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ABSTRACT

The purpose of this research was to develop and implement an observational instrument to measure the process of innovation adoption as described by the Concerns Based Adoption Model developed at the University of Texas. This model defines seven levels of use of an innovation, ranging from no knowledge of the innovation, through routine use, to looking for better alternatives. The inventory was developed to complement interviews to determine an individual's level. The inventory was twice administered to 33 elementary school teachers attending a summer institute to familiarize them with the Science Curriculum Improvement Study (SCIS), which they would be using in the fall. Concurrent validity for the inventory was shown to be 0.71, test-retest reliability was 0.94, and there was perfect interrater reliability using two independent judges. The results of the study indicated that a valid and reliable estimate of the levels of use could be determined if the particular teacher was observed in the actual process of using the innovation. (MH)

THE DEVELOPMENT AND IMPLEMENTATION OF THE LEVELS OF USE OBSERVATIONAL INVENTORY (LoUOI): AN INSTRUMENT TO AID IN THE ADOPTION OF AN INNOVATION PROCESS

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THE DEVELOPMENT AND IMPLEMENTATION OF THE (LoUOI)

Change is defined in Webster's Dictionary as "to make different: modify." It seems that all of us are in a constant state of change whether we realize it or not. This term is especially relevant to the teaching profession. The particular type of change that is most interesting to this author is that which teachers experience when they are faced with an innovation, e.g., a new curriculum, which they are supposed to teach. Too often a school system or even an individual school adopts one of the "new" curricula and the faculty is supposed to teach it without any advanced training and/or preparation. The results of this situation are that these extensively planned, field-tested, well researched, and expensive curricula do not fulfill the expectations of the school system. Therefore, when such an innovation does poorly or even fails in a school, everyone asks why and who is at fault. Everyone, from students to the superintendent, receives some blame; but in any event, the new curriculum is either retained, being used incorrectly, or dropped, at considerable expense to the taxpayer.

There has been considerable literature written concerning the adoption of an innovation process. However, little attention has been paid to the actual affective and behavioral changes that teachers go through in this adoption process. As mentioned earlier, too often is the case where the faculty has insufficient inservice training and/or preparation time to be able to handle this abrupt change. Why do they need time or training? Do they feel threatened? What kinds of changes do they go through during the initial and subsequent phases? These are interesting questions. Recently, at the University of Texas Research and Development Center for Teacher Education, researchers have been attempting to address such questions.

They have been using interviews and questionnaires to obtain some insight into the problem of change. It is the purpose of this project to build upon the University of Texas R&D Center's research by developing an instrument that permits direct observation of the types of behavioral changes teachers go through in the adoption of an innovation.

The author believed that while an interview had been an excellent method for gathering information, the value of the data would be enhanced by providing another vantage point relating to the level of use of a particular innovation. Therefore, it seemed necessary to develop an observational tool to complement the interview in order to verify the manner in which an innovation was adopted by a school system. It was also felt that the observational tool should use low inference categories or items, so as to maximize the accuracy of the ratings of the individuals under observation.

Review of the Literature

The Concerns Based Adoption Model

The present research is based on work done at the University of Texas Research and Development Center for Teacher Education under the direction of Dr. Gene Hall. This project has explored many important aspects in the adoption of innovations. Hall, et al (1975) asserted that changes did not occur just because a decision maker announces it, but that change was a developmental process. The focus of recent research has been on large scale, systems-wide changes, e.g., the development of national curricula, the open school concept, individualized instruction, and others. The focus of the Concerns Based Adoption Model (CBAM) is on the individual who must

make the change. CBAM proposes to describe the "developmental steps of growth in feelings and skills that are experienced by individuals as they adopt innovations" (Hall, 1975). Again, a key assumption is that the adoption of an innovation is a process, not an event. The two dimensions that describe the developmental growth in concerns and skills in using the innovation are the Stages of Concern About the Innovation (SoC) and the Levels of Use of the Innovation (LoU).

Stages of Concern (SoC). "Concerns are part of the change process as experienced by individual educators involved in implementing various innovations ..." (Hall, 1975). The Stages of Concern dimension suggests that "as individuals move from unawareness and nonuse of an innovation to ultimate, highly sophisticated use of an innovation their 'concerns' move through identifiable stages as well. There appears to be a somewhat developmental progression in the kinds of concerns that innovation users have about their use of an innovation" (Hall, 1975). There are seven SoC hypothesized to form the individual's "affective field" in relation to the adoption of an innovation. These are summarized in Table 1.

Insert Table 1

Hall and his associates have developed a 35 item Stages of Concern Checklist to measure the stages of concern for an individual. The checklist consists of seven scales, with each containing five items. The content of the scales is based on written responses of a large sample of teachers and professors as to their concerns about an innovation being adopted by their institutions. The SoC Checklist has been analysed in

several studies. Test-retest reliability has ranged from .65 to .86, internal consistency ranged from .80 to .93, and the alpha coefficient was .96 (Hall, 1975).

