27
	Residual	99	5.944	
Reflective Observation	Between People	99		
	Within People	100		
	Between Measures	1		
	Residual	99		
Abstract Conceptualization	Between People	99	17.732	
	Within People	100	7.360	
	Between Measures	1	5.120	0.69
	Residual	99	7.383	
Active Experimentation	Between People	99	16.304	
	Within People	100	6.445	
	Between Measures	1	3.645	0.56
	Residual	99	6.473	
Abstract/Concrete Learning Orientation	Between People	99	48.212	
	Within People	100	21.070	
	Between Measures	1	35.280	1.69
	Residual	99	20.926	
Active/Reflective Learning Orientation	Between People	99	53.458	
	Within People	100	18.135	
	Between Measures	1	2.205	0.12
	Residual	99	18.296	
<b>Adaptive Style Inventory</b>				
Total Concrete Experience	Between People	97	25.964	
	Within People	98	7.648	
	Between Measures	1	6.985	0.91
	Residual	97	7.655	

\*\*p &lt; .01

\*\*\*p &lt; .001

Table P continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Adaptive Style Inventory (cont.)</b>				
Total Reflective Observation	Between People	97	11.905	
	Within People	98	4.388	
	Between Measures	1	0.510	0.12
	Residual	97	4.428	
Total Abstract Conceptualization	Between People	97	18.667	
	Within People	98	6.801	
	Between Measures	1	4.291	0.63
	Residual	97	6.827	
Total Active Experimentation	Between People	97	11.327	
	Within People	98	5.016	
	Between Measures	1	0.046	0.01
	Residual	97	5.118	
Abstract/Concrete Adaptive Orientation	Between People	97	77.268	
	Within People	98	22.327	
	Between Measures	1	22.224	1.00
	Residual	97	22.328	
Active/Reflective Adaptive Orientation	Between People	97	34.621	
	Within People	98	12.332	
	Between Measures	1	0.862	0.07
	Residual	97	12.450	
Test of Thematic Analysis	Between People	97	1.463	
	Within People	98	0.801	
	Between Measures	1	0.413	0.51
	Residual	97	0.805	
<b>Analysis of Argument<sup>2</sup></b>				
Attack	Between People	93	2.092	
	Within People	94	1.511	
	Between Measures	1	0.000	0.00
	Residual	93	1.527	
Defense	Between People	88	0.418	
	Within People	89	0.410	
	Between Measures	1	0.680	1.67
	Residual	88	0.407	
<b>Critical Thinking Appraisal</b>				
Inference	Between People	89	15.258	
	Within People	90	3.778	
	Between Measures	1	0.089	0.02
	Residual	89	3.819	
Recognition	Between People	89	10.516	
	Within People	90	4.122	
	Between Measures	1	30.422	7.95**
	Residual	89	3.827	
Deduction	Between People	89	15.834	
	Within People	90	4.439	
	Between Measures	1	18.050	4.21*
	Residual	89	4.286	

\*p < .05  
\*\*p < .01

<sup>2</sup>Not administered to 1976 Weekday College students.

Table P continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Life History Exercise	Performance			
	Between People	87	96.894	
	Within People	88	29.614	
	Between Measures	1	10.023	0.34
	Residual	87	29.839	
Improvement	Between People	87	419.701	
	Within People	88	505.023	
	Between Measures	1	13.091	0.03
	Residual	87	510.677	

Table Q

Data Summary for Repeated Measures Analyses of Variance Between  
Entrance and Second Assessment for Students in High  
Educational Achievement Cohort

	Group	df	MS	F
Measure of Vocational, Educational, and Personal Issues	Between People	102	2.253	
	Within People	103	0.976	
	Between Measures	1	1.092	1.12
	Residual	102	0.975	
"Best Class" Essay	Between People	103	1.981	
	Within People	104	0.885	
	Between Measures	1	1.923	2.20
	Residual	103	0.875	
"Decision" Essay	Between People	92	2.010	
	Within People	93	0.914	
	Between Measures	1	0.774	0.85
	Residual	92	0.916	
"Career" Essay	Between People	105	1.169	
	Within People	106	0.646	
	Between Measures	1	0.005	0.01
	Residual	105	0.652	
Sentence Completion Test	Between People	28	1722.701	
	Within People	29	820.862	
	Between Measures	1	216.276	0.26
	Residual	28	842.454	
Moral Judgment Instrument	Between People	70	305.224	
	Within People	71	128.906	
	Between Measures	1	3116.135	36.14***
	Residual	70	86.231	
Defining Issues Test	Between People	70	75.058	
	Within People	71	19.875	
	Between Measures	1	173.025	9.78**
	Residual	70	17.687	
D Score	Between People	102	14.933	
	Within People	103	5.286	
	Between Measures	1	73.442	15.90***
	Residual	102	4.618	
Test of Cognitive Development	Between People	106	112.205	
	Within People	107	103.285	
	Between Measures	1	271.407	2.67
	Residual	106	101.699	
Picture Story Exercise	Between People	106	106.902	
	Within People	107	76.603	
	Between Measures	1	57.575	0.75
	Residual	106	76.782	
Autonomous	Between People	106	117.393	
	Within People	107	69.467	
	Between Measures	1	366.355	5.50*
	Residual	106	66.666	
Assertive	Between People	106	112.205	
	Within People	107	103.285	
	Between Measures	1	271.407	2.67
	Residual	106	101.699	
Stages of Adaptation Receptive	Between People	106	106.902	
	Within People	107	76.603	
	Between Measures	1	57.575	0.75
	Residual	106	76.782	
Autonomous	Between People	106	117.393	
	Within People	107	69.467	
	Between Measures	1	366.355	5.50*
	Residual	106	66.666	
Assertive	Between People	106	112.205	
	Within People	107	103.285	
	Between Measures	1	271.407	2.67
	Residual	106	101.699	

\*\*p < .01  
\*\*\*p < .001

Table Q continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Picture Story</b>				
<b>Exercise (cont.)</b>				
Integrative	Between People	106	115.503	
	Within People	107	72.047	
	Between Measures	1	22.897	0.32
	Residual	106	72.510	
Self-Definition	Between People	106	121.160	
	Within People	107	69.248	
	Between Measures	1	192.565	2.83 (p < .1) <sup>1</sup>
	Residual	106	68.084	
Achievement Motive	Between People	106	134.523	
	Within People	107	97.565	
	Between Measures	1	149.724	1.54
	Residual	106	97.073	
Affiliation Motive	Between People	106	117.506	
	Within People	107	73.154	
	Between Measures	1	75.369	1.03
	Residual	106	73.133	
Power Motive	Between People	106	124.040	
	Within People	107	74.486	
	Between Measures	1	437.551	6.16*
	Residual	106	71.061	
<b>Learning Style Inventory</b>				
Concrete Experience	Between People	107	11.390	
	Within People	108	4.866	
	Between Measures	1	22.042	4.68*
	Residual	107	4.705	
Reflective Observation	Between People	107	14.230	
	Within People	108	11.079	
	Between Measures	1	301.042	35.97***
	Residual	107	8.369	
Abstract Conceptualization	Between People	107	16.550	
	Within People	108	9.213	
	Between Measures	1	294.000	44.88***
	Residual	107	6.551	
Active Experimentation	Between People	107	11.877	
	Within People	108	5.907	
	Between Measures	1	0.667	0.11
	Residual	107	5.956	
Abstract/Concrete Learning Orientation	Between People	107	42.176	
	Within People	108	20.264	
	Between Measures	1	477.042	29.82***
	Residual	107	15.995	
Active/Reflective Learning Orientation	Between People	107	41.698	
	Within People	108	22.792	
	Between Measures	1	330.042	16.57***
	Residual	107	19.920	
<b>Adaptive Style Inventory</b>				
Total Concrete Experience		NA <sup>1</sup>		

\*p < .05  
\*\*\*p < .001

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

Table Q continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Adaptive Style Inventory (cont.)				
Total Reflective Observation		NA <sup>1</sup>		
Total Abstract Conceptualization		NA <sup>1</sup>		
Total Active Experimentation		NA <sup>1</sup>		
Abstract/Concrete Adaptive Orientation		NA <sup>1</sup>		
Active/Reflective Adaptive Orientation		NA <sup>1</sup>		
Test of Thematic Analysis	Between People	106	1.232	
	Within People	107	1.075	
	Between Measures	1	0.000	0.00
	Residual	106	1.085	
Analysis of Argument <sup>2</sup>				
Attack	Between People	68	2.347	
	Within People	69	1.500	
	Between Measures	1	0.065	0.04
	Residual	68	1.521	
Defense	Between People	66	0.627	
	Within People	67	0.433	
	Between Measures	1	0.030	0.07
	Residual	66	0.439	
Critical Thinking Appraisal				
Inference	Between People	101	15.614	
	Within People	102	4.853	
	Between Measures	1	4.412	0.91
	Residual	101	4.857	
Recognition	Between People	101	9.116	
	Within People	102	4.270	
	Between Measures	1	3.064	0.72
	Residual	101	4.182	
Deduction	Between People	101	17.987	
	Within People	102	5.059	
	Between Measures	1	7.843	1.56
	Residual	101	5.031	
Life History Exercise				
Performance		NA <sup>1</sup>		
Improvement		NA <sup>1</sup>		

<sup>1</sup>NA - not applicable - Students were not given this measure at time of first assessment.

<sup>2</sup>Not administered to 1976 Weekday College students.

Table R  
Data Summary for Repeated Measures Analyses of Variance Between  
Second and Third Assessment for Students in High  
Educational Achievement Cohort

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Measure of Vocational, Educational, and Personal Issues	Between People	99	2.079	
	Within People	100	1.555	
	Between Measures	1	6.125	4.06*
	Residual	99	1.509	
"Best Class" Essay	Between People	99	2.432	
	Within People	100	1.480	
	Between Measures	1	4.500	3.10 (p < .10)
	Residual	99	1.449	
"Decision" Essay	Between People	97	2.155	
	Within People	98	1.286	
	Between Measures	1	0.184	0.14
	Residual	97	1.297	
"Career" Essay	Between People	99	1.847	
	Within People	100	0.515	
	Between Measures	1	0.405	0.78
	Residual	99	0.516	
Sentence Completion Test	Between People	21	2985.845	
	Within People	22	866.795	
	Between Measures	1	164.205	0.18
	Residual	21	900.252	
Moral Judgment Instrument	Between People	65	296.681	
	Within People	66	88.051	
	Between Measures	1	154.267	1.77
	Residual	65	87.032	
Defining Issues Test	Between People	65	73.501	
	Within People	66	15.501	
	Between Measures	1	52.065	3.49 (p < .1)
	Residual	65	14.938	
P% Score	Between People	97	17.223	
	Within People	98	4.418	
	Between Measures	1	1.653	0.37
	Residual	97	4.447	
Test of Cognitive Development	Between People	96	107.668	
	Within People	97	104.490	
	Between Measures	1	460.830	4.57*
	Residual	96	100.778	
Picture Story Exercise	Between People	96	109.116	
	Within People	97	86.165	
	Between Measures	1	9.093	0.10
	Residual	96	86.968	
Stages of Adaptation	Between People	96	86.191	
	Within People	97	82.304	
	Between Measures	1	403.521	5.47*
	Residual	96	78.677	
Receptive	Between People	96	86.191	
	Within People	97	82.304	
	Between Measures	1	403.521	5.47*
	Residual	96	78.677	
Autonomous	Between People	96	86.191	
	Within People	97	82.304	
	Between Measures	1	403.521	5.47*
	Residual	96	78.677	
Assertive	Between People	96	86.191	
	Within People	97	82.304	
	Between Measures	1	403.521	5.47*
	Residual	96	78.677	

\*p < .05  
\*\*p < .01

Table P continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Picture Story Exercise (cont.)</b>				
Integrative	Between People	96	114.993	11.54***
	Within People	97	62.072	
	Between Measures	1	645.959	
	Residual	96	55.990	
Self-Definition	Between People	96	120.403	7.56**
	Within People	97	92.206	
	Between Measures	1	653.278	
	Residual	96	86.362	
Achievement Motive	Between People	96	109.333	7.19**
	Within People	97	78.541	
	Between Measures	1	531.139	
	Residual	96	73.827	
Affiliation Motive	Between People	96	116.020	3.20 (p < .1)
	Within People	97	86.273	
	Between Measures	1	270.314	
	Residual	96	84.356	
Power Motive	Between People	96	93.168	1.05
	Within People	97	65.887	
	Between Measures	1	69.361	
	Residual	96	65.850	
<b>Learning Style Inventory</b>				
Concrete Experience	Between People	101	12.687	0.93
	Within People	102	5.750	
	Between Measures	1	5.338	
	Residual	101	5.754	
Reflective Observation	Between People	101	19.579	0.10
	Within People	102	5.721	
	Between Measures	1	0.593	
	Residual	101	5.771	
Abstract Conceptualization	Between People	101	14.946	0.51
	Within People	102	8.627	
	Between Measures	1	4.412	
	Residual	101	8.669	
Active Experimentation	Between People	101	16.387	3.88 (p < .1)
	Within People	102	3.377	
	Between Measures	1	12.750	
	Residual	101	3.285	
Abstract/Concrete Learning Orientation	Between People	101	42.591	0.00
	Within People	102	21.299	
	Between Measures	1	0.044	
	Residual	101	21.509	
Active/Reflective Learning Orientation	Between People	101	58.180	1.47
	Within People	102	12.843	
	Between Measures	1	18.843	
	Residual	101	12.784	
<b>Adaptive Style Inventory</b>				
Total Concrete Experience	Between People	100	26.115	0.27
	Within People	101	7.965	
	Between Measures	1	2.183	
	Residual	100	8.023	

\*p &lt; .05

\*\*p &lt; .01

Table R continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
<b>Adaptive Style Inventory (cont.)</b>				
Total Reflective Observation	Between People	100	14.029	
	Within People	101	5.748	
	Between Measures	1	0.045	0.01
	Residual	100	5.805	
Total Abstract Conceptualization	Between People	100	19.251	
	Within People	101	6.243	
	Between Measures	1	1.431	0.23
	Residual	100	6.291	
Total Active Experimentation	Between People	100	12.611	
	Within People	101	4.099	
	Between Measures	1	0.317	0.08
	Residual	100	4.137	
Abstract/Concrete Adaptive Orientation	Between People	100	78.456	
	Within People	101	21.743	
	Between Measures	1	7.149	0.33
	Residual	10	21.889	
Active/Reflective Adaptive Orientation	Between People	100	40.970	
	Within People	101	13.054	
	Between Measures	1	0.599	0.05
	Residual	100	13.179	
Test of Thematic Analysis	Between People	95	1.416	
	Within People	96	0.953	
	Between Measures	1	0.255	0.27
	Residual	95	0.960	
<b>Analysis of Argument<sup>2</sup></b>				
Attack	Between People	94	1.647	
	Within People	95	1.616	
	Between Measures	1	1.900	1.18
	Residual	94	1.613	
Defense	Between People	89	0.576	
	Within People	90	0.478	
	Between Measures	1	0.800	1.69
	Residual	89	0.474	
<b>Critical Thinking Appraisal</b>				
Inference	Between People	91	12.853	
	Within People	92	4.788	
	Between Measures	1	24.397	5.34*
	Residual	91	4.573	
Recognition	Between People	91	9.434	
	Within People	92	3.875	
	Between Measures	1	12.005	3.17 (p < .1)
	Residual	91	3.786	
Deduction	Between People	91	15.836	
	Within People	92	4.353	
	Between Measures	1	7.440	1.72
	Residual	91	4.319	

\*p &lt; .05

<sup>2</sup> Not administered to 1976 Weekday College students.

Table R continued

	<u>Group</u>	<u>df</u>	<u>MS</u>	<u>F</u>
Life History Exercise				
	Performance	95	66.414	
	Between People	96	37.375	
	Within People	1	27.000	0.72
	Between Measures	95	37.484	
	Residual			
Improvement				
	Between People	95	561.936	
	Within People	96	480.500	
	Between Measures	1	927.521	1.95
	Residual	95	475.795	

Table S  
Multiple Correlations Between Entrance Assessments and  
Student Background Variables

Measure	n	Age	Religion	Mother's Education	Father's Education	Mother's Occupation	Father's Occupation	High School GPA	Prior College Experience	Marital Status	
									.239**	.125	
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	196	.045	.112	.106	.127	.113	.118	.129	.096	.278**
	"Decision" Essay	197	.221**	.142*	.105	.114	.203	.234*	.170	.198*	.302**
	"Career" Essay	180	.226**	.050	.100	.081	.180	.182	.100	.198*	.302**
Sentence Completion Test	199	.046	.047	.082	.165	.133	.198	.086	.068	.136	
Moral Judgment Instrument	42	.368*	.136	.249	.263	.224	.283	.231	.271	.228	
Defining Issues Test	PZ Score	140	.165	.017	.065	.148	.212	.179	.143	.176	.176
	D Score	140	.245**	.082	.133	.149	.225	.158	.169	.110	.110
Test of Cognitive Development	191	.037	.070	.122	.150	.106	.167	.313**	.099	.121	
Picture Story Exercise	Stages of Adaptation										
	Receptive	166	.088	.004	.220	.200	.154	.126	.076	.153	.151
	Autonomous	166	.001**	.061**	.171	.203	.211	.218	.103	.097**	.137
	Assertive	166	.128**	.235**	.138	.025	.083	.113	.176	.263**	.172
	Integrative	166	.149	.108	.176	.188	.127	.092	.133	.139	.029
	Self-Definition	166	.232**	.183*	.246*	.163	.207	.059	.069	.226*	.196*
	Achievement Motive	166	.102	.047	.152	.088	.136	.221	.166	.072	.182
	Affiliation Motive	166	.004	.020	.208	.146	.132	.209	.178	.068	.060
	Power Motive	166	.103	.136	.118	.079	.105	.128	.150	.118	.116
	Learning Style Inventory										
Concrete Experience	202	.195**	.079	.160	.197	.168	.151	.132	.126	.142	
Reflective Observation	202	.100**	.111*	.046	.175*	.136	.119	.105	.015	.038	
Abstract Conceptualization	202	.205**	.158	.163	.220	.145	.095	.097	.128	.121	
Active Experimentation	202	.078	.064	.153	.187	.172	.053	.166	.070	.027	
Abstract/Concrete Learning Orientation	202	.245**	.149*	.166	.215	.179	.119	.098	.149	.149	
Active/Reflective Learning Orientation	202	.104	.104	.085	.196	.155	.066	.093	.038	.014	
Adaptive Style Inventory	Total Concrete Experience	199	.113	.025	.158	.082	.160	.133	.058	.131	.157*
	Total Reflective Observation	199	.062	.039	.133	.146	.062	.147	.171	.089	.195
	Total Abstract Conceptualization	199	.006**	.080	.181	.116	.180	.134	.080	.171	.110
	Total Active Experimentation	199	.209**	.024	.109	.177	.184	.096	.226	.038	.147
	Abstract/Concrete Adaptive Orientation	199	.068	.055	.179	.081	.169	.124	.064	.156	.147
Active/Reflective Adaptive Orientation	199	.156*	.010	.129	.163	.121	.104	.226	.046	.195*	
Test of Thematic Analysis	194	.167*	.025	.142	.239*	.040	.097	.125	.193*	.265**	
Analysis of Argument	Attack	132	.071	.080	.205	.140	.081	.025	.204	.058	.171
	Defense	132	.101	.108	.153	.206	.184	.163	.202	.114	.161
Critical Thinking Appraisal	Inference	162	.114	.044	.106	.184	.093	.164	.254**	.134	.162
	Recognition	182	.119	.088	.113	.216	.181	.099	.322**	.114	.140
	Deduction	182	.002	.104	.126	.190	.112	.125	.232*	.076	.079
Life History Exercise	184	.064	.016	.176	.117	.211	.107	.314**	.105	.041	
Improvement	184	.014	.105	.083	.176	.134	.137	.122	.053	.058	

\*p < .05  
\*\*p < .01

Table T

Data Summary for  $t$  Tests of Mean Differences Between All Levels  
of Student Background Variables Significantly Correlated  
With Entrance Assessments

Index	Background Variable	n	M	$t$				
				1	2	3	4	5
Measure of Vocational, Educational, and Personal Issues								
"Best Class" Essay								
Prior College Experience								
	1. 1-12 Credits	21	2.86					
	2. 13+ Credits	46	3.59	1.87				
	3. No Prior	129	2.94	0.30	3.29**			
"Decision" Essay								
Religion								
	1. Catholic	127	3.50					
	2. Non Catholic	70	3.16	2.00*				
Father's Occupation								
	1. Level 1	61	3.30					
	2. Level 2	35	3.40	0.43				
	3. Level 3	67	3.25	0.20	0.61			
	4. Level 5	14	3.93	1.75	1.46	2.01*		
	5. Missing Data	20	2.65	2.20*	2.35*	2.08*	3.22**	
Marital Status								
	1. Married	38	3.63					
	2. Divorced/Widowed	15	4.14	1.47				
	3. Single	144	3.10	2.62**	3.41**			
"Career" Essay								
Prior College Experience								
	1. 1-12 Credits	19	3.37					
	2. 13+ Credits	44	3.32	0.15				
	3. No Prior	117	2.84	1.81	2.30*			
Marital Status								
	1. Married	37	3.54					
	2. Divorced/Widowed	15	3.67	0.36				
	3. Single	128	2.78	3.53**	2.82**			

\* $p < .05$ \*\* $p < .01$

Table T continued

Index	Background Variable	n	m	Paired Comparison				
				1	2	3	4	5
Test of Cognitive Development								
High School GPA								
1.	"D" Average	4	7.00					
2.	"C" Average	29	11.24	2.45*				
3.	"B" Average	99	11.38	2.64**	0.21			
4.	"A" Average	33	13.21	3.61**	2.38*	2.80**		
5.	Missing Data	26	10.38	1.94	0.98	1.40	3.33**	
Picture Story Exercise								
Stages of Adaptation								
Assertive								
Religion								
1.	Catholic	129	49.93					
2.	Non Catholic	70	46.04	2.93**				
Prior College Experience								
1.	1-12 Credits	21	46.00					
2.	13+ Credits	44	45.61	0.16				
3.	No Prior	134	49.93	1.87	2.78**			
Self-Definition								
Religion								
1.	Catholic	130	49.67					
2.	Non Catholic	69	46.13	2.56*				
Mother's Education								
1.	Primary	40	48.13					
2.	High School	88	47.06	0.60				
3.	Post High School	28	53.18	2.21*	3.04**			
4.	Graduate	23	50.57	1.02	1.64	1.01		
5.	Missing Data	20	45.90	0.88	0.50	2.68**	1.65	
Prior College Experience								
1.	1-12 Credits	21	46.76					
2.	13+ Credits	44	45.11	0.68				
3.	No Prior	134	49.77	1.38	2.88**			

\*p &lt; .05

\*\*p &lt; .01

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Table T continued

Index Background Variable	n	M	<u>t</u>				
			1	2	3	4	5
Picture Story Exercise (continued)							
Marital Status							
1. Married	39	47.36					
2. Divorced/Widowed	15	46.20	0.42				
3. Single	145	49.52	1.31	2.56*			
Learning Style Inventory							
Abstract Conceptualization							
Religion							
1. Catholic	132	15.37					
2. Non Catholic	70	14.27	2.26*				
Father's Education							
1. Primary	43	14.09					
2. High School	68	15.84	0.59				
3. Post High School	35	15.17	0.31	0.21			
4. Graduate	28	14.10	0.00	0.51	0.28		
5. Missing Data	28	15.00	1.13	1.12	0.20	1.02	
Abstract/Concrete Learning Orientation							
Religion							
1. Catholic	132	-0.44					
2. Non Catholic	70	-2.00	2.13*				
Adaptive Style Learning							
Total Reflective Observation							
Marital Status							
1. Married	15	16.20					
2. Divorced/Widowed	40	13.65	2.75**				
3. Single	144	14.15	2.47*	0.92			
Active/Reflective Adaptive Orientation							
Marital Status							
1. Married	15	6.93					
2. Divorced/Widowed	20	2.55	2.46*				
3. Single	164	3.78	2.23*	1.33			

\*p &lt; .05

\*\*p &lt; .01

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Table T continued

Index Background Variable	n	M	t				
			1	2	3	4	5
Test of Thematic Analysis							
Father's Education							
1. Primary	40	1.62					
2. High School	67	1.27	1.56				
3. Post High School	33	1.88	0.94	2.51*			
4. Graduate	28	1.07	1.96	0.77	1.92		
5. Missing Data	26	1.19	1.51	0.29	2.29*	0.39	
Prior College Experience							
1. 1-12 Credits	21	1.71					
2. 13+ Credits	42	1.74	0.08				
3. No Prior	131	1.25	1.72	2.39*			
Marital Status							
1. Married	35	1.75					
2. Divorced/Widowed	13	2.31	1.54				
3. Single	146	1.25	2.34*	3.25**			
Analysis of Argument							
Defense							
Marital Status							
1. Married	13	1.92					
2. Divorced/Widowed	33	1.48	1.80				
3. Single	138	-1.84	0.38	2.47*			
Critical Thinking Appraisal							
Inference							
High School GPA							
1. "D" Average	3	7.33					
2. "C" Average	26	9.07	0.95				
3. "B" Average	94	9.03	0.96	0.07			
4. "A" Average	33	10.97	2.00*	2.40*	3.18**		
5. Missing Data	26	9.19	1.01	0.14	0.24	2.26	

\*p &lt; .05

\*\*p &lt; .01

Table T continued

Index Background Variable	n	M	t				
			1	2	3	4	5
Critical Thinking Appraisal (continued)							
Recognition							
High School GPA							
1. "D" Average	3	11.67					
2. "C" Average	26	10.89	0.53				
3. "B" Average	94	10.52	0.81	.68			
4. "A" Average	33	12.70	0.71	2.87**	4.46**		
5. Missing Data	26	11.31	0.24	.63	1.48	2.20*	
Deduction							
High School GPA							
1. "D" Average	3	15.34					
2. "C" Average	26	15.73	0.21				
3. "B" Average	94	15.83	0.27	0.14			
4. "A" Average	33	17.67	1.22	2.33*	2.87**		
5. Missing Data	26	15.58	0.13	0.18	0.36	2.53*	
Life History Exercise							
Performance							
High School GPA							
1. "D" Average	3	58.67					
2. "C" Average	26	59.12	0.11				
3. "B" Average	97	59.37	0.18	0.17			
4. "A" Average	33	63.30	1.13	2.34	2.86*		
5. Missing Data	25	64.88	1.49	3.02*	3.61**	0.87	

\*p < .05  
\*\*p < .01



Table U

Squared Part Correlations of Categorical Variables With  
Entrance Assessments With Age Controlled

Index	Background Variable	Cumulative R <sup>2</sup>	Increment in R <sup>2</sup>	F
Measure of Vocational, Educational and Personal Issues				
"Decision" Essay	Age	.049		
	Religion	.061	.012	2.48
	Age	.049		
Father's Occupation	Father's Occupation	.091	.042	2.21
	Age	.049		
Marital Status	Marital Status	.083	.034	3.58*
	Age	.049		
"Career" Essay	Age	.051		
	Prior College Experience	.063	.012	1.13
	Age	.051		
Marital Status	Marital Status	.093	.042	4.08*
	Age	.051		
Picture Story Exercise				
Stages of Adaptation				
Assertive				
	Age	.032		
	Religion	.063	.031	6.49*
	Age,	.063		
	Religion	.063		
	Prior College Experience	.079	.016	1.69
	Age,	.063		
Self-Definition				
	Age	.056		
	Religion	.075	.019	4.03*
	Age	.056		
	Mother's Education	.113	.057	3.10*
	Age,	.113		
	Mother's Education	.113		
	Prior College Experience	.127	.014	1.53
	Age,	.113		
	Mother's Education	.113		
	Marital Status	.114	.001	0.11

\* p &lt; .05

Table U continued

Index Background Variable	Cumulative $R^2$	Increment in $R^2$	F
Learning Style Inventory			
Abstract Conceptualization			
Age	.042		
Religion	.058	.016	3.38
Age	.042		
Father's Education	.077	.035	1.86
Abstract/Concrete Learning Orientation			
Age	.060		
Religion	.072	.012	2.57
Adaptive Style Inventory			
Active/Reflective Adaptive Orientation			
Age	.024		
Marital Status	.077	.053	5.60**
Test of Thematic Analysis			
Age	.028		
Father's Education	.076	.048	2.44 *
Age, Father's Education	.076		
Prior College Experience	.090	.014	1.43
Age, Father's Education	.090		
Marital Status	.121	.031	3.28**
Analysis of Argument			
Age	.022		
Marital Status	.041	.019	1.80

\* p &lt; .05

\*\* p &lt; .01

Table V

## Correlations Between Assessments for Each Interval

Measure		Correlation Second with First	Correlation Third with Second
Measure of Vocational, Educational, and Personal Issues	"Best Class" Essay	.332	.184
	"Decision" Essay	.272	.176
	"Career" Essay	.320	.332
Sentence Completion Test		.359	.492
Moral Judgment Instrument		.486	.349
Defining Issues Test	P% Score	.518	.580
	D Score	.649	.643
Test of Cognitive Development		.477	.552
Picture Story Exercise	Stages of Adaptation		
	Receptive	(.042)	(.130)
	Autonomous	.149	.178
	Assertive	.251	.194
	Integrative	.154	.357
	Self-Definition	.297	.204
	Achievement Motive	.148	.248
	Affiliation Motive	.183	.242
	Power Motive	.226	(.121)
	Learning Style Inventory	Concrete Experience	.249
Reflective Observation		.311	.523
Abstract Conceptualization		.380	.341
Active Experimentation		.405	.548
Abstract/Concrete Learning Orientation		.342	.366
Active/Reflective Learning Orientation		.429	.572
Adaptive Style Inventory <sup>a</sup>	Total Concrete Experience		.540
	Total Reflective Observation		.435
	Total Abstract Conceptualization		.486
	Total Active Experimentation		.451
	Abstract/Concrete Adaptive Orientation		.559
Active/Reflective Adaptive Orientation			.499
Test of Thematic Analysis		.204	.241
Analysis of Argument	Attack	(.085)	(.149)
	Defense	(.046)	(.087)
Critical Thinking Appraisal	Inference	.483	.541
	Recognition	.366	.452
	Deduction	.510	.576
Life History Exercise	Performance	.480	.414
	Improvement	(.113)	(.002)

<sup>a</sup>This instrument was not given at time of first assessment.

Table W

Squared Part Correlations of Student Background Variables  
With Second Assessments With First  
Assessment Controlled

Index Background Variable	Cumulative $R^2$	Increment in $R^2$	F
Measure of Vocational, Educational and Personal Issues			
"Best Class" Essay			
First Assessment	.110		
Prior College Experience	.151	.041	4.61*
"Decision" Essay			
First Assessment	.074		
Age	.112	.038	8.22**
Marital Status	.126	.014	0.75
"Career" Essay			
First Assessment	.103		
Age	.118	.015	2.93
First Assessment	.103		
Marital Status	.126	.023	1.11
Moral Judgment Instrument			
First Assessment	.236		
Age	.241	.005	0.26
Defining Issues Test			
D Score			
1st Assessment	.421		
Age	.441	.020	4.90*
Test of Cognitive Development			
First Assessment	.227		
Grade Point Average	.270	.043	2.72*
Picture Story Exercise			
Stages of Adaptation			
Assertive			
First Assessment	.063		
Age	.064	.001	0.21
First Assessment	.063		
Religion	.063	.000	0.00
Self-Definition			
First Assessment	.042		
Age	.043	.001	0.21
First Assessment	.042		
Mother's Education	.069	.027	1.40

\*p &lt; .05

\*\*p &lt; .01

Table W continued

Index Background Variable	Cumulative $R^2$	Increment in $R^2$	$F$
Learning Style Inventory			
Concrete Experience			
First Assessment	.062		
Age	.064	.002	0.43
Abstract Conceptualization			
First Assessment	.144		
Age	.189	.045	11.04**
Abstract/Concrete Learning Orientation			
First Assessment	.117		
Age	.138	.021	4.87**
Test of Thematic Analysis			
First Assessment	.041		
Age	.057	.016	3.24
First Assessment	.041		
Father's Education	.057	.016	0.80
First Assessment	.041		
Marital Status	.099	.058	3.03*
Critical Thinking Appraisal			
Inference			
First Assessment	.232		
Grade Point Average	.254	.022	1.30
Recognition			
First Assessment	.140		
Grade Point Average	.173	.033	1.76
Deduction			
First Assessment	.260		
First Assessment, Quadratic	.306	.046	11.80**
Grade Point Average	.350	.044	2.95*
Life History Exercise			
Performance			
First Assessment	.230		
Grade Point Average	.271	.041	0.72

\* $p < .05$ \*\* $p < .01$

Table X

Squared Part Correlations of Student Background Variables  
With Third Assessments With Second  
Assessment Controlled

Index Background Variable	Cumulative $R^2$	Increment in $R^2$	F
Measure of Vocational, Educational, and Personal Issues			
"Best Class" Essay			
Second Assessment	.034		
Prior College Experience	.036	.002	0.22
"Decision" Essay			
Second Assessment	.031		
Age	.031	.000	0.00
Second Assessment			
Marital Status			
"Career" Essay			
Second Assessment	.110		
Second Assessment, Quadratic	.137	.027	5.38*
Age	.138	.001	0.20
Second Assessment			
Second Assessment, Quadratic	.137		
Marital Status	.169	.032	1.62
Moral Judgment Instrument			
Second Assessment	.146		
Age	.209	.063	3.19
Defining Issues Test			
D Score			
Second Assessment	.413		
Age	.414	.001	.234
Test of Cognitive Development			
Second Assessment	.305		
Second Assessment, Quadratic	.326	.021	5.86*
Grade Point Average	.359	.033	2.37
Picture Story Exercise			
Assertive			
Second Assessment	.038		
Second Assessment, Quadratic	.060	.022	4.56*
Age	.066	.006	1.25
Self-Definition			
Second Assessment	.042		
Age	.043	.001	0.21
Second Assessment	.042		
Mother's Education	.069	.027	1.40

\* $p < .05$

Table X continued

Index Background Variable	Cumulative $R^2$	Increment in $R^2$	F
<b>Learning Style Inventory</b>			
Concrete Experience			
Second Assessment	.153		
Age	.154	.001	0.17
Abstract Conceptualization			
Second Assessment	.116		
Second Assessment Quadratic	.135	.019	4.37*
Age	.136	.001	0.23
Abstract/Concrete Learning Orientation			
Second Assessment	.134		
Age	.135	.001	0.23
<b>Adaptive Style Inventory</b>			
Total Reflective Observation			
Second Assessment	.189		
Marital Status	.236	.047	2.97*
Total Active Experimentation			
Second Assessment	.203		
Age	.205	.002	0.49
Active/Reflective Adaptive Orientation			
Second Assessment	.249		
Age	.255	.006	1.58
Second Assessment	.249		
Marital Status	.297	.048	3.29*
<b>Test of Thematic Analysis</b>			
Second Assessment	.058		
Age	.075	.017	3.51
Second Assessment	.058		
Father's Education	.081	.023	1.18
Second Assessment	.058		
Marital Status	.077	.019	0.97
<b>Critical Thinking Appraisal</b>			
Inference			
Second Assessment	.251		
Grade Point Average	.274	.023	1.39
Recognition			
Second Assessment	.204		
Second Assessment, Quadratic	.205	.046	10.98**
Grade Point Average	.274	.024	1.45
Deduction			
Second Assessment	.335		
Grade Point Average	.355	.020	1.36
<b>Life History Exercise</b>			
Performance			
Second Assessment	.172		
Grade Point Average	.190	.018	0.99

\* $p < .05$ \*\* $p < .01$

Table Y

Squared Part Correlations of College Program Variables With  
Second Assessments Controlling for Background  
Covariates and First Assessments

Measure	First Assessment	Quadratic	Control for:	Age, Background	sR <sup>2</sup> Program Covariates			
					Entrance Cohort	Student Status	Residence	Major
Measure of Vocational, Educational, and Personal Issues								
"Best Class" Essay	11.0		Prior Col. Exp.	4.1	.039*	.019	.008	.045
"Decision" Essay	7.4		Age	3.8	.002	.007	.070**	.019
"Career" Essay	10.3				(.032*)	.011	0	.105*
Sentence Completion Test								
	12.9				.044**	.008	.027	.033
Moral Judgment Instrument								
	23.6				.091	.003	0	.007
Defining Issues Test								
P%	26.8				.001	.027	.022	.059
D Score	42.1		Age	2.0	.003	.010	.012	.040
Test of Cognitive Development								
	22.7		Grade Point Avg.	4.3	.009	.004	.007	.030
Picture Story Exercise								
Stages of Adaptation					--	--	--	--
Receptive	xxx				.013	.014	.031	.020
Autonomous	2.2				.014	.005	.005	.029
Assertive	6.3				.037*	.024	(.040*)	.040
Integrative	2.4				.024	.031	.001	.028
Self-Definition	8.8				.009	.014	.012	.058
Achievement Motive	2.2				.107**	(.057**)	.018	(.103**)
Affiliation Motive	3.4				.006	.018	.022	.050
Power Motive	5.1							
Learning Style Inventory								
Concrete Experience	6.2				.029*	.031	.004	.032
Reflective Observation	9.7				.010	.001	.016	.027
Abstract Conceptualization	14.4		Age	4.7	.002	.014	.010	.022
Active Experimentation	16.4				.014	.023	.034*	.034
Abstract/Concrete Learning Orientation	11.7		Age	2.3	.013	.026	.010	.020
Active/Reflective Learning Orientation	18.4				.015	.007	.028	.024
Test of Thematic Analysis								
	4.1		Marital Status	5.8	(.035*)	.024	.033	.086**
Critical Thinking Appraisal								
Inference	23.3				.003	.014	.008	.009
Recognition	13.4				.011	.010	.011	.032
Deduction	26.0	4.5	Grade Point Avg.	4.4	.011	.010	.011	.025
Life History Exercise								
Performance	23.0				(Data on Weekend only)			
Improvement	xxx							

\*p < .05  
\*\*p < .01

xxx Data for Weekend College students only.

