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ABSTRACT

In fall 1993, Coffeyville Community College (CCC) in Kansas announced the implementation of a new program known as Quantifying Learning Outcomes (QLO), one component of the college's Student Outcomes Assessment Plan. QLO calls for a clear articulation of CCC's goals regarding instructional support materials within the next 6 to 12 months; the revision of all course syllabi to include clearly stated instructional competencies and outcomes; the use of pre- and post-tests in every class using test items indexed back to specific learning outcomes; and on-going investigations of both student achievement and the level of appropriateness of course competencies and outcomes. To accomplish these objectives, in-house training and resource materials were made available to all faculty. In addition, PC-based TRACKER software was developed to assist instructors in developing, categorizing, and analyzing instructional competencies and outcomes. TRACKER provides an easy method of maintaining student records concerning what outcomes have been achieved. TRACKER's investigations package enables instructors to run simple numerical and statistical tests on classroom data. The document includes a discussion of the terminology used in current instructional paradigms; a brochure explaining the QLO program; and an instructional booklet for faculty on the TRACKER system. (KP)

QUANTIFYING LEARNING OUTCOMES: A GENTLE APPROACH

Presentation for
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Austin, TX

May 22-25, 1994

By

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Quantifying Learning Outcomes:
A Gentle Approach

> "Things are changing so fast that even the future isn't what it used to be." Yogi Berra

In the Fall of 1993 Coffeyville Community College announced the implementation of a new program. This program calls for the revision of all course syllabi, the writing of instructional competencies and outcomes, and the use of pre and post tests in every class. This series of activities came to be referred to as "Q.L.O." or Quantifying Learning Outcomes.

The factors which led to the decision to embrace these instructional strategies are many and include the Kansas State Department of Vocational Education's requirement to validate learning in all vocational programs. In addition, the North Central Association of Colleges and Schools decision to require all colleges and universities to document academic achievement in all course work especially those courses identified as core courses in the General Education sequence, played a decisive role in the launching of this program. Lastly, Coffeyville Community College has a seventy year history as a provider of quality higher education. The college sensed a "shift in the instructional paradigm" sweeping the nation and was quick to respond to this.

The definition (McDaniel, 1994) of a "paradigm shift" suggests that it represents a set of rules and regulations (Written or unwritten) that does two things:

1. Establishes or defines boundaries.

2. It tells you how to behave within the boundaries to be successful.

Spady & Marshall (McDaniel, 1994), leading proponents of Outcomes Based Education (O.B.E.), agree that " ... more, longer, and harder" must give way to " ... different, smarter, and better."

McDaniel goes ahead to speculate that college professors in the future will increasingly be asked to:

1. Define goals of instruction as measurable outcomes.

2. Concentrate on the kinds of outcomes that promote critical thinking, problem solving, and creativity that will serve the future citizen in a changing world.

3. Construct student evaluation opportunities that call for an integrating response.

4. Adjust time spent by students so that mastery is the goal.

5. Work to assure student success by using criterion-based evaluation rather than norm-based evaluation.

6. Redesign curriculum around priority outcomes to be performed by students in a performance context.

Anyone who has been in education for a while realizes that these "shifts in paradigms" occur periodically and in many instances cause significant upheaval among educators as they scramble to bring their efforts in line with the new paradigm. Interestingly, the pressures for change are usually exerted by individuals and groups from outside the educational system. Among the pressures brought to bear are:

1. Excellence - To compete in the world market place, we must address the issue of higher level thinking and sophisticated technical skills.

2. Accountability - Must prove that we are worth the increasing cost to the tax payer.

3. Information - Print information as the basis for the Knowledge industry will no longer suffice. Emphasis must be placed on incorporating computer networking, databases, and the hypermedia technology.

Common to all instructional paradigms is the vocabulary used to identify its key points. Currently the terms most in vogue include:

1. Critical Thinking - Based on Bloom's taxonomy of cognitive skills, critical thinking would be typified by components of analysis, synthesis, and evaluation. These skills involve the processing of information to arrive at generalities from which further information may be derived. (Inductive reasoning).

   A storm of controversy rages over the issue of rather or not "critical thinking" can be taught. That is, is it possible to teach critical thinking skills apart from subject matter. As McPeck(McPeck, 1990) puts it, " thinking is also about something, to think about nothing is a conceptual impossibility." Critical thinking guru, Richard Paul, believes that seminars on developing critical thinking skills apart from subject matter can be successful.

2. Understanding - Understanding represents an area of intense interest of recent years. Teachers quite often realize that students have acquired information but do not "understand" related concepts. According to the Harvard Graduate School of Education in their recent "Teaching for Understanding Project", (Perkins & Blythe, 1994) the following definition for "understanding" is proposed:

   " ... The ability to do a number of thought demanding activities such as:

explaining, finding evidence, applying, analogizing, and representing the topic in a new way (Understanding Performance)." Perkins and Blythe in their article "Putting Understanding Up Front" suggest that to teach a youngster to roller skate, rather than having the child read books about it, or watch someone else do it, the child must be engaged in that particular activity himself. The "mainstay" of learning for understanding is the engagement on the part of the student of those performances which involve higher levels of learning.