Levels of Use (LoU). The other CBAM dimension, and the one primarily dealt with in this study, is the Levels of Use of the Innovation. The emphasis is not on the feelings or affect concerning the innovation, but on what is actually being done with it. The LoU also involves a hypothesized developmental progression. The initial stages begin with an orienting, i.e., awareness, stage to a decision to use the innovation, to a preparation stage and initial use, often mechanical in nature, to routine use and refinement, to a collaboration with colleagues stage, and finally, the renewal stage, where better alternatives are sought. A summary of each stage is located in Table 2.

Insert Table 2

The LoU Chart is located in Table 3. This chart not only contains a description of each level but also the decision points which must be determined before an individual can be rated at a particular level. These decision points and definitions served as the foundation for the observational inventory developed in the present study.

Insert Table 3

The Levels of Use have measured by a "focused" interview developed by Hall and his associates. The interview appears to be a normal conversation with the user concerning the innovation. It uses a branching technique with defined decision points that differentiate and separate each LoU.

Specific probing questions are used to gain more detailed information to increase the confidence of the LoU rank. The conversation is taped and rated by trained raters. Interjudge reliability for the LoU Interview ranged from .64 to .81 (Hall, 1975).

Research Studies. Several studies have been conducted in the development of the CBAM with interesting results. Stages of Concern were studied using two independent variables, teaming and modules (Hall, 1975). Hall found that "the concerns data on both teaming and modules leave a distinct impression that there is a classic nonuser concerns profile similar to what was hypothesized [that self concerns were the most intense] and that the user concerns profile appears to move through some developmental progression although the rate of movement and shapes are dependent on both time and on the characteristics of the institution's support systems." LoU were also studied for teaming and modules. Hall concluded that the most dominant LoU was LoU IV-A, routine, and that LoU V, integration, and LoU VI, renewal, were rare. He also concluded that there wasn't a linear development in LoU. It appeared that individuals can go back and forth one or more levels, or stay at a particular level and never move.

Loucks (1975) referred to research conducted using the CBAM in evaluating Individually Guided Education (IGE) in Austin, Texas schools. IGE was considered to be an innovation bundle composed of such innovations as teaming, multi-age grouping, and individualized instruction. Conventional analysis of the data, using one-way analysis of variance, indicated no significant differences between users and nonusers of IGE at both grade levels studied. Overall, it could be concluded that IGE did not make a difference. However, after studying a critical innovation, individualized instruction, it was indicated that there were significant differences in both IGE and non-IGE schools. These differences were found to be due to the fact that a number

of non-IGE teachers were individualizing instruction and a sizeable number of IGE teachers were not individualizing instruction. Therefore, the results were misleading. "The phenomenon of 'controlling' for the presence of the innovation or treatment and not having firsthand knowledge of its presence greatly increases the danger of developing spurious findings and misinterpretations" (Loucks, 1975).

Loucks (1975) also studied the relationship of LoU and achievement. The innovations considered were individualized reading and individualized mathematics for second and fourth grades. Overall comparisons revealed no significant differences, but grouping by grade level did. Results of the analysis for the second grade sample indicated a significantly greater achievement for users of individualized reading than non-users; there was no significant difference between users and non-users of second grade individualized mathematics. For the fourth grade, users of both innovations showed significantly greater gains in achievement than non-users. Loucks also looked at the relationship of achievement gains across the different LoU. Results for individualized reading indicated a peak in achievement for LoU III and LoU IV-A and decreasing for higher levels, while mathematics achievement increased steadily from LoU I to LoU V. The samples were small and only one grade level sampled, thus, these findings are not readily generalizable. More research is needed in this area.

LaShier, Hall, and Colbert (1976) conducted an evaluation of teacher concerns for a National Science Foundation Summer Institute in which SCIS was introduced to a group of teachers for implementation the following year. The 28 summer, 1975 participants who had no experience with SCIS were given the SoC Questionnaire prior to the Institute and compared with 28 teachers who attended a summer, 1974 Institute and had one year's

experience with SCIS. The results indicated that those with one year's experience and the previous workshop had reduced the early stages of concerns. At the conclusion of the summer, 1975 Institute participants had greater concerns for: management of SCIS, increasing student impact through collaboration with other teachers, and exploring more universal benefits from SCIS, including looking for better alternatives. Observational data for the LoU of the participants were collected after four months of SCIS teaching. Results indicate that 79% were using SCIS at LoU III or higher. Those below LoU III were either not assigned to science teaching or did not elect to teach the SCIS material.