Table Z

Squared Part Correlations of College Program Variables With  
Third Assessments Controlling for Background  
Covariates and Second Assessments

Measure	Second % Assessment	% Quadratic	Control for:	% Age, % Background	sR <sup>2</sup> Program Covariates			
					Entrance Cohort	Student Status	Residence	Major
Measure of Vocational, Educational, and Personal Issues								
"Best Class" Essay	3.4				.008	.007	.017	.029
"Decision" Essay	3.1				.058**	.005	.012	.019
"Career" Essay	11.0	2.7			.035*	.011	.002	.057
Sentence Completion Test								
	24.2				.002	.011	.022	.007
Moral Judgment Instrument								
	12.2				.270**	(.207*)	.033	.136
Defining Issues Test								
P% Score	33.6				.009	.013	.006	.036
D Score	41.3				.019	.011	.005	.010
Test of Cognitive Development								
	30.4	2.2			.006	.004	.002	.027
Picture Story Exercise								
Stages of Adaptation					--	--	--	--
Receptive	xxx							
Autonomous	3.2				.010	.015	.001	.040
Assertive	3.8	2.2			.007	.007	.010	.014
Integrative	12.7	3.3			.019	.011	.020	.039
Self-Definition	4.2				.028	.037	.005	.022
Achievement Motive	6.2				.009	.002	.006	.043
Affiliation Motive	5.8				.017	.004	.031	.039
Power Motive	xxx				--	--	--	--
Learning Style Inventory								
Concrete Experience	15.3				.060	.016	.014	.022
Reflective Observation	27.4				.020	(.033*)	.035*	(.051*)
Abstract Conceptualization	11.6	1.9			.005	.010	.005	.015
Active Experimentation	30.0				.016	.020	.005	.024
Abstract/Concrete Learning Orientation	13.4				.002	.007	.007	.017
Active/Reflective Learning Orientation	32.7				.022*	(.030*)	.018	.031
Adaptive Style Inventory								
Total Concrete Experience	29.2	1.8			.000	.003	.019	.036
Total Reflective Observation	18.9		Marital Status	4.7	.021	.007	.005	.015
Total Abstract Conceptualization	23.7	2.1			.006	.004	.026	.012
Total Active Experimentation	20.3				.011	.044*	.001	.014
Abstract/Concrete Adaptive Orientation	31.2	2.9			(.003*)	.001	.027*	.028
Active/Reflective Adaptive Orientation	24.9		Marital Status	4.8	.033*	.025	.003	.016
Test of Thematic Analysis								
	5.8							
Critical Thinking Appraisal								
Inference	29.3				.021	.015	.007	.005
Recognition	20.4	4.3			.016	.011	.024	.031
Deduction	33.2				.004	.001	.001	.015
Life History Exercise								
Performance Improvement	17.2 xxx				.030*	.020	.006	.027

\*p < .05  
\*\*p < .01

Table AA

Comparison of Correlations Between Unexplained Variance in the  
First Interval and College Performance Variables  
in Raw and Corrected Form

Measure	Corrected Form			Raw Form		
	Number of Semesters	Credit Hours	Competence Level Units	Number of Semesters	Credit Hours	Competence Level Units
Measure of Vocational, Education and Personal Issues						
"Best Class" Essay	.007	.004	-.002	.009	.065	.066
"Decision" Essay	.077	.089	.041	.091	.039	.059
"Career" Essay	-.083	.040	.006	-.083	.024	.019
Sentence Completion Test	-.018	.030	.085	-.021	.055	.122(p<.1)
Moral Judgment Instrument	-.046	.054	.096	.044	.042	.162
Defining Issues Test						
P% Score	-.014	.134	.144(p<.1)	.025	(.188*)	.237**
D Score	.140	.065	-.021	.162(p<.1)	.023	-.007
Test of Cognitive Development	(.152*)	(.180*)	.228***	.134(p<.1)	.120	.171*
Picture Story Exercise						
Stages of Adaptation	xxx	xxx	xxx	xxx	xxx	xxx
Receptive	xxx	xxx	xxx	xxx	xxx	xxx
Autonomous	-.027	-.014	.009	-.043	.064	.081
Assertive	-.097	.030	.069	-.099	.068	.070
Integrative	-.044	.001	.092	-.086	.134(p<.1)	.148*
Self-Definition	-.004	-.083	-.049	-.042	-.053	-.076
Achievement Motive	-.054	.013	-.014	-.083	.045	.052
Affiliation Motive	.070	.011	.065	.039	-.076	.032
Power Motive	-.023	.051	.068	.029	-.021	.009
Learning Style Inventory						
Concrete Experience	-.097	-.024	-.079	-.064	-.116	-.126(p<.1)
Reflective Observation	-.024	-.021	-.148*	-.059	.028	-.104
Abstract Conceptualization	.062	.068	.127(p<.1)	.060	.100	.144*
Active Experimentation	.055	.050	.111	.072	-.029	.063

\*p &lt; .05

†p &lt; .01

‡p &lt; .001

Table AA continued

	Corrected Form			Raw Form		
	Number of Semesters	Credit Hours	Competence Level Units	Number of Semesters	Credit Hours	Competence Level Units
Learning Style Inventory (continued)						
Abstract/Concrete Learning Orientation	.086	.050	.115	.071	.109	.143*
Active/Reflective Learning Orientation	.051	.025	.144*	.095	-.076	.066
Adaptive Style Inventory						
Total Concrete Experience						
Total Reflective Observation						
Total Abstract Conceptualization						
Total Active Experimentation						
Abstract/Concrete Adaptive Orientation						
Active/Reflective Adaptive Orientation						
Test of Thematic Analysis	-.023	-.145(p<.1)	-.058	-.023	-.123	-.090
Analysis of Argument						
Attack	xxx	xxx	xxx	xxx	xxx	xxx
Defense	xxx	xxx	xxx	xxx	xxx	xxx
Critical Thinking Appraisal						
Inference	-.117	-.053	.072	-.095	-.109	-.017
Recognition'	.018	.050	.106	.043	-.048	.059
Deduction	-.043	-.049	-.045	-.038	-.068	-.086
Life History Exercise						
Performance	-.030	.036	-.005	-.022	.170	.101
Improvement	xxx	xxx	xxx	xxx	xxx	xxx

\*p &lt; .05

Table BB

Comparison of Correlations Between Unexplained Variance in the  
Second Interval and College Performance Variables  
in Raw and Corrected Form

Measure	Corrected Form			Raw Form		
	Number of Semesters	Credit Hours	Competence Level Units	Number of Semesters	Credit Hours	Competence Level Units
Measure of Vocational, Education and Personal Issues						
"Best Class" Essay	-.071	.029	-.010	---	---	---
"Decision" Essay	.020	.136(p<.1)	.006	.008	.081	.027
"Career" Essay	.026	.115	-.074			
Sentence Completion Test	-.072	.005	-.131(p<.1)	-.081	-.054	-.127(p<.1)
Moral Judgment Instrument	.026	.241	-.421**	.047	.188	-.367*
Defining Issues Test						
P% Score	-.017	.124	.003	-.023	.562	-.030
D Score	.012	.150(p<.1)	.136	-.009	.100	.115
Test of Cognitive Development	.080	.077	-.022	.064	.029	.024
Picture Story Exercise						
Stages of Adaptation						
Receptive	xxx	xxx	xxx	xxx	xxx	xxx
Autonomous	-.112	-.143*	-.076	-.139(p<.1)	-.011	-.042
Assertive	-.168*	-.136(p<.1)	(-.150*)	-.146*	-.075	-.152*
Integrative	.006	-.029	-.023	-.037	-.010	.010
Self-Definition	.004	.017	-.069	.033	-.102	-.137(p<.1)
Achievement Motive	.075	.084	.119(p<.1)	.053	.035	.114
Affiliation Motive	-.056	-.022	-.070	-.079	-.056	-.077
Power Motive	xxx	xxx	xxx	xxx	xxx	xxx
Learning Style Inventory						
Concrete Experience	-.061	-.153*	.008	-.051	-.144*	.011
Reflective Observation	-.012	-.106	-.097	-.043	.024	-.024
Abstract Conceptualization	.047	.087	-.080	.027	.096	-.074
Active Experimentation	-.007	.037	.103	.035	.044	-.021

\*p &lt; .05

\*\*p &lt; .01

Measure	Corrected Form			Raw Form		
	Number of Semesters	Credit Hours	Competence Level Units	Number of Semesters	Credit Hours	Competence Level Units
<b>Learning Style Inventory</b>						
(continued)						
Abstract/Concrete Learning Orientation	.071	.149*	-.055	.056	.135(p<.1)	-.054
Active/Reflective Learning Orientation	.015	.090	.132(p<.1)	.025	.039	.079
<b>Adaptive Style Inventory</b>						
Total Concrete Experience	-.007	-.051	-.012	.019	.059	.064
Total Reflective Observation	.064	.123(p<.1)	.069	.032	.089	.051
Total Abstract Conceptualization	.017	.089	.025	-.010	.050	.009
Total Active Experimentation	-.060	-.161*	-.100	-.056	-.112	-.089
Abstract/Concrete Adaptive Orientation	.003	.078	.017	-.035	.019	-.034
Active/Reflective Adaptive Orientation	-.085	-.155*	-.088	-.099	-.081	-.056
Test of Thematic Analysis	-.215**	-.074	-.108	-.184*	-.145*	-.150*
<b>Analysis of Argument</b>						
Attack	xxx	xxx	xxx	xxx	xxx	xxx
Defense	xxx	xxx	xxx	xxx	xxx	xxx
<b>Critical Thinking Appraisal</b>						
Inference	-.078	-.063	-.000	-.042	-.093	-.008
Recognition	.015	.006	-.058	.039	-.063	-.067
Deduction	-.070	.016	-.023	-.055	.037	-.046
<b>Life History Exercise</b>						
Performance	.049	.079	.072	.059	.133(p<.1)	.140(p<.1)
Improvement	xxx	xxx	xxx	xxx	xxx	xxx

\*p &lt; .05

\*\*p &lt; .01

Table CC

## Entrance Assessment Correlation Matrix

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
(1) "Best Class" Essay	--															
(2) "Decision" Essay	.31***	--														
(3) "Career" Essay	.20**	.37***	--													
(4)	.19**	.11	.28***	--												
(5)	.24	-.02	.10	.01	--											
(6) P <sub>2</sub> Score	.12	.21**	.28***	.33***	.35*	--										
(7) D Score	.03	.22**	.21**	.22**	.28	.71***	--									
(8)	.13*	.10	.19**	.24***	.01	.35***	.28***	--								
Stages of Adaptation																
(9) Receptive	.00	-.02	-.08	-.04	.11	-.14*	-.06	.07	--							
(10) Autonomous	.15*	.02	-.05	.08	.03	.05	-.02	-.02	.04	--						
(11) Assertive	-.14*	.05	-.01	.00	-.12	.01	.01	-.08	-.06	.18**	--					
(12) Integrative	.13*	.09	.09	.04	.02	-.01	.03	.13*	.05	-.01	.05	--				
(13) Self-Definition	-.06	-.02	-.07	-.05	-.44**	-.10	.00	.10	.26***	-.00	.08	.15*	--			
(14) Achievement Motive	-.15*	-.00	.02	-.10	.17	.05	.10	-.01	-.14*	.02	.04	.26***	.07	--		
(15) Affiliation Motive	.04	-.08	-.09	.19**	-.24	-.14*	-.05	-.09	.17**	-.21**	-.19**	-.01	.04	-.20**	--	
(16) Power Motive	-.01	.06	.09	-.04	.09	.04	.02	.08	.10	.24***	.38***	.07	.23	-.09	-.18**	--
(17) Concrete Experience	-.08	.07	.05	-.05	-.06	-.09	.09	-.07	.12*	-.01	.01	-.05	-.00	.03	.00	-.01
(18) Reflective Observation	.05	-.02	.08	.07	-.23	-.01	-.01	.11	-.05	-.11	.05	-.04	.02	-.09	.01	-.09
(19) Abstract Conceptualization	.01	-.04	-.05	-.01	-.01	.02	-.07	.14*	.04	-.02	.04	-.04	.10	.03	.05	-.05
(20) Active Experimentation	-.11	-.06	-.11	-.01	-.05	-.07	-.02	-.15*	.01	.12	-.09	.10	-.03	.11	.03	.08
(21) Abstract/Concrete Learning Orientation	.05	-.07	-.06	.02	.02	.06	-.09	.13*	-.04	-.01	.03	-.00	.06	.00	.03	-.03
(22) Active/Reflective Learning Orientation	-.09	-.02	-.11	-.05	.10	-.03	-.00	-.15*	.04	.13	-.07	.07	-.03	.11	.01	.10
(23)	.10	.08	.14*	.25***	.34*	.18	.21**	.29***	.02	.12*	-.08	.01	-.06	.00	.08	.07
(24) Attack	.04	.03	.09	.03	-.11	.01	.03	.09	-.05	.10	.05	-.06	-.03	.09	-.06	-.01
(25) Defense	.02	-.11	-.04	-.01	-.22	-.17*	-.13	-.21**	-.17*	.01	-.10	-.04	-.10	.17*	.06	-.11
(26) Inference	.03	.14*	.18*	.07	.37	.35***	.42***	.28***	.13*	.06	-.07	.14*	.08	.11	-.13*	.00
(27) Recognition	-.02	.07	-.00	.04	.15	.06	.23**	.21**	.10	.02	-.07	.05	.01	.14*	.05	-.02
(28) Deduction	.09	.15*	.11	.17*	.10	.30***	.27***	.35***	.08	.00	-.15*	.06	.15*	.10	-.00	.03
(29) Performance	.03	-.19	.05	.01	.12	.30*	.24*	.17	-.13	.01	-.06	-.08	-.15	.15	-.20	-.15
(30) Improvement	-.05	-.29*	.04	-.06	.45	-.10	-.37**	-.14	-.06	-.07	.05	.14	-.05	.10	-.15	-.12

\*p &lt; .05

\*\*p &lt; .01

\*\*\*p &lt; .001

Measure	17	18	19	20	21	22	23	24	25	26	27	28	29	30
(17) Concrete Experience	--													
(18) Reflective Observation	-.07	--												
(19) Abstract Conceptualization	-.34***	-.13*	--											
(20) Active Experimentation	-.09	-.51***	.24***	--										
(21) Abstract/Concrete Learning Orientation	-.78***	-.04	-.85***	-.11	--									
(22) Active/Reflective Learning Orientation	-.00	-.90***	-.04	.83***	-.03	--								
(23)	-.05	-.00	.14*	-.06	.12	-.03	--							
(24) Attack	-.02	.03	-.02	.02	-.00	-.01	-.00	--						
(25) Defense	-.01	-.01	.00	.02	.01	.02	.00	-.04	--					
(26) Inference	.02	.06	.03	-.11	.01	-.09	.15*	.11	-.06	--				
(27) Recognition	.10	-.06	.10	-.09	.01	-.01	.16*	.01	-.07	.29***	--			
(28) Deduction	-.04	.02	.16*	-.21**	.13*	-.12*	.22***	-.04	-.23**	.29***	.38***	--		
(29) Performance	-.06	-.13	.12	-.04	.11	.06	.11	-.01	.17	.09	.15	-.01	--	
(30) Improvement	-.11	.20	.15	-.29*	.16	-.27*	.13	.19	.15	-.11	-.19	-.14	.02	--

\* $p < .05$ \*\* $p < .01$ \*\*\* $p < .001$

ALVERNO COLLEGE  
Milwaukee, Wisconsin 53215

INTER-OFFICE CORRESPONDENCE

To: Christine Trimberger  
Lucy Cromwell  
Rosemary Hufker  
Leona Truchan  
Mary Hueller  
Allen Wutzdorff

From: Marcia Mentkowski

Date: February 13, 1978

Re: Study of Seniors

At the recent chairpersons' meeting, I discussed the procedures for assessment of the May graduates. Many of the students in professional areas, such as Nursing, Education and Music, have been introduced to the study via their classes. For some students, the lack of shared classes requires that they be introduced through individual appointments with me during the next two weeks.

I would greatly appreciate your assistance in encouraging these students to participate in the study. In order to save your time I have drafted the following memo. Would you be willing to send it to those students and sign your name?

Thank you.

APPENDIX B



March 6, 1978

Dear graduating senior,

All graduating seniors have now been personally introduced by Marcia Mentkowski to the project funded by the National Institute of Education to advance understanding of women's professionalism. As a follow-up to our earlier agreement, we wish to reaffirm the dates for your participation as a graduating senior in music.

Assessment Day, March 10  
Room 076, Nursing Education Building

Because of time requests on your part, we have arranged the following schedule. The schedule includes adequate break time to insure that the process does not create too much fatigue.

7:45-8:00 Coffee, Tea and Doughnuts  
8:00-11:30 Timed Assessments  
11:30-12:30 Lunch Break  
12:30-(We expect that you will finish sometime  
between 2 to 3 p.m.)

If you have an anticipated conflict with this schedule, please come to the music office.

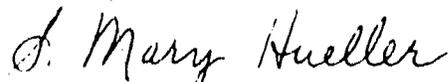
Assessment Week: May 8, 9, or 10

During Assessment Week, you will be asked to complete the Written Interview for Graduating Seniors. As soon as the final exam schedule has been printed, we will ask you to choose a one-hour appointment on either May 8, 9, or 10 from 12-3 p.m. in Kellogg A.

You may also recall that Marcia Mentkowski is choosing 20 names from the hat for special oral interviews with her. If you are chosen, you will be contacted to arrange a time convenient for you.

Dr. Mentkowski will meet you March 10 at 7:45 for coffee in Room 076 in the Nursing Education Building. Thank you for this professional contribution.

Sincerely,



S. Mary Hueller, Chairperson  
Division of Performing Arts



Alverno College

April 7, 1978

Dear graduating senior,

You may recall Marcia Mentkowski's explanation of the graduating senior assessments. At that time, she explained that she would invite each senior to record their perspective on their college experience via a written interview during assessment week. We chose assessment week, because seniors graduating previously indicated that it was when they had "picked up a cap and gown" that they began to reflect on the last four years.

This written interview, which is confidential, can be completed in 45 minutes to an hour and a half. We have scheduled three time blocks during assessment week for you to stop by Kellogg A to complete your interview:

May 8	12-3	Kellogg A
May 9	12-3	Kellogg A
May 10	12-3	Kellogg A

We ask that you indicate on the attached form when you will be visiting Kellogg A to complete your written interview. Please return this form to Marcia Mentkowski's mailbox.

At the time you come for the written interview you will also receive feedback on the Learning Style Inventory, one of the assessments you completed this semester.

Thank you for sharing so much of yourself.

Cordially,

Marcia Mentkowski

APPENDIX C continued

TIMES AVAILABLE — KELLOGG A

May 8 12-3

May 9 12-3

May 10 12-3

Note: (The interview takes 45 minutes to an hour and a half.)

\*\*\*\*\*

I will come to Kellogg A on

May 8 — sometime between 12 and 3

May 9 — sometime between 12 and 3

May 10 — sometime between 12 and 3

Name \_\_\_\_\_

APPENDIX D



May 5, 1978

Dear graduating senior,

I wish to take this opportunity to thank you for your contribution to the study funded by the National Institute of Education that you participated in this semester. I have been extremely gratified by the professional responsibility demonstrated by you and the other graduating seniors.

I promised to mail your feedback on the Learning Style Inventory before graduation as part of my continuing commitment to you to apprise you of outcomes of the study that may be of benefit to you in your future professional development. The Learning Style Inventory is one of the inventories you completed that we expect will contribute to the validation of the Alverno degree, and to this study of women's perspective on professionalism and personal development. I expect that feedback on your score will assist you in interpreting and understanding your preferred learning style.

Your results are enclosed. I have also included several explanatory pages describing the theoretical base for the inventory. Instructions for interpreting the Learning Style Profile and several tables describing comparisons on the inventory for several groups are also included.

Additional feedback on the other inventories and research results will be mailed to you as soon as it becomes available. Keeping your address current with the Alverno Alumnae Association will assist me in mailing other information, and in contacting the followup study groups in the spring of 1980. Since we do have your permanent address, I expect that we will be able to reach you with feedback there.

Again, your contribution has made this work possible. I thank you and congratulate you on your graduation.

Best wishes for the years ahead,



Marcia L. Mentkowski, Ph.D.  
Associate Professor of Psychology  
Director of Evaluation



Alverno College

March 13, 1978

Dear student,

You may recall that when you entered Alverno in the fall of 1977, you participated in a series of long-range inventories. The purpose of these inventories is to establish the validity of the Alverno College degree. Last fall, you were promised feedback on these inventories as it became available.

One of the instruments, the Learning Style Inventory, has been scored. We have prepared a feedback session for giving each person a profile of their learning style. We expect this session to provide you with an additional tool that will assist you in the many learning situations you are involved in as a college student. This session has been scheduled for Friday, March 17, from 12:30 to 1:30 pm in the Administration Building (Liberal Arts) room 106. At this time, we will explain the meaning and implications of these profiles to the group.

We look forward to providing this service to you as a way of showing our appreciation for your participation last fall.

Sincerely,

Marcia Mentkowski  
Director, Office of Evaluation

-----  
(tear off)

Please indicate your plans for this feedback session:

I plan to attend the feedback session March 17 at 12:30 in LA 106

I will be unable to attend.

Please return this slip to my mailbox -- Thank you!

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**ALVERNO COLLEGE  
OFFICE OF RESEARCH AND EVALUATION**

**CHANGES IN STUDENT PROFILES ON THE LEARNING STYLE INVENTORY**

**FIRST REPORT TO PARTICIPANTS IN A  
LONGITUDINAL STUDY OF COLLEGE OUTCOMES**

**Marcia Mentkowski**

**Funded by a grant from the National Institute of Education:  
Careering After College: Establishing the Validity of Abilities  
Learned in College for Later Success  
(NIE-G-77-0058)**

**Principal Investigators:  
Marcia Mentkowski  
Austin Doherty  
Alverno College  
3401 South 39th Street  
Milwaukee, Wisconsin 53215**

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Dear Participant,

The data from the Learning Style Inventory I wish to share with you in this brief report are truly exciting. I expect that when you finish reviewing the materials, you will share the feeling I have had over the last few weeks as I reviewed the computer printouts: there is something happening here in regard to the development of learning style, based on students' report of their learning style preferences, that will shed light on the effects of college on students. This information will add to current theoretical assumptions about how learning style develops, and how it is affected by the college experience.

READ THE PINK SHEET

Before you continue reading this letter, read the enclosed pink sheet describing the theoretical base underlying learning style. It gives meaning to the Alverno curriculum's emphasis on experiential learning (OCEL/ONCEL/clinical and other field experiences). (Note: Working for a living can also be termed "experiential learning"!)

READ THE YELLOW SHEETS THAT SHOW  
YOU HOW TO INTERPRET YOUR SCORES

Now that you understand the theory, carefully read the information explaining how the Learning Style Inventory results may be interpreted.

FIRST EXAMINE YOUR INDIVIDUAL LEARNING STYLE PROFILE AND THEN THE GROUP REPORT

I hope you will find the differences or similarities in your preferences from 1977 to 1979 interesting!

Because I cannot speak to you in person to qualify what you may be interpreting, I have included the following "qualifiers" to aid your interpretation of your individual Learning Style Inventory feedback.

QUALIFIERS IN INTERPRETING RESULTS  
FROM THE LEARNING STYLE INVENTORY

As future professionals, you are becoming more and more aware of contributions that data from a particular inventory can make to our understanding of the learning process. You are also, however, becoming increasingly aware of limitations such inventories have in their ability to add to our understanding, the accompanying materials identify the contributions. I now wish to apprise you of the limitations of the Learning Style Inventory, because I would not want anyone to either misinterpret or overemphasize the results.

1. The inventory is a measure of preference, not "personality."

One way to misinterpret the Learning Style Inventory is to assume that it says something about one's level of intelligence or personality. Rather, the inventory is a measure of one's preference for a particular learning style. Does that mean that if a person strongly prefers a particular learning style he or she is incapable of using other styles? No! It simply means that the person has a preference for a particular style.

2. The Learning Style Inventory is not a perfect indicator of an individual's learning style.

No inventory is completely accurate—don't trust your individual results too much. Each inventory contains "measurement error." While we are able to estimate the extent to which large group results contain error due to chance, I cannot tell the extent to which your individual score is affected by a variety of factors. Perhaps you interpreted some words differently the first time you took the inventory than you did when you took the inventory the second time. Perhaps you were more nervous the first time. Perhaps you spent more time on it the second time. No inventory is completely accurate. Consider this as you interpret your feedback.

3. Individual trends in the development of learning style preference may be different from the group trends.

There are certain trends in the development of learning style preference if we look at students as a group from time one to time two. Your individual development of preferences may be quite different from that of the group. The fact that an individual score differs from a group trend is an indicator that one's preferences have developed in a different direction, nothing more. People have different patterns of development.

Frankly, I am certain that Alverno students, with their vast experience in taking assessments, are experts in how to interpret results showing a pattern of individual preferences. I would not be so comfortable giving out individual results at another college where students are likely to think of an inventory as giving personal information about success or failure.

Incidentally, some people don't change at all during a particular time period. I took the Learning Style Inventory in January, 1977, and again in January of 1978. I had not changed in my preference one bit! Perhaps some time in the future my preferences may change. But so far they haven't that I can see.

4. The group data you will see on the following pages is interesting, but for now, I can only speculate on why these changes show up in Alverno students as a group.

Development in learning style preference varies for individuals for a variety of reasons I cannot pinpoint. When all the results are in from the evaluation study, I may be able to say with more certainty why these changes occur.

Good reading!

*Marcia*  
Marcia Mentkowski, Ph.D.  
Director of Evaluation

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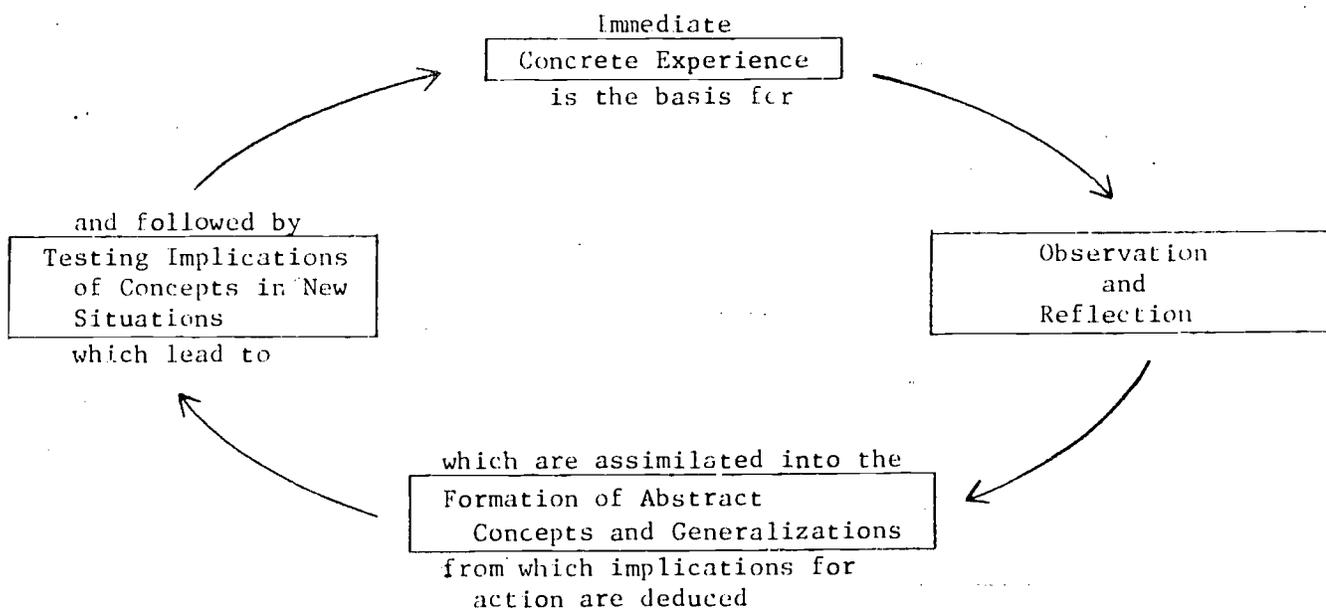
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## Kolb's Experiential Learning Theory<sup>1</sup>

At the undergraduate or college level, experiential learning has long been part of the curriculum—especially as field experience, foreign study, or a winter session away from the campus. There is an assumption that any or all of these activities in some way contribute to the human development of the person. But how and why?

One of the most persuasive theories today as to the "why" of the case for experiential learning is that of David Kolb. His learning theory is labeled "experiential" precisely because it underscores the importance of experience in the learning process. Kolb (1976) describes his model of the learning process as "a simple description of the learning cycle of how experience is translated into concepts which in turn are used as guides in the choice of new experiences (p. 2)."<sup>2</sup>

TABLE I



Kolb's four stage cycle is both circular and dialectic: circular because learning begins with experience and ends with new experiences; dialectic because learning requires abilities that are opposites (concrete/abstract) (active/reflective).

Kolb's theory is likewise developmental. Growth toward adulthood is reflected in the ability to choose and demonstrate the learning style most appropriate to a new learning situation. Rather than being characterized by a dominant style, the mature learner is characterized by the integration of all learning styles and the ability to adapt to a variety of learning situations, despite their complexity.

<sup>1</sup>Adapted from A. Doherty, M. Mentkowski, & K. Conrad, Toward a theory of experiential learning, in Morris P. Keeton and Pamela J. Tate (Eds.), New Directions for Experiential Learning, No. 1 (San Francisco: Jossey-Bass, 1978).

<sup>2</sup>David A. Kolb, Learning Style Inventory: Technical manual (Boston: McBer, 1976).

Early on, the different learning styles can develop separately from the others. In an academic setting where lectures and readings receive high priority, the student's ability to engage in reflective observation and abstract conceptualization is fostered. But will the other learning styles, concrete experience and active experimentation, be developed equally? Will they also be recognized as abilities that need to be equally fostered so that integration of learning styles can develop?

According to Kolb, integration leads to increased adaptability. His thesis is that affective and behavioral complexity gained through concrete experience and active experimentation, respectively, are as essential to the learner's development as the perceptual and symbolic complexity gained through reflective observation and abstract conceptualization.

In addition to providing a rationale for including experiential learning as part of the learning process, Kolb has introduced an easy, effective tool for diagnosis of a student's predominant learning style: the Learning Style Inventory (LSI).<sup>1</sup> Because of individual differences and a variety of learning histories, persons develop a preferred learning style that is relatively stable. Each individual resolves the dialectic between being active or reflective and being immediate (concrete) or analytical in a measurable way. While the Learning Style Inventory assesses strengths and weaknesses of learners, Kolb has set as a goal for educators that of enhancing the degree to which an individual's learning style is balanced and adaptive.

What implications does this diagnostic attempt have? Learning Style Inventory data generate several implications for pedagogy. Should learning experiences be matched to the student's preferred learning style? If a student is aware of his/her preferred learning style, he/she may choose learning situations more appropriate for that preference. However, the instructor should also structure learning to encourage adaptability. The learner's ultimate goal is to operate effectively in a variety of learning situations, and to be able to exercise the circular learning process: involve oneself fully and without bias in new experiences, observe and reflect on the experience from many perspectives, integrate experience through creating abstract concepts, and actively test out one's "theory" or concepts through decision-making and problem solving. Only then can we assert that a curriculum is facilitating learning and also development.

While experiential learning has often been left out of the educational process, Kolb's theory cautions against the opposite extreme: the assumption that any or all experience can facilitate learning in the absence of the other learning modes. Only experience that has been reflected on in a variety of ways is likely to facilitate learning, and that, as Kolb has indicated, involves a critical step—the translation of experience into concepts.

<sup>1</sup>David A. Kolb, Learning Style Inventory: Self-Scoring Test and Interpretation booklet (Boston: McBer, 1976).

## Interpretation of Your Scores on the Learning Style Inventory

The Learning Style Inventory (LSI) is a simple self-description test, based on experiential learning theory, that is designed to measure your strengths and weaknesses as a learner. Experiential learning is conceived as a four stage cycle: (1) immediate concrete experience is the basis for (2) observation and reflection; (3) these observations are assimilated into a "theory" from which new implications for action can be deduced; (4) these implications or hypotheses then serve as guides in acting to create new experiences. The effective learner relies on four different learning modes—*Concrete Experience* (CE), *Reflective Observation* (RO), *Abstract Conceptualization* (AC), and *Active Experimentation* (AE). That is, he must be able to involve himself fully, openly, and without bias in new experiences (CE), he must be able to reflect on and observe these experiences from many perspectives (RO), he must be able to create concepts that integrate his observations into logically sound theories (AC), and he must be able to use these theories to make decisions and solve problems (AE).