The Harvard Project proposes a four part framework for the teaching of understanding:

A. Generative Topics

Not all topics lend themselves as well for the teaching of understanding. Statistics does well in this regard however, the quadratic formula, while equally important, does not.

B. Understanding Goals

Too many generative topics can occur. Some focus must be used. "Students will understand the features that make the Boston Tea Party like other political protests from historical various historical periods."

C. Understanding Performances

Must extend over a unit of study, several weeks to a month. Preferably students will end up doing some culminating activity such as an extended essay or exhibition.

D. Ongoing Assessment

Students need continual feedback from the instructor or peers. They need opportunity for reflection on "public criteria", or outside scrutiny of their project.

3. Metacognition

Metacognition is the newest of the "hot" topics to consider while designing instructional systems. According to Weinert(Weinert, 1987), "Metacognition are second order cognitions; thoughts about thoughts, knowledge about knowledge, reflections about actions." Requiring students to consider "how" they learn best, what works for them, what study habits lead to success, etc. In addition to these, suggest that the students consider concepts in relation to other concepts, what they have in common, how best they might learn new concepts based on material already learned.

4. Competencies/Outcomes

A search of the literature quickly reveals no overall agreement on the definition of the terms "competencies" and "outcomes". To compound this problem, teachers who have been around for awhile may find some confusion with these terms and earlier terms such as behavioral objectives and goals.

Initially one is tempted to suggest that which terms a person use makes little difference as long as the instructional process is served. However, given the reality of the times, it is advantageous for all us to use the terminology suggested by the various state departments of education and regional accrediting agencies. This is especially true if we are seeking funding or some type of program approval from external authorities.

One definition for competencies according to McAshan(McAShan, 1979), is " ... the knowledge, skills, and abilities or capabilities that a person achieves, which becomes part of his or her being to the extent that he or she can satisfactorily perform particular cognitive, affective, and psychomotor behaviors. They represent the intents of a program and are stated as specific goals to be achieved."

Competencies at Coffeyville Community College are viewed as statements of learning supported by observable and measurable "outcomes". This is not to say that others are wrong if they use these terms differently, but that there should be a set of agreed upon terms in use by everyone participating in the same instructional activities.

Direct Assessment of Student Academic Achievement
At
Coffeyville Community College

Coffeyville Community College has implemented a bold and ambitious program of instructional assessment. This program is one component of the Student Outcomes Assessment Plan developed and adopted by the college in the Fall of 1993. The identified benchmarks of this program are:

1. Identification of Courses

Courses designated to be brought into the mainstream of activities, which by this time will be essentially all academic and vocational offerings.

2. Identification of Specific Performance Objectives

(Competencies). Competencies and outcomes have been written for essentially all course.

3. Evaluation/Revision of Current Syllabi

Syllabi revision for all classes taught.

4. Pre/Post Testing

Pre and post testing for each class offered.

5. Correlation of Exams and Specific Performance Objectives

This correlation activity will provide for close monitoring of instructional efficacy.

6. Systematic Evaluation of Instruction

A systematic means of analyzing student achievement feedback allowing for the suggested modifications of instructional materials and/or procedures.

TRACKER SYSTEM SOFTWARE

Any attempt to implement a comprehensive, quantifiable system of instructional evaluation involves a number of reports to be generated, files to be kept, and no little amount of math to be used in the documentation process. Taking advantage of the availability of pc's by the faculty both in their offices and at home, a complete software system was developed to assist in "tracking" student achievement, writing competencies, and quantifying learning outcomes.

The faculty of Coffeyville Community College was invited to learn this software by means of several short training sessions. Although no coercion was used, approximately one-third of the faculty took advantage of the opportunity to attend training sessions, with the understanding that upon completing the three sessions, they would be given a free copy of this pc-based software for use on their own computer.

A partial list of reports generated by "TRACKER" includes:

A. Analysis & Categorization of Competencies

B. Summary of Class Academic Achievement

C. Individual Academic Achievement

D. Pre/Post Test Analysis

E. Correlation of Items

F. Looking for Predictors

Conclusion

Coffeyville Community College is excited about the changes occurring within its instructional areas. Much has been learned, and there is much yet to learn about the process of quantifying student academic achievement. While results are sought after, it is the process that is most important. Anytime a group of professionals join together to seek "improvement" of instruction, good things happen and all benefit.

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COFFEYVILLE COMMUNITY COLLEGE

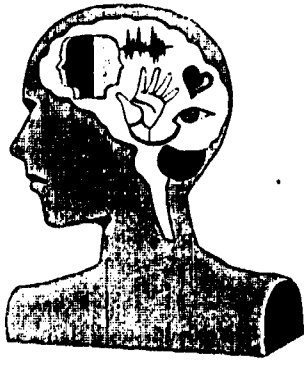
A college with Caring, Commitment, and Challenge for all students

Q.L.O.