Method

Sample

The sample consisted of 33 elementary school teachers from the Lawrence, Seaman, Holton, Basehor, and Turner, Kansas school districts. These people were all participants in a National Science Foundation Institute for four weeks during the summer of 1975. The purpose of the Institute was twofold. First, the participants became familiar with the ecology and natural history of northeastern Kansas, and second, they were introduced, quite extensively, to the Science Curriculum Improvement Study (SCIS) Life Science curriculum, which was to be adopted by the school districts the following fall. Prior to the summer Institute the participants completed the LoU Interview and the Concerns Questionnaire. The Concerns Questionnaire was also given at the end of the Institute. The participants also completed these instruments in October, 1975, and again in January, 1976. The purpose was to collect data on the changes, if any, that these people were going through over a specified period of time. The LoUOI was

utilized immediately following the January, 1976 data collection by the University of Texas staff, without any prior knowledge of the LoU Interview and Concerns Questionnaire results.

Instrumentation

The instrument under development in this research was called the Levels of Use Observational Inventory (LoUOI). The criteria used in this checklist are based on actual observations, telephone calls, attendance at workshops, and communication between the participants and the author during the months of September, 1975 to January, 1976. The author's role during these months and extending through the remainder of the school year was that of following up the summer Institute and assisting these teachers with the implementation of science, particularly SCIS, in their classes.

The LoUOI is located in Appendix I. After each item there are three categories in which to place a check. In the Attendance and Out of Class sections the "yes" category was marked only if the teacher met the criteria more than two times. If two or less times, "occasionally" was checked. Monthly workshops refer to those held by the author to reinforce and implement SCIS Life Science. The In Class category depended on what was occurring at the time of visitation and only the "yes" or "no" categories applied. The degree of confidence item at the top of the instrument refers to the inferred degree of certainty of the predicted LoU. It is a subjective item and refers only to how certain the observer is of the LoU predicted.

A section on classroom climate was included since it was decided that this type of criterion was essential, especially for discriminating LoU III from LoU IV-A. As can be seen in the LoU Chart, in Table 3, classroom climate is a key criterion for differentiating between LoU III and LoU IV-A. In LoU III, mechanical use, the user experiences management problems; the

flow of actions of the teacher and students being disjointed, uneven, and uncertain; and the roles of teacher and students are not well defined with many procedural questions asked by the students. Level IV-A, routine, is exemplified by few management problems, a general smoothness in classroom procedures, and a well defined role structure.

The first three substantive teacher statements and/or questions during each classroom visitation were also included, as these appeared to be good indicators of the LoU for an individual. The author was hesitant to include this section at first because the original intent of the instrument was to be a low inference measure, and categorizing what people say may result in high inference items. However, since it was very normal for subjects to indicate how things were going, and what their needs may have been, it was decided to include a section on verbal communication.

The next step was to classify these data according to the Levels of Use Observational Inventory Classification. This classification scheme is located in Table 4. The purpose of this instrument is to help people who are in a position to implement new curricula or other types of innovations in the classrooms to determine the Levels of Use for an individual and as a diagnostic device to aid in the adoption process.

Insert Table 4

Procedures

The LoUOI was used twice in the classrooms of each of the participants. Data were gathered at approximately two week intervals. This procedure was used so as to allow the shortest possible time after the participants were interviewed by the University of Texas staff. Time appears to be a key element in the CBAM concept (Hall, 1975), and it was hoped that a high

level of agreement between the LoUOI and the LoU Interview would result.

The data were gathered as unobtrusively as possible. In most instances the author simply entered the classroom, was greeted by the teacher and students, sat down at the side or back of the room and proceeded to check off the appropriate observations. Usually, the teacher would engage the observer in conversation during or at the close of the lesson and the first three substantive questions and/or statements were jotted down or remembered and noted soom thereafter. Classroom climate was noted during the lesson and one or two students were approached and asked if they did SCIS regularly. The only deviation from this procedure occurred when the teacher did not teach science at all or on that particular day. In the first case, there were seven teachers. They were usually teamed with another teacher who taught science. Six subjects taught social studies and/or language arts, and one was a media specialist and librarian and was not assigned any science teaching as such. In this instance, the classroom climate section did not apply and was noted accordingly. This same procedure was followed for those who were not teaching SCIS at the time of visitation, although in this case students were asked if they did SCIS regularly.

Data Analysis

The data analysis consisted of a correlative analysis using the Spearman Rank-Difference Correlation Coefficient (Rho). The purpose of this procedure was to determine if there was a significant relationship between what the participants said in the LoU Interview and what was actually observed in their classes using the LoUOI.

Content validity for the LoUOI was addressed by asking a panel of experts to inspect the LoUOI and the LoUOI Classification, and to validate the items

and the Classification with the LoU Chart descriptions for each level. The panel consisted of Dr. William S. LaShier, Dr. Gene Hall, and Ms. Beulah Newlove. The instrument and Classification were revised until total agreement was reached. Concurrent valid[illegible]d by correlating the LoUOI ranks with the LoU Interview [illegible]an's Rho.