The LSI measures your relative emphasis on the four learning modes by asking you to rank order a series of four words that describe these different abilities. For example, one set of four words is *feeling, watching, thinking, doing* which reflects CE, RO, AC, and AE, respectively. The inventory yields six scores: CE, RO, AC, and AE plus two combination scores that indicate the extent to which you emphasize abstractness over concreteness (AC - CE) and the extent to which you emphasize active experimentation over reflection (AE - RO).

One way to better understand the meaning of your scores on the LSI is to compare them with the scores of others. The "target" on the next page gives norms on the four basic scales (CE, RO, AC, AE) for 1,933 adults, ranging from 18 to 60 years of age. About two thirds of the group are men and the group as a whole is highly educated (two thirds have college degrees or higher). A wide range of occupations and educational backgrounds are represented, including teachers, counselors, engineers, salespersons, managers, doctors and lawyers.

The raw scores for each of the four basic scales are listed on the crossed lines of the target. By circling your raw scores on the four scales and connecting them with straight lines you can create a graphic representation of your learning style profile. The concentric circles on the target represent percentile scores for the normative group. For example, if your raw score on *Concrete Experience* was 15, you scored higher on this scale than about 55% of the people in the normative group. If your CE score was 22 or higher, you scored higher than 99% of the normative group. Therefore, in comparison to the normative group, the shape of your profile indicates which of the four basic modes you tend to emphasize and which are less emphasized.

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This description has been excerpted from the following source:  
Kolb, David A. *Learning Style Inventory: Self-scoring Test and Interpretation Booklet*. Boston: Messer and Company, 1976.

A high score on *Concrete Experience* represents a receptive, experience-based approach to learning that relies heavily on feeling-based judgments. High CE individuals tend to be empathetic and "people oriented." They generally find theoretical approaches to be unhelpful and prefer to treat each situation as a unique case. They learn best from specific examples in which they can become involved. Individuals who emphasize *Concrete Experience* tend to be oriented more towards peers and less towards authority in their approach to learning, and benefit most from feedback and discussion with fellow CE learners.

A high score on *Abstract Conceptualization* indicates an analytical, conceptual approach to learning that relies heavily on logical thinking and rational evaluation. High AC individuals tend to be oriented more towards things and symbols and less towards other people. They learn best in authority-directed, impersonal learning situations that emphasize theory and systematic analysis. They are frustrated by and benefit little from unstructured "discovery" learning approaches like exercises and simulations.

A high score on *Active Experimentation* indicates an active, "doing" orientation to learning that relies heavily on experimentation. High AE individuals learn best when they can engage in such things as projects, homework, or small group discussions. They dislike passive learning situations such as lectures. These individuals tend to be extroverts.

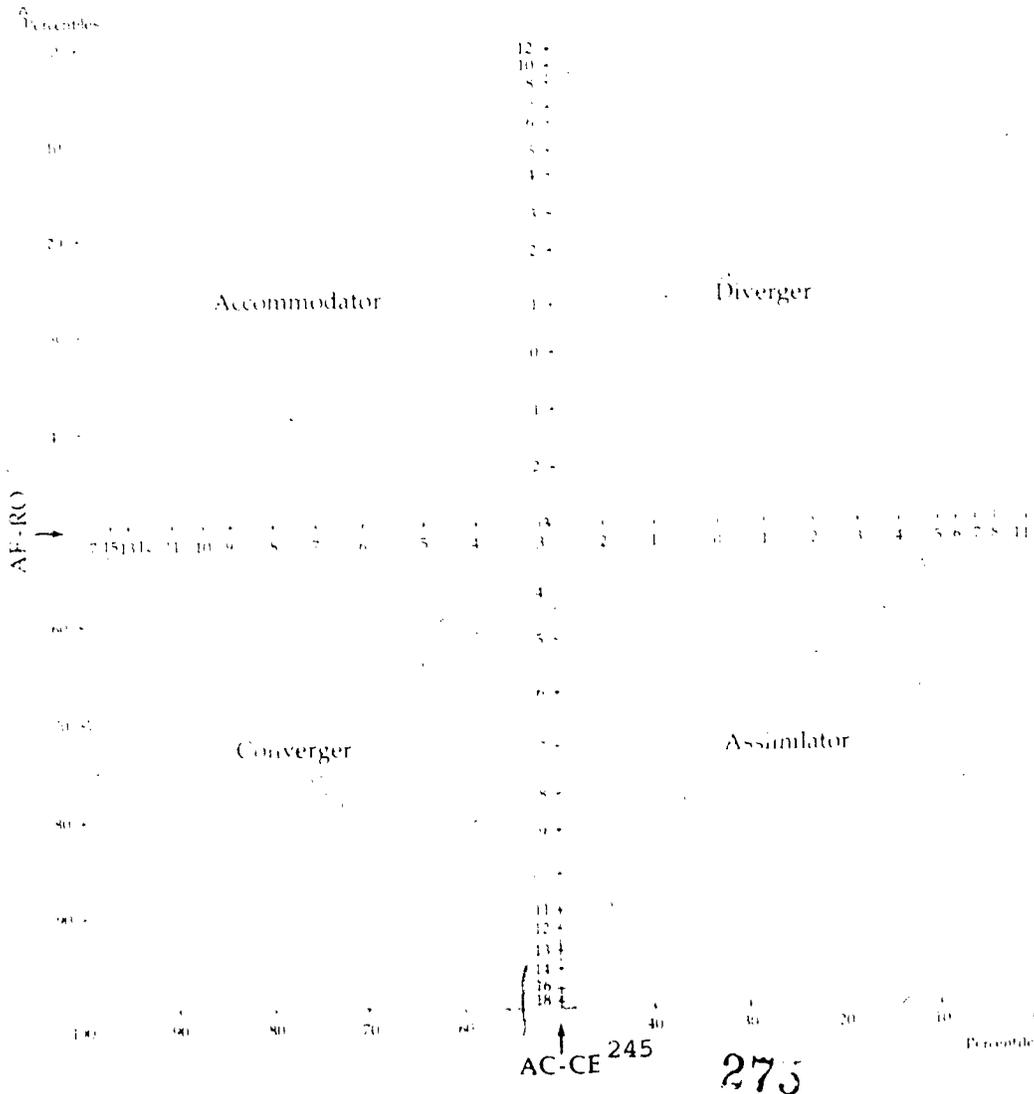
A high score on *Reflective Observation* indicates a tentative, impartial and reflective approach to learning. High RO individuals rely heavily on careful observation in making judgments, and prefer learning situations such as lectures that allow them to take the role of impartial objective observers. These individuals tend to be introverts.

# Identifying Your Learning Style Type

It is unlikely that your learning style will be described accurately by just one of the four preceding paragraphs. This is because each person's learning style is a combination of the four basic learning modes. It is therefore more meaningful to describe your learning style by a single data point that combines your scores on the four basic modes. This is accomplished by using the two combination scores, AC-CE and AE-RO. These scales indicate the degree to which you emphasize abstractness over concreteness and action over reflection, respectively.

The grid below has the raw scores for these two scales on the crossed lines (AC-CE on the vertical and AE-RO on the horizontal) and percentile scores based on the normative group on the sides. By marking your raw scores on the two lines and plotting their point of interception you can find which of the four learning style quadrants you fall into. These four quadrants, labelled *Accommodator*, *Diverger*, *Converger*, and *Assimilator*, represent the four dominant learning styles. If your AC-CE score were -4 and your AE-RO score were +8, you would fall strongly in the Accommodator quadrant. An AC-CE score of +4 and an AE-RO score of +3 would put you only slightly in the Converger quadrant. The closer your data point is to the point where the lines cross the more balanced is your learning style. If your data point is close to any one of the four corners, this indicates that you rely heavily on one particular learning style.

LEARNING STYLE TYPE GRID



The following summary of the four basic learning style types is based on both research and clinical observation of these patterns of LSI scores.

The *Converger's* dominant learning abilities are Abstract Conceptualization (AC) and Active Experimentation (AE). This person's greatest strength lies in the practical application of ideas. A person with this style seems to do best in those situations like conventional intelligence tests where there is a single correct answer or solution to a question or problem. This person's knowledge is organized in such a way that through hypothetical-deductive reasoning this person can focus it on specific problems. Research on this style of learning shows that Convergers are relatively unemotional, preferring to deal with things rather than people. They tend to have narrow technical interests, and choose to specialize in the physical sciences. This learning style is characteristic of many engineers.

The *Diverger* has the opposite learning strengths of the converger. This person is best at Concrete Experience (CE) and Reflective Observation (RO). This person's greatest strength lies in imaginative ability. This person excels in the ability to view concrete situations from many perspectives. We have labelled this style "Diverger" because a person with this style performs better in situations that call for generation of ideas such as a "brainstorming" idea session. Research shows that Divergers are interested in people and tend to be imaginative and emotional. They have broad cultural interests and tend to specialize in the arts. This style is characteristic of individuals from humanities and liberal arts backgrounds. Counselors, organization development specialists and personnel managers tend to be characterized by this learning style.

The *Assimilator's* dominant learning abilities are Abstract Conceptualization (AC) and Reflective Observation (RO). This person's greatest strength lies in the ability to create theoretical models. This person excels in inductive reasoning and in assimilating disparate observations into an integrated explanation. This person, like the converger, is less interested in people and more concerned with abstract concepts, but is less concerned with the practical use of theories. For this person it is more important that the theory be logically sound and precise; in a situation where a theory or plan does not fit the "facts," the Assimilator would be likely to disregard or re-examine the facts. As a result, this learning style is more characteristic of the basic sciences and mathematics rather than the applied sciences. In organizations this learning style is found most often in the research and planning departments.

The *Accommodator* has the opposite learning strengths of the Assimilator. This person is best at Concrete Experience (CE) and Active Experimentation (AE). This person's greatest strength lies in doing things — in carrying out plans and experiments — and involving oneself in new experiences. This person tends to be more of a risk-taker than people with the other three learning styles. We have labelled this person "Accommodator" because this person tends to excel in those situations where one must adapt oneself to specific immediate circumstances. In situations where a theory or plan does not fit the "facts," this person will most likely discard the plan or theory. This person tends to solve problems in an intuitive trial and error manner, relying heavily on other people for information rather than on one's own analytic ability. The Accommodator is at ease with people but is sometimes seen as impatient and "pushy." This person's educational background is often in technical or practical fields such as business. In organizations people with this learning style are found in "action-oriented" jobs often in marketing or sales.

THE DEVELOPMENT OF LEARNING STYLE PREFERENCES AT ALVERNO COLLEGE

The following preliminary report responds to two major questions about the development of learning style preferences: (1) What is the impact of the college experience on learning style preferences? (2) How do learning style preferences change during college? Results from the cross-sectional study are presented in response to the first question on college impact. Results from the longitudinal study are then presented in response to the question of the development of learning style during college.

I. WHAT IS THE IMPACT OF THE COLLEGE EXPERIENCE ON LEARNING STYLE PREFERENCES?

A. When Weekend College Women First Enter Alverno, How Do They Compare to Entering Students in the Weekday College?<sup>2</sup>

1. Weekend College womens'<sup>3</sup> preferences compared with Weekday students' are significantly greater for Concrete Experience significantly less for Reflective Observation and significantly greater for Active Experimentation. Weekend students are no different in their preference for Abstract Conceptualization than the Weekday College women (Table I, Figure 1).
2. Weekend College women are similar to Weekday students in learning style type (Diverger) but the greater preferences for Concrete Experience and Active Experimentation and the lesser preference for Reflective Observation show up here as well. On the Concrete/Abstract dimension, Weekend students are farther toward the Concrete end of the dimension than the Weekday students. On the Reflective/Active dimension, Weekday students are farther toward the Reflective end of the dimension than the Weekend students (Table I, Figure 2).

B. How do Entering Weekend and Weekday College Women Compare to Weekday Graduates?

1. Weekday graduates are significantly less likely to prefer Concrete Experience than entering students in the Weekend and Weekday College (although the difference is less marked for the Weekday College students:  $p < .057$ ). Graduates are also significantly less likely to prefer Reflective Observation and significantly more likely to prefer Abstract Conceptualization than entering students in both the Weekday and Weekend College. While entering Weekend women have

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<sup>1</sup>This report was prepared by Marcia Mentkowski with the assistance of Elizabeth Davies, Eunice Monroe, Mary Schneider and Donna Siekert.

<sup>2</sup>Data reported from Fall, 1977.

<sup>3</sup>Weekend College womens' average age is 33; Weekday womens' average age is 22.

a higher initial preference for Active Experimentation than entering Weekday women, neither group differs significantly from Weekday graduates in their preference for this style<sup>1</sup> (Tables II and III and Figure 1).

2. On the Concrete/Abstract dimension, the Weekday graduates have changed their preferences significantly toward the Abstract, compared with Weekend and Weekday entering students. On the Reflective/Active dimension, Weekday graduates have changed their preferences significantly toward the Active, compared with Weekday and Weekend entering students (Tables II and III and Figure 2).
3. Weekday graduates are significantly more "balanced" in their preferences for the four learning styles (Figure 1). These differences place graduates as a group in the Accommodator learning style type in contrast to entering students in both Weekday and Weekend College who prefer the Diverger learning style type (Figure 2).
4. The largest significant differences found between Weekday graduates and students entering Alverno in 1976 hold:<sup>2</sup> Weekday graduates prefer Reflective Observation significantly less and Abstract Conceptualization significantly more than entering students. No differences in preference for Concrete Experience and Active Experimentation appear between the two groups (Table IV). These entering students also prefer the Diverger learning style type.

Discussion: WHAT IS THE IMPACT OF THE COLLEGE EXPERIENCE ON LEARNING STYLE PREFERENCES?

These interesting comparisons between entering students in the Weekend and Weekday College and Weekday Graduates allow us to examine to some extent the impact of the college experience on learning style preferences because we can control for the effects of change that may be due to general life experiences or maturation. (Weekend women are, on the average, 11 years older.)

The order from greatest to least preference for Concrete Experience is as follows: Weekend Students > Weekday Students > Graduates

<sup>1</sup>This finding could also reflect some differences between the entering students in 1976 and the Weekday entering students in 1977. Since Weekend College did not begin until the Fall of 1977, older more experienced women were probably more likely to enter Weekday College. In fact, the 1976 entering class as a group is less likely to prefer the reflective mode ( $p < .058$ ) and significantly more likely to prefer the active mode ( $p < .05$ ). This shows up again on the Reflective/Active dimension where students entering in 1976 prefer less Reflective and more Active modes ( $p < .02$ ) (Compare Table I and Table IV).

<sup>2</sup>Weekend College had not yet begun in Fall, 1976.

Life experiences do not change persons' preferences from the Concrete toward the Abstract on the Concrete/Abstract dimension. Indeed, life experiences enhance one's preference for the Concrete Experimentation learning style.

The order from greatest to least preference for Reflective Observation is:

Weekday Students > Weekend Students > Graduates

Life experiences (judged from the fact that Weekend entering women are 11 years older), will change persons' preferences from the Reflective toward the Active on the Reflective/Active dimension. College enhances this developmental pattern. Compared with the Graduates' preferences — if their preferences are an accurate picture of college outcomes — we see that the entering Weekend women are more like the graduates on the Reflective/Active dimension. Indeed, there are no differences between the Weekend women and the graduates in their preference for Active Experimentation, while entering Weekday women prefer this style significantly less than the Weekend women. This confirms our conclusion that both life experiences and college experiences enhance this move from the Reflective to the Active on the Reflective/Active dimension.

College, in contrast to life experience, does change persons' preferences from the Concrete toward the Abstract on the Concrete/Abstract dimension. Weekend and Weekday entering students are alike in their preferences for Abstract Conceptualization when they enter college and both increase their preferences over two years. The most important finding, overall, is that college promotes a balanced learning style. From this we might infer that college graduates are more able to use the appropriate learning style in a given learning situation, rather than be quite so dependent on their preferences.

## II. HOW DO LEARNING STYLE PREFERENCES DEVELOP DURING COLLEGE?

### A. How Do WEEKDAY COLLEGE Students<sup>1</sup> Change Their Learning Style Preferences After Two Years?

#### Learning Style Profile (Table V, Figure 3)

1. As a group, Weekday students who entered Alverno in Fall, 1977 and who completed the Learning Style Inventory (LSI) again in Fall, 1979 have changed their preference for each of the four learning styles after two years as follows:
  - a. Students have not significantly<sup>2</sup> changed their preference for Concrete Experience.
  - b. Students have significantly decreased their preference for Reflective Observation.
  - c. Students have significantly increased their preference for Abstract Conceptualization.
  - d. Students have not significantly<sup>2</sup> changed their preference for Active Experimentation.
2. After two years, Weekday College students show a more balanced learning style profile than they did when they entered Alverno.

#### Learning Style Type (Table V, Figure 4)

3. As a group, Weekday students who entered Alverno in Fall, 1977 and who completed the LSI again in Fall, 1979 have changed their learning style type after two years as follows.
  - a. Students have changed their preferences significantly on the Concrete/Abstract dimension from Concrete toward Abstract.
  - b. Students have changed their preferences significantly on the Reflective/Active dimension from Reflective toward Active.
4. After two years, students still prefer the Diverger learning style type, although they are more balanced in their preferences for the other types as well.

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<sup>1</sup>These are students who were still enrolled at Alverno in Fall, 1979.

<sup>2</sup>While there is a decrease in preference, the change is not statistically significant, that is, it could be due to chance.

B. How Do WEEKEND COLLEGE Students<sup>1</sup> Change Their Learning Style Preferences After Two Years? (Table V)

Learning Style Profile (Table V, Figure 5)

1. As a group, Weekend students who entered Alverno in Fall, 1977 and who completed the Learning Style Inventory (LSI) again in Spring or Fall, 1979 have changed their preference for each of the four learning styles after two years as follows:
  - a. Students have significantly decreased their preference for Concrete Experience.
  - b. Students have significantly decreased their preference for Reflective Observation.
  - c. Students have significantly increased their preference for Abstract Conceptualization.
  - d. Students have not changed their preference for Active Experimentation.<sup>2</sup>
2. After two years, Weekend College students show a more balanced learning style profile than they did when they entered Alverno.

Learning Style Type (Table V, Figure 6)

3. As a group, Weekend students who entered Alverno in Fall, 1977 and who completed the LSI again in Spring or Fall, 1979 have changed their learning style type after two years as follows:
  - a. Students have changed their preferences significantly on the Concrete/Abstract dimension from Concrete toward Abstract.
  - b. Students have changed their preferences significantly on the Reflective/Active dimension from Reflective toward Active.
4. After two years, students have changed their preference from the Diverger type to the Accommodator type, and they are more balanced in their preferences for other types as well.

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<sup>1</sup>These are students who entered Alverno in Fall, 1977 and were enrolled at Alverno in Fall, 1979. Weekend students who graduated after two years in Spring, 1979 are also included in this group.

<sup>2</sup>While there is an increase in preference, the change is not statistically significant, that is, it could be due to chance.

C. How Do Weekday College Students Who Entered Alverno in 1976 Change Their Learning Style Preferences After Two Years?

Learning Style Profile (Table VI, Figure 7)

1. As a group, Weekday students who entered Alverno in Fall, 1976<sup>1</sup> and who completed the Learning Style Inventory (LSI) again in Fall, 1978 have changed their preference for each of the four learning styles after two years as follows:
  - a. Students have significantly decreased their preference for Concrete Experience.
  - b. Students have significantly decreased their preference for Reflective Observation.
  - c. Students have significantly increased their preference for Abstract Conceptualization.
  - d. Students have significantly decreased their preference for Active Experimentation.
2. After two years, Weekday College students who entered Alverno in Fall, 1976 show a more balanced learning style profile than they did when they entered Alverno.

Learning Style Type (Table VI, Figure 8)

3. As a group, Weekday students who entered Alverno in Fall, 1976 and completed the LSI again in Fall, 1978 have changed their learning style type after two years as follows:
  - a. Students have changed their preferences significantly on the Concrete/Abstract dimension from Concrete toward Abstract.
  - b. Students have not changed their preferences significantly on the Reflective/Active dimension. This is due to students' preferences for less Reflective styles and less Active styles and the differences balance each other to show no statistically significant change on the dimension itself.
4. After two years, students have changed their preference from the Diverger type to the Assimilator type, and they are more balanced in their preferences for other types as well.

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<sup>1</sup>Weekend College had not yet begun in Fall, 1976.

D. Do Weekday and Weekend Students Differ in the Way They Change During the First Two Years After They Enter College? (Table V)<sup>1,2</sup> (Figures 4 and 6)

1. Both Weekday and Weekend College students' preferences on the Learning Style Inventory changed across time in the following directions: Students, after two years in college, tended to prefer Concrete Experience less (although this change is significant only for the Weekend students), Reflective Observation less, Abstract Conceptualization more, and Active Experimentation the same. Students shifted significantly in their preferences from the Concrete toward the Abstract on the Concrete/Abstract dimension and from the Reflective toward the Active on the Reflective/Active dimension. When we compare Weekday with Weekend students across time, however, we find that there are significant differences between the two groups.
2. There are no significant differences between Weekend and Weekday students in their initial preferences for Concrete Experience or for their later preference. Both groups reduce their preference for Concrete Experience across time although only the Weekend College student difference is statistically significant. Both groups prefer Abstract Conceptualization to the same degree initially. But Weekday students have a significantly greater preference for Abstract Conceptualization as a learning style after two years in college than do the Weekend College students — even though both groups begin Alverno with no difference in their preference for Abstract Conceptualization. There is a significant difference between the two groups on the Concrete/Abstract Dimension ( $p < .01$ ) both when they enter and two years later. Weekend students prefer more Concrete styles and Weekday more Abstract and this yields a significant difference between the two groups on the Concrete/Abstract Dimension.
3. Both Weekday and Weekend students significantly reduce their preference for Reflective Observation after two years, but do not significantly change their preference for Active Experimentation after two years. Even though the change in preference for Active Experimentation over time is not statistically significant, the Weekend women do change toward greater preference for Active Experimentation, and the Weekday women change toward lesser preference for Active Experimentation. Thus, there is a difference between the two groups on the Reflective/Active dimension ( $p < .05$ ). Weekend women tend to prefer the Active Experimentation style more than the Weekday women after two years ( $p < .05$ ). Weekend students prefer more Active styles and Weekday students more Reflective and this yields a significant difference between the two groups on the Reflective/Active dimension initially and after two years.

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<sup>1</sup>This section compares students in the 1977-1979 longitudinal study only.

<sup>2</sup>Results are based on a 2 X 2 Repeated Measure Analysis of Variance, Group (Weekday and Weekend) by Time (1977 and 1979).

Discussion: HOW DO LEARNING STYLE PREFERENCES DEVELOP DURING COLLEGE?

Both Weekday and Weekend students have become more "balanced" in their learning style preferences. From this we may infer that they are able to call forth a particular learning style irrespective of the learning situation in which they find themselves. Both groups have moved from the Concrete to the Abstract on the Concrete/Abstract dimension and from the Reflective to the Active on the Reflective/Active dimension. The clearest finding is that the direction of this change is supported by both the longitudinal and cross-sectional data. But when we compare the two groups of students -- Weekday and Weekend, we find significant changes on both dimensions. The pattern seems to be: Weekend women prefer more Concrete and more Active styles when they enter and also two years later; Weekday women prefer more Reflective and more Abstract styles than the Weekend women, when they enter and also two years later.

The cross-sectional comparison suggested that life experience creates movement along the Reflective/Active dimension, and in the absence of college -- a higher initial preference for Concrete Experience. College enhances movement on this dimension. Only the college experience can create movement from the Concrete to the Abstract on the Concrete/Abstract dimension.

Weekday and Weekend women both were "Divergers" when they entered. Two years later, the Weekday students are still Divergers, and the Weekend women are Accommodators -- as were the 1978 Weekday graduates.

Weekday students -- many of them fresh out of high school -- are affected more by the college-enhanced support for a change toward Abstract Conceptualization, and make their greatest change on the Concrete/Abstract dimension after two years. While Weekend College women also change in the same direction, they change less toward the Abstract. They make their greatest shift on the Reflective/Active dimension. They continue their development toward Active Experimentation, a college supported change that may receive additional reinforcement from the work environment most Weekend College women experience concurrently. Only another look at learning style preferences two years from now -- at graduation, can fully support these tentative conclusions.

LEARNING STYLE INVENTORY (LSI) RESULTS: CROSS-SECTIONAL  
COMPARISONS OF VARIOUS GROUPS OF STUDENTS AT ALVERNO COLLEGE

TABLE I

GROUP	n		CE	RO	AC	AE	AC-CE	AE-RO
entering WEEKDAY students, Fall, 1977	201	Mean S.D.	15.76* 2.54	15.20* 3.45	15.31 3.33	15.17** 2.68	-.44* 4.76	-.02* 5.29
entering WEEKEND students, Fall, 1977	267	Mean S.D.	16.36* 2.91	14.43* 3.71	15.09 3.34	15.71** 2.66	-1.27* 5.31	1.28* 5.54

TABLE II

GROUP	n		CE	RO	AC	AE	AC-CE	AE-RO
entering WEEKDAY students, Fall, 1977	201	Mean S.D.	15.76+ 2.54	15.20*** 3.45	15.31*** 3.33	15.17 2.68	-.44*** 4.76	-.02*** 5.29
WEEKDAY Graduates, Spring, 1978	60	Mean S.D.	15.02+ 2.90	12.33*** 3.59	17.48*** 2.80	15.77 2.98	2.47*** 4.83	3.43*** 5.97

TABLE III

GROUP	n		CE	RO	AC	AE	AC-CE	AE-RO
entering WEEKEND students, Fall, 1977	267	Mean S.D.	16.36*** 2.91	14.43*** 3.71	15.09*** 3.34	15.71 2.66	-1.27*** 5.31	1.28** 5.54
WEEKDAY Graduates, Spring, 1978	60	Mean S.D.	15.02*** 2.90	12.33*** 3.59	17.48*** 2.80	15.77 2.98	2.47*** 4.83	3.43** 5.97

TABLE IV

GROUP	n		CE	RO	AC	AE	AC-CE	AE-RO
entering WEEKDAY students, Fall, 1976	211	Mean S.D.	15.75 3.22	14.59*** 3.09	15.56*** 3.29	15.71 2.79	-.18*** 5.43	1.12** 4.90
WEEKDAY Graduates, Spring, 1978	60	Mean S.D.	15.02 2.90	12.33*** 3.59	17.48*** 2.80	15.77 2.98	2.47*** 4.83	3.43** 5.97

\*Column comparison significant:  $p < .05$

\*\*Column comparison significant:  $p < .01$

\*\*\*Column comparison significant:  $p < .001$

\*\*\*\*Column comparison significant:  $p < .057$

LEARNING STYLE INVENTORY (LSI) RESULTS: LONGITUDINAL  
COMPARISONS OF VARIOUS GROUPS OF STUDENTS AT ALVERNO COLLEGE

TABLE V

Group	n		CE		RO		AC		AE		AC-CE		AE-RO	
			1977	1979	1977	1979	1977	1979	1977	1979	1977	1979	1977	1979
Entering WEEKDAY Students, Fall, 1977; Retested Fall, 1979	101	Mean	15.48	15.23	15.07	13.53	15.60	17.39**	15.44	15.21*	.13*	2.16*	.37*	1.67*
		S.D.	2.56	2.61	3.41	3.39	3.29	3.33	2.71	3.44	4.63	5.16	5.39	6.10
Entering WEEKEND Students, Fall, 1977; Retested Spring or Fall, 1979	149	Mean	16.15	15.41	14.50	12.79	14.99	16.09**	15.79	16.07*	-1.17*	.68*	1.29*	3.29*
		S.D.	-2.94	3.15	3.80	3.80	3.14	3.69	2.65	3.34	5.14	6.16	5.63	6.38

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TABLE VI

Group	n		CE		RO		AC		AE		AC-CE		AE-RO	
			1976	1978	1976	1978	1976	1978	1976	1978	1976	1978	1976	1978
Entering WEEKDAY Students, Fall, 1976; Retested, Fall, 1978	83	Mean	15.90 <sup>++</sup>	14.67 <sup>++</sup>	14.11 <sup>+</sup>	13.16 <sup>+</sup>	15.49 <sup>+++</sup>	17.87 <sup>+++</sup>	16.17 <sup>+</sup>	15.42 <sup>+</sup>	-.41 <sup>+++</sup>	3.19 <sup>+++</sup>	2.06	2.27
		S.D.	3.21	2.97	2.93	2.86	3.64	3.26	2.64	2.70	5.91	5.56	4.70	4.56

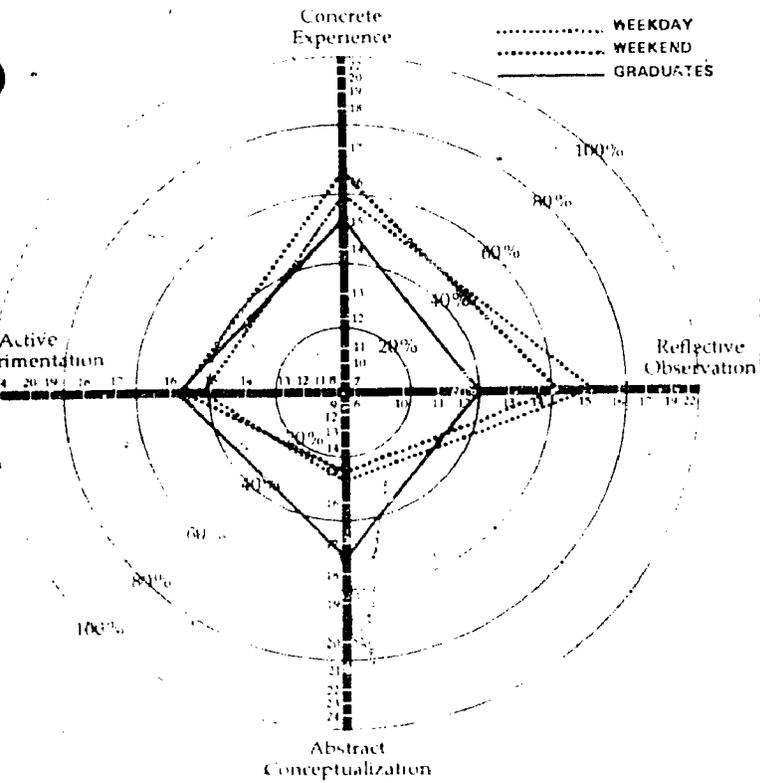
+ Row comparison significant:  $p < .05$   
 ++ Row comparison significant:  $p < .01$   
 +++ Row comparison significant:  $p < .001$

\* Column comparison significant:  $p < .05$   
 \*\* Column comparison significant:  $p < .01$   
 \*\*\* Column comparison significant:  $p < .001$

280

LEARNING STYLE PROFILE

Norms for the Learning Style Inventory



LEARNING STYLE TYPE GRID

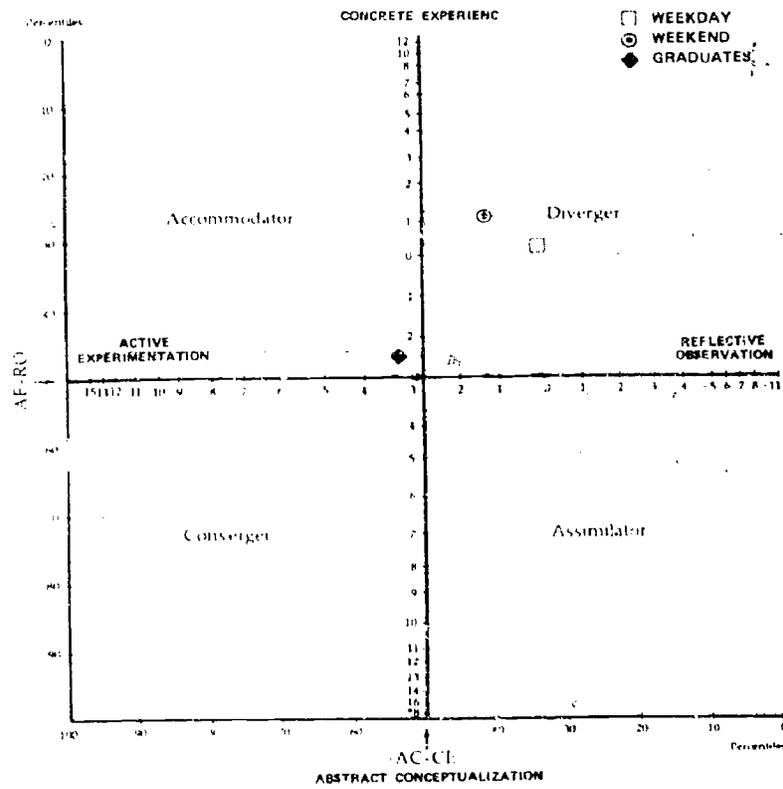
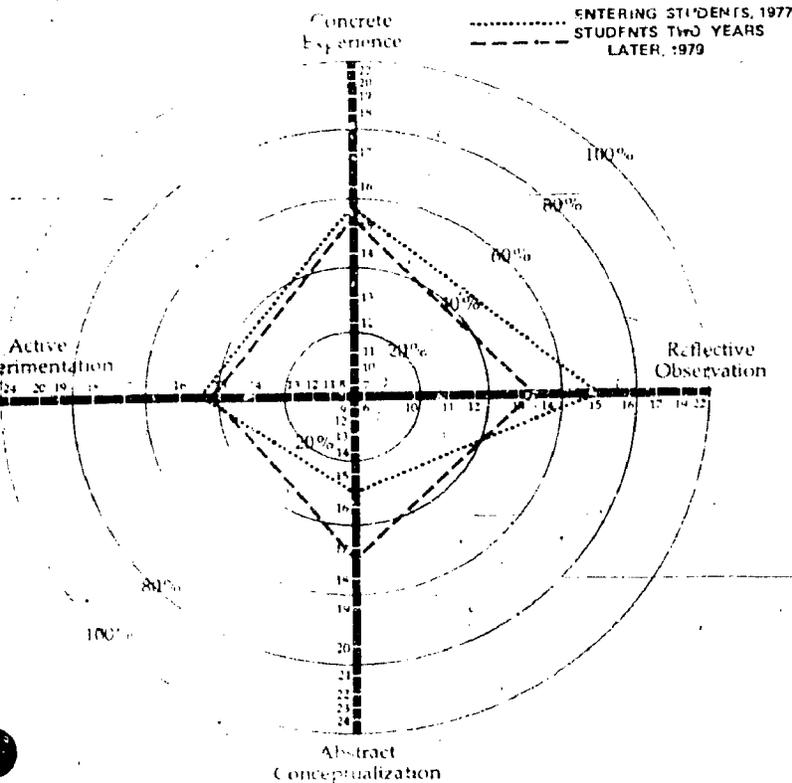


FIGURE 1. CROSS-SECTIONAL COMPARISON OF ENTERING WEEKDAY AND WEEKEND STUDENTS (1977) AND WEEKDAY GRADUATES (1978).

FIGURE 2. CROSS-SECTIONAL COMPARISON OF ENTERING WEEKDAY AND WEEKEND STUDENTS (1977) AND WEEKDAY GRADUATES (1978).