Quantifying

Learning

Outcomes



A Closer Look at Learning.....

Q.L.O. HISTORY

In the Spring of 1994 Coffeyville Community College launched a bold and innovative program known as QLO or Quantifying Learning Outcomes. This program has as its primary focus the following specific components:

1. A clear articulation of where CCC must be within the next si to twelve months with instruc ional support materials.

2. A call for uniform course syllabi utilizing clearly stated, specific instructional competencies and outcomes.

3. Pre/post testing in every class using test items indexed back to the specific learning outcomes.

4. Enhanced record keeping documenting student academic achievement both by class as well by individual.

5. On-going investigations of both student achievement and the level and appropriateness of course competencies and outcomes.

THE COURSE OF ACTION

All faculty are required to redo their syllabi including instructional competencies and pre/post testing in their classes. It is important to note, however, that the manner in which they embark on this journey is largely left up to the individual instructor. The institution clearly refrains from mandates and yet makes every effort to provide assistance wherever possible.

"Are you sure you know how much your students are learning?"

CRITICAL COMPONENTS

To accomplish the above stated activities, several critical components have been put into motion:

1. In-house training and/or resource materials were made available to all faculty.

2. PC-based software was developed to assist instructors develop, categorize, and analyze instructional competencies and outcomes.

3. PC-based software was developed to maintain records of student achievement of competencies as well as to do simple numerical tests to gauge student learning.

4. Instructors were invited to participate in software usage sessions with those finishing all three parts eligible for a free copy of the instructional software to use at home or in their office. This does much in the way of encouraging staff to develop and analyze ideas in private with the option of releasing findings for archiving purposes.

TRACKER SOFTWARE

TRACKER software is a system of programs designed for ease of use and pc compatibility. This user-friendly package consists of three major components:

COMPETENCY EDITOR

This section assists the instructor in the preparation, categorization, and analysis of instructional competencies and outcomes. Information is built into the system concerning Bloom's Taxonomy, important predicates, cognitive, psychomotor, and affective domains; and information and provisions for "megacognitive" activities.

"... you say you want the outcomes achievement record for who? ..."

STUDENT RECORDS

TRACKER provides an easy and convenient method of maintaining student records concerning what outcomes have been achieved. Reports generated include, among others, printouts for individual students as well as total class reports. The class reports summarize for the instructors what competencies are giving the student the most difficulties. In addition, TRACKER reports what percentage of the class is achieving at or above 80% level.

CLASSROOM INVESTIGATIONS

TRACKER's investigations package enables the instructor to quickly and easily run simple numerical and statistical tests on data gathered in the classroom. This is particularly helpful when trying to establish what changes are taking place, Pre/post test analysis, or in writing grant summations.

"The improvement of understanding is for two ends; first, our increase of knowledge; secondly, to enable us to deliver that knowledge to others ..." JOHN LOCKE

SUMMARY

Across the country more and more state Departments of Education and various regional accrediting associations are requiring some documentation of academic achievement on all students, more for those students enrolled in vocationally approved programs of study.

Coffeyville Community College is meeting this challenge head on. With the leadership of its administration and the commitment of its faculty, CCC is well along in this process. We are willing to share our findings with others and assist in any way we can those interested in similar adventures.

Move your instructional strategies into the "Information Age" and don't sweat the reports!

TRACKER SYSTEM SOFTWARE

Produced & Distributed
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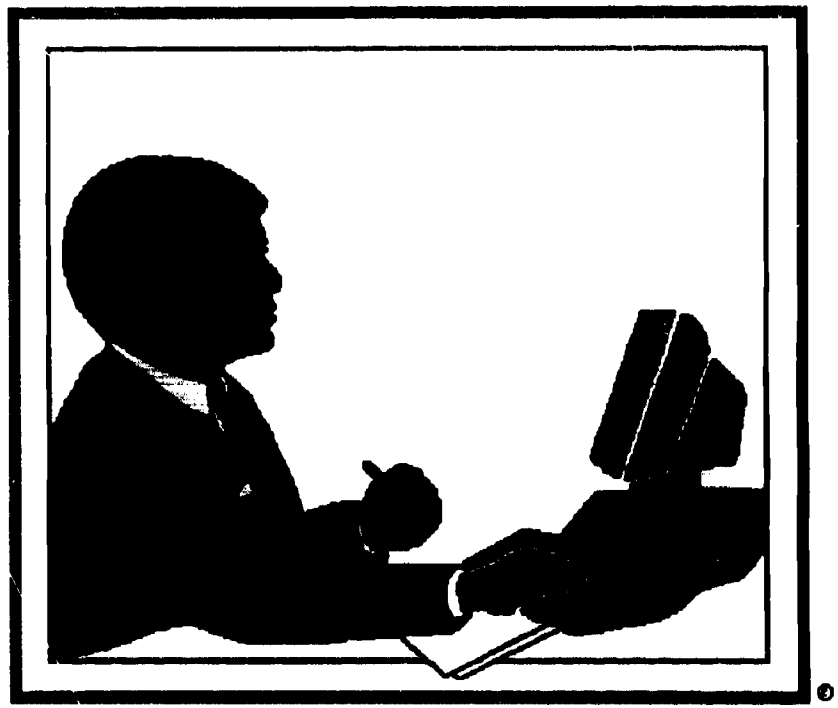