The stability coefficient of this instrument was determined by observing each participant two times approximately one to two weeks apart and correlating the rankings using Spearman's Rho. Interrater reliability for the LoU Interview was determined by having several trained raters listen to the taped interview. Their reliability coefficients ranged from .64 to .81. The interrater reliability for the LoUOI was established by training another person familiar with this project to use the LoUOI and record data at the same time the author did.

Results and Discussion

The concurrent validity for the LoUOI, using the Spearman Rho procedure, was .711 (significant at alpha = .05). Test-retest reliability resulted in a correlation of .94 (significant at alpha = .05). Interrater reliability was perfect between the two judges, so no further analysis of the interrater reliability was necessary.

A relative frequency distribution for the LoU is located in Table 5. The results indicate that 78.78% were using SCIS at the LoU III or higher. There were seven teachers who were below LoU III. This was due to the fact that they were not assigned to teach science or did not elect to do so. The dominant category was LoU III, with 51.51%. The author feels that this was due to the fact that this was the first year of teaching SCIS for most of the

participants, hence, the use of SCIS was very mechanical with all sorts of management problems. The one individual ranked LoU VI had been teaching SCIS for three years, and was deeply involved in science teaching. Therefore, it was not too suprising that the participant received this rank.

The validity and reliability of the LoUOI has been indicated. However, the concurrent validity of .711 had several factors affecting it that need further consideration. The first factor that affected this value was time. The Interview was conducted on January 24, 1976 and, according to the University of Texas staff, the LoU determined was based on all previous information as well as the current interview. The LoUOI was used in the three and one half week period following the interview. The first section of the LoUOI included the information gathered from the summer Institute up to the administration of the LoUOI, but the rest of the data were concerned with the actual time the observations were made. The question is whether the more cumulative aspects of the Interview effect the Levels of Use determined by the LoUOI. The answer is probably "yes", to a degree. For example, there were nine participants who were ranked at LoU III by the LoUOI and LoU IV-A by the Interview. This may be explained by the fact that these people had just finished teaching the SCIS Physical Science material and were starting the Life Science unit. These nine teachers had successfully taught the physical science material and accordingly ranked LoU IV-A by the Interview. However, when the rater was observing these participants they were just beginning the SCIS Life Science and were at LoU III. This is very important because it effects the interpretation of the data. It is important to know both kinds of information, i.e., where the teacher is at on a cumulative type of measure, and what is currently going on in the class. This difference obviously lowered the correlation value obtained for the overall study.

Another problem was in the definition of the LoU 0 and LoU 1 categories. There were seven teachers who did not teach any science at all. The situation was that they taught language arts and/or social studies and another teacher taught science. According to the LoUOI Classification they attended the summer Institute and may or may not have attended the monthly workshops. Therefore, these teachers were knowledgeable about SCIS (and even had an opportunity to teach in summer) and were rated at LoU I. However, in a recent communication with the University of Texas staff, the author was informed that some of these people could be rated LoU 0 as is reflected in the composite score. The differentiation appears to be in their pursuit of more knowledge about the innovation and whether or not they collaborate with other teachers and help them in the implementation of SCIS. Since the LoUOI Classification was based on the LoU Chart, the Classification had to be revised to include this difference.

Another problem arose with the discrimination of LoU III and LoU IV-A. One of the criteria for assigning an individual to LoU IV-A was their reporting that everything was going satisfactorily, whereas in LoU III there were management and logistical problems, e.g., equipment breakdown, scheduling problems, preparation problems, and classroom climate problems, resulting in unsatisfactory and ineffective use of SCIS. What the interviewers encountered were teachers reporting that everything was fine, but upon observing in the classes, there were such problems as previously mentioned. In fact, this discrepancy occurred in 10 cases. The individuals were rated at LoU III due to the results of the data gathered in sections I and II of the LoUOI and other verbal responses, but the teachers perceived everything as fine. There could be many reasons for this, e.g., presence of the rater or inaccurate perceptions.

Overall, there are going to be differences in the LoU's between the two instruments. However, the Spearman r value of .711 is significant and does appear to offer a high degree of agreement between them.

The reliability of the inventory is also important. This was due to the design of the instrument. The LoUOI was intentionally designed to be a low inference measure. The items were observations that were clearcut and did not have to be inferred to a high degree by the raters. The classroom climate section required interpretation and classification of the first three substantive statements and/or questions were more subjective and did require the rater to make inferences. However, with the high test-retest reliability and agreement between judges, the LoUOI appears to have maintained the intended low inference items. Obviously, replications of this study are necessary to further establish the reliability and validity.