LEARNING STYLE PROFILE

Norms for the Learning Style Inventory



LEARNING STYLE TYPE GRID

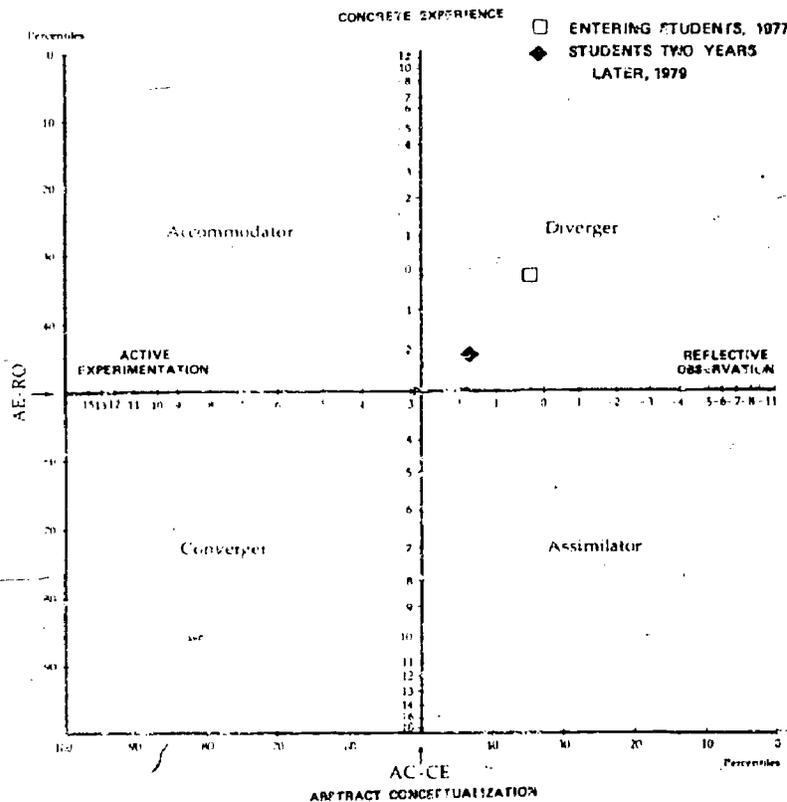


FIGURE 3. LONGITUDINAL COMPARISON OF ENTERING WEEKDAY STUDENTS (1977), RETESTED TWO YEARS LATER (1979).

FIGURE 4. LONGITUDINAL COMPARISON OF ENTERING WEEKDAY STUDENTS (1977), RETESTED TWO YEARS LATER (1979).

LEARNING STYLE PROFILE  
Norms for the Learning Style Inventory

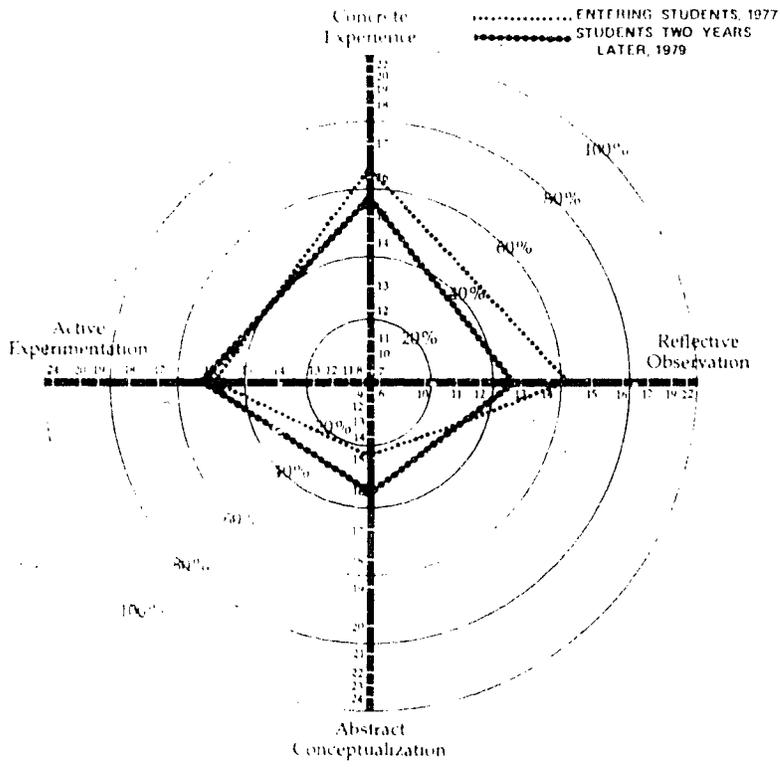


FIGURE 5. LONGITUDINAL COMPARISON OF ENTERING WEEKEND STUDENTS (1977), RETESTED TWO YEARS LATER (1979)

LEARNING STYLE TYPE GRID

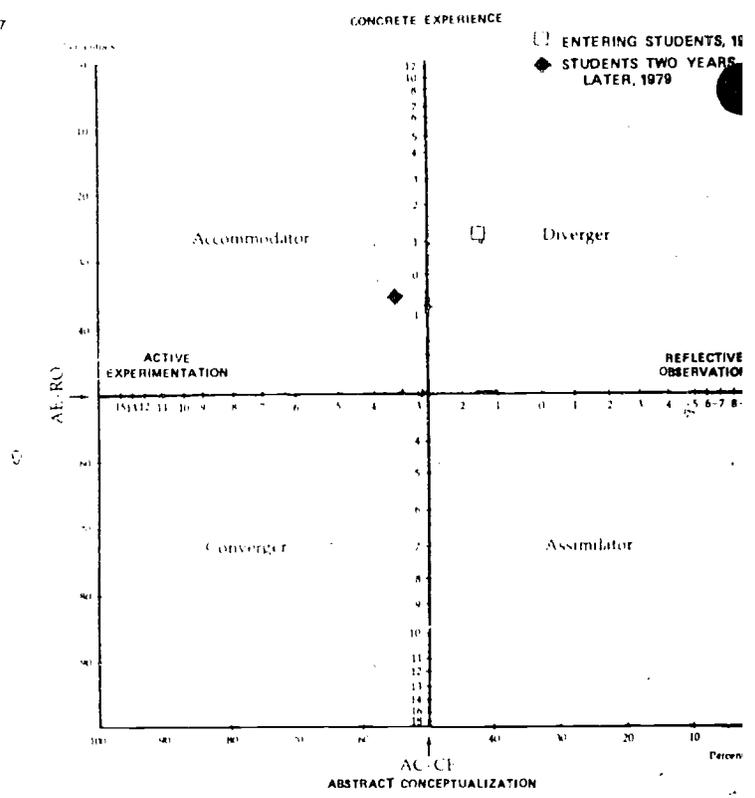


FIGURE 6. LONGITUDINAL COMPARISON OF ENTERING WEEKEND STUDENTS (1977), RETESTED TWO YEARS LATER (1979)

LEARNING STYLE PROFILE  
Norms for the Learning Style Inventory

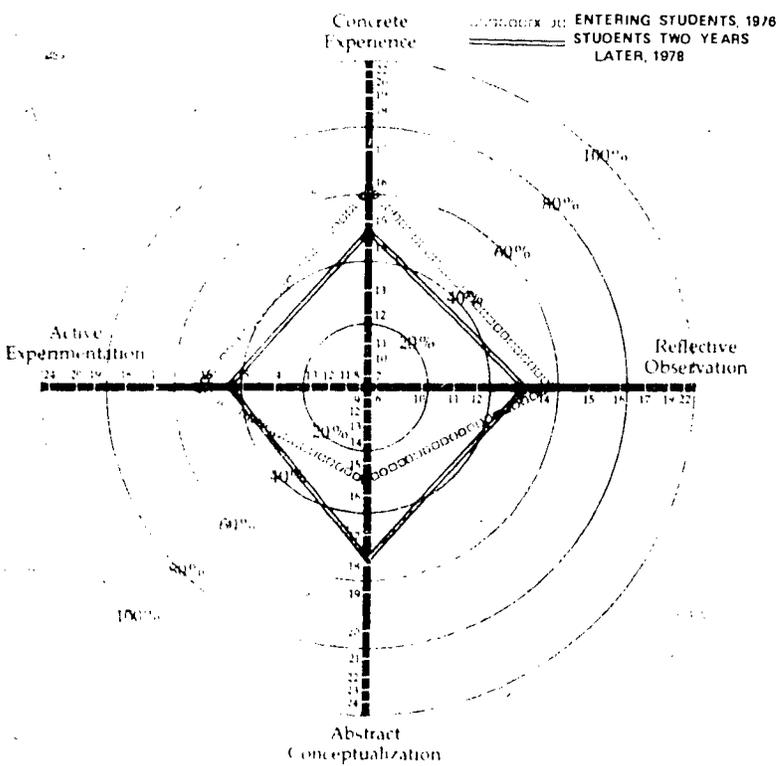


FIGURE 7. LONGITUDINAL COMPARISON OF ENTERING WEEKDAY STUDENTS (1978) RETESTED TWO YEARS LATER (1978)

LEARNING STYLE TYPE GRID

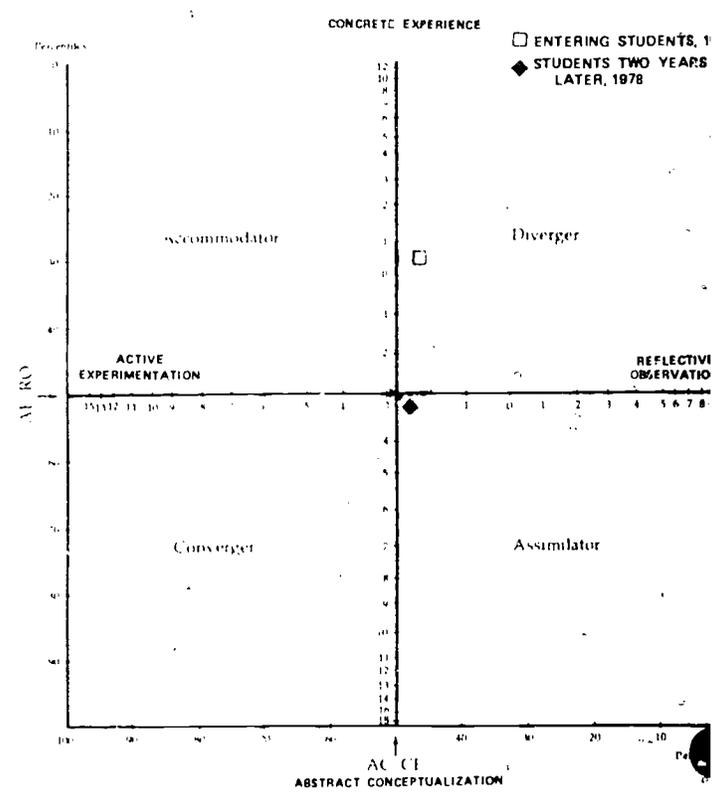


FIGURE 8. LONGITUDINAL COMPARISON OF ENTERING STUDENTS (1978) RETESTED TWO YEARS LATER (1978)

A Note to Participants Entering Alverno in 1976 on  
Results from Their College Group  
on the Learning Style Inventory

Dear Participant,

You are part of the longitudinal participant group who entered Alverno in 1976, and you contributed time to our evaluation study of college outcomes in 1976, 1978 and 1980. The following materials on the Learning Style Inventory describe the meaning of the inventory, cautionary notes on how not to interpret group results in relation to your individual profile, and our results from large numbers of students completing the inventory during the last five years. In this note, I would like to direct your attention to some more recent results describing changes in your class as it progressed through college. The attached figures and table illustrate my comments.

First, it is clear that as a group, your class made significant changes in preference for learning style during the first two years in college. As a group, your class maintained these preferences during the last two years of college, and show no statistically significant changes from the time your class completed the inventory in 1978 and again in 1980. Naturally, group differences should not be used to predict or explain your individual profile. Any one person may show quite different patterns from the overall group picture.

One reason we may see changes in learning style preferences in the first two years of college and not during the last two years is that the measure is an indication of preferences. During the first years in college, students as a group may change their preferences to reflect the variety of ways of learning they are experiencing, and students enhance their understanding of the reasons they often choose a number of approaches to learning rather than just one or two. As a group, college students may express this value for using various learning styles, and this preference shows up as almost equal preference for each learning style on the LSI. (Naturally, individual profiles will look quite different from this overall group result.)

It may be that during the last two years of college, students more likely express their preferences for various learning styles by actually trying them out in learning both on and off campus. However, the Learning Style Inventory does not measure learning style behavior. It can only measure preferences. The Inventory would not be able to measure whatever behavioral changes are taking place in the group as a whole during the last two years.

Our next step is to look at patterns of change in individual differences in learning style. This may shed further light on the ways in which preferences change or do not change during the last two years in college. We also need to look closer at the LSI data from students in particular majors. We plan to begin that analysis this summer, since we can now begin working with our complete set of data, including LSI profiles from students who entered Alverno a year after you did and who just completed their last assessment.

We will be sending you more reports in the future. Now, I trust this information on both your own individual profile and group results will be of interest.

Sincerely,



Marcia Mentkowski

NM:la

Longitudinal Comparison of Weekday Students Who Entered in Fall, 1976 and Rewrote the Learning Style Inventory (LSI) in Fall, 1978 and Spring, 1980

GROUP	n		CE	RO	AC		AC-CE	AE-RO
Entering Weekday Students, Fall 1976	57	MEAN	15.81	14.44	15.40	15.63	-.40	1.19
		S.D.	3.09	2.86	3.73	2.62	5.79	4.58
Retested, Fall 1978		MEAN	14.42	13.32	17.77	15.28	3.35	1.96
		S.D.	2.93	2.88	3.48	2.81	5.80	4.63
Retested, Spring 1980		MEAN	14.33	13.49	17.81	15.33	3.47	1.84
		S.D.	2.90	2.93	3.69	2.67	5.82	4.69

(See reverse side for graphs.)

Norms for the Learning Style Inventory

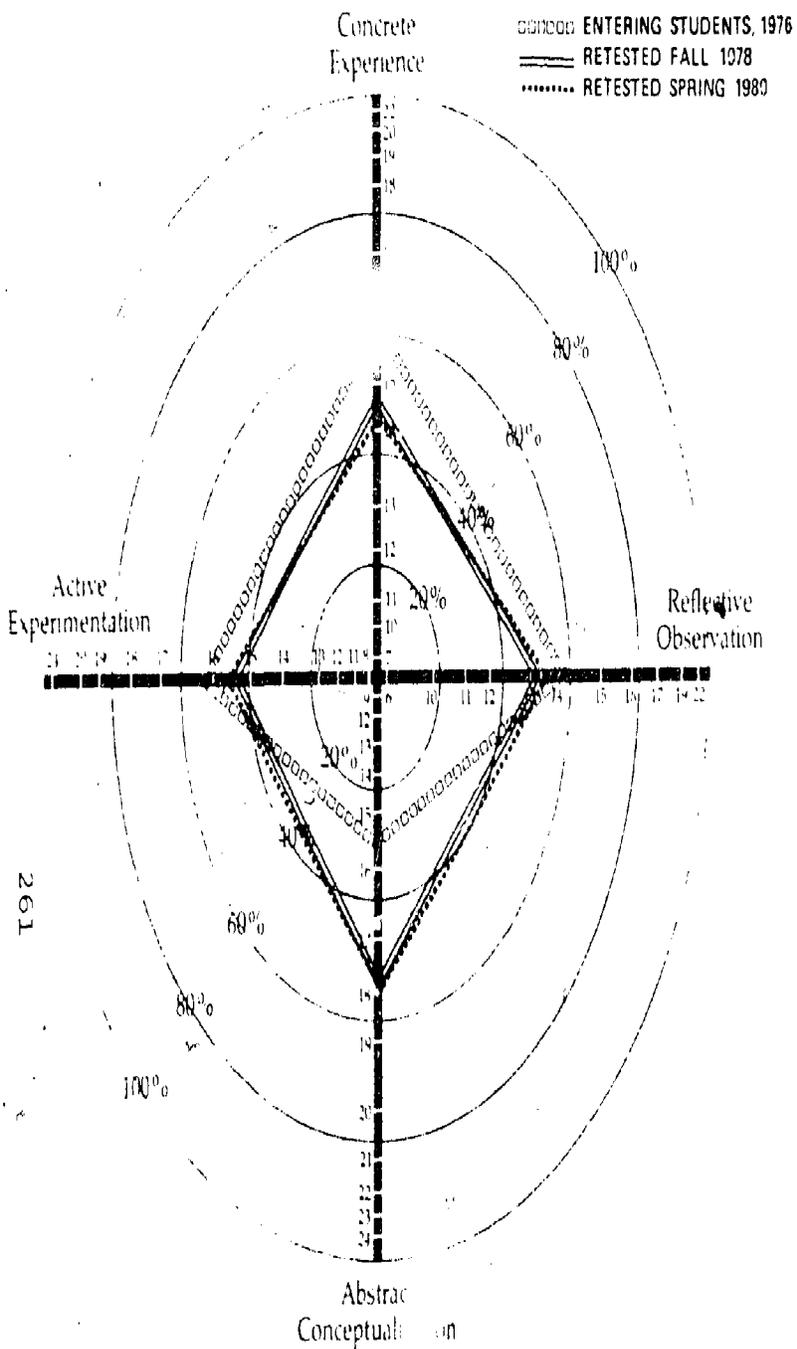


FIGURE 7. LONGITUDINAL COMPARISON OF ENTERING WEEKDAY STUDENTS (1976) RETESTED IN FALL 1978 AND SPRING 1980.

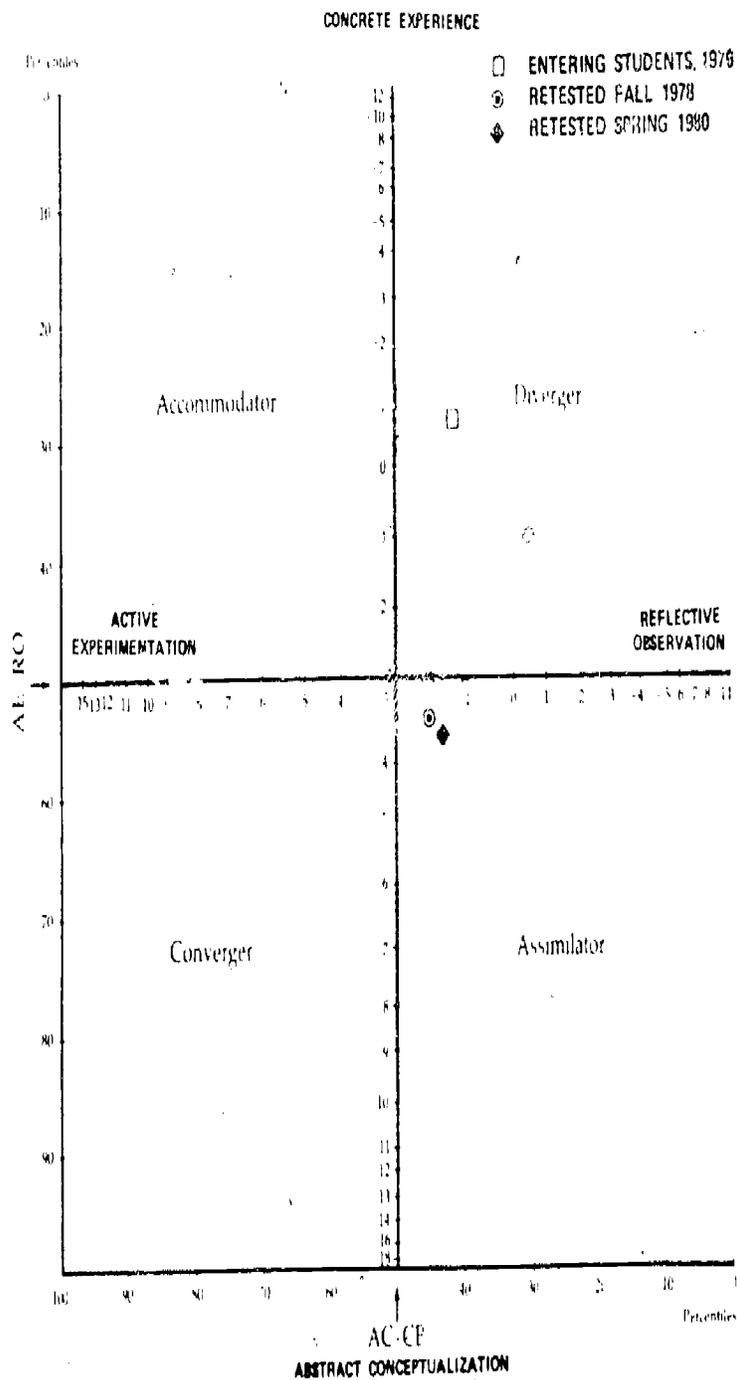


FIGURE 8. LONGITUDINAL COMPARISON OF ENTERING STUDENTS (1976) RETESTED IN FALL 1978 AND SPRING 1980.

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 Publishers: M. Perazich, Inc.

Copyright David A. Kolb, 1976  
 Publishers: M. Perazich, Inc.

A Note to Participants Entering Alverno in 1977 on Results  
from Their College Group on the Learning Style Inventory

Dear Participant,

You are part of the longitudinal participant group who entered Alverno in 1977, and you contributed time to our evaluation study of college outcomes in 1977, 1979 and 1981. The following materials on the Learning Style Inventory describe the meaning of the inventory, cautionary notes on how not to interpret group results in relation to your individual profile, and our results from large numbers of students completing the inventory during the last five years. In this note, I would like to direct your attention to some more recent results describing changes in your class as it progressed through college. The attached figures and table illustrate my comments.

First, it is clear that as a group, your class made significant changes in preference for learning style during the first two years in college. As a group, your class maintained these preferences during the last two years of college, and show no statistically significant changes from the time your class completed the inventory in 1979 and again in 1981. Naturally, group differences should not be used to predict or explain your individual profile. Any one person may show quite different patterns from the overall group picture.

One reason we may see changes in learning style preferences in the first two years of college and not during the last two years is that the measure is an indication of preferences. During the first years in college, students as a group may change their preferences to reflect the variety of ways of learning they are experiencing, and students enhance their understanding of the reasons they often choose a number of approaches to learning rather than just one or two. As a group, college students may express this value for using various learning styles, and this preference shows up as almost equal preference for each learning style on the LSI. (Naturally, individual profiles will look quite different from this overall group picture.)

It may be that during the last two years of college, students more solidify their preferences for various learning styles by actually trying them out in learning both on and off campus. However, the Learning Style Inventory does not measure learning style behavior. It can only measure preferences. The Inventory would not be able to measure whatever behavioral changes are taking place in the group as a whole during the last two years.

Our next step is to look at patterns of change in individual differences in learning style. This may shed further light on the ways in which preferences change or do not change during the last two years in college. We also need to look closer at the LSI data from students in particular majors. We plan to begin that analysis soon.

We will be sending you more reports in the future. For now, I trust this information on both your own individual profile and group results will be of interest.

Sincerely,



Marcia Mentkowski  
Director of Evaluation

12/81

Longitudinal Comparison of Students Who Entered and Completed the Learning Style Inventory (LSI)  
in Fall 1977, Fall 1979, and Spring 1981

TABLE A: WEEKDAY STUDENTS

Group	n		CE			RO			AC			AE			AC-CE			AE-RO		
			Interval 1		Interval 2	Interval 1 ***		Interval 2	Interval 1 ***		Interval 2	Interval 1		Interval 2	Interval 1 ***		Interval 2	Interval 1 *		Interval 2
			1977	1979	1981	1977	1979	1981	1977	1979	1981	1977	1979	1981	1977	1979	1981	1977	1979	1981
WEEKDAY students entering and tested in Fall 1977, and retested in Fall 1979 and Spring 1981	76	Mean	15.68	15.26	14.74	15.25	14.34	13.58	15.34	17.67	17.01	15.36	15.00	15.46	-0.14	2.47	2.28	0.11	1.66	1.88
		S.D.	2.58	2.60	3.19	3.34	3.64	3.76	3.21	3.19	3.34	2.77	3.39	3.14	4.59	5.01	5.57	5.35	6.19	6.22

TABLE B: WEEKEND STUDENTS

Group	n		CE			RO			AC			AE			AC-CE			AE-RO		
			Interval 1		Interval 2	Interval 1 ***		Interval 2	Interval 1 **		Interval 2	Interval 1		Interval 2	Interval 1 **		Interval 2	Interval 1 ***		Interval 2
			1977	1979	1981	1977	1979	1981	1977	1979	1981	1977	1979	1981	1977	1979	1981	1977	1979	1981
WEEKEND students entering and tested in Fall 1977, and retested in Fall 1979 and Spring 1981	71	Mean	16.32	15.79	15.08	15.24	12.33	12.13	14.25	15.96	16.48	15.52	16.01	16.66	-2.07	0.23	1.59	0.28	3.28	4.39
		S.D.	2.85	3.12	3.58	3.58	4.00	3.54	3.15	3.82	3.31	2.55	3.71	3.45	4.88	6.21	6.00	5.41	6.95	6.09

\* p < .05

\*\*

\*\*\* p < .001

# LEARNING STYLE PROFILE

Norms for the Learning Style Inventory ..... FALL 1977

..... FALL 1979

..... SPRING 1981

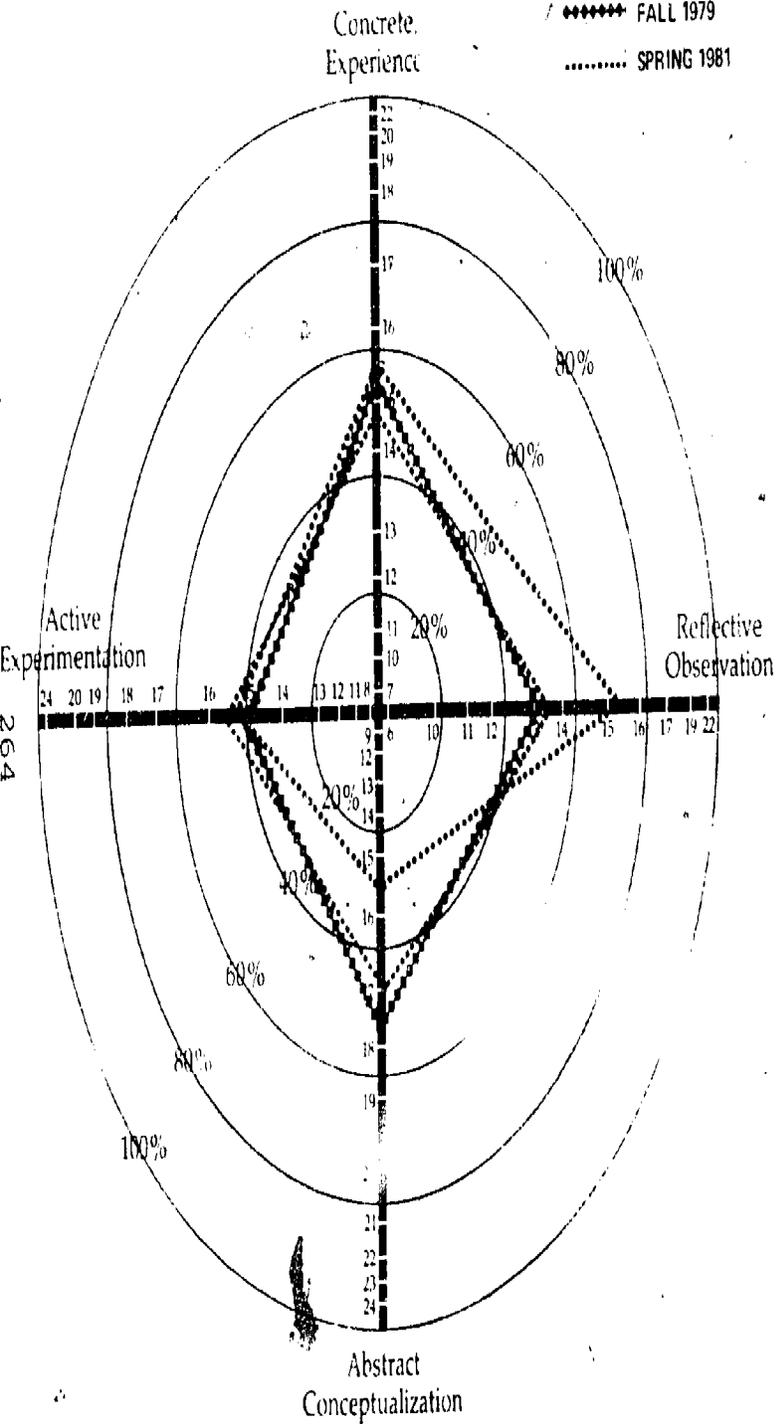


FIGURE A: LONGITUDINAL COMPARISON OF WEEKDAY STUDENTS WHO ENTERED IN FALL 1977, RETOOK THE LSI IN 1979, AND SPRING 1981.

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Published by McBer and Company

# LEARNING STYLE TYPE GRID

○ FALL 1977

◆ FALL 1979

□ SPRING 1981

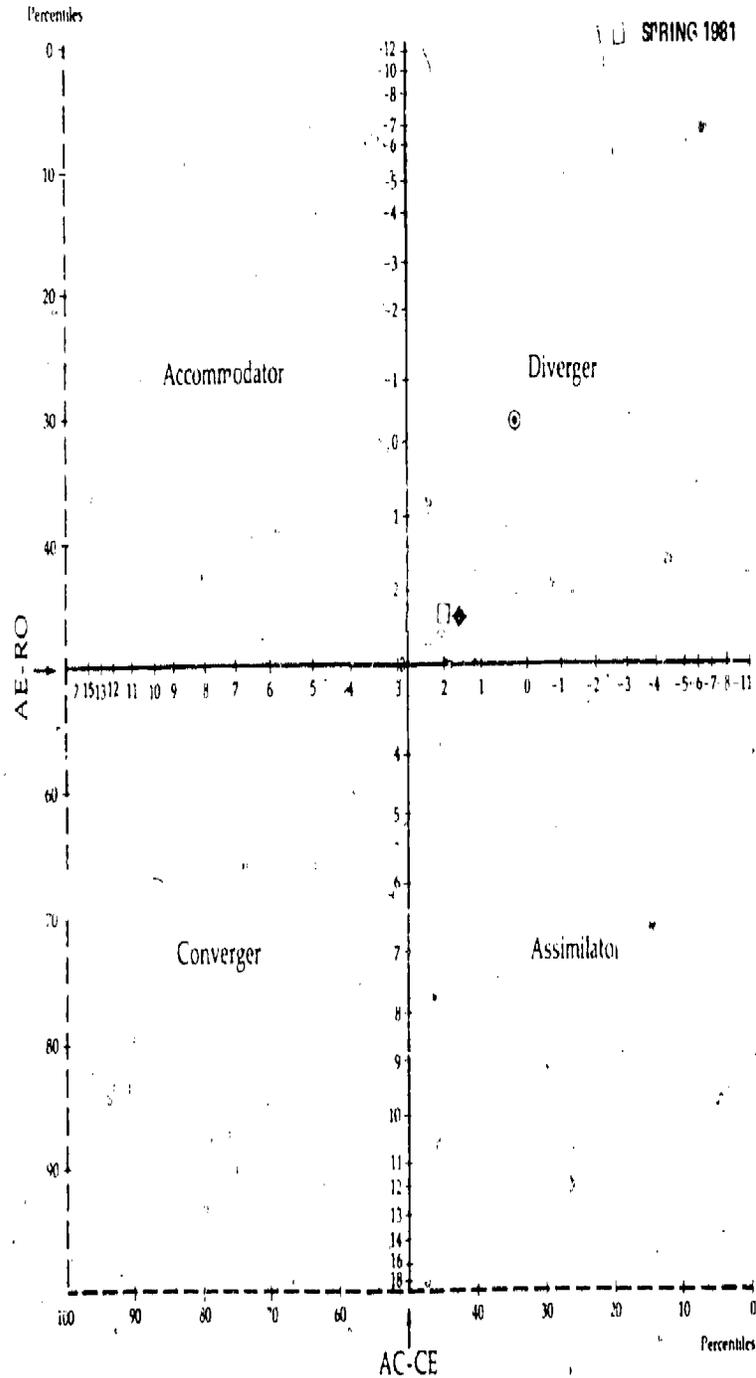


FIGURE B: LONGITUDINAL COMPARISON OF WEEKDAY STUDENTS WHO ENTERED IN FALL 1977, RETOOK THE LSI IN 1979, AND SPRING 1981.

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LEARNING STYLE PROFILE

Norms for the Learning Style Inventory

..... FALL 1977  
 ◆◆◆◆◆ FALL 1979  
 ..... SPRING 1981

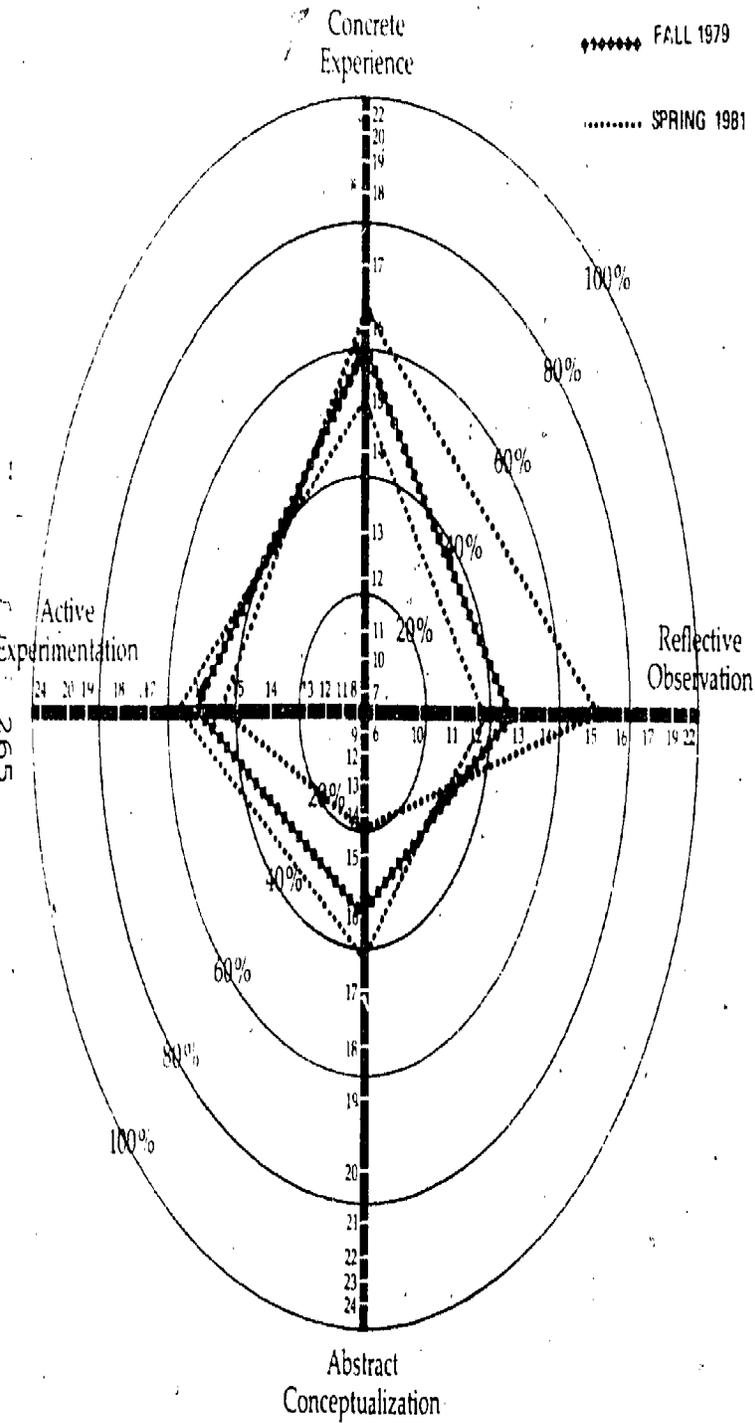


FIGURE C: LONGITUDINAL COMPARISON OF WEEKEND STUDENTS WHO ENTERED IN FALL 1977, RETOOK THE LSI IN 1979, AND SPRING 1981.