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CHAPTER 1

INTRODUCTION

About the Program

Welcome to the TRACKER SYSTEM! TRACKER is a system of some ten programs working together to produce a powerful aid to the classroom instructor. This system will assist you in three separate but related areas:

1. Writing, editing & analyzing instructional competencies and outcomes.

2. Recording, monitoring and reporting on class as well as individual academic achievement.

3. Pre/Post testing analysis and an introduction to other classroom investigations.

Hardware Requirements

The minimum hardware requirements to run
TRACKER satisfactorily are:
An IBM compatible PC, 386 or better.
DOS 3.1 or later, preferably 5.0 or later.
Hard disk with at least 2 or 3 MB of free space, and at least one high density floppy disk drive.
A minimum of 2 MB RAM memory as TRACKER runs almost totally in protected mode.
Color monitor.
Mouse(optional).

Installation

The TRACKER SYSTEM comes on either three 5.25" or three 3.5" high density floppy disks. Two of these disks are marked as system disks #1 and #2, the third disk is a data disk.

1. At the C> make either drive A or drive B active(depending on which you will be using to install the program)by issuing the A: or B: command and pressing enter.

2. Place disk #1 in the drive and type "INSTALL"

3. You will be prompted to remove this disk in a few minutes and insert disk #2. When disk #2 is finished installing, you may be asked to insert the disk with the batch file. If so, simply place disk #1 back into the drive and press enter. The installation process is now complete.

4. Make "C" your active drive by entering C: and pressing enter.

5. At the C prompt type "TRACKER" (without the quotes), this should load the TRACKER program and bring you to the opening screen.

6. Place the DATA disk in either drive A or B and select that as the default drive on the opening screen.

Selecting Printer

It is recommended as a part of the installation, that you proceed immediately to the UTILITIES menu and select your default printer. Simply press the spacebar until you see the printer of your choice and press enter If you do not see your printer listed, and if your printer is a dot matrix type, it is recommended that you select the "IBMPRO". This is an almost universal setting for dot matrix printers.

TRACKER will use this printer every time you start the program. If you ever need to change this setting simply repeat the above steps.

Customizing TRACKER

Using the same UTILITIES menu and selecting the BROWSE CUSTOMIZE FILE option, a screen appears which allows the user to enter his/her name, school, department of division, etc. This information is used by TRACKER on the opening screen and on various reports generated by the TRACKER system. These settings may be changed at any time by repeating the above mentioned steps.

Using a Mouse

TRACKER makes extensive use of popup menus and various types of entry fields. Some people will find it easier and quicker to navigate through these using a mouse. While TRACKER supports mouse usage, if you prefer not to do so, keyboard strokes are very simple and quite ample. Note: TRACKER automatically looks for and can detect an active mouse system. The operator has to do nothing to use his mouse with TRACKER.

Using the Audio Cassette

The audio cassette which accompanies TRACKER is a brief(45 minutes or so)recording designed to walk you through the various reports TRACKER generates and may be of help to the user at this time or at any time later.

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CHAPTER 2

RELATED INSTRUCTIONAL TOPICS

The Paradigm Shift

The educational literature of today is full of references to the need for a shift in instruction to more clear and quantifiable types of outcomes. One of the major trends in this area is the O.B.E. or Outcomes Based Education. This system requires that the instructor:

1. Clearly articulate to the student what it is that he is to learn. This often takes place by the use of instructional competencies and outcomes.
2. Pretest the student on these competencies to ascertain the level of achievement which he brings to the class at the outset.
3. Instruct the student using the competencies and outcomes as a guide both to the various instructional activities and assessment.
4. Post test the student, ascertain what has been achieved and what has not.
5. Use the achieved outcomes and those not achieved to serve as indicators as to how the content, delivery, and/or assessment might be enhanced.
6. Make the suggested changes within the instructional system and repeat the above steps starting with step 1.

Competencies & Outcomes

A "competency" is a topical statement of what it is to be learned. Each competency is accompanied by one or more "outcomes" which state what actions the student will demonstrate to prove that he has mastered that competency. An example of this idea is as follows:

1. The student will acquire the ability to recognize and solve quadratic equations.

The student will:

A. Identify from a list of mathematical expressions, those which are quadratic.

B. Solve a quadratic equation by means of factoring.

C. Solve a quadratic equation by means of completing the square.

D. Solve a quadratic equation by means of the quadratic formula.

E. Solve a quadratic equation by graphical methods.

Item one is a statement of what is to be learned. Statements A through E are means by which the student can demonstrate that he has achieved the learning task.