Conclusions

Based on this research, there appears to be two methods for looking at Levels of Use of an Innovation. The first is the interview approach, which gathers much important information, but which lacks the actual observation of the innovation being used. The second approach is to use an observational system such as the LoUOI. This mode lacks the indepth information which can be collected by the interviewer and is limited to the actual time of the visitation and therefore is not as cumulative as the interview. This researcher does not feel that either one of these techniques alone can assess the situation to the fullest possible extent, but that observational studies can supplement and complement reactive types of measurement and provide another perspective from which to gather data. This is especially true in the present case, because how can one accurately

measure the amount of use an innovation is receiving without actually observing it in use? This question is fundamental to this type of research.

The author believes that this inventory is a powerful tool for assessing the way a particular innovation is used. The present study specifically dealt with SCIS, but the LoUOI could easily be adapted to many situations, simply by substituting items in the appropriate section. However, the three sections of the LoUOI are necessary components for measuring LoU, while the items within the three sections are subject to more flexibility.

The Concerns Based Adoption Model (Hall, 1975) represents an approach to most types of innovations that are considered for adoption within a school system and that are the subject of teacher workshops and institutes. The underlying assumption of this model is that change is a process, not an event. It is felt that the LoUOI represents an attempt to describe individuals who are a part of the process, and, combined with the Stages of Concern Questionnaire and Levels of Use Interview, can provide a valid and reliable description of the teachers involved, and a stepping stone to developing strategies to resolve the concerns and problems that are part of the adoption process.

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Table I

Stages of Concern About the Innovation

0 UNAWARENESS: No indication of interest in or concern about the innovation.

I INFORMATIONAL: Expresses a general awareness of the innovation and learning more about it. The user seems to be unworried about himself in relation to the innovation. The potential adopter considers substantative aspects of the innovation in a selfless manner inquiring about general characteristics, effects, and requirements for use. Information needs and interest are of a more cursory nature reflecting general non-committal feelings, limited evaluation and minimal personal investment.

II PERSONAL: Reflects uncertainty about the roles played by the individual user and of the demands placed upon him, including analysis of his role in relation to the reward structure of the organization decision making and consideration of potential conflicts with existing structures or personal commitment that have financial or status implication of the program for self and colleagues may also be expressed.

III MANAGEMENT: Expressions about the process of using the innovation and the best use of information and resources. The statements focus on issues related to efficiency, organizing, managing, scheduling, and time demands.

IV CONSEQUENCE: Indications of exploration of impact of the innovation on clients in his immediate sphere of influence. Expressions about relevance for clients, evaluation of client outcomes, including performance and competencies, and how his use of the innovation can be changed to increase client outcomes are stated.

V COLLABORATION: Focus is on increasing impact on clients through collaboration with others regarding use of the innovation.

VI REFOCUSING: Indications of user's exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative.

Table 2

Levels of Use of the Innovation

	LEVELS OF USE	DEFINITION OF USE
0	NONUSE	State in which the user has little or no knowledge of the innovation, no involvement with the innovation and is doing nothing toward becoming involved.
I	ORIENTATION	State in which the user has recently acquired or is acquiring information about the innovation and/or has recently explored or is exploring its value orientation and its demands upon user and user system.
II	PREPARATION	State in which the user is preparing for first use of the innovation.
III	MECHANICAL USE	State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a step-wise attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use.
IVA	ROUTINE	Use of the innovation is stabilized. Few, if any, changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.
IVB	REFINEMENT	State in which the user varies the use of the innovation to increase the impact on clients within the immediate sphere of influence. Variations are based on knowledge of both short- and long- term consequences for clients.
V	INTEGRATION	State in which the user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within their common sphere of influence.
VI	RENEWAL	State in which the user reevaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