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 Published by McBer and Company

LEARNING STYLE TYPE GRID

○ FALL 1977  
 ◆ FALL 1979  
 □ SPRING 1981

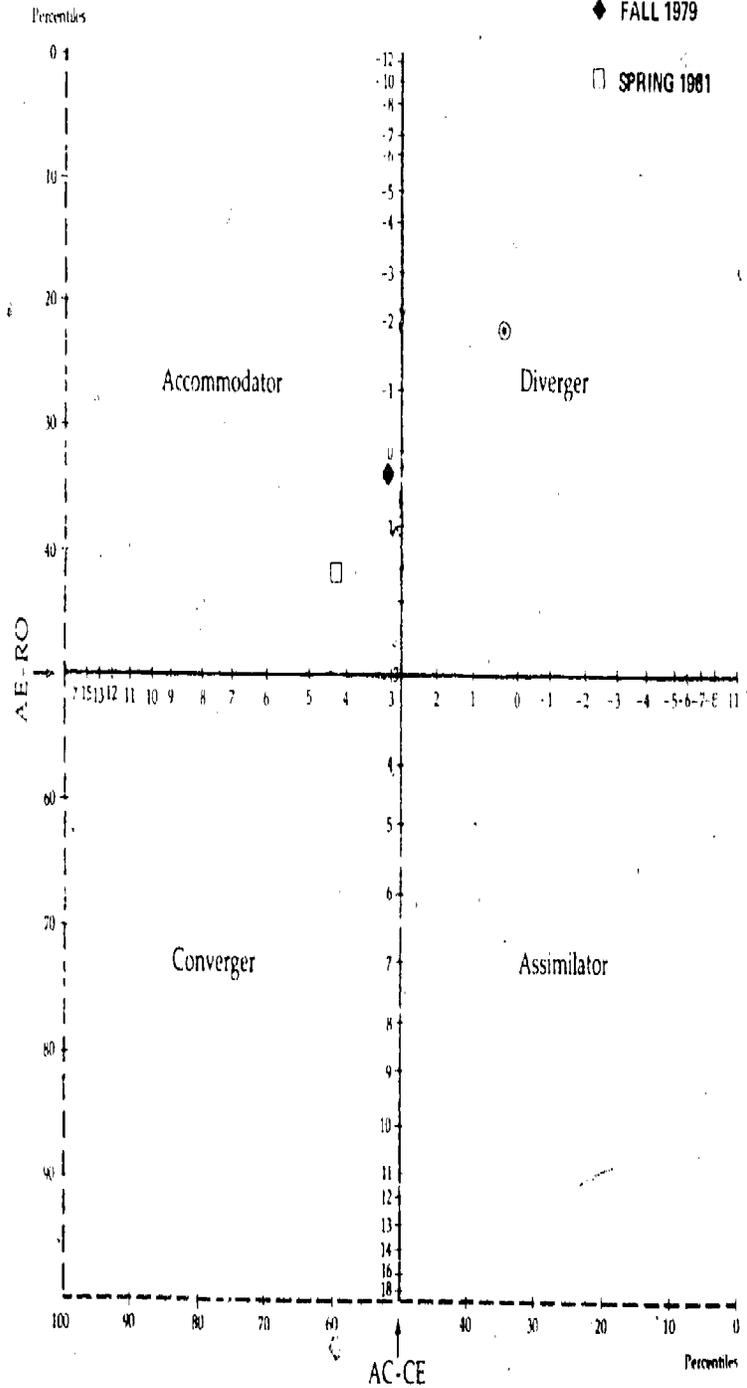


FIGURE D: LONGITUDINAL COMPARISON OF WEEKEND STUDENTS WHO ENTERED IN FALL 1977, RETOOK THE LSI IN 1979, AND SPRING 1981.

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 Published by McBer and Company

# THE FOUR LEARNING MODES

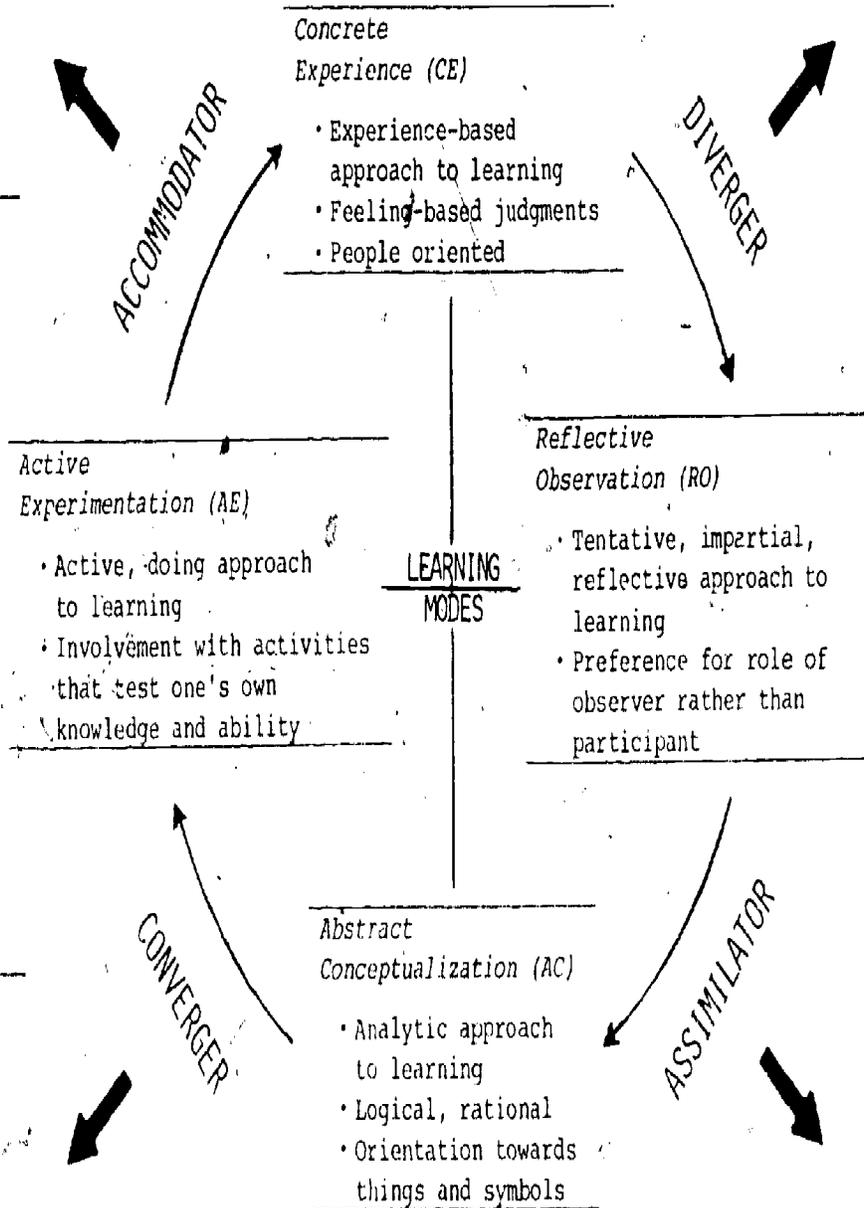
## AND THEIR CORRESPONDING LEARNING STYLES\*

### Accommodator (AE, CE)

- > Ability to carry out plans, action oriented
- > Likes new experiences, a risk-taker
- > Adapts to immediate circumstances
- > Intuitive, trial-and-error style
- > Characteristic of people with backgrounds in practical fields like business

### Diverger (RO, CE)

- > Imaginative ability, good at generating ideas, "brainstorming"
- > Can view a situation from many perspectives
- > Emotional, interested in people
- > Characteristic of people with backgrounds in the humanities or liberal arts
- > Characteristic of counselors, personnel managers, organizational development specialists



### Converger (AC, AE)

- > Good at practical application of ideas
- > Does well in situations where there is one answer to a problem, e.g., conventional IQ tests
- > Unemotional, prefers things to people
- > Narrow technical interests
- > Characteristic of engineers

### Assimilator (AC, RO)

- > Ability to create theoretical models
- > Inductive reasoning
- > More concerned with concepts than people, but less concerned with practical use of theories
- > Characteristic of people in the basic sciences and those in research and planning



April 17, 1978

Dear student,

You may recall that when you entered Alverno in the fall of 1977, you participated in a series of long-range inventories. The purpose of these inventories is to establish validity of the Alverno College degree. Last fall, you were promised feedback on these inventories as it became available.

One of these inventories, the Learning Style Inventory, has been scored. Enclosed are your results, along with an explanation of your scores. This information was presented to many students during "Feedback Sessions" in various classes this spring. Because you were not in attendance at one of these sessions, we have decided to send you your feedback by mail.

Thank you for your participation last fall. We hope that this information will provide you with an additional tool to use in the many learning situations you will encounter in the upcoming years.

Sincerely,



Marcia Mentkowski  
Director, Office of Evaluation



April 20, 1978

Dear student,

You may recall that when you entered Alverno in the fall of 1977, you participated in a series of long-range inventories. The purpose of these inventories is to establish validity of the Alverno College degree. Last fall, you were promised feedback on these inventories as it became available.

One of these inventories, the Learning Style Inventory, has been scored. Enclosed are your results, along with an explanation of your scores. This information was presented during the first Week End College session in January. Because you were not in attendance at this session, we have decided to send you your feedback by mail.

Thank you for your participation last fall. We hope that this information will provide you with an additional tool to use in the many learning situations you will encounter in the upcoming years.

Sincerely,



Marcia Mentkowski  
Director, Office of Evaluation



May 5, 1978

Dear graduating senior,

I wish to take this opportunity to thank you for your contribution to the study funded by the National Institute of Education that you participated in this semester. I have been extremely gratified by the professional responsibility demonstrated by you and the other graduating seniors.

I promised to mail your feedback on the Learning Style Inventory before graduation as part of my continuing commitment to you to apprise you of outcomes of the study that may be of benefit to you in your future professional development. The Learning Style Inventory is one of the inventories you completed that we expect will contribute to the validation of the Alverno degree, and to this study of women's perspective on professionalism and personal development. I expect that feedback on your score will assist you in interpreting and understanding your preferred learning style.

Your results are enclosed. I have also included several explanatory pages describing the theoretical base for the inventory. Instructions for interpreting the Learning Style Profile and several tables describing comparisons on the inventory for several groups are also included.

Additional feedback on the other inventories and research results will be mailed to you as soon as it becomes available. Keeping your address current with the Alverno Alumnae Association will assist me in mailing other information, and in contacting the followup study groups in the spring of 1980. Since we do have your permanent address, I expect that we will be able to reach you with feedback there.

Again, your contribution has made this work possible. I thank you and congratulate you on your graduation.

Best wishes for the years ahead,

A handwritten signature in cursive script that reads "Marcia".

Marcia L. Mentkowski, Ph.D.  
Associate Professor of Psychology  
Director of Evaluation

LEARNING STYLE INVENTORY INFORMATION : GROUPS AT ALVERNO COLLEGE

LEARNING STYLE PROFILE

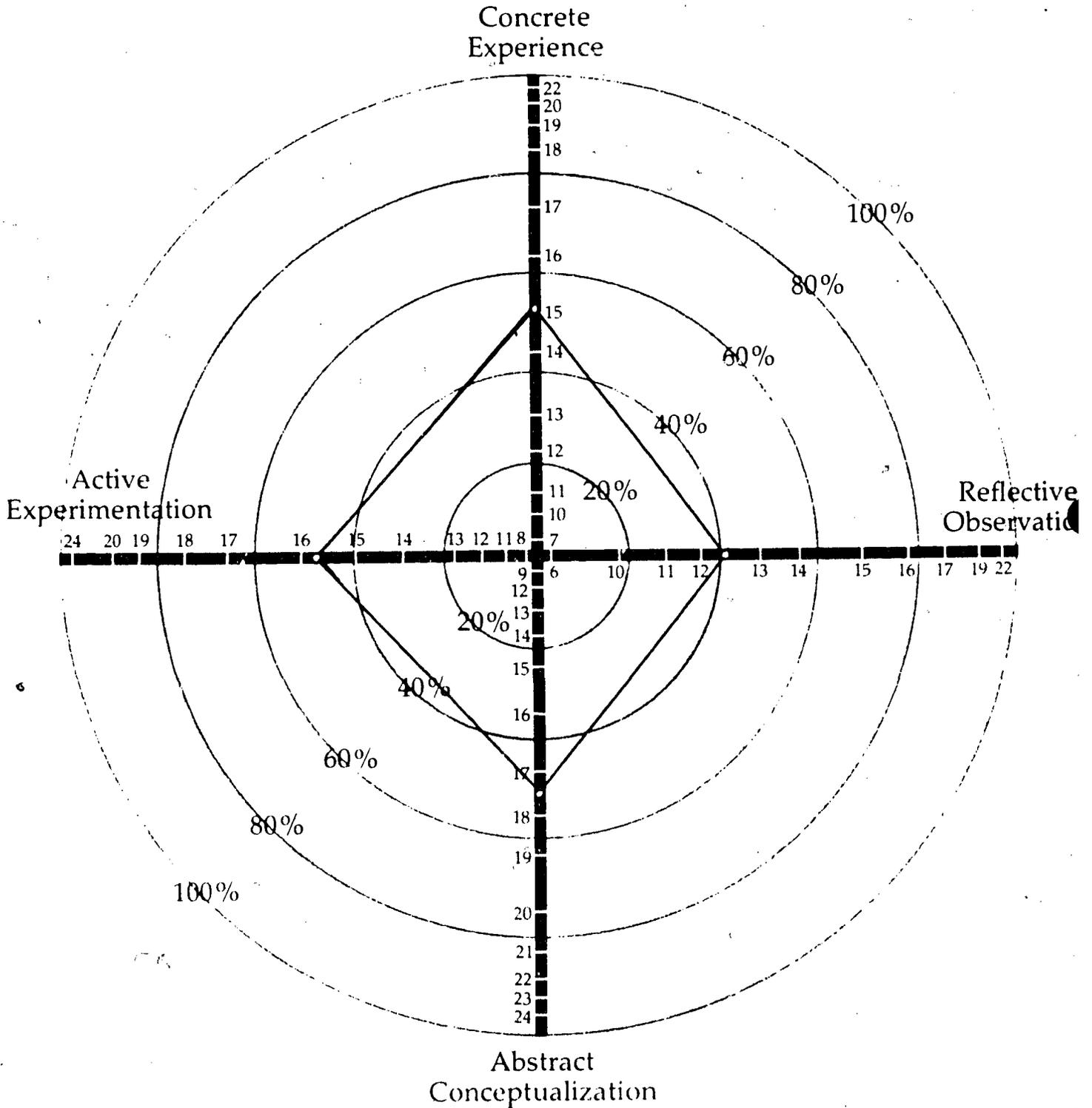


Figure 1: MEAN SCORES OF SENIOR STUDENTS

(SPRING 1978)  
270

APPENDIX H continued  
LEARNING STYLE PROFILE

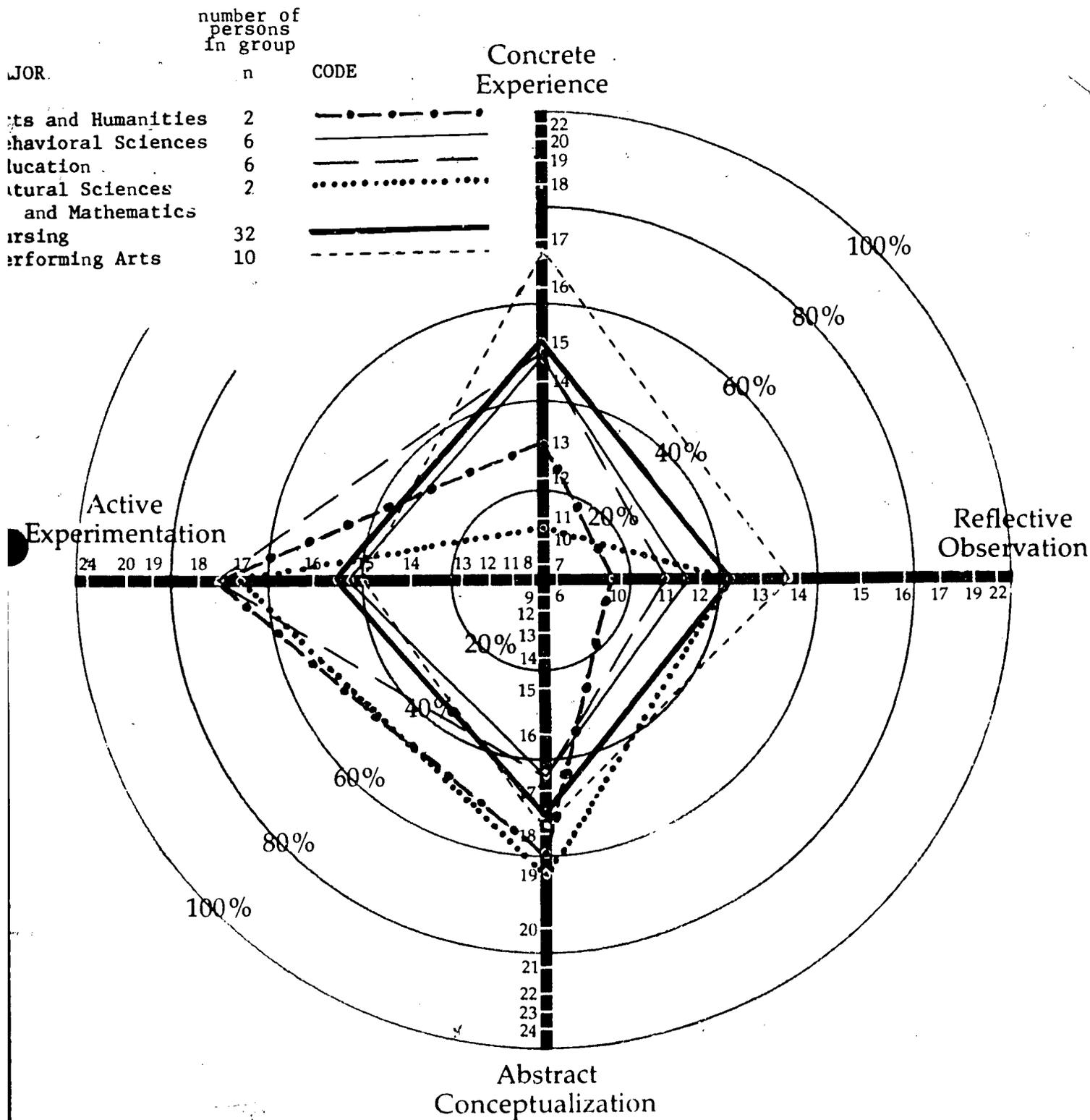


Figure 2: MEAN SCORES OF SENIOR STUDENTS BY MAJOR

(SPRING 1978)



APPENDIX H continued  
 LEARNING STYLE TYPE GRID

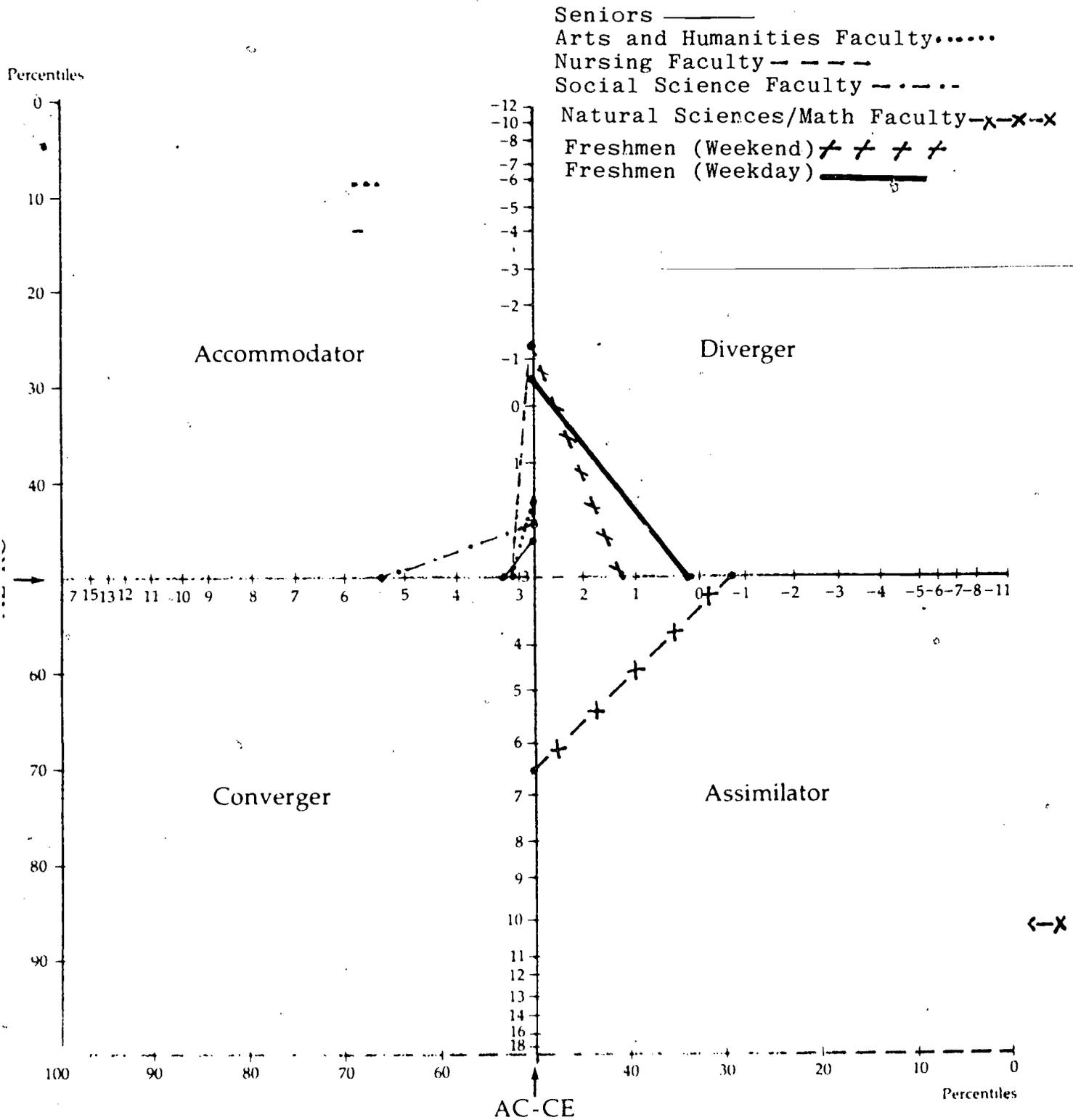


Figure 4: Mean Type for Faculty, Seniors (Spring, 1978), and Freshmen (Weekend and Weekday, Fall, 1977)



September 13, 1978  
406 Corona Hall  
telephone Ext. 412

Dear (student's name):

We have been contacting students regarding their participation in completing a series of inventories. These inventories are part of Alverno's effort to demonstrate the validity of the competences and abilities that lead to your capability as a professional.

The following arrangements have been made for your participation:

Friday, September 15      12:30 - 3:30 pm      Kellogg A

and

Friday, September 29      12:30 - 3:30 pm      Kellogg B

Please plan to attend both sessions. Thank you so much for your cooperation. We will be expecting you on September 15.

Cordially,



Marcia Mentkowski  
Director of Evaluation



S. Rosemary Hufker  
Chairperson of the Education  
Division



October 25, 1978

Dear (Student's name):

I am writing to re-introduce you, as a nursing student, to the research being done here at Alverno on women professionals, including nurses. Dr. Marcia Mentkowski is directing a project that looks at women's perspectives on learning and at changes in these perspectives that might occur during the years spent in college.

The Division of Nursing is very excited about this project and is giving its full support to this important work. The insight gained from these efforts will be invaluable in improving the nursing program at Alverno, and in providing the best possible guidance for our students toward their goals as professionals.

Dr. Mentkowski will be meeting with students individually to explain these efforts in greater detail. Mary Schneider will be contacting you in the near future to arrange for a fifteen minute appointment.

Thank you for your contribution.

Cordially,



Vivien Deback, Chairperson  
Division of Nursing



OFFICE OF EVALUATION

April 11, 1979

Dear Graduating Senior of the Weekend College,

First, let me congratulate you on becoming a member of the first graduating class from the pioneering Weekend College. I recall welcoming you to that first weekend in the Fall of 1977 when you contributed to the college by completing a series of inventories. I will be there on May 13 to add my best wishes when we gather to mark your remarkable achievement.

One characteristic of the Weekend College women is that they tend to suggest ideas that we have not thought of yet, and I am writing this letter because one of you did just that. Last fall during a feedback session to you I reported on the current progress of the outcomes from the National Institute of Education grant, and the current status of our work on the inventories you completed when you began college here. I noted also that I wished to conduct a "midpoint assessment" of students entering in the Fall, 1977 after they had completed two years at Alverno. The date for this midpoint assessment is scheduled for Fall, 1979. This semester, one of you pointed out to me that there would be a number of students graduating this spring, and if I wanted you to have the opportunity for a re-assessment, I had better contact you now!

The purpose of this letter is to describe this "midpoint assessment" and to enlist your cooperation in completing it. I plan to call each of you personally to discuss your schedule with you and to find a time or times when you would be available.

● What is a "midpoint assessment?"

When you entered Alverno in the Fall of 1977, you completed a number of inventories designed to assess the outcomes of the Alverno College experience, and to establish the validity of abilities learned during your college career for later success. In the beginning of the January, 1978 semester, you completed the remaining inventories. When you did so, you were contributing to the evaluation objectives funded by the National Institute of Education designed to insure that the curriculum was meeting student needs by developing their capabilities in ways that would assist them professionally. We want to show that women can achieve in a weekend time frame, even though they are handling multiple responsibilities.

● What feedback will I receive?

As feedback on your contribution, you received your score on the Learning Style Inventory in a group feedback session with me. In the Fall of 1978, I met with you again. I reported progress on all of the objectives, including the nursing and management professional studies, as well as some of the early research results on some of the inventories. You will continue to receive feedback on the research results. Since last fall, we have been working to "score" the remaining inventories. Our consultants in Boston, McBer and Company, discussed their progress with us in December, 1978. They have decided to "rescore" all inventories using better defined criteria because of new understandings that they had reached in defining the competences measured by some of the inventories. They are currently working to complete the analysis, and we will send you the results when they are available.

Following reassessment, this spring, you will receive both your Fall, 1977 Learning Style Inventory profile scores and your current profile scores. We will compare the scores and show changes over time.

When results from the other inventories become available, you will receive reports describing the findings.

- How will the results be used?

The results of this work will be used in four ways: to demonstrate the effectiveness of the Alverno learning process, to contribute to research in higher education, to improve instruction, and most importantly, to provide feedback to you on your personal and intellectual changes. Another important contribution will be to provide a comparison between the achievements of women who attend college immediately after high school, and women who attend college after some time has passed. In order to insure confidentiality code numbers are used on all inventories.

I will be calling you within the next week to discuss your schedule with you and to answer any questions you may have about this important work.

Graduating classes often leave a memento for those who come after. They plant a tree or give a piece of art work. I can think of no greater legacy for you to leave for those who are aspiring to be like you, than to create a record of what you as a class are like: your perceptions, your future goals, your hopes, and most important, how you have changed. Alverno College has always held the contributions of its students in high esteem. This is the beginning of our future relationship with you.

Cordially,



Marcia Mentkowski, Ph.D.  
Director of Evaluation  
Associate Professor of Psychology

MM/bj



Alverno College

August 6, 1979

Dear (Student's name):

I am writing to commend you on your contribution to the important work being conducted by Dr. Marcia Mentkowski on the outcomes of the college experience. I have just read a copy of the report she is sending to you, which is attached to this letter. This is indeed an exciting project, and as a contributor you have already demonstrated a commitment to research that will benefit not only you as a student, but other students as well. Your participation not only increases the stature of your Alverno degree, but it will also enable the professionals you work with in the future to have greater confidence in your capabilities as a colleague.

All of us in the Nursing Division are very enthusiastic about this project and are giving our full support to this work. The insights we gain from this study of the validity of outcomes of the Alverno experience will be invaluable in improving the curriculum at Alverno and in providing the best possible assistance to you in meeting your goals.

I am also writing to ask for your continued assistance during the upcoming year. I understand that you began your participation when you first came to Alverno in the fall of 1977. At that time, you completed a series of inventories that assessed your initial capabilities in a number of areas which are expected to relate to future professional performance. Feedback on one of these inventories, the Learning Style Inventory, was presented to you by Dr. Mentkowski in your pre-professional seminar or by mail during the latter part of your first year. In addition to continued feedback (such as the report attached) you will be receiving further individual feedback on the Learning Style Inventory after your participation this year. This feedback will show your changes in preference for learning style since the fall of 1977. It is my understanding that all of the information from the inventories is confidential and anonymity is maintained through the use of code numbers used only by Dr. Mentkowski in her work for with you.

Since this work is an institution-wide effort, the chairpersons and faculty in all departments have set aside time specifically for you to continue your participation now, at the beginning of your third year at Alverno. Your instructors will excuse you from classes during the time set aside for your participation, enabling you to complete the inventories as part of your regular school day, rather than contribute time outside of class. In order to insure that you will not miss important class time, I have asked your instructors to plan the day with your absence in mind. Faculty will not assign additional

or make-up work for this time. Each of your instructors has been informed of your contribution and is being notified of your absence for that time period. We have scheduled your participation for the following day:

Wednesday, September 12  
Kellogg Conference Center  
8:10 a.m. - 2:00 p.m.

During the day, there will be refreshments available and time for breaks and lunch. At the completion of the inventories, Dr. Mentkowski plans to meet with you to answer any questions you might have, and to discuss the attached report in greater detail. She will also advise you of when you will be receiving additional feedback about the study.

You will be receiving another notification prior to the date above. Thank you for your assistance in this important work.

Cordially,



Vivien DeBack  
Chairperson  
Nursing Division

VD:mh  
Enclosure



August 6, 1979

Dear (Student's name):

I am writing to commend you on your contribution to the important work being conducted by Dr. Marcia Mentkowski on the outcomes of the college experience. I have just read a copy of the report she is sending to you, which is attached to this letter. This is indeed an exciting project, and as a contributor you have already demonstrated a commitment to research that will benefit not only you as a student, but other students as well. Your participation will directly benefit your profession and will not only increase the stature of your Alverno degree, but will also enable the professionals you work with in the future to have greater confidence in your capabilities as a colleague.

All of us in the Nursing Division are very enthusiastic about this project and are giving our full support to this work. The insights we gain from this study of the validity of outcomes of the Alverno experience will be invaluable in improving the curriculum at Alverno and in providing the best possible assistance to you in meeting your goals.

I am also writing to ask for your continued assistance during the upcoming year. I understand that you began your participation when you first came to Alverno in the fall of 1977. At that time, you completed a series of inventories that assessed your initial capabilities in a number of areas which are expected to relate to future professional performance. Feedback on one of these inventories, the Learning Style Inventory, was presented to you by Dr. Mentkowski during your first year. Also, in fall 1978, Dr. Mentkowski talked with you about the outcomes and benefits of the study. In addition to continued feedback (such as the report attached) you will be receiving further individual feedback on the Learning Style Inventory after your participation this year. This feedback will show your changes in preference for learning style since the fall of 1977. It is my understanding that all of the information from the inventories is confidential and contributed anonymously through the use of code numbers used only by Dr. Mentkowski in her work with you.

Since this work is an institution-wide effort, the chairpersons and faculty in all departments have set aside time during orientation specifically for you to continue your participation now, at the beginning of your third year at Alverno.

We have scheduled you to participate on

Saturday, August 25  
Kellogg Conference Center  
\*8:15 a.m. - 3:30 p.m.

During the day, there will be refreshments available and time for breaks and lunch. At the completion of the inventories, Dr. Mentkowski plans to meet with you to answer any questions you might have, and to discuss the attached report in greater detail. She will also advise you of when you will be receiving additional feedback about the study.

Thank you for your assistance in this important work.

Cordially,

Vivien DeBack  
Chairperson  
Nursing Division

VD:mh  
Enclosure

\*NOTE: These students who are enrolled in N140 or N190 can begin the inventories after class and will be rescheduled to complete the inventories at a later date. Students enrolled in LA003 can participate in the morning and will also be rescheduled for completion at a later date.

ALVERNO COLLEGE  
OFFICE OF RESEARCH AND EVALUATION

UNDERSTANDING THE DEVELOPMENT OF THINKING IN COLLEGE

SECOND REPORT TO PARTICIPANTS IN A  
LONGITUDINAL STUDY OF COLLEGE OUTCOMES

Marcia Mentkowski

Funded by a grant from the National Institute of Education:  
Careering After College: Establishing the Validity of Abilities  
Learned in College for Later Success  
(NIE-G-77-0058)

Principal Investigators:  
Marcia Mentkowski  
Austin Doherty  
Alverno College  
3401 South 39th Street  
Milwaukee, Wisconsin 53215



Alverno College  
Office of Evaluation

A PROGRESS REPORT TO PARTICIPANTS  
CONTRIBUTING TO THE STUDY FUNDED BY THE NATIONAL INSTITUTE OF EDUCATION  
ESTABLISHING THE VALIDITY OF THE OUTCOMES OF THE COLLEGE EXPERIENCE

The purpose of this report is to provide you with information and results of the study you have contributed to and to extend our invitation to you to participate again this year.

One of the important responsibilities I have as director of the study is to disseminate information as it accumulates, rather than to "wait to the end" to present findings to you. I also wish to convey the significance of the work to you and to your future as student, as alumna, and, most importantly, as a professional.

I am also interested in what you may have to say about the results. What meaning do they have for you? At the end of the scheduled inventory collection day, I will be holding a special session to meet with you to discuss issues and questions you may have about our mutual effort.

### PROGRESS

A little over one-half of the three-year grant period has passed, and we have now collected much of the information that will be the basis for our final reports. This third year, 1979-80, is a crucial year for the remaining data collection. It will be our first opportunity to study our graduates, specifically ~~the~~ students who graduated in spring, 1978. We will collect a midpoint assessment of our second longitudinal group (students who entered Alverno in fall, 1977) and the final assessment of our first longitudinal group (students who entered Alverno in fall, 1976). We are currently interviewing our last group of professional nurses for the professional studies; we are beginning to set interviews with professional women managers. These studies, as you may recall, will be used to validate Alverno's professional programs.