Quantifying Outcomes

Often times the only thing which is quantified is the number of correct or incorrect answers on a test. While this is certainly important there is much more that can be quantified and studied. Each course that is taught should have the following benchmarks:

1. A set of clearly stated competencies and outcomes.
2. A pre and post test consisting of individual items each indexed to a specific competency.
3. A series of unit exams consisting of items each of which can be indexed back to specific competencies.
4. The compilation of competencies and outcomes should represent a predetermined mix of learning tasks representing the various levels of cognition and metacognition.
5. A detailed analysis of the pre/post test results along with a clearly documented reports indicated which competencies were achieved by the class and which were not, etc.

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Chapter 3

WORKING WITH COMPETENCIES

TRACKER's Main Menu

The main menu of the TRACKER SYSTEM has the options listed below:

```
**********************************
Competencies                  Menu
Classes                       Menu
Achievement                   Menu
Investigations                Menu
Utilities                     Menu
Reset Data Drive
Exit
**********************************
```

The first option is the primary area where instructors work creating, writing, editing, and analyzing their competencies and outcomes. This is one of the most important parts of the TRACKER system in that without a file of competencies to work with, TRACKER will not perform some of its other assigned tasks. The most important first step in using the TRACKER system is to prepare a list of competencies for the class you wish to "track".

The Competency Menu

It is recommended that you have a rough draft of your competencies and outcomes on paper at the time you proceed to the COMPETENCIES MENU. This menu contains the following options:

```
**************************
Create a Competency File
Edit  a Competency File
Delete a Competency File
Print  a Competency File
Print  a Comp. Check Sheet
Exit
**************************
```


By selecting the first option, the user is presented with a template form consisting of a top line for entering the competency and up to ten subsequent lines for supporting outcomes. **NOTE!** These fields are of the horizontal scrolling type which means that you can type far beyond the right edge to the screen. The actual text lengths for both the competencies and the outcomes are 200 characters each.

Each competency can have up to ten supporting outcomes, if it is felt that a particular competency needs more than this, consideration should be given to the possibility that this competency might need to be broken into two competencies with up to ten supporting outcomes each. TRACKER allows for up to fifty competencies to a file. If it is decided that a particular course needs more than fifty, the instructor may elect to develop competency files for each unit of study. In so doing, the number of competencies is virtually unlimited,(Except by hard disk space,..etc.)

Each competency requires two data entry screens in which to enter it. Using the PageUp and PageDn keys you can move through your entered competencies very quickly and easily. **NOTE!** Each outcome must start with a predicate. Besides being the recommended method of writing these, TRACKER must find the action word or predicate at the beginning of each outcome if it is to analyze them and report back to you.

Entering Class Notes

A recently added feature to TRACKER is the Class Notes capability. Towards the bottom center of the TRACKER COMPETENCY entry screen is a field designated as **"NOTES"**. By placing the cursor on this field and pressing the **CTRL HOME** keys (or by pressing the **F9**, or by double clicking with the mouse), TRACKER opens a window into a text editor. This feature provides the user with a means of jotting down notes on each competency within the file. This is especially useful in recording problem assignments pertaining to that competency, relevant homework, labs, or class lecture notes for that particular topic. The Class Notes Files is saved by pressing **CTRL END**.

Saving Your Competency File

When you are finished entering the various competencies and outcomes, you press the **CTRL END** keys to save your work. Simply hold down on the **CTRL** key and while holding it down, press the **END** key

...d a Competency File

By entering this option from the COMPETENCY MENU, a selection of previously entered competency files are presented. By highlighting the desired file, or double-clicking on it with the mouse, it becomes the active file and is load into the Competency editor. When you have finished making the desired corrections, deletions, and changes, saves your changes by pressing the **CTRL END** keys.

Deleting a Competency File

By activating the COMPETENCY MENU and selecting the DELETE option, a list of current files are presented to the user. By highlighting the file to be deleted or by double-clicking with the mouse, the file is prompted deleted.

Printing Competency Files

By going to the COMPETENCY MENU and selecting the PRINT COMPETENCY FILE option, TRACKER will allow a file to be chosen after which it will proceed to make a hard copy using the default printer attached to your pc. **NOTE!** Before sending anything to be printed set TRACKER default printer to the one most nearly matching the one you will be using.

Printing a Competency Check-Off Sheet

Because it is important to maintain daily records of each student's achievement, TRACKER provides a convenient and easy means of producing a streamlined version of your competencies in the form of a check-off sheet(s). These are best used by Xeroxing one for each student and entering his name in the space provided. By maintaining a folder on each student and checking off each competency achieved by that student, enormous time can be saved when you sit down to enter this "achievement" information into TRACKER later.