Table 3 —LoU CHART

CATEGORIES			
ASSESSING	PLANNING	STATUS REPORTING	PERFORMING
Examines the potential or actual use of the innovation or some aspect of it. This can be a mental assessment or can involve actual collection and analysis of data.	Designs and outlines short- and/or long-range steps to be taken during process of innovation adoption, i.e., aligns resources, schedules activities, meets with others to organize and/or coordinate use of the innovation.	Describes personal stand at the present time in relation to use of the innovation.	Carries out the actions and activities entailed in operationalizing the innovation.
Takes no action to analyze the innovation, its characteristics, possible use, or consequences of use.	Schedules no time and specifies no steps for the study or use of the innovation.	Reports little or no personal involvement with the innovation.	Takes no discernible action toward learning about or using the innovation. The innovation and/or its accouterments are not present or in use.
Analyzes and compares materials, content requirements for use, evaluation reports, potential outcomes, strengths and weaknesses for purpose of making a decision about use of the innovation.	Plans to gather necessary information and resources as needed to make a decision for or against use of the innovation.	Reports presently orienting self to what the innovation is and is not.	Explores the innovation and requirements for its use by talking to others about it, reviewing descriptive information and sample materials, attending orientation sessions, and observing others using it.
Analyzes detailed requirements and available resources for initial use of the innovation.	Identifies steps and procedures entailed in obtaining resources and organizing activities and events for initial use of the innovation.	Reports preparing self for initial use of the innovation.	Studies reference materials in depth, organizes resources and logistics, schedules and rehearses skill training in preparation for initial use.
Examines own use of the innovation in respect to problems of logistics, management, time, schedules, results, and general reactions of clients.	Plans for organizing and managing resources, activities, and events related primarily to immediate ongoing use of the innovation. Planned-for changes address managerial or logistical issues with a short-term perspective.	Reports that logistics, time, management, resource organization, etc., are the focus of most personal efforts to use the innovation.	Manages innovation with varying degrees of efficiency. Often lacks anticipation of immediate consequences. The flow of actions in the user and clients is often disjointed, uneven and uncertain. When changes are made, they are primarily in response to logistical and organizational problems.
Limits evaluation activities to those administratively required, with little attention paid to findings for the purpose of changing use.	Plans intermediate and long-range actions with little projected variation in how the innovation will be used. Planning focuses on routine use of resources, personnel, etc.	Reports that personal use of the innovation is going along satisfactorily with few if any problems.	Uses the innovation smoothly with minimal management problems; over time, there is little variation in pattern of use.
Assesses use of the innovation for the purpose of changing current practices to improve client outcomes.	Develops intermediate and long-range plans that anticipate possible and needed steps, resources, and events designed to enhance client outcomes.	Reports varying use of the innovation in order to change client outcomes.	Explores and experiments with alternative combinations of the innovation with existing practices to maximize client involvement and to optimize client outcomes.
Assesses collaborative use of the innovation in terms of client outcomes and strengths and weaknesses of the integrated effort.	Plans specific actions to coordinate own use of the innovation with others to achieve increased impact on clients.	Reports spending time and energy collaborating with others about integrating own use of the innovation.	Collaborates with others in use of the innovation as a means for expanding the innovation's impact on clients. Changes in use are made in coordination with others.
Analyzes advantages and disadvantages of major modifications or alternatives to the present innovation.	Plans activities that involve pursuit of alternatives to enhance or replace the innovation.	Reports considering major modifications of or alternatives to present use of the innovation.	Explores other innovations that could be used in combination with or in place of the present innovation in an attempt to develop more effective means of achieving client outcomes.

Table 3 — LoU CHART

LEVELS OF USE SCALE POINT DEFINITIONS OF THE LEVELS OF USE OF THE INNOVATION Levels of Use are distinct states that represent observably different types of behavior and patterns of innovation use as exhibited by individuals and groups. These levels characterize a user's development in acquiring new skills and varying use of the innovation. Each level encompasses a range of behaviors, but is limited by a set of identifiable Decision Points. For descriptive purposes, each level is described by seven categories.	CATEGORIES KNOWLEDGE That which the user knows about characteristics of the innovation, how to use it, and consequences of its use. This is cognitive knowledge related to using the innovation, not feelings or attitudes.	ACQUIRING INFORMATION Solicits information about the innovation in a variety of ways, including questioning resource persons, corresponding with resource agencies, reviewing printed materials, and making visits.	SHARING Discusses the innovation with others. Shares plans, ideas, resources, outcomes, and problems related to use of the innovation.
LEVEL 0 NON-USE: State in which the user has little or no knowledge of the innovation, no involvement with the innovation, and is doing nothing toward becoming involved.	Knows nothing about this or similar innovations or has only very limited general knowledge of efforts to develop innovations in the area.	Takes little or no action to solicit information beyond reviewing descriptive information about this or similar innovations when it happens to come to personal attention.	Is not communicating with others about the innovation beyond possibly acknowledging that the innovation exists.
DECISION POINT A	*Takes action to learn more detailed information about the innovation.*		
LEVEL I ORIENTATION: State in which the user has acquired or is acquiring information about the innovation and/or has explored or is exploring its value orientation and its demands upon user and user system.	Knows general information about the innovation such as origin, characteristics, and implementation requirements.	Seeks descriptive material about the innovation. Seeks opinions and knowledge of others through discussions, visits, or workshops.	Discusses the innovation in general terms and/or exchanges descriptive information, materials, or ideas about the innovation and possible implications of its use.
DECISION POINT B	*Makes a decision to use the innovation by establishing a time to begin.*		
LEVEL II PREPARATION: State in which the user is preparing for first use of the innovation.	Knows logistical requirements, necessary resources and timing for initial use of the innovation, and details of initial experiences for clients.	Seeks information and resources specifically related to preparation for use of the innovation in own setting.	Discusses resources needed for initial use of the innovation. Joins others in pre-use training, and in planning for resources, logistics, schedules, etc., in preparation for first use.
DECISION POINT C	*Begins first use of the innovation.*		
LEVEL III MECHANICAL USE: State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a clumsy attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use.	Knows on a day-to-day basis the requirements for using the innovation. Is more knowledgeable on short-term activities and effects than long-range activities and effects of use of the innovation.	Solicits management information about such things as logistics, scheduling techniques, and ideas for reducing amount of time and work required of user.	Discusses management and logistical issues related to use of the innovation. Resources and materials are shared for purposes of reducing management, flow and logistical problems related to use of the innovation.
DECISION POINT D-1	*A routine pattern of use is established.*		
LEVEL IV A ROUTINE: Use of the innovation is established. Few if any changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.	Knows both short- and long-term requirements for use and how to use the innovation with minimum effort or stress.	Makes no special efforts to seek information as a part of ongoing use of the innovation.	Describes current use of the innovation with little or no reference to ways of changing use.
DECISION POINT D-2	*Changes use of the innovation based on formal or informal evaluation in order to increase client outcomes.*		
LEVEL IV B REFINEMENT: State in which the user varies the use of the innovation to increase the impact on clients within immediate sphere of influence. Variations are based on knowledge of both short- and long-term consequences for clients.	Knows cognitive and affective effects of the innovation on clients and ways for increasing impact on clients.	Solicits information and materials that focus specifically on changing use of the innovation to affect client outcomes.	Discusses own methods of modifying use of the innovation to change client outcomes.
DECISION POINT E	*Initiates changes in use of innovation based on input of and in coordination with what colleagues are doing.*		
LEVEL V INTEGRATION: State in which the user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within their common sphere of influence.	Knows how to coordinate own use of the innovation with colleagues to provide a collective impact on clients.	Solicits information and opinions for the purpose of collaborating with others in use of the innovation.	Discusses efforts to increase client impact through collaboration with others on personal use of the innovation.
DECISION POINT F	*Begins exploring alternatives to or major modifications of the innovation presently in use.*		
LEVEL VI RENEWAL: State in which the user re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.	Knows of alternatives that could be used to change or replace the present innovation that would improve the quality of outcomes of its use.	Seeks information and materials about other innovations as alternatives to the present innovation or for making major adaptations in the innovation.	Focuses discussions on identification of major alternatives or replacements for the current innovation.