This will be an important year--a year dependent on you if we are to be successful in our goal of validating the outcomes of the college experience. For now, I want to share with you some of what we know so far--the results that justify and encourage continued work with the inventories.

### UNDERSTANDING THE DEVELOPMENT OF THINKING IN COLLEGE

For this report, I will tie the research objectives together around a single concept: Thinking. I will be interpreting results that help us to understand the development of thinking by referring to a number of different inventories that you have completed as well as to ideas shared with us by practicing professionals. Our various objectives approach thinking in different ways, using different terms. These terms are:

- I. ANALYSIS
- II. COGNITIVE STRUCTURE
- III. PERSPECTIVE-TAKING
- IV. ABSTRACT CONCEPTUALIZATION
- V. CONCEPTUALIZING

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Our objective of understanding "thinking" is one to which all of you have contributed. We have results from two comparisons made possible by contributions from seniors and entering students (mostly freshmen) who completed inventories. We have results from the first longitudinal sample: students who took the inventories in the beginning of their first year at Alverno (1976) and who completed the inventories two years later--at the beginning of their third year. We can also look at the Weekend students, whose life and work experience add another dimension to student development. You have participated in completing the series of inventories and we are inviting you to do so again during the coming year.

## I. ANALYSIS

Analytical capability is one of the eight competences which provide the framework for the Alverno educational process. We feel that it is vitally important to continue to develop our understanding of this ability.

One of the inventories that is designed to assess analytical capability is the Test of Thematic Analysis developed by David Winter. Winter feels that standardized tests, objective tests (including multiple choice) and grades do not adequately measure the ability to analyze. His inventory assesses the ability to create and communicate modes of analysis by asking the student to discover and discuss the ideas and themes in two groups of paragraphs about a man working alone at his desk.

Our cross-sectional comparison of entering freshmen and graduating seniors on this inventory shows that there have been significant changes in student performance on this inventory--changes which indicate that cognitive complexity and the ability to analyze is developing in Alverno students. Because Winter and his colleagues are working with this instrument at a number of colleges, we will be able to study what is happening at Alverno in the context of other institutions. For instance, Winter's earlier work indicated that students at a liberal arts college he studied improved in their ability to analyze to a greater degree than did students at both a state teacher's college and a two-year vocationally-oriented community college. Winter states, "Liberal Arts seniors were better able to bring confusion and complexity typical of everyday life under cognitive control."<sup>1</sup>

We believe that our extensive longitudinal data will add another dimension to this research--development of analysis at Alverno, a women's liberal arts college with a specially designed program focusing on analytical competence as one of its objectives.

We are also interested in investigating whether practicing professionals, including Alverno graduates, identify the ability to analyze as important to successful careering. Our study of outstanding nurses, for example, has shown that conceptual ability is important and essential.

The results from your contributions and those of practicing professionals combine into an exciting picture of what analytical capability is and how it fits into both learning and performance. The more we understand this competence, the better we will be able to teach toward it.

---

<sup>1</sup>Winter, D. "Business Leadership and the Liberal Arts." New Jersey Bell Journal  
Vol, 1, 3, 1978/79, p. 43. 286.

## II. COGNITIVE STRUCTURAL CHANGE

Assumptions about knowledge, the "framework" that a person uses to understand her surroundings, are what we refer to as "cognitive structure." Several of the inventories you have written look at the ways in which cognitive structure changes during college. These include Opinions About Social Problems (by James Rest after Lawrence Kohlberg), Measure of Personal, Educational and Vocational Issues (by Lee Knefelkamp after William Perry), and Sentence Completion (by Jane Loevinger).

We have found significant changes--I call them "leaps in development"--that seem to be occurring as a result of the college experience. And the changes are in the predicted direction--after some college, students are able to do more complex thinking, using more sophisticated frameworks to organize their experiences and to make sense out of a multitude of ideas and experiences.

Interestingly, we are finding that life experiences can assist in the development of some of these cognitive structures, but that persons who go to college do develop these to a greater extent. For example, on Opinions about Social Problems, an inventory that asks the student to check off and prioritize the important issues in a story, Weekend College freshmen showed more sophisticated thinking than the younger students entering as freshmen in the Weekday College. However, graduating seniors in the Weekday College showed greater sophistication in terms of cognitive structure than did the Weekend College freshmen, who were eight years older, on the average, and had more work experience.

These are very important findings because they indicate that college does offer experiences that lead to more sophisticated cognitive processes than do life and work experiences alone. Students and educators have often wondered whether it is really any kind of advantage to go to college, or if one should seek life and work experiences instead. Our findings indicate that college does have a significant effect on some types of thinking.

I would also like to share with you some of our findings on the Measure of Vocational, Educational and Personal Issues. This inventory is designed to measure development by looking at the way a person approaches three critical issues: learning, decision-making, and career choice. You may recall being asked to write about your favorite class, a critical decision you recently made, and your career goals. Data from the Weekday students (collection of comparable data on Weekend students is planned) suggests that approaches to these issues change during the first two years in college. Students who have been in college for two years are more likely to see many sides to an issue rather than just two, and to see and understand multiple points of view. Belief in a "right answer" to all issues gives way to coming up with one's own answer, based on one's own judgment and utilizing, but not depending upon, the judgments of others.

It will be important to check these findings with our other longitudinal groups. Those students who will be completing the inventories this year--notably those who will be completing them in their third and fourth years--will help us to see if there are significant changes for individuals, not just groups of individuals. After all, Alverno's goal is to assure individual development, not simply to summarize group data.

### III. PERSPECTIVE-TAKING

Another major goal of the grant proposal is to provide a vehicle for students who experience college--and for alumnae who have entered "life after college," (I have heard there is life after college)--to describe their own perspectives on college and on their post-college careers. How do they see the college experience? What kinds of experiences in college triggered their own growth and development as women, as professionals, and as persons who transfer what they have learned in college not only to their work setting, but to their personal life? Do abilities acquired in college really assist in personal and professional success? What is learning--from the student's point of view?

We have involved a randomly selected group of students who meet individually and share with us, at the end of each year in college, their perspectives on these questions. Some initial analyses of these interviews indicate that most students do grow in a number of important ways, notably toward greater self-confidence in themselves as learners; they begin to take more and more responsibility for their own learning. One interesting hypothesis we have identified and that we wish to develop further involves the integration of a career with a personal life. This seems to become a major issue for younger women in college. The more experienced woman also is concerned with the issue, but in different ways. We are not sure just how, but it seems to us that while a conflict between career and personal life may be anticipated and felt by women in their younger years, the Weekend women show that there is a resolution to this particular conflict--integration of career and personal life can occur. Does that mean there is an end to conflict? Probably not. But life and work experience, and the support of fellow learners seem to allow consideration of new aspects of the dilemma. Experienced women are more likely to take for granted that an integration is possible and turn their attention to working on how to do this well. Does college help them? This and other questions are being asked as we continue to talk with students and alumnae.

### IV. ABSTRACT CONCEPTUALIZATION

All of you who participated in the inventories have received individual profiles from the Learning Style Inventory. The Weekday students who entered their third year in fall, 1978, and the graduating seniors from the Weekend College this year have received the most recent results. All of you have received this feedback in oral presentations and/or in written form. Everyone completing inventories this year will be receiving feedback on your individual changes on the Learning Style Inventory shortly after completing it. Given all the information we have communicated to you (results, graphs, discussions), what can we say about the development of Learning Style? What is important about the development of learning style and what does it mean?

Students in college develop a significant preference for abstract conceptualization, the learning style that involves forming abstract concepts, ideas and theories for further testing out in actual situations. Both Weekday and Weekend women come in with high preferences for the concrete rather than the abstract. Both groups change significantly to prefer the abstract. This finding is reinforced by the two year comparison on students who completed the Learning Style Inventory when they entered (fall, 1976),

and again two years later (fall, 1978). There is also a movement away from a dominant preference for reflective observation upon entering college. Students seem to prefer the more conceptual and active testing out of theories after they have experienced some college.

The most important finding from this inventory is that students become more balanced in their preferences. What this means to me is that students seem to become versatile, to prefer all styles to a degree. I believe this is an indicator that you are more likely to use a particular learning style according to what is called for by the classroom or field situation, rather than sticking to a preference despite the contingencies of the situation. These results show that changes in college are taking place, and we tentatively think that there may be patterns in development that do lead to increased effectiveness in professional areas--or at least some professional areas. We will need further assistance from the seniors who graduate in 1980 to really check out these ideas. They will be the first group to provide us with the necessary information so that we can look at development through the critical field experiences that take place in the junior and senior years at Alverno.

#### V. CONCEPTUALIZING

A second major goal of the grant proposal is to evaluate our curriculum objectives in various professional areas by comparing them to the important capabilities identified by practicing professionals as necessary to outstanding professional performance in the work setting. While many faculty have had extensive experience in the profession for which they create curriculum, they request practicing professionals--who accept Alverno graduates as future colleagues--to add to or to assist in curriculum development. The NIE grant provides the opportunity to do that as well. Professionals are interviewed, asked to talk about their work--what they actually do--and then to comment on what they think are the important capabilities for professional performance.

For example, the study of nurses which is currently undergoing its third and final phase of data collection, has already provided important insights. Nurses with a college degree were found to demonstrate two of the critical capabilities that discriminate outstanding performance to a greater degree than did the nurses without a B.S.N. One of these competences is "conceptualizing." Nurses nominated as outstanding by their peers, and interviewed about their work and what they actually do, conceptualize to a significantly greater degree than those nurses who do not have a B.S.N. Further, conceptualizing was identified by nurses in the interviews as an important competence for performance. We expect that the study of nursing competences will be completed during 1980, and that it will then be ready for dissemination in its entirety. You may be interested to know that the nursing study was conducted in three settings--a nursing home, a hospital, and a community health setting--to ensure generalizability to the nursing profession.

Other studies include, as mentioned earlier, the professional woman manager and the professional educator. We are using the concept of educator to mean any person who educates--and our current thinking includes many persons who educate outside the context of public or private elementary, secondary, and higher education. The parent, for example, fits this description of educator!

By now, I expect you have thought of a number of questions that I have not covered here. Good! Every person who asks a question about our work assists us in thinking of new ways to look at the results and in planning further work. Questions create meaning. Questions are why we are here.

In order to facilitate your question-asking, I have arranged for you to interact with me personally at the end of the inventory participation sessions this coming fall and spring of 1980. Perhaps you can challenge us on certain issues; perhaps you would like to know more about the specific results. I would like to meet with all of you then.

Just in case you would like to know more about our work than this report can convey, our progress reports are located on reserve in the Alverno library under "Office of Evaluation." A complete documentation of the progress since fall, 1976 is recorded in four progress reports. These reports have been sent to Washington to the Office of the National Institute of Education (NIE) in the Department of Health, Education and Welfare.

During the last year, we have received numerous comments from across the country about the importance of our mutual efforts. Besides yourselves, there are numbers of others who are awaiting the results. All of our research reports will be filed in the library as they become available as a means of letting you know what is happening in addition to these letters of feedback.

We cannot make this contribution to the study of professions, to the understanding of important professional capabilities, to the understanding of the growth and development that takes place in college and of its meaning for later life, without you. And I am aware of this simple fact every moment of every working day. We have been fortunate that you will share in the benefits as women, professional women, and you who have accepted the challenge of the college experience.

August, 1979

APPENDIX O



September 4, 1979

Dear (student's name):

Welcome back to school! I hope you had an enjoyable summer.

You may recall that you are scheduled to participate in the inventories to be administered by the Office of Evaluation on:

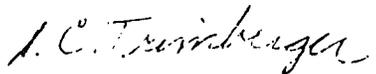
Wednesday, September 12  
Kellogg Conference Center  
8:10 a.m. - 2:00 p.m.

There will be time for a break and lunch during the day. At the completion of the inventories, Dr. Marcia Mentkowski will be available to answer any questions you might have and to provide you with information on the progress of your mutual efforts in a specially arranged feedback session.

As I mentioned in the previous letter, your instructors have been informed of your contribution, and have excused you from attending classes during the time noted above.

Your participation in this important research is greatly appreciated.

Sincerely,



S. Christine Trimmerger  
Chairperson  
Arts and Humanities Division

CT:mh



August 3, 1979

Dear Faculty Member,

During Faculty Institute last May, Marcia Mentkowski presented the latest results from the study, "Careering After College: Establishing the Validity of the College Experience for Later Success," funded by the National Institute of Education and currently entering its third year. If you are a new faculty member, the attached report being sent this summer to student participants will be an introduction to this work being conducted by the Office of Evaluation.

This year, three important data collections will be made to continue our evaluation of the curriculum. To enable a more systematic data collection, we wish to arrange for the students who participate to contribute their time during the regular school day. Descriptions of the three data collections follow:

- The first involves students who entered Weekend College in the Fall of 1977, who will be reassessed on the inventories. They will participate during the orientation period for Weekend College in August. This collection will not affect your scheduling.
- The second data collection involves students who entered Weekday College in the Fall of 1977 who will also be reassessed on the inventories. In order to set a time for these students to participate this fall, the chairperson will excuse them from classes September 12 (September 13 for some nursing students). Students who are involved (most are juniors) will be excused from classes from 8 a.m. to 2 p.m. on that day. You will be notified by letter prior to September 12 (or 13) exactly who will be absent from your classes.
- Next spring, the graduating seniors will participate in the inventories for the third time. We will set aside a day for them to complete the inventories. We will notify you of the day and time. Again, you will be told who will be absent from your classes.

I am enclosing a copy of the letter to students and the report that was attached to the letter. I have promised students that you will be aware of their absence, that you will allow for it, and not expect that they make up work. I believe that this assurance that we truly support their participation will ensure their continued contribution.

Last year, Marcia Mentkowski and the Office of Evaluation staff were so successful in recruiting students that they achieved over 94% participation. The procedures to achieve this result were possible then because smaller numbers of students were involved. This year, however, the Office will be collecting about 3600 inventories from 280 students. Due to this increased volume, systematic

APPENDIX P continued

-2-

administration, without extensive scheduling of students on an individual basis, has become essential. Inventories for graduating seniors in the Spring of 1981 is the final collection of data for the portion of the project involving students. Other follow-up studies are planned, but they will involve alumnae.

Your support is needed to assist in this important work. I know we will all be looking forward to the results.

Cordially,

The Discipline Chairpersons

maq

Enclosures (2)



October 18, 1979

Dear (Student's name):

As you may recall from my August 6 letter to you, a set of inventories was administered August 25 to the Weekend College women who entered Alverno in the fall of 1977 and also took the set of inventories at that time. Since you were unable to attend this session, and because your participation in our efforts to evaluate the curriculum is so important, I am writing to ask if you will be able to schedule a time in the near future to come in to complete the inventories.

Any date and time which is best for you can be scheduled. Completion of the inventories ranges from approximately three and a half to five hours, depending on the pace at which you work. The inventories (most of them are self-paced) can be taken all at once, or you can come in periodically for briefer time periods until you are finished.

If you let me know on the attached form when you would be able to come in, Liz Davies will meet you in Room 408, Corona Hall, at that time.

As soon as all persons involved have completed the inventories, we will be able to prepare feedback to you on the Learning Style Inventory. Feedback will consist of a two-year comparison, showing your scores in 1977 and 1979.

Thank you very much for your participation in this work, which is so important to the status of your degree, to the evaluation of the Alverno learning process, and to the development of the (communications) curriculum.

Sincerely,

Larry Cleve, Coordinator  
Professional Communications Department

LC:nh  
Attachment

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APPENDIX R

ALVERNO COLLEGE  
Milwaukee, Wisconsin 53215

INTER-OFFICE CORRESPONDENCE

TO

DATE September 6, 1979

FROM Marcia Mentkowski

COPIES TO

SUBJECT ADMINISTRATION OF INVENTORIES TO WDC  
STUDENTS WHO ENTERED ALVERNO IN FALL, 1977

During faculty institute, I reviewed the contents of the letter you received last month from the Discipline Chairpersons regarding the administration of inventories in September to the Weekday College students who entered Alverno in Fall, 1977. You recall that the chairpersons have excused these students from classes on September 12 (September 13 for some nursing students) from 8:10 a.m. to 2:00 p.m. to allow them to be reassessed on inventories they also completed two years ago.

Chairpersons have told students in a letter to them that faculty will be aware of their absence, will plan for it, and will not assign makeup work. (You also have a copy of this letter to students.)

In order that you may plan for their absence, students who are excused from your class(es) are listed below.\* Thank you very much for your support.

CLASS: \_\_\_\_\_ DAY/DATE: \_\_\_\_\_

STUDENT NAMES LISTED HERE

\*This listing may not be completely accurate since registrar's records would not include students who drop or add classes between 9/4 and 9/12.



September 27, 1979

Dear (Student's name):

Yesterday, I spoke with you about the ongoing work to evaluate and validate the curriculum, and to identify the capabilities of outstanding nursing performance. At that time, I asked for your continued participation in this effort and asked that you let me know your response.

Since yesterday, I have worked out an alternative option to participating that I think may be of help. I have arranged for Liz Davies to be available at your request for any time during the week, so that you could come in individually, when it is convenient for you, and work at your own pace. This arrangement would allow for working for short or long periods of time, depending on your schedule.

Liz Davies' room number is #408 Corona Hall and her phone extension is 441. At the bottom of this page, there are some appointment times listed that she has already scheduled. In addition to these times, other times can be arranged to suit your schedule if these don't work out.

I hope that this will be of some assistance to you and that it will enable you to participate. Again, thank you for your time yesterday. I believe it gave us the opportunity to discuss all the reasons for making this commitment.

Cordially,

*Marcy*  
Marcy Mentkowski

These are some dates currently set up. Please check and return this slip to my mailbox.

(Room 408, Corona Hall, is open from 8:00 a.m. to 5:00 p.m.)

NAME: \_\_\_\_\_

MONDAY:

Oct. 1 Time: \_\_\_\_\_  
 Oct. 8 Time: \_\_\_\_\_  
 Oct. 15 Time: \_\_\_\_\_  
 Oct. 22 Time: \_\_\_\_\_  
 Oct. 29 Time: \_\_\_\_\_

FRIDAY:

Oct. 5 Time: \_\_\_\_\_  
 Oct. 12 Time: \_\_\_\_\_  
 Oct. 19 Time: \_\_\_\_\_  
 Oct. 26 Time: \_\_\_\_\_

These times will not work out for me.

## APPENDIX T

### Comparison of WEC Women Who Entered in Fall, 1977, and Graduated in Spring, 1979

#### Results

Table A and Figures A and B show that, as a group, WEC students who entered in the Fall of 1977 with a previous college credits and graduated in Spring of 1979 did show a significant change in their preference for one learning style during the two-year period. Concrete experience is preferred significantly less in 1979 than in 1977. Even though the differences are not statistically significant, the mean scores for active experimentation and reflective observation are slightly lower in 1979 than in 1977, and the mean for abstract conceptualization is slightly higher. Also, Figure B shows that there is a tendency to move from the Accommodator learning style to the Converger style, because of the shift along the Concrete/Abstract dimension. However, this shift does not reach statistical significance.

Overall, the scores suggest that these WEC women may have established their preferences on the Reflective/Active dimension and maintained them with relative stability over their two years at Alverno. While the scores imply that a change in learning style may be taking place among these women, the process is not rapid enough to be captured in two years. These women show a significant shift away from an earlier preference for concrete experience, and thus do shift on the Concrete/Abstract dimension.

These results are tentative because of the small sample size ( $n = 20$ ). If we examine and compare these results to those from the larger study, we can conclude that college does promote a shift on the Concrete/Abstract dimension for these women as well.

TABLE A

LONGITUDINAL COMPARISON OF WEEKEND STUDENTS WHO ENTERED IN FALL, 1977 AND REWROTE THE LEARNING STYLE INVENTORY (LSI) IN SPRING, 1979

Group	n		CE		RO		AC		AE		AC-CE		AE-RO	
			1977	1979	1977	1979	1977	1979	1977	1979	1977	1979	1977	1979
Entering WEEKEND Students in Fall, 1977; Retested at Graduation Spring, 1979	20	Mean	15.15+	13.50+	12.30	11.80	16.60	17.05	16.55	16.25	1.45	3.55	4.25	4.45
		S.D.	3.13	3.65	3.51	3.71	2.98	3.69	2.46	3.48	5.21	7.01	4.92	6.46

+ Row comparison significant:  $p < .05$

# LEARNING STYLE PROFILE

## Norms for the Learning Style Inventory

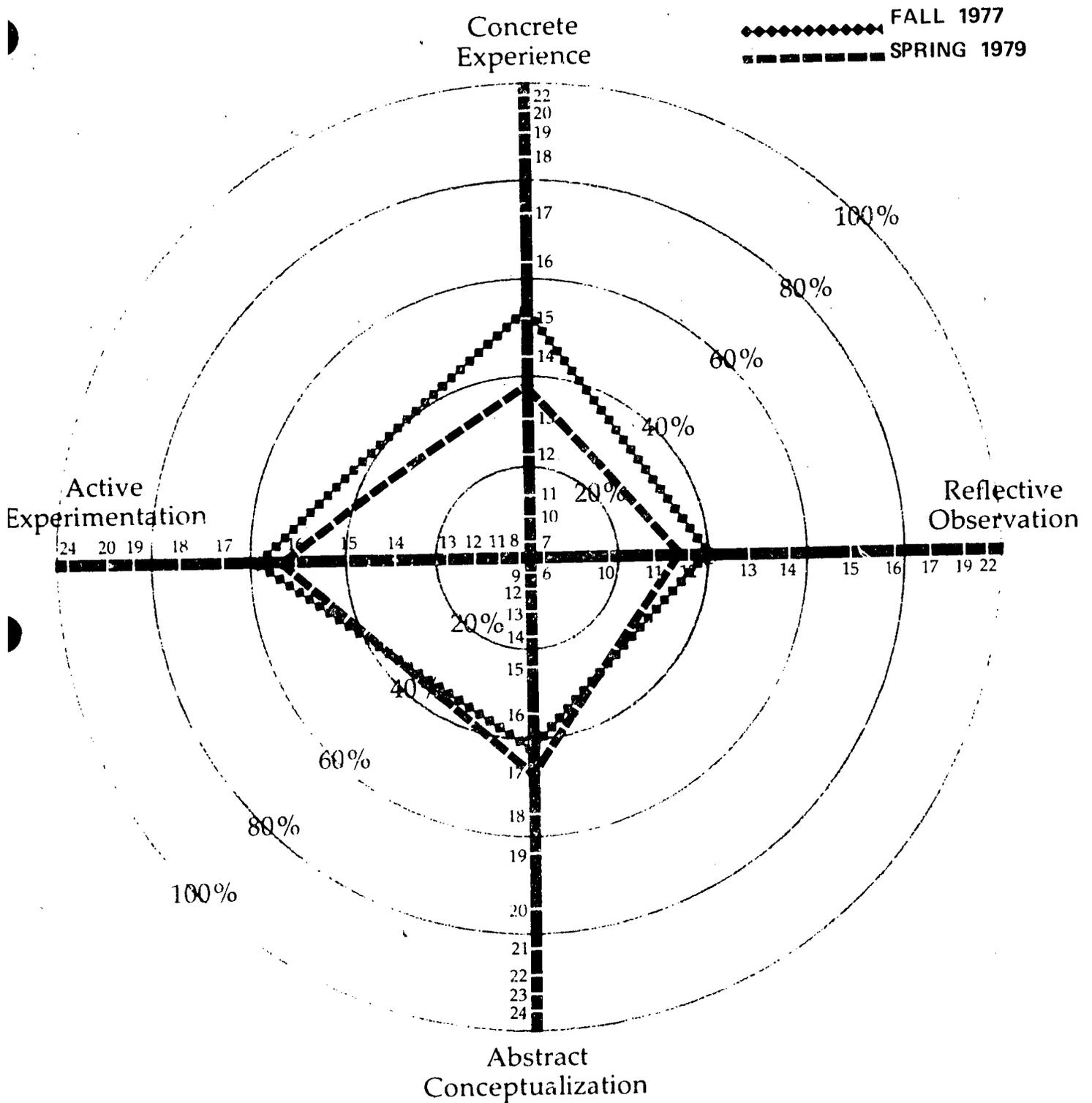


FIGURE A: LONGITUDINAL COMPARISON OF ENTERING WEEKEND STUDENTS (1977) WHO GRADUATED SPRING 1979.





January 23, 1980

Dear (Student's Name):

You may recall my letter to you last August, inviting you to continue your participation in the evaluation project conducted by Dr. Marcia Mentkowski on the outcomes of the college experience. The third and final inventory collection from your group (students who entered in the fall of 1976) will again assess your capabilities in a number of areas related to future professional performance and will help to complete the picture of your college experience over the years.

As we are well aware that many of you are nearing the end of your studies at Alverno and will have more responsibilities this semester, we have set aside a block of time during a regular school day. The inventory collection will be held on:

Thursday, March 13, 1980  
8:10 a.m. to 2:00 p.m.  
Room 074 in the Nursing Building

Faculty know that this date and time have been set aside and are planning their courses to allow for your attendance at the inventory administration. However, I do ask that you inform each of your instructors that you will not be in class that day. It is important for them to know just how many students are excused from each of their classes.

All of us in the Mathematical and Natural Sciences Division are very enthusiastic about the project and are giving our full support to this work. The insights we gain from this study will be invaluable in improving the curriculum at Alverno and in providing the best possible assistance to you in meeting your goals.

We are investing time and resources in this project -- and asking you to contribute your time and efforts -- because we are interested in evaluating individual development. To know how your class fares at Alverno, we really need to look at how effective the program is for each student, from beginning to end. Aggregate data and group scores can obscure the unique individual patterns and achievements that tell us what has really happened in the educational process. Only longitudinal studies, looking at individual growth across time, can reveal these patterns. The particular inventories used in this study look rather different from most or all of your course assessments, but they have been chosen as "outside" measures of general ability areas similar to the competences with which you are familiar. They have also been shown in some cases to relate significantly to future professional performance -- as we expect the Alverno curriculum to do.

Feedback on one of these inventories, the Learning Style Inventory (LSI), was mailed to you last spring by Dr. Mentkowski, who has also talked with you about the research objectives and the benefits of the study. You will be receiving further individual feedback on the LSI showing your changes in preference for learning style over four years of college. It will also include information on changes that you and other students show as a group throughout the college years. All the information is confidential. As you may remember, anonymity is maintained with code numbers used only by Dr. Mentkowski in her work with you.

At the completion of the inventories, Dr. Mentkowski plans to meet with your group to answer any questions you might have and to present some of the more recent results from the studies of professionals that have emerged since her written report to you last summer. At that time, she will also be able to answer questions on an individual basis. She will let you know when you will receive the additional LSI feedback.

You are an irreplaceable part of the longitudinal study. As a member of the original group that took the inventories at the beginning of your college experience in the fall of 1976 and again at midpoint in the fall of 1978, you have already demonstrated a commitment to research that will benefit both you and other students as well. Your participation will increase the status of your Alverno degree, in that your future colleagues tend to have even more confidence in your capabilities as a professional when they are aware that ongoing studies are being conducted to continuously demonstrate the effectiveness of the educational process you have completed. I hope that you will again demonstrate that commitment by taking part in the inventory collection this spring. Your participation in this important work is invaluable and greatly appreciated.

Sincerely,

*Sister Alice Theine*

S. Alice Theine  
Chairperson  
Mathematical and Natural Sciences Division

AT:mh

**ALVERNO COLLEGE  
OFFICE OF RESEARCH AND EVALUATION**

**SOME QUESTIONS AND ANSWERS ABOUT EVALUATION STUDIES**

**THIRD REPORT TO PARTICIPANTS IN A  
LONGITUDINAL STUDY OF COLLEGE OUTCOMES**

**Marcia Mentkowski**

**Funded by a grant from the National Institute of Education:  
Careering After College: Establishing the Validity of Abilities  
Learned in College for Later Success  
(NIE-G-77-0058)**

**Principal Investigators:  
Marcia Mentkowski  
Austin Doherty  
Alverno College  
3401 South 39th Street  
Milwaukee, Wisconsin 53215**





Alverno College

Dear Participant,

In materials distributed at feedback and dialogue sessions this past academic year, I described how I had gathered questions about the inventory collection from students. I listed 11 such questions for your review, and attached several pages of response titled "Some Questions and Answers About Evaluation Studies at Alverno College."

I am now including an addendum to that letter on the following yellow pages, because I wish to respond to these additional questions that came up during the sessions.

- A. What has been done to insure that the inventory administration session fits my schedule and that I can find the time to contribute?
- B. Why are students who attend college part-time also participating?
- C. What effect does taking the inventories "too quickly" have on the results?
- D. Are there other arrangements for students unable to take the inventories at the time they are scheduled?
- E. May I speak with you personally? I still have some questions.

Some of you may have further interest in the questions I listed last fall, so I have also attached my response to these previous questions (gold pages).

1. What do the inventories measure?
2. What are the benefits to me personally?
3. What are the benefits to my major area, my chosen profession, to higher education, and to other students?
4. Why am I taking the inventories a third time?
5. What feedback will I be receiving on the inventory results?
6. What effect does it have on the results if I remember some of the questions on the inventories?
7. Who has access to the inventories?
8. Who has access to research reports on the group results from the inventories?
9. Can I see my individual scores on the inventories?
10. How does the concern for "informed consent" by participants in the study relate to this kind of evaluation research?
11. Who else is participating in the evaluation research besides me and other Alverno students?

You will soon be receiving a progress report with the most current study results titled "Learning to Learn at Work: Students, Alumnae and other Professionals."

Your contribution this spring brings to fruition five years of longitudinal research on student performance on these inventories that will assist all of us to improve the curriculum for other women here and at other colleges. Thank you for your support. I trust I will be seeing you assessment weekend!

Cordially,

Marcia Mentkowski, Ph.D.  
Director of Evaluation

MM:jr  
Enclosures

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SOME QUESTIONS AND ANSWERS ABOUT EVALUATION STUDIES  
AT ALVERNO COLLEGE — Part II

- A. What has been done to insure that the inventory administration session fits my schedule and that I can find the time to contribute?

After discussions with Weekend College students, faculty, the Weekend College coordinator and the Dean, we arranged to have the inventory collections scheduled during the external assessment weekend, May 1-3, 1981. This was communicated to students orally and in the materials distributed at the "Feedback and Dialogue: What Have I Achieved" sessions conducted by Marcia Mentkowski and Dean Doherty in the Fall and Spring semesters. Students we spoke with felt that planning participation during a regularly scheduled assessment weekend would be better for most students than asking students to come to campus outside regularly scheduled weekends.

This week, each student's schedule for the external assessment weekend is being carefully reviewed. We will schedule each student's inventory collection period(s) around her assessment(s). We have eliminated time conflicts with your assessment(s), and as nearly as possible, scheduled inventory collection periods to follow your assessment(s). We have also scheduled the inventory collection during periods which will be least likely to cause fatigue. You will receive notification of your personal schedule for assessment weekend by April 2.

Naturally, we do individual scheduling for the inventory collections at your convenience if you are ill, or have some other pressing problem that does not allow your participation during your scheduled time. We do try to have all persons complete the inventories at somewhat the same time to minimize the problem created in any study when persons participate at different times.

Preliminary results from each inventory were carefully reviewed, to make sure that each should still be included in the inventory collection. In addition, one inventory, the Alverno College Career Questionnaire, has been added. This inventory asks students to describe their expectations for careering (starting or changing jobs) after college. Since we have completed our first graduating senior vs. alumnae followup study with Weekday College students, it is important that we begin to obtain information and evaluations of college preparation from our Weekend students also. Some of the preliminary results from our careering studies are included in the "Learning to Learn at Work: Students, Alumnae and Other Professionals progress report you are receiving.

I am very concerned, as are many people, with the issue of "over testing." Tests and testing have come under fire in recent years—especially personality and intelligence tests. That is one of the important reasons the National Institute of Education is funding this study. They are particularly interested in Alverno because of its approach to focusing on the broad outcomes of the college experience, and because of the way in which course assessments are designed here. The inventories used in the study are chosen precisely because they do not measure abilities the way commonly known tests do. We expect the abilities and the way they are measured to contribute to the way other testing is carried on including types of tests used in college, state boards, licensing, and personnel use in business. Changes must be made in the ways testing has been used to discriminate against different kinds of persons.

- B. Why are students who attend college part-time also participating?

We have designed the evaluation study to assess students every two years during college. The first inventory collection was upon entering in Fall, 1977. The second was two years later in Fall, 1979, and the last time is four years after entering in Spring, 1981. In Weekend College, persons stop in and out of college, and may attend either part- or full-time. Some of the persons who entered in Fall, 1977 have graduated, some are graduating this semester, and some will graduate in the future.

B. Why are students who attend college part-time also participating? (continued)

All persons, whether full- or part-time, are irreplaceable in the evaluation study. When we analyze the information on student performance on the inventories, we pay special attention to the amount of time a person has actually attended college during the four years. We call this factor "time in college." Obviously, we must consider "time in college" if we are to separate out the relative effects of college experience vs. other kinds of experiences, on the development of abilities measured by the inventories. Because our student group in Weekend College consists of both full- and part-time students, we can ask more questions about the effect of the college experience than we would be able to ask without this comparison.

C. What effect does taking the inventories "too quickly" have on the results?

While "knowing the questions" does not seem to affect results on these inventories, rushing through them does. It is very important on these inventories that each person "stretch her thinking" to the utmost, in order for measurement of her abilities in the fullest sense. That is why we schedule a period of time so that students can "take time" to really think through the questions and take a break if they feel fatigued. We are attempting to "break through" artificial barriers and limits that have been set on women's performance and abilities with these inventories. We know these limits are broken many times by Alverno women students—but like everything else, we have to demonstrate it!

D. Is there follow-up for students unable to take the inventories at the time they are scheduled?

Yes. I make a special point to contact persons to provide alternative scheduling. Frankly, it is essential that we have a good follow-up so that the groups of students who participate can be assured that the results are truly representative of all Alverno students—not just those who may have a particular time frame free. Group results from evaluation studies are meaningful when we can build on the complexity and richness of representative data. If the results can be expected to generalize beyond Alverno to other colleges, and be helpful to other women, we must do a good job of arranging things so everyone can participate. Educators who are considering changes are unimpressed when evaluation studies are conducted only with a few students.

This year, we have our first opportunity to inventory the abilities of experienced, adult students who have been "in college" for four years. Little, if any, longitudinal data on experienced adults exists in higher education that can be used to develop curricula for adult learners.

We have had excellent cooperation from students. People outside the institution often comment on the professionalism of Alverno students—who, by participating in evaluation research, make such a large contribution to other women, to their profession and to higher education.

E. May I speak with you personally? I still have some questions.

I will be delighted to discuss any issues with you individually. My office number is 647-3811. I will also be able to discuss issues with you following your participation in the inventories so that you can ask questions about a particular inventory—or comment on its use as a tool. At that time I will also discuss some of the results detailed in the latest progress report. Remember, my home phone is 774-7018.

SOME QUESTIONS AND ANSWERS ABOUT EVALUATION STUDIES  
AT ALVERNO COLLEGE

1. What do the inventories measure?

The inventories measure broad abilities that are expected outcomes of college. They measure abilities such as analysis, problem-solving, conceptual thinking related to social interaction, the valuing ability, etc. But they also measure more intangible abilities that are also expected to predict professional and career performance.

One example of a more intangible ability is learning style, measured by the Learning Style Inventory. Learning style is an important ability for starting or changing jobs and learning on the job.