Adding or Removing Predicates From Dictionary

TRACKER maintains an extensive collection of action words, verbs or predicates. This is used by the program to monitor the various cognitive levels and other domains of learning represented by the collection of competencies in each file. If predicates of your choice are not currently in the Dictionary simply go to the UTILITY MENU and select BROWSE DICTIONARY. You will be presented

with a view of the complete dictionary listing. Any words you wish to add or delete may easily be done at this time(Directions for doing these operations are presented on the Dictionary screen at that time).

Getting a Print Out of Current Dictionary

By going from the MAIN MENU to the UTILITY MENU, and selecting the "Print Dictionary" option, a hard copy of all the current Dictionary's entries may be obtained. Careful inspection of this print out will reveal that the Dictionary's contents has also been separated and printed out according to their type or "level". A discussion of these "levels" may be found in the next topic, "Altering Predicate Levels".

Altering Predicate Levels

TRACKER makes use of a "simplified" version of Bloom's taxonomy of learning. Bloom's six cognitive levels are divided into three "levels". Level One in TRACKER corresponds to Bloom's "knowledge" category. Level Two in TRACKER corresponds to Bloom's second two categories, "comprehension" and "application", and the LEVEL Three of TRACKER coincides with Bloom's last three categories namely, "analysis", "synthesis", and "evaluation". In addition to these three cognitive Levels, TRACKER also employs three additional levels beyond cognition. A summary is provided below of TRACKER's six functional LEVELS:

LEVEL 1: Recall
LEVEL 2: Understanding
LEVEL 3: Critical Thinking
LEVEL 4: Metacognition
LEVEL 5: Psychomotor
LEVEL 6: Affective

TRACKER determines the level of any outcome by comparing its predicate with those listed in its current dictionary. If a particular verb is used but is not in the dictionary, the user needs simply to add it to his now "customized" dictionary. TRACKER reports such missing words as "NON-RECOG" or non-recognizable. **NOTE!** Some words reported as "NON-RECOG" may be simply misspelled in your entries making it impossible for TRACKER to recognize it.

As one moves up the ladder of LEVELS, the choice of predicates may become more and more subjective. That is, the level of learning represented by a particular outcome may be more "contextual" than before. This implies that a

ticular predicate used in one outcome may represent the same learning LEVEL in most cases but not all. If you disagree with any of the currently stored predicate's levels, you may go into the Dictionary through the BROWSE DICTIONARY option of the UTILITY menu and "alter" its LEVEL by changing the CATEGORY number to whatever you deem appropriate. This change becomes permanent and that predicate will be at its new level until the Dictionary has been altered once more.

Temporary Predicate Assignments

If a particular use of a predicate in an outcome suggests that its level be changed for that time and only that time, a temporary assignment of a new level may be made by simply placing that level's number immediately in front of the predicate in the stated outcome. The numbers allowed are 1-6 as discussed in the preceding topic. A good example of this might be the attempt on the part of an instructor to designate a predicate as a level 4 or "metacognitive" action word in an outcome. Since there are very few dedicated predicates in Level 4, other predicates are used and by their context can be interpreted at other levels of learning. Example:

> The student will:
> Describe what style of teaching he finds most effective to his learning style.

The word "Describe" is a mere LEVEL 1 recall type of activity but its used here denotes something far more different, namely a reflection of his thoughts on how best he learns. This is a typical "metacognitive" activity. To temporarily "upgrade" this outcome to a metacognitive one, it would entered into TRACKER in the following manner:

> The student will:
> 4Describe what style of teaching he finds most effective to his learning style.

NOTE the "4" immediately preceding the predicate. This will alter the use of the verb "describe" in this outcome to the metacognitive level, but only here. The predicate "describe" used anywhere else in the same set of outcomes will still be a LEVEL 1.

Analyzing Your Competencies

When you are finished entering your competencies and outcomes into the COMPETENCY EDITOR and saving your file you might want to go to the INVESTIGATION EDITOR and select ANALYZE COMPETENCY FILE. Instructors find this revealing as to the number and types of competencies and outcomes they have written. By requesting this analysis, the instructor is provided the following information:

1. The total number of competencies with a breakdown as to how many had "recognizable" predicates.
2. A reminder of the various "Levels" types and codes.
3. An outcome by outcome breakout by category or Level.
4. A percentage breakout showing percentages of each category or Level.
5. A simplified bar graph showing relative numbers of "cognitive" levels.
6. A list of all predicates used more than once and how many times they were used.

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Chapter 4

BUILDING CLASS FILES

Starting a New Class File

By selecting the CLASSES EDITOR option from the main menu, the menu for class files will appear as follows:

****
Create a Class File
Edit/Add a Student
Print Class File
Delete a Class File
Delete a Student
Print Class Notes
Exit
****

Selecting the "CREATE a CLASS FILE" will permit the user to set up a class for student records. **NOTE!** A competency file for that class must already be in existence. This order was chosen so that multiple section classes such as Biology or Algebra which all use the same set of competencies can have separate sets of student records. Each time a new class section file is created TRACKER will ask for information such as the name of the class for report headings, time of class, instructor name, etc.
All of this information is stored in an ARCHIVE file and the system will go there automatically to retrieve what it needs.