Procedures for Adopting Educational Innovations Project, Research and Development Center for Teacher Education, University of Texas at Austin, 1975, H.I.E. Contract No. NIE-C-74-0057.

Table 4

Classification of LoUOI Criteria
for Determination of Level of Use

* indicates the criterion is mandatory for designation in Level. Otherwise, the criterion is optional.

Level 0 - Nonuse

No attendence at NSF/SCIS summer Institute.
No evidence of seeking information by reading materials about SCIS.
*No requests for information or materials concerning SCIS.
*Oriented in SCIS, but expressing no interest in using it.

Level I - Orientation

*Attendence at NSF/SCIS summer Institute
Requests information about SCIS to learn more about it, but has not made a decision to use SCIS.
Attends monthly workshops to acquaint self with what SCIS is and is not, but has not made a decision to use it.
SCIS materials may or may not be observable in classroom.

Level II - Preparation

*Evidence of SCIS materials in class for the purpose of implementing SCIS(no experiments observable).
*Teacher asks logistical questions about how to begin using SCIS.
Teacher requests materials from the Science Resource Center to begin use of SCIS.
Teacher requests assistance in setting up experiments for initial use of SCIS.
Teacher requests materials from SCIS kits to learn how to begin imminent use of SCIS.

Level III - Mechanical Use

*Evidence of SCIS materials in room(experiments may or may not be going on).
*Teacher asks questions concerning management and/or availability of materials to aid him/her in current use.
Teacher asks logistical questions about how to cope with or cut down on ineffective mechanical use.
*Classroom climate and use of SCIS chaotic, not smooth as defined by:
a. Roles of teacher and students not well defined.
b. Students ask many procedural questions that indicate a lack of teacher anticipation of needed materials, procedures, preparation, etc.
c. Flow of actions in the teacher and students disjointed, uneven, and uncertain resulting in the ineffective use of SCIS,
Teacher requests materials from the SCIS kits to decrease logistical problems for teacher benefit.

Table 4

Level IV-A - Routine

*Evidence of SCIS materials in room(experiments going on).
*Teacher reports personal use of SCIS satisfactorily going on.
*Classroom climate and use of SCIS smooth, not chaotic, as defined by:
a. Roles of teacher and students are well defined(students know what they are to do, procedures are set for material distribution, grading, testing, getting teacher help, etc.).
b. Students ask few procedural questions.
c. Flow of actions in the teacher and students is smooth, even, and certain, resulting in the effective use of SCIS.
Students report doing SCIS regularly.