The Picture Story Exercise is another example. Who could forget the six pictures and the six stories you are asked to write? Abbey Stewart, who designed this instrument, has been working for years to uncover the motivational patterns of women who are particularly successful personally and professionally. Early data indicates that Alverno women, even when they first enter Alverno, have particularly well-developed motivational patterns. How do these patterns—so critical to "moving" in a career or profession—develop further during college? For whatever goals women want to achieve in life—be they personal or professional—motivation is the key to any kind of success. Results from this inventory will lead to further understanding, so women can develop their own motivational patterns even more.

Another measure that students sometimes ask about is the Sentence Completion inventory, which requires completing unfinished sentence stems. Sometimes the sentence stems seem unrelated to college learning. Yet the purpose of the inventory is to measure women's perspectives across age, and across the life-span so that we can get a better understanding of thinking as it develops in college. The sentence stems are asking persons to respond to experiences which everyone might be expected to have—irrespective of a person's socio-economic, geographic, religious, racial or cultural background. If the sentence stems were too related to the college experience, they would discriminate against respondents who had not had certain educational opportunities, or are not college students. Responses to sentence stems are analyzed for thinking ability, not personality.

All the inventories fit together to form a composite picture of both the tangible and more intangible outcomes of the college experience. They are not personality tests. They measure performance and cognitive abilities and perspectives—how people think.

2. What are the benefits to me personally?

Personal benefits come to you in the form of individual feedback on the Learning Style Inventory, and feedback and dialogue sessions, and progress reports that keep you up to date on the results. These results give you more

information to talk about the outcomes of college for Alverno students. A senior who interviewed me recently asked: "Alverno is different in some ways than other colleges. How can I talk about my college experience in a way that will communicate to others, in a meaningful way, that going to this kind of college was 'worth it.'" I personally feel very strongly that the Alverno program will benefit me to a greater extent than some other colleges I might have chosen. But how can I 'stand up for my choice' for selecting this kind of college?" I expect these evaluation research results to provide graduates of Alverno with information to enable them to talk to others—including potential employers—about the demonstrated outcomes of the Alverno curriculum. The 1980 follow-up study of alumnae who graduated in Spring, 1978, also provides valuable data on the careering of graduates. Since a major reason students choose Alverno is to develop careering skills and professional abilities for employment purposes, the careering success of Alverno graduates is of particular importance to the Alverno student.

3. What are the benefits to my major area, my chosen profession, to higher education, and to other students?

The major personal benefit to an Alverno student participating in the inventory collections comes to her as a member of a professional group such as professional teachers, nurses, managers, writers, musicians, artists, historians, etc. Other groups that benefit, of course, are alumnae, college students, employers who hire college graduates, faculty who teach in higher education, etc. Institutions also benefit—colleges, hospitals, schools, business firms, volunteer agencies, etc., as a result.

Let me elaborate on some of these benefits more specifically.

College students, including Alverno students, benefit because evaluation results enable a systematic critique of curriculum, so that faculty can be more effective in giving students the skills and abilities they need. Higher education must better understand how adults learn and what abilities are really important if it is to survive the 80s' downward enrollment trends. Employers in business have long challenged liberal arts colleges for being unable to graduate students with effective communications and other skills so that a firm has to spend money not just on expected job training, but on "re-training" persons who should have certain skills and abilities. Many employers are looking for women to hire to fulfill affirmative action programs—but women must be competent. Institutions, such as hospitals and schools, are interested in graduates being educated for the future, not just the present. All these groups are interested in the outcomes of college and whether they predict future effective performance.

Professionals are interested in colleges demonstrating that they are effective in graduating students who are competent so that the degree is a meaningful credential. Other specific benefits accrue to professional groups. Licensing and state boards or exams are undergoing severe criticism in many professions, nursing in particular. The critique is that state board exams do not predict future professional performance. Groups are working to change the content of the state boards, but they are asking: "What should we measure? What abilities do predict effective performance in nursing?" The inventories you are completing are designed to measure these kinds of

abilities—and to show they can be measured in ways other than the currently designed state boards.

And there are benefits to women. Some employers think some abilities can only be developed to the fullest extent by men. We expect this study to break these limits and barriers by demonstrating that women not only have the abilities, but that they can achieve the professional goals they set for themselves.

4. Why am I taking the inventories the third time?

Our earlier results showed us that we had to collect longitudinal data (give the same inventory at the beginning, midpoint, and toward the end of the student's college career). Seniors in 1978 also took the inventories, and we have cross-sectional data. But then we discovered that we could not be sure that either entering or graduating classes were necessarily alike. For example, on some inventories, entering classes in 1976 performed differently than entering classes in 1977! Longitudinal measurement—across time—is the only way to insure that the results are valid! This is especially important because the curriculum changes as well. Further, there is little, if any, information on the learning and abilities of the graduates who enter programs created for more experienced adults (e.g. Weekend College).

I am very concerned, as are many people, with the issue of "over testing." Tests and testing have come under fire in recent years—especially personality and intelligence tests. That is one of the important reasons the National Institute of Education is funding this study. They are particularly interested in Alverno because of its approach to focusing on the broad outcomes of the college experience, and because of the way in which course assessments are designed here. The inventories used in the study are chosen precisely because they do not measure abilities the way commonly known tests do. We expect the abilities and the way they are measured to contribute to the way other testing is carried on including types of tests used in college, state boards, licensing, and personnel use in business. Changes must be made in the ways testing has been used to discriminate against different kinds of persons.

Longitudinal group results from evaluation studies are meaningful when we can build on the complexity and richness of representative data. If the results can be expected to generalize beyond Alverno to other colleges, and be helpful to other women, we must do a good job of arranging things so everyone can participate. Educators who are considering changes are unimpressed when evaluation studies are conducted only with a few students.

We have had excellent cooperation from students. People outside the institution often comment on the professionalism of Alverno students—who, by participating in evaluation research, make such a large contribution to other women, to their profession and to higher education.

5. What feedback will I be receiving on the inventory results?

Your individual score and group data on the Learning Style Inventory will be mailed to you soon after everyone has completed the inventories. You will be receiving other progress reports, even though you may have graduated. These reports similar to the two you have already received, include results from the other studies of professionals and the student and alumnae interviews.

6. What effect does it have on the results if I remember some of the questions on the inventories?

I know that since you are taking the inventories for the third time you will remember some of the questions. The inventories as nearly as I can determine at this time, have good test-retest reliability. But because they are relatively new, alternate forms are not available. Frankly, having seen a question before is not expected to affect the results, since we are not asking questions where there is a "right answer." Even knowing what is expected should not effect the results, because the inventories measure your ability as you have developed it up to this time. That is what is important. The inventories do not consist of "trick" questions or questions which require a "right answer," which if you knew, would affect the results. For the most part, it is obvious—even to the student entering college, what the question is measuring.

7. Who has access to the inventories?

Only the Office of Evaluation professional staff members who do some coding of the inventories have access. Other inventories are sent to expert coders in Boston. No piece of inventory data is ever entered in the student's college file. Neither faculty nor administrators have access to any individual student's inventory score.

We use code numbers to protect persons and to insure confidentiality and anonymity. The most important ethical issue in inventory collection or interviews is protecting the participant's right to contribute confidentially and anonymously. Code numbers also allow me to compare performance from one year to the next—and to give you personal feedback on the Learning Style Inventory.

8. Who has access to research reports on the group results from the inventories?

Students, faculty, administration, the business and professional community, the National Institute of Education who supports the study and other persons in higher education. Two major papers were presented in Boston in April, 1980 to the American Educational Research Association. Results from the Learning Style Inventory have been mailed to student participants, and special progress reports describing general results were mailed to student participants. Extensive progress and research reports are on reserve under "Office of Evaluation" in the library. Many visiting faculty from other colleges also have access.

9. Can I see my individual scores on the inventories?

I would never deny the right to see one's own scores to any student. But there are two ethical considerations I must keep in mind in giving you your individual score. First, a single score must be meaningful. Second, an individual score must be given in a context, it must be accompanied by feedback on "what my score means to me."

The Learning Style Inventory is an instrument that is meaningful because the inventory was originally designed to provide individual scores together with feedback. Second, it can be scored quickly enough so that feedback can be given relatively quickly compared to other inventories which may take months to code. Even so, I have added to the feedback information designed for the LSJ by creating a page of "qualifications"—how not to interpret your score. Too often, we all seem to take any kind of test score too seriously without such qualifications.

The other inventories were not designed to give out individual scores, and have no such accompanying feedback. They have been developed to provide group results for large numbers of persons—to see trends and differences in performance in broad abilities over time. Therefore, an individual score is not necessarily meaningful—it is the group results that create meaning.

Since it is the group results that create meaning rather than the individual scores, I present feedback to students in the form of progress reports describing the results, except of course, for the Learning Style Inventory.

10. How does the concern for "informed consent" by participants in the study relate to this kind of evaluation research?

I have been particularly concerned that you have as much information as you feel you need about the rationale and purposes of evaluation studies. I feel this is especially important because in a study of this sort—which takes four years to complete—explanations of rationale and procedure I have enumerated on a number of occasions are easily buried under mounds of other information. Who would remember Dean Doherty's speech or my comments to you on your first orientation days in Fall, 1977, before you first completed the inventories? Or the talk to you in 1978? Or the talks to you either individually or in a group prior to or after the 1979 inventory collections? Or all the information in the two Learning Style Inventory feedback packets? Or the material in the two progress reports? Or the contents of the letters from chairpersons re-introducing you to the study? How many students really have been able to read the elaborate progress and research reports on reserve in the library under "Office of Evaluation"? Now that I have more experience, I can see even more alternatives for communicating to you than I was aware of when I first began my work here. I have also learned much more about what students really want to know. The question/response format of this letter is, I hope, a more effective method than a speech.

This kind of evaluation research is seen as part of the college experience, and the inventories are similar to other college assessments in that they are an expected part of college for students. The difference between these inventories and regular course assessments is that they are used to demonstrate changes in group performance over time for all students—and can cross content, discipline and career lines. Inventories such as these are given to improve instruction and demonstrate the validity of the college experience. Educators see evaluation research as part of the original "contract" made between institution and student, and so expect students to take the inventories in the same way that they take assessment instruments. What is different about the inventories is that they are not used to credential. The scores of an individual student are not ever shown to an instructor or administrator. We deliberately do not make the inventories, or other evaluation tools like the attitude survey, a criterion for graduation. That would defeat the purpose, because we are interested in measuring performance of abilities in the absence of pressure for credentialing or validation.

In sum, the ethical issues in conducting evaluation studies include providing information about the purposes of the study and what the inventories measure, establishing ways to insure confidentiality and anonymity, and providing the group results to participants.

This type of evaluation research is, of course, quite different from experimental research, where different groups are being "experimented on," that is, given different treatments. In our evaluation research, for example, everyone takes the same inventory—and we are not "manipulating variables" or experimental conditions. If we did that kind of research we would be asking for volunteers, and we would be asking persons to fill out "informed consent" forms.

11. Who else is participating in the evaluation research besides me and other Alverno students?

Over 80 registered nurses and 103 women managers and executives in the Milwaukee area are contributing to the professional studies. They contribute interviews and take other instruments as well. We have been extremely gratified at the excellent participation from these professionals too. They are also eagerly awaiting results and are, in some cases, planning to put them to use in their institution! You may recall that the study also is identifying competence models of three professions by going to the professionals themselves—to identify what abilities are critical for outstanding performance in their chosen field.

Alumnae from the Class of 1978 also participated in 1980. A careering questionnaire was sent to all alumnae. Half of these former students came to Alverno for an individual 2-hour interview in summer, 1980.

Groups of students in both Weekday and Weekend College are participating.

APPENDIX W

3401 S. 39th Street  
Milwaukee, WI 53215  
(414) 671-5400



Alverno College

March 4, 1980

Dear (student's name):

You may recall my letter to you early in the semester, inviting you to continue your participation in the evaluation project on the outcomes of the college experience. In my letter, I also informed you of the date set aside during a regular school day. I would like to confirm the date and time:

Thursday, March 13, 1980  
8:10 a.m. to 2:00 p.m.  
Room 074 Nursing Building (downstairs)

Faculty know that this date and time have been set aside to enable you to contribute, and have planned their courses to allow for your absence from classes. There will be time for a break and lunch during the day. Dr. Mentkowski will be available after you complete the inventories to answer questions and give you additional information on the study results.

Dr. Mentkowski has written you a special letter in a question and answer format that she wrote after meeting with some of the students who will be taking the inventories March 13. This letter to you is attached.

You are an irreplaceable part of this longitudinal study. I hope that you will again demonstrate that commitment by taking part in the inventory collection March 13. Your participation in this important work is invaluable and greatly appreciated.

Sincerely,

*Sister Alice Theine*

Sister Alice Theine, Chairperson  
Mathematical and Natural Sciences Division

Enclosure



Fall, 1980

Dear (Student's name):

I am writing to commend you on your contribution to the important work being conducted by Dr. Marcia Mentkowski on the outcomes of college. This is indeed an exciting project, and as a contributor you have already demonstrated a commitment to research that will benefit not only you, but other students as well. I also wish to communicate that all of us in the Behavioral Sciences Division are very enthusiastic about this project and are giving our full support to this effort. The insights we gain about the learning and abilities of students are invaluable in improving the curriculum and in providing the best possible assistance to you in meeting your goals.

An example of the most recent impact of your contribution is the group results from the Learning Style Inventory. These were mailed to you following your two previous participations, and presented to the faculty in May. At that time, David Kolb, professor at Case Western Reserve University, author of the Learning Style Inventory and originator of experiential learning theory, met with the faculty to discuss his recent insights on how students and career professionals learn. Together with Dr. Mentkowski, he discussed Alverno student preference patterns on the Learning Style Inventory and drew implications for college curricula. Dr. Kolb also met with faculty who are working to increase the ways in which learning can occur in the variety of off-campus experiential learning settings students experience. Thus, the results from just this one inventory are serving as important guidelines for faculty to improve learning experiences. The results also validated that students as a group leap dramatically in their preference for abstract conceptualizing after two years in college, an important step if learning in settings off campus is to occur in the best possible ways.

I am also writing to ask for your continued assistance during the Spring Semester in 1981. Since this work is an institution-wide effort, the chairpersons and faculty have set aside time for the inventory collection. We are well aware that many of you will have increased responsibilities as you near the end of your Alverno studies, and we have arranged for your participation this spring in a way that will enable you to contribute as part of the regular school day. I am writing to you now so that you will have adequate time to plan this work and schedule it with your other responsibilities. I will notify you shortly after the second semester begins in January 1981 as to just when you will be involved. (If you are graduating in December, we will involve you then.)

I know that you have had a number of opportunities to hear Dr. Mentkowski discuss the study purposes and outcomes since 1977 and have received three written reports. Still, I would like to add a note to her comments, to underscore the importance of your contribution.

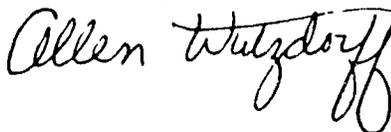
You are an irreplaceable part of a longitudinal evaluation study. We are investing time and resources in this project--and asking you to contribute your time and efforts--because we are interested in evaluating changes in learning. To know how your class fares at Alverno, we really need to look at how effective the program is in promoting learning, from beginning to end. Aggregate data and group scores alone can obscure the unique growth patterns and achievements that tell us what has really happened in the educational process. Only longitudinal evaluation studies, looking at changes in learning across time, can reveal these patterns.

The particular inventories used in this study look rather different from most or all of your course assessments, but they have been chosen as "outside" measures of general ability areas similar to the competences with which you are familiar. Many have also been shown to relate significantly to future professional performance--as we expect the Alverno curriculum to do.

The benefits from this study will multiply over the years. You will receive individual feedback on the Learning Style Inventory once again, and other group results. But your participation will also increase the status of your degree, in that your future colleagues tend to have even more confidence in your abilities as a professional when they are aware that ongoing studies are being conducted to continuously demonstrate the effectiveness of the educational process you have completed. In taking this opportunity to again demonstrate your professionalism by contributing to such an effort, you join 84 nurses and 115 women managers and executives in the Milwaukee area who have also contributed a picture of their abilities. Your work complements and extends similar participation by other weekday and weekend students, and the alumnae of the class of 1978, many of whom interviewed on campus this summer to create a picture of the abilities needed for "life after college." Dr. Mentkowski plans to share the alumnae report with you this year.

Your contribution toward describing abilities learned in college can make a difference--to you, to other women in higher education, and to the professionals you will join as colleagues. I thank you for your continued assistance.

Sincerely,



Allen Wutzdorff, Chairperson  
Behavioral Sciences Division

AW:dvp

**MEMO**

**TO:** Alverno Faculty:  
Date for Weekday College Inventory Collection

**FROM:** Discipline Division Chairpersons

**DATE:** December 5, 1980

**RE:** Inventory Collection for Weekday and Weekend Students Entering Alverno in Fall, 1977: March 24, 1981 for Weekday College

In order to assist you in planning classes and syllabi for next semester, we would like to notify you of plans for some students on March 24, 1981.

The attached letter details the plans of the Office of Evaluation to administer inventories to all students who entered Alverno in 1977 in Spring, 1981. Most of these students, but not all, are graduating in May of 1981. Full-time and part-time students are included in this group. The date chosen for this data collection is Tuesday, March 24, 1981. To enable a systematic data collection, the 100 students who are involved will be excused from classes on that day from 8:00 a.m. until 2:00 p.m. As mentioned in the attached letter to you, the students will be told that you are aware of their absence, that you will allow for it, and plan March 24 with their absence in mind. We will ask each student to notify you if they will be one of the absent students.<sup>1</sup>

The students in this particular group are taking the inventories for the third time: they completed these inventories during new student orientation in 1977, in Fall, 1979, and will complete them again in March, 1981, prior to graduation. This last data collection on the inventories is vitally important. It will enable a complete set of longitudinal data on the inventories and will be a major contribution to the evaluation of the curriculum. We will continue our contact with these students after college to allow for followup studies.

As March 24 nears, a reminder memo will be sent to you. Your support in this important work is needed and greatly appreciated.

**cc:** <sup>1</sup>Students will be notified of this date after they return from the Christmas vacation.



December 5, 1980

Dear Faculty Member,

During Faculty Institute last May, Marcia Mentkowski in a special session with David Kolb, presented the latest results from the study, "Careering After College: Establishing the Validity of Abilities Learned in College for Later Success," funded by the National Institute of Education and currently completing its third year. If you are a new faculty member, you had an introduction to this work being conducted by the Office of Evaluation during Fall orientation, and received several related materials at that time, including a brief synopsis of the project sent to students.

This year, two important data collections will be made to continue our evaluation of the curriculum. To enable a more systematic data collection, we wish to arrange for the students who participate to contribute their time during the regular school day, just as we did last year. Descriptions of the two data collections follow:

1. The first data collection involves students who entered Weekday College in the Fall of 1977 who will be assessed for the third time on the inventories. In order to set a time for these students to participate in Spring, 1981, the chairpersons will excuse them from classes March 24. Students who are involved (most are seniors) will be excused from classes from 8:00 a.m. to 2:00 p.m. on that day. You will be notified by letter prior to March 24 exactly who will be absent from your classes.
2. The second involves students who entered Weekend College in the Fall of 1977 who will be assessed for the third time on the inventories. They will participate during assessment weekend for Weekend College, May 1 - 3, 1981. This collection is being worked out with Weekend College Coordinators.

I am enclosing a copy of our letter to Weekday College students and the "question and answer" letter from Marcia attached to the fall letter reintroducing the students to the project. I have promised students that you will be aware of their absence, that you will allow for it, and plan class on March 24 to allow for their attendance at the inventory administration.

Last year, Marcia Mentkowski and the Office of Evaluation staff were so successful in recruiting students and alumnae that they achieved over 94% participation. The procedures to achieve this result are based on a policy of providing as much information as possible to students about the rationale and results of participation. For example, this fall, Austin Doherty and Marcia held a series of five feedback and dialogue sessions on the project with Weekend College students. Marcia is currently planning special meetings with students involved in Weekday College. Such efforts, together with your informed support, are the key to the amount and quality of student participation. Inventories for students in the Spring of 1981 is the final collection of the project involving students. Other follow-up studies are planned, but they will involve alumnae.

Your support is needed to assist in this important work. I know that we will all be looking forward to the results.

Cordially,

The Discipline Chairpersons

enc: Letter to WDC students  
Marcia's letter to students



February 2, 1981

Dear (Student's name):

You may recall my letter to you last August, inviting you to continue your participation in the evaluation project conducted by Dr. Marcia Mentkowski on the outcomes of the college experience. The third and final inventory collection from your group (students who entered in the fall of 1977) will again assess your capabilities in a number of areas related to future professional performance and will help to complete the picture of your college experience over the years.

As we are well aware that many of you are nearing the end of your studies at Alverno and will have more responsibilities this semester, we have set aside a block of time during a regular school day. The inventory collection will be held on:

Tuesday, March 24, 1981  
8:10 a.m. to 2:00 p.m.  
Room 074 in the Nursing Building

Faculty know that this date and time have been set aside and are planning their courses to allow for your attendance at the inventory administration. However, I do ask that you inform each of your instructors that you will not be in class that day. It is important for them to know just how many students are excused from each of their classes.

All of us in the Behavioral Sciences Division are very enthusiastic about the project and are giving our full support to this work. The insights we gain from this study will be invaluable in improving the curriculum at Alverno and in providing the best possible assistance to you in meeting your goals.

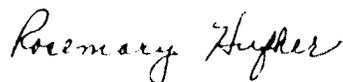
We are investing time and resources in this project -- and asking you to contribute your time and efforts -- because we are interested in evaluating individual development. To know how your class fares at Alverno, we really need to look at how effective the program is for each student, from beginning to end. Aggregate data and group scores can obscure the unique individual patterns and achievements that tell us what has really happened in the educational process. Only longitudinal studies, looking at individual growth across time, can reveal these patterns. The particular inventories used in this study look rather different from most or all of your course assessments, but they have been chosen as "outside" measures of general ability areas similar to the competences with which you are familiar. Many have been shown to relate significantly to future professional performance -- as we expect the Alverno curriculum to do.

Feedback on one of these inventories, the Learning Style Inventory (LSI), was mailed to you last spring by Dr. Mentkowski, who has also communicated with you about the research objectives and the benefits of the study. You will be receiving further individual feedback on the LSI showing your changes in preference for learning style over four years of college. It will also include information on changes that you and other students show as a group throughout the college years. All the information is confidential. As you may remember, anonymity is maintained with code numbers used only by Dr. Mentkowski in her work with you.

At the completion of the inventories, Dr. Mentkowski plans to meet with your group to answer any questions you might have and to present some of the more recent results from the studies of professionals that have emerged since her written report to you last summer. At that time, she will also be able to answer questions on an individual basis. She will let you know when you will receive the additional LSI feedback.

You are an irreplaceable part of the longitudinal study. As a member of the original group that took the inventories at the beginning of your college experience in the fall of 1977 and again at midpoint in the fall of 1979, you have already demonstrated a commitment to research that will benefit both you and other students as well. Your participation will increase the status of your Alverno degree, in that your future colleagues tend to have even more confidence in your capabilities as a professional when they are aware that ongoing studies are being conducted to continuously demonstrate the effectiveness of the educational process you have completed. I hope that you will again demonstrate that commitment by taking part in the inventory collection this spring. Your participation in this important work is invaluable and greatly appreciated.

Sincerely,



S. Rosemary Hufker  
Chairperson  
Education Division

RH:ml

**MEMO****TO:**

**FROM:** Marcia Mentkowski  
Office of Evaluation

**DATE:** February 27, 1981

**RE:** ADMINISTRATION OF INVENTORIES TO WDC STUDENTS WHO ENTERED ALVERNO IN FALL, 1977

As you may recall, a memo was sent to you last December from the Discipline Division Chairpersons informing you that inventories will be administered on Tuesday, March 24 to the Weekday College students who entered Alverno in Fall, 1977. The chairpersons have excused these students from classes from 8:10 a.m. to 2:00 p.m. that day. The students in this particular group are taking the inventories for the third time. They completed these inventories during new student orientation in 1977, and again in Fall, 1979. This will complete the set of longitudinal data on the inventories and will be a major contribution to the evaluation of the curriculum.

Chairpersons told students in a January letter (attached) that faculty will be aware of their absence and will allow for their attendance at the inventory administration in their planning. A reminder letter to the students, which includes answers to questions frequently asked about the study, will also be forwarded to you.

In order that you may further plan for their absence, students who are excused from your class(es) are listed below.\* Thank you very much for your support.

CLASS: \_\_\_\_\_

Enclosure: Letter from Discipline Division Chairperson  
Letter from Marcia Mentkowski  
Two sets of "Questions and Answers about Evaluation Studies at Alverno" (note especially the "blue" pages)  
A Progress Report to Participants

\* This listing may not be completely accurate since Registrar's records would not include students who dropped or added classes after February 13.

ALVERNO COLLEGE  
OFFICE OF RESEARCH AND EVALUATION

LEARNING TO LEARN AT WORK:  
STUDENTS, ALUMNAE AND OTHER PROFESSIONALS

FOURTH REPORT TO PARTICIPANTS IN A  
LONGITUDINAL STUDY OF COLLEGE OUTCOMES

Marcia Mentkowski  
Deborah Fowler

Funded by a grant from the National Institute of Education:  
Careering After College: Establishing the Validity of Abilities  
Learned in College for Later Success  
(NIE-G-77-0058)

Principal Investigators:  
Marcia Mentkowski  
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LEARNING TO LEARN AT WORK:  
STUDENTS, ALUMNAE AND OTHER PROFESSIONALS

A PROGRESS REPORT TO PARTICIPANTS<sup>1</sup>

Marcia Mentkowski and Deborah Fowler<sup>2</sup>

Some students come to college directly from high school. Others attend after an interim filled with extensive work and personal experience. All are interested in how college learning will prepare them for "life after college."

In earlier talks and written reports, we have discussed how students' preferences for "thinking" -- for abstract conceptualizing, for reflecting and planning action -- developed during college. But at some point each student looks beyond college. She sees herself beginning an entry-level position, taking on assignments with more complex responsibilities, realizing greater self-enhancement and meaning in her personal life. How will college learning make a difference then? In what ways will she really be prepared?

In this report, we respond to these questions by reviewing some initial findings from our analysis of student performance on inventories and interviews completed during college as part of curriculum evaluation efforts. We will also share some of the initial findings from last summer's interviews of the 1978 graduates who participated in the study as seniors, and again as

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<sup>1</sup>Participants include students entering Alverno in 1976 and 1977 who contributed throughout college, 1978 graduates who contributed as seniors and as alumnae in 1980, and professional nurses and women managers in the Milwaukee area.

<sup>2</sup>Mark Hein provided editorial assistance.

alumnae two years later. Finally, we will review our studies of other professionals, part of which are now complete. From the results we have so far, we will respond to the following questions:

- What have I learned in college?
- How do students "learn to learn" at work? What abilities do they utilize in new situations they face in Off Campus Experiential Learning (OCELS), clinical experiences or current jobs?
- How do alumnae learn to learn at work? What abilities do they use in new situations?
- How do other professionals learn to learn at work? What abilities do they use in new situations?
- Does a college degree make a difference in the kinds of abilities demonstrated by outstanding professionals?
- What are the implications for higher education?

#### WHAT HAVE I LEARNED IN COLLEGE?

Earlier we noted that results from the inventories indicate that Alverno's graduating seniors show more complex and sophisticated thinking abilities than students just entering college from high school. Seniors also perform at a higher level than entering students who have extensive out-of-college life and work experience, although the "experienced" entering students perform higher than those just out of high school.

These results indicate that college learning does contribute to performance in ways that out-of-college life and work experiences do not. What is the nature of this contribution? One important part of learning at Alverno that seems to emerge again and again is the value of actual involvement in situations that require students to perform. Clinical experiences, OCELS, taking on an additional responsibility in a job one currently holds, applying new concepts to day-to-day situations, reflecting

on one's performance in a seminar group, are all part of experiential learning.<sup>1</sup>

Experience is an important part of learning. But it seems that "learning to learn" requires experience coupled with reflective, structured opportunities to develop one's thinking abilities. "Learning to learn" from experience happens when students are able to "think": to stand back from the experience, to reflect and analyze, to self-assess, to link ideas and concepts in order to make sense out of experience, to guide future actions and even to select the experiences from which they will learn in the future.

Once a student learns how to learn from experience, she is much better able to "make sense" out of her previous work and life experiences. We find, for example, that on some inventories students with extensive previous work and life experience seem to make more sophisticated relationships after only two years in college than persons who spend two years in college right after high school. Apparently, the more experience you have, the more you are able to test out college-acquired ideas, concepts and frameworks against remembered situations and actions.

Remember, however, that traditional-age students graduate with more developed thinking abilities than the older student returns with -- they are better able to conceptualize, to create elaborate conceptual frameworks, to identify cause-effect relationships against which to analyze their experiences, and to self-assess. Can they also use this ability to "learn to learn" on the job, where it will be critical to realizing their personal and professional career goals?

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<sup>1</sup> A. Doherty, M. Mentkowski, and K. Conrad, Toward a Theory of Undergraduate Experiential Learning. In M. Keeton and P. Tate, (Eds.), Learning by Experience -- What, Why, How (San Francisco: Jossey-Bass 1978), pp. 23-35.

HOW DO STUDENTS LEARN TO LEARN AT WORK?  
WHAT ABILITIES DO THEY USE IN NEW SITUATIONS?

While our analysis of interview data is not complete, it seems clear that work experiences during college are important to students, and help them to "translate" learning to make it work for them during their OCEL or clinical experiences. Here is an example<sup>1</sup> of one student's comments as she describes "learning to learn" on a special project she completed during an OCEL:

For my OCEL, I chose a rather large task that had been coming up for a long time in our organization. When it came to a head, I asked to take it on as an OCEL; it involved implementing a change in our organization that would impact many people. My actual boss was my OCEL mentor. And then I was taking the "experiential learning" course with my Alverno instructor, who had me doing these experiential learning logs.

At the time, I was a secretary. Not that I was a typical secretary -- I did the purchasing and I supervised clerical staff. But I can be confident as an individual now, separate from my job, because for the first time, through my OCEL, I was able to view my job from a different perspective -- something more than just a job was involved.

Well, I took on this change. It was tough. Many of the people I work with are in a different field and have very high qualifications. And I was having to confront them because I was making the decisions. I would often get treated as a secretary and not as a professional, not as a peer. Sure, it's possible to relate on a friend to friend basis in many situations. But when push comes to shove in a work situation and decisions are being made by someone you feel inferior to, or who feels inferior to you, then a whole new set of circumstances are created.

My OCEL gave me the opportunity to view that situation I was in from a different perspective and in a very logically set mode.

HOW DID THAT HAPPEN?

Well, to keep these logs I had to constantly ask myself very specific questions about what I was doing. That was very important. I had to take that work experience that I've been in for years and years -- home! It was probably the hardest thing I've ever had to do. I worked and slept and ate and chewed that task for four months.

<sup>1</sup>All interview examples are edited to exclude any information that could identify the contributor, to maintain confidentiality.

#### IN WHAT WAYS DID YOU DO THAT?

Well, first, I guess, it was becoming aware of all the things that make up what you actually do on the job, and then attaching some ideas to them. It was a conscious effort to feel more in control. I used to do things so intuitively and then feel very shaky about them. This was a means to move out of that realm of reaction, to some form of action.

I've learned that there are more ways to reflect, and there are more ways to link. When everything you're doing is new, it's difficult to tie into something else. The reflection process is almost impossible and very uncomfortable. It seems easier to make connections when you have some kind of framework or grid against which to compare your experiences.

For example, I was able to bring in some sense of organizational theory or behavioral theory. And then I began to plan long-range, and sort of stick to it. This plan allowed me to see where I deviated and why. As I looked back on the decisions that I made at work, many had a very direct relation to something else that I knew or that I had experienced. I began searching for alternatives. I began to see the differences in profit vs. non-profit management, as we discussed in class. I began to understand that everybody has different perceptions -- that there won't be consensus among people on why certain things were happening.

The OCEL integrated all these ideas for me. That was really beneficial -- and I think it allowed the change I implemented to go well, too.

#### IN WHAT WAYS HAVE YOU LEARNED?

I learned through my OCEL that what I was doing at my job was a process; changing anything in an organization takes a great deal of time. All of the activities such as setting forth how the change would occur, keeping staff apprised of possible alternatives, communicating my thoughts and ideas to my boss, getting his feedback and reaching consensus, determining just how each staff person should be involved -- just simple things like making choices -- each of these was part of a process. Before, each of these things would have had too much importance. Each disagreement, each agreement, would have carried too much weight -- the highs and lows would have been too pronounced. Now, however, I was able to go into this change with a perspective on the whole thing. In each incident, I could see it as a part of a solution -- each incident contributed to a whole process that was gradually getting somewhere.

#### ARE THERE ANY OTHER WAYS IN WHICH YOU'VE LEARNED?

Well, I'm pretty sure we learn as much from each other as we learn from a text. Learning that goes on through conversation and

discussion, through group work, or just sitting over coffee discussing what we read confirms or disconfirms our ideas. I think that learning can take place in any situation. I can't imagine sitting in a room by myself with an encyclopedia and coming out very much the wiser. We each bring with us our own sets of perceptions, the other experiences we've had, and people are able to listen and to tell what effect those experiences have. To understand what it means to bring your own perceptions and learn from other people's as well allows me to grow personally as well.

WHAT WERE THE RESULTS OF YOUR OCEL ON THE JOB?

The change was accomplished to everyone's satisfaction, and I was given a promotion. I have settled into my new duties well, and now my boss is willing to trust me with more things, to send me out of town on trips, to have me do research. There is an atmosphere of success. Also, I feel more in balance -- not so up and down toward my job -- and that balance was achieved through that OCEL.

IN WHAT WAYS DID YOU GROW PERSONALLY?

Well, I think I made a major change in the last six months. I am more likely to mull things over, and not react as quickly. I'm not so tempted to respond off the top of my head as I normally might have before. I can say 'I don't know' and take things under consideration, or I can do a little more digging on some problem, instead of feeling the need to answer. And I value challenges more.

I've also begun to feel fairly competent analytically -- in thinking through problems. And in being more open to trying solutions. I feel better about most decisions I make.

WHY IS THAT IMPORTANT?

It's important to me to remain as objective as I can. Always acting out of my intuitive mode is something I want to get away from; so then, knowing why I do things is important.

This interview suggests a number of abilities that the student brings to bear on the problems she faces on the job -- problems she has an opportunity to discuss and analyze during her weekly seminar on campus. This student also completed a number of "logs" as part of the course assignment which she says assisted her to "ask some very specific questions," to

further analyze and reflect on her work experience, to draw relationships and to identify which changes in work plans -- and her own behavior -- she wished to make.

First, she discusses the work experience itself, and "becoming aware of all the things . . . you actually do on the job." She speaks of finding more ways to "reflect." Here she demonstrates perspective-taking, the ability to "view that situation I was in from a different perspective and in a very logically set mode."

She also speaks of linking and tying ideas to each other, and making connections, which are easier to make "when you have some kind of framework or grid against which to compare your experiences." Her framework consisted of principles of organizational theory, and styles of management in different organizations.