Entering Students

The most important data entries into the STUDENT DATA ENTRY screen are the names and the pre/post test scores. While there are many other data fields available, most of the data collected in this area is informational only and not used in most formal generated reports. When finished entering student data press **CTRL END** to save this information.

Majors Window

While in the student data entry screen the **F1** key opens a window and allows the operator to view additional data. The default setting for this window are some student major numerical codes. This window of information can be customized to your needs by going to the UTILITY EDITOR and BROWSE MAJORS option. At this point any similar data or information may be stored for use in the student data entry screen.

Adding/Editing Students

The second option from the CLASSES EDITOR allows the user to add new students and add or correct information concerning existing students. Simply select this option, then indicate the desired class, and the DATA ENTRY screen for that class will appear.

Printing Class Files

This option allows the user to select the class file in question and print it immediately. Using the PRINT CLASS FILE option, the user is prompted to highlight or double-click on the class file he wishes to print out.

Deleting Students

When it becomes necessary to delete a student from a class file, by selecting the "Delete a Student" option, TRACKER presents to the user a list of classes from which you choose the correct one, then a list of student's names within the selected class. By highlighting the student in question and pressing the ENTER key(or by double-clicking with the mouse), that student will be removed from the class file.

Deleting a Class Files

To remove an entire class file, simply select the "Delete a Class File" option. TRACKER then presents a list of classes to the user. By highlighting the desired class or double-clicking with the mouse, that class file is permanently erased.

....ting Class Notes

The last option in this menu is the "Printing Class Notes" function. These are the notes which the user may have entered while working in the COMPETENCY EDITOR. Bearing in mind that these notes are stored in a text editor, the print out of these will be essentially in a free form style. **NOTE!** Be sure your printer is properly selected before exercising this option.

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Chapter 5

MONITORING ACADEMIC ACHIEVEMENT

ACHIEVEMENT EDITOR
****
Edit Achievement Records
Print Indiv. Achievement Record
Print Class Achievement Records
****

Recording Student Achievement

By selecting the **ACHIEVEMENT EDITOR** from the main menu the operator will go into the area where actual student achievement records are kept. Choosing the first option, **"EDIT ACHIEVEMENT RECORDS"**, will bring up the main data entry screen for the student performance records. This screen upon close examination will be found to accept up to 500 tally marks or 1's. Each time a student has indicated that he has mastered one of the outcomes associated with a stated competency, a tally mark or 1 is placed in that field. Keeping in mind that the limit on the number of competencies is 50 and each has up to 10 outcomes, accounts for the 500 maximum tally slots.

All student achievement data is entered into this main screen. The class summary files on achievement gets its information from this area. While entering the 1's if a mistake is made, it should be corrected by use of the space bar and not the delete key. This is due to the way the data has to be stored and is very important.

Generating Individual Achievement Records

This option allows one to highlight or double-click on the name of class, and then the name of the student to report upon. At this time TRACKER looks back into the ARCHIVE file to find information about the class for purposes of writing the report. It then proceeds to generate the report on that particular student. This report shows:

1. What class he is in.
2. Details about that class.

3. How many competencies are used by that class.
4. How many outcomes per competency.
5. How many outcomes successfully achieved by the student.
6. The percent of the outcomes for each competency achieved.
7. Accumulative average attained by student.
8. Percent of competencies achieved at the 80% level or better.

There is space available on the report for the instructor to jot comments about the student if he deems this appropriate or necessary.

Generating Class Achievement Reports

This option requires the operator to indicate what class he wants at which time TRACKER then proceeds to the ARCHIVE file and looks up the associated COMPETENCY file, also various facts about the class such as catalog number, time, days, instructor, etc. TRACKER then proceeds to look up every student in that class and determine what he/she has done with every competency in the related file. This may take a few seconds so be patient! The report generate contains the following:

1. Details about the class
2. How many competencies the class is using.
3. The percent of each competency attained by class.
4. A summary of which competencies gave the class most trouble.
5. The total number of students in class.
6. The number of students achieving 80% of the competencies or better.
7. The percentage of the students achieving 80% of the competencies or better.

Space is available for the instructor to add comments concerning the class or the percentage of competencies achieved, etc.

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Chapter 6

PRE AND POST TESTING

Some Ideas on Pre & Post Testing

Increasing pressure is being felt by instructors to "validate" what the student has learned and how much. This chapter deals with the "how much". Knowing what the student leaves your class with is no longer sufficient if indeed it ever was. The point being currently stressed is "what did the student actually achieve in your class?". This is where the pre and post testing comes in. Think for a moment what a "diet" center would do to validate what good if any their treatment has done. In order to measure this for sure they would insist on the weight of the client coming in and the weight at the end of the treatment. The difference between these two weights would be attributable to the "treatment".