Level IVB - Refinement

*Evidence of SCIS materials in room.
*Observable experiments in class as well as additional student projects.
*Teacher asks questions concerning modifying SCIS to improve student impact.
Teacher promotes science fairs and/or individual projects.
Teacher uses SCIS Evaluation Strategies or has designed behavioral objectives with a unique way of evaluating students, and changes the use of SCIS to increase student outcomes.
Observation and/or reports of coordinating SCIS with other subjects, e.g., language arts, math, etc.

Level V - Integration

*Team teaching activities for improving use of SCIS.
*Teacher reports collaboration with colleagues to integrate use of SCIS and expand integration.
Teacher helps organize workshops that will expand integration of use with colleagues.
Participation in newsletter with the focus on greater SCIS impact through collaboration with other faculty.
Teacher requests materials from SCIS kits for integration of SCIS With other faculty members.

Level VI - Renewal

*Other science curricular materials present in room which teacher is exploring for the purpose of enhancing SCIS use or replacing SCIS with something better for student use.
Teacher requests information about other science which h/she is exploring to enhance SCIS or replace SCIS to increase student outcomes.
Teacher shares ideas h/she has about alternatives which h/she might combine with SCIS to increase student outcomes.
Teacher requests materials from SCIS kits to enhance current use of SCIS by making major modifications to increase learner outcomes.

Table 5

Relative Frequency Distribution for Levels of Use Using the LoUQI

LoU	Frequency	Proportional Frequency	Percent Frequency
0	2	.0606	6.06
I	5	.1515	15.15
II	0	.0000	0
III	17	.5151	51.51
IV-A	5	.1515	15.15
IV-B	3	.0909	9.09
V	0	.0000	0
VI	1	.0303	3.03

Appendix

Levels of Use Observational Inventory(LoUOI)

Name _____ Predicted LoU _____
School _____ Degree of Confidence-circle one
Date _____ 90% 70% 50% 30%

The purpose of this instrument is to help administrators, department chairmen, faculty, and other interested persons to determine the Level of Use of an innovation by an individual. It was designed to aid in the curriculum adoption process, i.e., not as a personal evaluation of teachers.

Directions

Place a check in the appropriate category following each item.

	Yes	Occasionally	No
Attendence			
1. At 1975 NSF Summer Institute	___	___	___
2. At monthly workshops(specify dates)	___	___	___
3. At Environmental Education workshops(specify)	___	___	___
Out of Classroom			
1. Requests materials from SCIS kits	___	___	___
2. Requests SCIS teacher manuals, workbooks, etc.	___	___	___
3. Requests materials from Science Resource Center	___	___	___
4. Requests more indepth information about SCIS, e.g., evaluation packets, outdoor activities, etc.	___	___	___
5. Requests field trip information	___	___	___
6. Requests learning center information	___	___	___
7. Requests guest speaker information	___	___	___
8. Requests film information	___	___	___
9. Provides comments and/or articles for newsletter	___	___	___
In Classroom Observations			
1. Aquaria and/or terraria(class use)	___		___
2. Student used aquaria and/or terraria (for experiments)	___		___
3. Other living organisms present(not student used)	___		___
4. Student used living organisms present(for experiments)	___		___
5. SCIS Physical Science materials present	___		___
6. SCIS Physical Science experiment observed	___		___
7. SCIS Life Science experiment observed	___		___
8. Other science activity observed(describe)	___		___
9. Team teaching and/or collaboration	___		___
10. SCIS related bulletin board	___		___
11. Presence of other curricular materials	___		___
12. Evidence of SCIS Evaluation Strategies being used	___		___
13. SCIS Life Science Chapters completed		___	
14. SCIS Physical Science chapters completed		___	

LoUOI - 2

	Yes	No
Classroom Climate		
Roles of teacher and students well defined.	___	___
Flow of actions in teacher and students smooth, even, and certain resulting in the effective use of SCIS.	___	___
Few procedural questions asked by teacher and/or students.	___	___
Students report doing SCIS regularly.	___	___

II. Tally the first three substantive statements and/or questions for each visit.

	Tallies
Asks for SCIS teacher manuals, student workbooks, teacher handbooks, etc.(LoU I).	_____
Asks logistical questions relating to the initial use of the innovation(LoU II).	_____
Asks immediate usage questions involving management problems, availability of materials, etc., to aid him/her to smooth out current use(LoU III).	_____
Asks logistical questions about how to cope with or cut down on ineffective mechanical use(LoU III).	_____
Reports personal use of SCIS satisfactorily going on(LoU IVA).	_____
Asks questions that bear on modifying or adapting SCIS to improve impact on students(LoU IVB)	_____
Asks questions about how to get together with other faculty members who are currently working to integrate the use of SCIS for student benefit(LoU V).	_____
Asks questions concerning future group meetings, perhaps with suggestions for topics to be explored, or suggestions for the newsletter(LoU V).	_____
Asks questions which deal with other curriculum projects which conceivably could replace or augment SCIS for the purpose of improving benefits to students(LoU VI).	_____
Other(specify)	_____