She contrasts her new working style of "moving out of the realm of reaction to some form of action" with her previous style of "acting intuitively and then feeling very shaky. Knowing why I do certain things is important to me." Her new style seemed to enable her to "feel more in control . . . to value challenges more. I'm not so up and down. I can do a little more digging on a problem instead of feeling the need to answer. I feel competent analytically." In addition to her own increased confidence, "my boss actually changed the way he thought of me and my abilities -- I actually received a promotion."

Reflecting on what she has learned, she now sees her job as a process, that her actions fit together and are directed toward a goal. "Before, each little incident had too much importance." Now she sees each event "as part of a solution . . . a whole process that was gradually getting somewhere."

Examples like these are exciting because they help to uncover how students learn on the job. With many more and different examples, we can improve our understanding of the abilities that make up learning to learn at work, and how it compares to classroom learning. We can then create better OCEL and clinical experiences, and we will also be better able to help students take on more complex responsibilities in jobs they hold while still in school, as well as in the future.

HOW DO ALUMNAE LEARN TO LEARN AT WORK?  
WHAT ABILITIES DO THEY USE IN NEW SITUATIONS?

To illuminate the abilities that make up learning to learn at work, we can also turn to observations and insights from alumnae interviews. In 1978, the senior class participated in the study by completing the inventories, and over half also contributed a two-hour interview at the end of their senior year. In 1980, we sent a careering questionnaire to this group of alumnae (similar to one given to the 1980 and 1981 senior classes) and most of those who had been interviewed in 1978 were interviewed again in the summer. We are now working to analyze these interviews, to see what we can learn from our alumnae.

The transition to "life after college" is only one focus of these interviews. But it is an important one because alumnae take the opportunity to reflect on what they have found difficult, what seems to cause stress and frustration, what skills and abilities they are able to call forth in working through difficult times, what seems to work and what does not. They can also help us understand what kinds of strategies they use to deal with professional problems, and can critique Alverno's current program in light of "what I needed."

The first test, of course, is the extent to which alumnae actually find

jobs. Last year (1980), of the students about to graduate, 94% expected to work after college. The alumnae in this study (1978 graduates) report that 94% actually are employed. Seventy-nine percent of the 1980 seniors expected to find work in their major area, and 88% of the alumnae actually found positions directly related to their majors. So Alverno graduates are successfully finding jobs in their chosen fields.

While nearly all of the alumnae are employed, they are not all in the same positions they took just after graduation. Indeed, we found that in two years some had already been promoted, questioned whether they wanted to stay in the position or institution they were working in, changed jobs, or even changed professions. Our alumnae have had to deal with change and challenge since graduation.

The following interview excerpts will illustrate some of the variety of these experiences and challenges. To get at these and analyze them, we asked a variety of questions:

- What was it like leaving school and starting the life you have now?
- In what ways is learning still a part of what you do?
- How is learning now different than it was when you were in college?
- What kinds of abilities are most important in making the transition from college to life after college -- to new kinds of work?
- To what extent are you doing what you expected you would be doing?
- Have there been any times during your transition from school to your current occupational activities that you found particularly difficulty or problematic?<sup>1</sup>

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<sup>1</sup>The complete set of questions are found in M. Mentkowski and N. Much, Alverno College Alumna Perspectives Interview (Milwaukee, WI: Alverno Productions, 1980).

In our preliminary analyses of the interviews, we find that the need for flexibility and adaptability is important for making a successful transition from college to work. For most graduates, things did not always work out exactly as they expected. They had to make adjustments in their thinking. These interview excerpts illustrate thinking, changing and adapting. Consider the following example of a woman who got a major job offer:

I got the promotion. It was five levels up, a very large jump. . . . The promotion was in [a city 100 miles away] so I had to make the decision. If I wanted the promotion I would have to move there unless I wanted to commute. . . . Being that I had a family and husband to consider, it had to be a joint decision. We decided we would go based on my job transfer, but it would have to be over a period of 5 or 6 months before we actually made the move. In the meantime I am doing a lot of staying there and commuting. . . . I didn't know if my husband would be willing to watch the children on days that I had to stay overnight . . . it was a little hard to swallow at first. I think he felt like he was being left in the lurch, but he has come a long way. . . . I think we, as a family, have learned a great deal from this transition.

Needless to say, she had to rethink many of the choices she had made up to that point. She and her family also had to adjust to a commuting relationship, something none of them had anticipated.

One of the themes that comes up often is that alumnae experience more pressure and stress working than they did in college. As one alum said, "Going to school, from my perspective, is much more relaxing, even though at the time it didn't seem very relaxing. I find learning fun. It was much more fun for me to go to school than it is to work at a job."

Another challenge some graduates faced was disenchantment as their first position stopped providing new challenges:

I came to a point in my job when I felt I had learned as much as I wanted to, and maybe now it was time to move on to something different. I put off the decision for a long time because I was afraid to leave a job that I now felt secure in. . . . I guess it was something I really had to sift through my mind. . . . I finally decided that I was losing the things I felt were important and needed to get out of it in order to maintain a professional type of standing

with myself. . . . I would go to work, put in my eight hours, be kind of crabby, do my work as fast as I could, and leave. Then I would go home and be depressed. . . . I got to the point where I had to sit down and decide whether that was what I wanted to be like, and if I could live with myself. I couldn't. I had to get a new job. . . . I'm glad I made the decision.

The decision to change jobs is seldom an easy one. This alumna grappled with it, reflecting on her behavior and sorting out her priorities until she reached a firm decision. At the time of the interview she had been in her new job for a month and reported feeling excited about the new learning she was doing.

Do alumnae have to learn at work? Yes: Learning on the job was clearly a major part of what each alumna faced. As one alumna said, "You might think the teacher's lounge after school is for relaxing -- I found it to be the place I learned the most. I sat and listened to other teachers talk about their problems, I analyzed in my own mind what they did, and that helped me when I faced similar situations my first year."

Three of the abilities that seems to come to the fore are reflecting, analyzing, and creating plans for action. We hear alumnae tell us how they stepped back from problems -- reflected, thought them through. They asked themselves what it was that was bothering them, what their goals were, and what kind of action they needed to take. They took time to plan their future actions rather than act impulsively.

In addition, alumnae usually made some reference to a skill they used that assisted them. Some mentioned role-taking, some wrote out conversations between themselves and others and then analyzed them for patterns, some compared "where I am in my job now" with "where I want to be in my profession."

One superintendent had a difficult encounter with an employee:

I turned an individual down for a promotion he had applied for and he became very irate and started yelling. . . . I found myself

becoming extremely annoyed with him, raising my voice . . . and after the whole thing was over I was very uncomfortable. I had been totally unprepared for that type of response. . . . I was so unsatisfied with the way I handled the situation that for several days I really thought about it. I tried to go back to things I had learned about how to effectively handle situations. In my own mind, I role-played what I would do if it happened again and it did happen again, with the same individual. Several days later he came back to me and tried to convince me to change my mind and again raised his voice and started carrying on. I was very calm this time because I was prepared. . . . The whole thing came off beautifully.

This woman had a rare opportunity for a second chance to interact with the employee and try out what her role-playing had taught her. She also learned the benefits of being so well prepared to deal with a person about such a sensitive issue.

Another alumna had "a very rough second year of teaching,"

There was something major that went on every week. If it wasn't a problem with things missing, it was a problem with parents. I would come home at the end of each day or week and write down all the things that happened -- just the bare facts. This is what happened, this is what I said, this is what they said. Then I would reread it and look at it and analyze what the real problem was -- why things didn't go the way they should have or the way I would like them to. I would think about what I would do if a particular situation would come up next, and then I took action on it.

Her situation did not improve much, but she became better able to cope with it by her process of analyzing and planning. Her learning process also included "just talking to family members and friends that were not in the situation. I just did the best I could. There was nothing else I could do."

Another alum was passed over for a supervisory position and thought she had been treated unfairly.

Instead of being the way I was maybe three years ago and saying "What the hell do you mean?", I sat back and thought. "All right, what are the things that I want to say to get my point across? Do I think this is a legitimate complaint? How am I going to tell this person without making her do things worse to me than she is already doing?" When the time came, I felt I was ready to do that. It wasn't that day, but a couple of days down the line when I had time to sit back and organize myself and think about what I really needed to say to her. It went fine. . . . There were a lot of

things I said that were important. I think it worked out really well, because after that she had much more respect for my point of view.

This woman did not "fly off the handle" as she might once have done, but spent considerable time thinking and analyzing the situation before taking action. As a result, she came to a reasonable and effective solution.

The alumnae also noted several other abilities that contributed to their transition from college to work. For example, organizing and planning action were important to several. "I really value my organizational skills. I rely very heavily on lists and time schedules." Another said, "I tend to approach my job in a very organized fashion, and although many of my days are not organized because of unexpected occurrences that I have no control over, I still have a plan for myself."

One alum is "learning to interact with people without judging them. I try to see the person as a person and accept them for who they are." Another said simply, "I think one of the abilities that helped me is that school has given me confidence in myself."

HOW DO PROFESSIONALS LEARN TO LEARN AT WORK?  
WHAT ABILITIES DO THEY USE IN NEW SITUATIONS?

Studies of outstanding professionals are beginning to illuminate how persons learn to learn at work, and how they transfer learning and use their abilities in new situations. While the study of outstanding women managers is still incomplete, some interesting facts are emerging from a preliminary analysis of the demographic data about the relative effects of education and experience.

Women managers and executives from 50 organizations in the Milwaukee area participated in this study. Of the 103 women, sixty-four (62%) had a bachelor's degree or more education; but only fifteen (24%) of these

college graduates majored in a field related to management. (Another nineteen women -- 18% of our sample -- were taking courses in college when the interviews were collected.)

Why are these women, 85% of whom do not have their educational credentials in management, making it in management? What abilities did they earn that allowed them to perform in their present job? We are hypothesizing that one ability they may share is the ability to transfer generic competences learned in college or previous jobs to the jobs they are in now -- to apply general skills in new situations.

This hypothesis is reinforced when we look at their experience. Almost two-thirds of these women were not yet 40 years old. Fifty-two percent of them had been in their present positions two years or less; 21% had been in their present positions from 3 to 4 years; and only 27% had been in their present positions 5 years or more. Thus, most of the women have relatively little experience on which to draw in their present positions. If their education is not directly related to their management roles, and they do not have much experience in their present positions, we hypothesize that they are transferring generic abilities (similar to our competences of analysis, problem-solving, communications, etc.) from previous education and experience to their current jobs. They may then pick up technical skills and specialized knowledge and expertise on-the-spot.

Each of these woman managers was asked, in an hour long interview, to describe six work situations about which the interviewer asked the following questions:<sup>1</sup>

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<sup>1</sup>David C. McClelland, Behavioral Event Interview (Boston: McBer and Company, 1978).

"Can you recall an effective or ineffective experience?

- What happened?
- What led up to it?
- Who was involved?
- What did you think, feel, want to do?
- What did you do?
- What happened as a result?"

While we are still in the process of analyzing all the interviews we collected, one example clearly illustrates adapting abilities learned earlier to a new position:

What happened? What led up to it?

I had worked for a consumer product company. When I first came to work here the nature of this company's products was new to me. I was very uncomfortable with the terminology people used. These people I was dealing with had been with the company many years. I set up meetings with various divisions to review their marketing plans with them.

Who was involved?

Fifteen marketing directors and myself.

What did you do?

I went individually to get acquainted with some of the directors before our meetings. I reviewed their marketing plans prior to meeting with them.

From that I developed a year-long public relations plan: "Here's a schedule of various releases and literature you should send out relative to the product. This product is significant enough to have a news release."

Through talking with them I also set up parameters based on the products and customers. By giving them parameters I could ask them of their new product, "Does it fit this bill? OK. The trade show you'll be introducing it at would be an ideal time for a news conference." We also discussed any articles that could be written.

I followed thru, kept them informed of what we've done, the timing of it and mailed them news clippings.

What were your thoughts and feelings?

I was not sure of the products and to whom they were sold. I was very confident in setting up these meetings, reviewing marketing plans and developing P.R. plans, sure of my ground in that area.

I was very aware I was asking extremely basic questions. I was aware of being new and different. I was very careful and didn't want to embarrass this department by appearing too "green".

What happened as a result?

It's helped this division to get acquainted with the markets.

The meetings not only helped directors but also helped me become acquainted with the various departments we market. Our department might have put out the same type of work, but I don't think I would have understood it as well.

It took time, but I was also helping my assistant to learn. I was putting my organizational skills and his knowledge of the company together.

I don't have that feeling of having to account for my background.

In this example, it is clear that this manager did not have the technical knowledge she felt she needed. But she used other abilities. She was proactive, initiating interaction with the marketing directors. She gave them information about how to set up parameters for news releases and shows, and even selected products for such handling. She followed up with more information, and she was very careful to assess the impact of what she was doing. Further, she showed accurate self-assessment, noting areas where she is sure of her ground and where she is not. It seems clear that she was "learning on the job" -- combining the competences she used in this situation, with the crucial ability to transfer them to a new setting as learning tools.

Our interview analysts also point out some other interesting observations from their early work with the interviews. They are finding that the women managers demonstrate a wide variety of competences. Most of the work situations these women relate seem to call for demonstrating a number of abilities simultaneously and to require integrating them as well.

DOES A COLLEGE DEGREE MAKE A DIFFERENCE IN THE KINDS  
OF ABILITIES DEMONSTRATED BY OUTSTANDING PROFESSIONALS?

A college degree has been criticized as merely a "paper qualification," a necessary line on one's resume. Some argue that persons without college degrees can perform just as well if they have the same on-the-job training and experience. In the studies of outstanding professionals we are conducting, we have been especially interested in the relative contribution of education and job experience.

A finding from the study of registered nurses<sup>1</sup> suggests that experience is not enough -- in fact, education is critical. First we identified several abilities that describe outstanding performance, drawn from what professionals said they actually did in their jobs. We then examined the extent to which each of these abilities was related to education (a bachelor's degree vs. less than four years of college) and experience (five years or more vs. less than five years).

Three of the nine abilities or competences we identified are:<sup>2</sup>

HELPING	Taking action to help a client or subordinate when both are seeking the same goal.
INFLUENCING	Taking action to change a client or subordinate's behavior when he/she may have a different goal than the professional.
COACHING	Using a variety of strategies to instruct, train or encourage clients or subordinates to change their behavior and their motivation to accept more responsibility for themselves or for their jobs.

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<sup>1</sup>M. Mentkowski, V. DeBáck, J. Bishop, Z. Allen, & B. Blanton, Developing a Professional Competence Model for Nursing Education. Paper presented at the meeting of the American Educational Research Association, Boston, MA, 1980.

<sup>2</sup>In-depth descriptions of each ability can be found in the Codebook.

One important difference between these three abilities is that helping is easier to demonstrate than influencing, which is in turn easier to demonstrate than coaching. If we review the brief descriptions we can see why. If a client who has a heart condition agrees that he needs to exercise, I can help him get started. I may walk with him, go with him to exercise class, monitor changes, etc. What I must do will be far more difficult if the client does not agree. I must influence him to change his behavior, even though he may not see its value. But if I am to have a lasting effect, I must demonstrate effective coaching. I must change his own attitudes and motivation to exercise, so that he takes responsibility for his own wellness.

The same may apply to other professions. To change the behavior of a child who agrees to change becomes quite a different task when the child does not wish to change. Influencing may be required, and in the long run, coaching. A child with "math anxiety" or one who is engaged in a music therapy program will probably need extensive coaching. Getting a subordinate to take responsibility for his/her job can likewise require a variety of coaching strategies.

What did we find about the value of education and job experience in our study of professional nurses?

HELPING	Amount of education or experience was not related. Professionals with greater or lesser experience and greater or lesser education all performed <u>helping</u> equally well.
INFLUENCING	Amount of experience was related, amount of education was not. Professionals who had five years or more of experience demonstrated <u>influencing</u> more often, regardless of education.
COACHING	Amount of education was related, amount of experience was not. Professionals who had a bachelor's degree demonstrated <u>coaching</u> significantly more often than those who had less than four years of college -- no matter how many years' experience they had.

Experience was necessary to demonstrate influencing in part because it is a more complex skill than helping. But opportunity for influencing is probably also related to what kind of position a person holds -- the staff nurse, at an entry level position, has less opportunity to deal with situations requiring influencing than a more experienced supervisor. Education is critical for the most difficult ability to demonstrate, coaching. Nurses with a bachelor's degree were significantly more likely to demonstrate the most complex and difficult of the professional competences.

Two other competences were enhanced by education:

INDEPENDENCE            Taking action when there is no external pressure to do so; taking the advocacy role for a client; acting on her own judgment and taking responsibility for it.

CONCEPTUALIZING      Linking information, using concepts, creating rationales for behavior and judgment.

Professionals with a bachelor's degree showed significantly more instances of independence. Conceptualizing behavior increased significantly with experience, but professionals with a bachelor's degree were significantly less likely to make conceptualizing errors that included failure to link information and apply concepts, and to see overriding principles that could guide her behavior.

Our conclusion is that previous job experience is important to developing abilities and skills at work, and that a college degree is critical for the more complex abilities. Education and experience are both important; how can we make them work together?

## WHAT ARE THE IMPLICATIONS FOR HIGHER EDUCATION?

From our review of students, alumnae and other professionals demonstrating "learning to learn" at work, we can derive several implications for higher education.

First, what abilities need to be learned and assessed in college to enable learning to learn at work? It seems clear that learning at work requires perspective-taking -- standing back from a situation one has just experienced and looking at it from several points of view. Alumnae and professional managers have shown us also that "thinking" -- analyzing situations against some theoretical framework or goal and conceptualizing a plan of action -- is critical. Role-taking, writing out what happened, comparing possible courses of action against alternatives, contrasting a current situation against one's educated judgment, are some of the other abilities used. Persons also generalized across a number of situations in creating an action plan.

In the experiential learning courses and seminars that accompany student OCELS at Alverno, some new instructional tools are now being used that further strengthen "learning to learn" skills. One such tool, developed in response to the interview data, is the "Experiential Learning Incident Log."<sup>1</sup> This log asks students to record work situations in which they learned, and questions guide the student to develop a continuous narrative. First, she creates an accurate description of what happened in the situation, focusing on the circumstances that led up to the incident, her own and others' activities and conversations, and the outcome. Then she records what she was thinking and feeling about what she did and others did during the situation itself.

The log questions then ask her to step back from the situation and

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<sup>1</sup>Developed by the Office of Evaluation, Department of Management and Department of Professional Communications, Alverno College.

analyze what she intended to accomplish, and to take on the perspectives and intentions of others in the situation. Other questions guide her to analyze what she thinks and feels now about the incident, to look for cause/effect relationships, and to form generalizations across similar situations. Then she is asked to comment on what she learned, and to plan an improved performance.

Once this is done, further log questions encourage the student to compare her observations to theoretical frameworks she is learning. To help her develop her own "theories," she is also asked to discuss the ideas and concepts that guided her actions. She also identifies the skills and abilities she will need in situations like this one and specifies ideas and concepts that seem to apply now. After she has completed several logs, she repeats this process over a number of her collected situations, in dialogue with her peers and instructor.

Another tool<sup>1</sup> used in OCEL seminars helps a student to evaluate and assess her own working style from the perspective of her employer. She then compares this "projected evaluation" with her mentor's actual evaluation of her work. Here she not only describes her own behavior, but takes on another's perspective, makes evaluative generalizations about her behavior from that point of view, and takes an objective stance about her work.

It seems clear that college learning needs to provide some very important processes if students are to benefit from concurrent job experience, and to be able to transfer abilities they learn in college to their future work settings. Teaching skills in "learning to learn" at work is one way for higher education to prepare graduates who will not only find entry-level positions but will also achieve mobility and growth in their career development.

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<sup>1</sup>Developed by Patricia Hutchings, Coordinator, English Department, and Allen Wutzdorff, Chairperson, Behavioral Sciences Division, Alverno College.  
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March 2, 1981

Dear Participant,

One of my responsibilities as director of this study is to disseminate information as it accumulates, rather than wait until "firm conclusions" are in hand. As you know, I have shared pieces of information with you in the past. With this report, I am bringing some results to you that I hope you will find of particular interest and assistance.

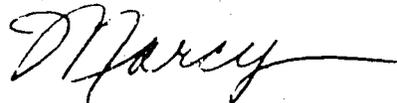
In the last progress report, I described what we understood so far about the development of thinking in college. I used several terms -- analysis, cognitive structure, perspective-taking, abstract conceptualization -- to discuss the initial findings about thinking that seemed to come together after two and one-half years of work.

In this report, I will be discussing thinking again, but as an important part of learning to learn at work. How do students learn to learn during OCEs or other clinical work experiences? How do alumnae and other professionals who have contributed interviews and questionnaires learn to learn at work? What abilities do they use in new situations?

I am also interested in what you have to say. I will be discussing this report with you in specially arranged individual and group sessions this month. At the end of the scheduled inventory collection day this year, I have also set aside time for discussing other issues and questions you want to raise about the work.

I hope this report will both stimulate your thinking and express my appreciation for your valuable contribution.

Cordially,



Marcia Mentkowski, Ph.D.  
Director of Evaluation

MM: vvp



Alverno College

March 19, 1981

Dear Participant,

One of our responsibilities to you as a participant in the evaluation studies is to disseminate information as it accumulates, rather than wait until "firm conclusions" are in hand. With this report, we are bringing some results to you that we hope you will find of particular interest and assistance. We would like you to receive some immediate benefit from your participation.

The August, 1979 written progress report described what we understood so far about the development of thinking in college. Several terms — analysis, cognitive structure, perspective-taking, abstract conceptualization — were used to discuss the initial findings about thinking that seemed to come together after two and one-half years of work.

When we met with you in Fall, 1980 (or 1/81) ("What Have I Achieved: Feedback and Dialogue") we discussed the relative effects of education and experience on the development of thinking and other professional abilities in women, as understood from recent results from student performance on the inventories, and the studies of professionals.

In this report, thinking is discussed again, but as an important part of learning to learn at work. How do students learn to learn on the job, during OCELS or other clinical work experiences? How do alumnae and other professionals who have contributed interviews and questionnaires learn to learn at work? What abilities do they use in new situations?

The report you receive after the May inventory collection will contain your third individual profile and group results from the Learning Style Inventory. Other reports will follow as results accumulate.

We are also interested in what you have to say. At your scheduled inventory collection time held during May 1-3, we will be able to discuss other issues and questions you want to raise about the work.

We hope this report will both stimulate your thinking and express our appreciation for your valuable contribution.

Cordially,

Marcia Mentkowski, Ph.D.  
Director of Evaluation

S. Austin Doherty  
Academic Dean

MM:jr



Alverno College

August 8, 1980

I am writing to recognize and commend you on your contribution to the important work being conducted here at Alverno on the outcomes of the college experience. I invite you to a special feedback and dialogue session describing recent outcomes of the study that I think you will find valuable during your next year's work in your professional area.

This session will be held during your first weekend this fall, and is noted on the schedule that was mailed to you this week. The title of the session is "What Have I Achieved? Feedback and Dialogue with Austin Doherty and Marcia Mentkowski, Director of Evaluation." We have scheduled two identical sessions to enable you to attend:

Saturday, August 23, 1980 in Wehr Hall  
11:45 to 1:00 — immediately after the colloquium  
all students will be attending

Sunday, August 24, 1980 in Wehr Hall  
11:30 to 12:30

Together we will present some of the initial study outcomes, including the development of various perspectives on learning you have achieved during your first two years at Alverno, as measured by the inventories you completed in Fall, 1977 and again in Fall, 1979. We also plan to review what is understood so far from the professional studies of nurses, and women managers and executives. We will discuss the abilities that have emerged from the interviews and relate them to those we have been assessing here at Alverno. At this session, you will receive some materials that will outline plans to involve all students who entered Alverno in Fall, 1977 in a final evaluation during assessment week, May 1-3, 1981.

As a contributor to this project, you have already demonstrated the kind of professional commitment that will benefit not only yourself and other students, but your profession as well. Your future colleagues tend to have even more confidence in your abilities as a professional when they are aware that ongoing studies are being conducted to continuously demonstrate the effectiveness of the educational process you have completed.

Join those professional women in the Milwaukee area whose contribution is also reflected in the study outcomes we will share with you in this special session.

I welcome you to another academic year, and to this opportunity to discuss our mutual efforts to prepare each other for our future work.

Sincerely,

Austin Doherty  
Academic Dean

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AD:mca

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August 22, 1980

Dear (Student's name):

During your first week at Alverno, you are meeting with Dean Austin Doherty and Dr. Marcia Mentkowski in a feedback and dialogue session describing the outcomes of the evaluation study you have participated in since you entered Alverno in Fall, 1977. I am writing to lend my support to this work, to commend your contribution, and to ask for your continued assistance during Spring Semester, 1981. I also wish to communicate that all of us in the Behavioral Sciences Division are very enthusiastic about this project and are giving our full support to this effort. The insights we gain about the learning and abilities of adult students are invaluable in improving the curriculum and in providing the best possible assistance to you in meeting your goals.

An example that comes immediately to mind is the group results from the Learning Style Inventory, which were mailed to you following your two previous participations. These results were presented to the faculty in late May. At that time, David Kolb, professor at Case Western Reserve University, author of the Learning Style Inventory and originator of experiential learning theory, met with the faculty to discuss his recent insights on how adult students and career professionals learn. Together with Dr. Mentkowski, he discussed Alverno student preference patterns on the Learning Style Inventory and drew implications for college curricula. Dr. Kolb also met with faculty who are working to increase the ways in which learning can occur in the variety of off-campus experiential learning settings students experience. Thus, the results from just this one inventory are serving as important guidelines for faculty, and have also validated that students as a group leap dramatically in their preference for abstract conceptualizing after two years in college, an important step if learning in settings off-campus is to accomplish its goals.

I am also writing to ask for your continued assistance during the Spring Semester, in 1981. Since this work is an institution-wide effort, the chairpersons and faculty have set aside time for the inventory collection. We are well aware that many of you will have increased responsibilities as you near the end of your Alverno studies, and we have arranged for your participation this spring in a way that will enable you to contribute as part of the regularly scheduled weekend of May 1--3, 1981. I will notify you shortly after the start of the semester in January, 1981, just where and when participation is scheduled. Those of you graduating this semester will be involved in December.

APPENDIX DD continued

I know that you have had a number of opportunities to hear Dr. Mentkowski discuss the study purposes and outcomes since 1977 and have received three written reports. I have just read the report she is giving you now. Still, I would like to add a note to her comments, to underscore the importance of your contribution.

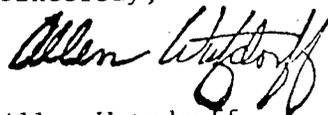
You are an irreplaceable part of a longitudinal evaluation study. We are investing time and resources in this project -- and asking you to contribute your time and efforts -- because we are interested in evaluating changes in learning. To know how your class fares at Alverno, we really need to look at how effective the program is in promoting learning, from beginning to end. Aggregate data and group scores alone can obscure the unique growth patterns and achievements that tell us what has really happened in the educational process. Only longitudinal evaluation studies, looking at changes in learning across time, can reveal these patterns.

The particular inventories used in this study look rather different from most or all of your course assessments, but they have been chosen as "outside" measures of general ability areas similar to the competences with which you are familiar. Many have also been shown to relate significantly to future professional performance -- as we expect the Alverno curriculum to do.

The benefits from this study will multiply over the years. Of course, you will receive individual feedback on the Learning Style Inventory once again, and other group results like the current report. But your participation will also increase the status of your degree, in that your future colleagues tend to have even more confidence in your abilities as a professional when they are aware that ongoing studies are being conducted to continuously demonstrate the effectiveness of the educational process you have completed. In taking this opportunity to again demonstrate your professionalism by contributing to such an effort, you join 84 nurses and 115 women managers and executives in the Milwaukee area who have also contributed a picture of their abilities. Your work complements and extends similar participation by students from two weekday classes and the alumnae of the class of 1978, many of whom interviewed on campus this summer to create a picture of the abilities needed for "life after college."

Your contribution toward describing abilities learned in college by adult women in Weekend College can make a difference ~~to you~~, to other women in higher education, and to the professionals you will join as colleagues.

Sincerely,



Allen Wutzdorff  
Chairperson  
Behavioral Sciences Division

AW:mt



Alverno College

November 14, 1980

Dear (Student's name):

I am writing to remind you of the feedback and dialogue sessions that Marcia Mentkowski and I will be conducting Saturday, November 22, and Sunday, November 23, and also to notify you of an addition to the schedule. Several students have told us that they cannot attend the Saturday sessions because they have class until 1:00 p.m. In order to allow everyone to attend, we have scheduled an additional session Saturday, from 1:00 to 2:00 p.m. All sessions will be held in Alumnae Hall.

I've enclosed a form for you to indicate which of the three sessions you will attend. If you cannot attend any of these sessions, we will call you to schedule another time.

I am looking forward to seeing you next weekend.

Sincerely,

Austin Doherty  
Academic Dean

AD:mca  
Enclosure

NAME: \_\_\_\_\_

I will attend one of the sessions scheduled.

Saturday, November 22, 12:00 - 1:00

Saturday, November 22, 1:00 - 2:00

Sunday, November 23, 12:00 - 1:00

I cannot attend any of the scheduled sessions.  
Please call to arrange another time.

PLEASE RETURN TO MARCIA MENTKÓWSKI'S MAILDRAWER BY SATURDAY, NOVEMBER 22.



Alverno College

January 7, 1981

Dear Weekend College Student,

Remember the invitations you received last semester to attend a feedback and dialogue session with Marcia Mentkowski and me? While most of the students involved were able to attend, some of you had scheduling conflicts, etc., that did not allow you to come at the times we scheduled. Consequently, we are scheduling two additional feedback and dialogue sessions:

Saturday, January 17	12 noon to 1:00 p.m.	Alumnae Hall
Sunday, January 18	12 noon to 1:00 p.m.	Alumnae Hall

(Bring your lunch if you wish)

I have enclosed a form for you to fill out to indicate which session suits you best.

Together we will present some of the initial study outcomes, including the development of various perspectives on learning you have achieved during your first two years at Alverno, as measured by the inventories you completed in Fall 1977 and again in Fall 1979. We also plan to review what is understood so far from the professional studies of nurses, women managers and executives. We will discuss the abilities that have emerged from the interviews, and relate them to those we have been assessing here at Alverno. At this session, you will receive materials that will outline plans to involve all students who entered Alverno in Fall 1977 in a final evaluation during assessment week, May 1-3, 1981. Other materials on the study outcomes are also included in your packet.

Your professional commitment as a contributor to this project is greatly appreciated. Welcome to another semester, and to this opportunity to receive feedback and to dialogue on our mutual efforts.

Sincerely,

Austin Doherty  
Academic Dean

AD:dvp  
Enclosure

APPENDIX EE continued

NAME \_\_\_\_\_

I will attend one of the sessions scheduled:

Saturday, January 17 12 noon to 1:00 p.m.

Sunday, January 18 12 noon to 1:00 p.m.

I cannot attend any of the scheduled sessions.  
Please call to arrange other time.

PLEASE RETURN TO MARCIA MENTKOWSKI'S MAIL DRAWER BY SATURDAY, JANUARY 17.

**MEMO**

**TO:** (Faculty member's name)

**FROM:** Marcia Mentkowski  
S. Austin Doherty

**DATE:** April 3, 1981

**RE:** Inventory collections for WEC students entering Fall, 1977

As you know, this Spring is the final inventory collection for our longitudinal study of college outcomes.

Students who entered Alverno in Fall, 1977 are participating. This year we have scheduled the WEC inventory collection to take place during the weekend of external assessments (May 1-3). Students who complete their external assessment Friday, May 1, are scheduled to participate in the inventory collection Saturday, May 2, and students who complete their external assessment Saturday will be participating in the inventory collection on Sunday, May 3. All participants were mailed their schedule April 1. Two weeks before that mailing, these students were sent a letter from their Division Chairperson inviting their participation and explaining how their schedule came about. Also included with this letter was a letter from Marcia Mentkowski with "Questions and Answers about Evaluation Studies at Alverno College", which gives a detailed rationale for student involvement, and describes how their participation will benefit other students and professional women. (See materials attached)

Now we would like to mail, distribute to each participant a copy of the progress report, which as you may know we created to describe to these participants some of the initial results of the study, to let them see some outcomes, and to encourage their participation.

Would it be possible for one of us to come to your class for just a few minutes to speak to the persons involved, and to give them their personal copy of the progress report? \_\_\_\_\_ would be visited on \_\_\_\_\_ at \_\_\_\_\_ and \_\_\_\_\_ students would be involved.

Please return the bottom part of this memo to Marcia's mailbox by Tuesday, April 7. Thank you!

I can assist you by making my students available to you as scheduled above.

I will be unable to assist you.

cc:

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Alverno College

March 19, 1981

Dear Participant,

You may recall my letter to you inviting you to continue your participation, during external assessment weekend May 1-3, 1981, in the evaluation studies on the outcomes of the college experience. My letter was distributed during your session with Dean Doherty and Marcia Mentkowski ("What Have I Achieved: Feedback and Dialogue").

The third and final inventory collection from the Weekend College Charter Class (students who entered in Fall, 1977) will again assess your abilities in a number of areas related to future professional performance and will help complete the picture of your college experience over the years.

We are well aware that many of you are nearing the end of your studies, and may have more responsibilities this semester. Therefore, we are reviewing your personal schedule for external assessment weekend. We are scheduling your inventory collection period to consider your external assessment(s), to include time for lunch and "breaks," and to minimize fatigue. You will, for the most part, be working at your own pace. Students take different amounts of time to complete the inventories; most complete the work well within the time scheduled. But you can judge best from your experience just how much of the scheduled time period you will personally need.

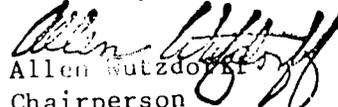
You will be receiving your individual schedule by April 2, 1981.

Your schedule will include time for your external assessment inventory participation.

You are an irreplaceable part of the longitudinal study. You have already demonstrated a commitment to research that will benefit other students and professionals for years to come. And we will continue our commitment to you to apprise you of results. You will, of course, be receiving your Learning Style Inventory profile again. The progress report of some current results you will receive in April, also describes some curriculum improvements built on initial study results. You will continue to receive results, even after graduation.

Your participation in this important work is invaluable and greatly appreciated.

Sincerely,

  
Allen Wutzdorfer  
Chairperson  
Behavioral Sciences Division

AW:ls1



Alverno College

April 1, 1981

Dear WEC Colleague:

Congratulations! You have nearly completed another challenging semester of Weekend College. To culminate this experience, and your learning, we have scheduled the spring round of WEC External Assessments.

Based on the courses you are taking, your external assessments are listed below. An inventory collection period has also been arranged for you, as the attached note from Marcia Mentkowski explains.

<u>Date</u>	<u>Assessment</u>	<u>Time</u>	<u>Location</u>
Sat. May 2	Inventory Collection Period	8:00 a.m. - 12:00 p.m.	College A

Please report promptly at the times indicated.

If you have any questions about the External Assessment, please call Lori Miller in the Assessment Center at 647-3928. Questions related to the Inventory Collection Period should be directed to Marcia Mentkowski at 647-3811.

We join in wishing you every success as you demonstrate your unfolding abilities!

Sincerely,

Lavetta Meyer  
WEC Coordinator  
Assistant to the Dean

Lori Miller  
WEC Assessment Coordinator



**Alverno College**  
3401 South 39th Street / Milwaukee, WI 53215