We need to measure what skills a student brings to a class and what skills he leaves with. Knowing this information the teacher is in an excellent position to ascertain, at least to some extent, the "gain of skills' attributable to the class delivery & activities. A student leaving a class with many skills does not necessarily imply that the class was responsible, he might have had most of the skills upon entering the class.

Pre/Post Test and Competencies

Unless the pre/post test corresponds to what is going to be taught, or what has been taught, its of little value. Designing such a test which corresponds to the course competencies can be a problem in that in some courses such a test might require 5 or 6 hours to administer. If this is the case, steps should be taken to identify the various competencies as either "antecedental" or "dependent". In so doing a list of thirty or forty competencies can be reduced for testing purposes to some ten or fifteen questions or problems. While this is not the best solution to this problem, it is probably the only one.

Generating Quantitative Reports

By selecting the "Pre/Post Test" option from the INVESTIGATIONS EDITOR an instructor can quickly and easily run a test on a given class. This is, of

rse, assuming that the scores earned by the students on these two tests have been recorded in the class file. The print out for this reports includes the following information:

1. A listing of all students by name(or names blanked out).
2. A listing of both the PRE & POST score and the difference between these indicating growth.
3. The average for each test for those who either test.
4. The average for both test for those who took both tests.
5. The results of a t-Test for comparison of these means. This test is automatically set up and ran with the results printed out along with a complete interpretation of these results.

Interpreting Pre/Post Test Results

While a statistical test for significance between two means is usually not necessary, it certainly is appropriate when the two averages are so close to one another that one may wonder what role chance played in the final results and/or interpretation. Just a reminder TRACKER will report to you significance pertaining to what level of confidence. The smaller this factor is the better. Example, if a finding is significant at the 10% level, this implies that there is only a one in ten probability that these results were due to chance. Obviously a 2% level is great in that it suggests an even greater level of confidence.

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Chapter 7

OTHER CLASSROOM INVESTIGATIONS

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Analyze/Categorize a Set of Competencies
Investigation of a Single Set of Data
Pre/Post Test Results
Search for a Correlation Between Two Items
To Exit for the Module of TRACKER
****

Data Analysis

Option two of the INVESTIGATIONS EDITOR allows for the entry of random data(numerical) and the generation of statistical description of that data. The information is printed along with a brief description of what each item represents. Items included are:

Mean
Median
Range
Maximum Value
Minimum Value
Variance
Standard Deviation

Simple Correlations

Often an instructor has a hunch that scores earned on one test seems to be related to scores earned on another, or that pretest scores are related to final course grades, etc. To check this the scores in question may be entered and a Pearson's r correlation procedure ran. The closer to a +1 or a -1 the result is, the more tightly the scores are related. This module of TRACKER will run this test for you and also interpret the results plus provide reminders of what should be concluded and not concluded based on these outcomes.

ntifying Predictors

Once it has been established that a correlation exists between two items it might be desirable to use one item to predict the other. This is done by means of a "linear regression" equation which TRACKER calculates and displays for you. Once given this equation the instructor can plug in the value of the "predictor" and determine the value of the "dependent" variable. The help screens accompanying this module are of great help in learning to use this valuable tool.

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Chapter 8

TRACKER UTILITIES

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Browse Dictionary
Print Dictionary
Browse Custom File
Browse Majors File
Browse Archive File
Create a Data Disk
Select Printer
Exit
****

Browse Archive File

Some of the options presented in the UTILITIES EDITOR have already been discussed. The fifth selection BROWSE ARCHIVE file provides for the change of report titles, class titles, or course catalog numbers without having to completely re-enter the file in question. **NOTE!** it is recommended that unless it is absolutely necessary, no changes be made in this file. This is because there is a possibility that certain changes may corrupt a file and render it unusable by TRACKER.

Create a Data Disk

This option provides the user with a means of creating a data disk as others fill up. TRACKER automatically copies to the new disk those files needed by the program to operate correctly. A word of warning, when preparing a new data disk using this option, the TRACKER dictionary copied to the new disk is of the original default type and will NOT reflect any changes you have made to your original dictionary files. If you wish you can make a new data disk with this option and then copy your "customized" dictionary to that disk by the following process:

1. Go to the C>
2. Make a temporary directory called "TEMP"
3. Make this directory active by typing CD TEMP
4. Copy your current dictionary into this area by placing your current disk in drive A or B and typing at the C>

C>copy B:VERBS. *A: or C>COPY A:VERBS.* B: depending on the drives being used. This will copy over the default directory.

5. At the C> type in DELTREE TEMP and this will erase the new directory and its contents. If your version of DOS does not support the DELTREE command you may have to delete the files in your TEMP directory then return to C:\ and type RD TEMP which will remove the new directory.

Reports Generated

TRACKER produces the following reports and print outs:

Analysis of Competencies
Competency file Print Out
Competency Check-Off Report
Class Achievement Report
Individual Achievement Report
Class Record Print Out
Class Notes Print Out
Dictionary Print Out
Analysis of Data Report
Pre/Post Test Results
Looking for Predictors
Correlation Report

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