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ABSTRACT

This paper, designed to assess the degree of implementation of the important features of a curriculum innovation, was presented at the 1978 Bat-Sheva Seminar on Curriculum Implementation and its Relationship to Curriculum Development in Science, Rehovot-Jerusalem, Israel. It investigates the use of sub-interviews within the main interview to assess the level of use of each of the components of interest innovation bundle. The methodology described is used to measure the level of implementation of the junior high school science program, The National World" (TNW). This is the revision and modular adaptation of the Intermediate Science Curriculum Study (ISCS). A total of five teachers using the TNW program were interviewed personally or by telephone. Results show that all teachers are regular users of the program and there are considerable variations in their degree and level use of the program. Scales used to measure the use of innovation and interview format are also presented. (HM)

# ASSESSING THE DEGREE OF IMPLEMENTATION OF THE IMPORTANT FEATURES OF A CURRICULAR INNOVATION



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## ASSESSING THE DEGREE OF IMPLEMENTATION OF THE IMPORTANT FEATURES OF A CURRICULAR INNOVATION

Any review of the literature in education reveals many studies that report no significant findings or indicate conflicting results. The lack of definitive findings regarding the superiority of particular programs, materials, strategies, and techniques has frustrated researchers and practitioners alike for years. A few researchers such as Stephens (1967) seem to have despaired of ever obtaining definitive results. Some more optimistic researchers have sought achievement-treatment interactions. Although this research area has yielded some results, progress has been slow (Tobias, 1976). Other researchers have questioned the basic research methodologies used in educational research.

Charters and Jones (1973) drew the attention of the research community to the fact that sometimes the differences between "experimental" and "control" programs are more fictional than factual. They stated that unless adequate measurement techniques are used this lack of difference will be undetected.

The relevance of this to curriculum research was shown by Hall and Loucks (1977). Their study compared student achievement in reading and mathematics between schools using Individually Guided Education (IGE) and non-IGE schools. Initial results indicated no significant differences. However, when the researchers interviewed teachers to determine the extent to which each teacher was individualizing reading and mathematics in their classroom, they found that use and nonuse of individualization was widespread in both IGE and non-IGE schools. Re-analysis of the data to compare actual users and nonusers of individualization revealed significant differences. This study clearly indicated the need for careful measurement to ensure that curriculum innovations have been implemented in the "experimental" group and not in the "control" group.

A number of different techniques have been used to assess the fidelity of implementation, the degree to which the actual use of an innovation corresponds to its intended or planned use. These include:

direct classroom observation (Ashley and Butts, 1970; Evans and Scheffler, 1974; Gross, Giacquinta, and Bernstein, 1971; Hess and Buckholdt, 1974; and Naumann-Etienne, 1974), a combination of questionnaires and direct observation (Crowther, 1972; Leinhardt, 1973; Leinhardt, 1974), questionnaires and an analysis of key documents (Downey et al., 1975), teacher questionnaires (Cole, 1971), and focused interviews with teachers (Hall and Loucks, 1977).

Direct classroom observation over an extended period would seem to be the most desirable and valid technique of assessing the degree of implementation of a curricular innovation; however, limitations of time and money often preclude the use of this technique.

The Level of Use framework (Hall et al., 1975; Hall & Rutherford, 1976) appears to be an attractive alternative. This framework is based on the Concerns-Based Adoption Model (CBAM) developed by Hall, Wallace, and Dossett (1973). They hypothesized eight different Levels of Use: Non-use, orientation, preparation, mechanical use, routine [use], refinement, integration, and renewal. A branched, focused interview with the user of the innovation (teacher) is used to assess the Level of Use of the innovation in the classroom (Loucks, Newlove, & Hall, 1975). Evaluations of the technique indicated interrater reliabilities of from 0.87 to 0.96 for repeated ratings of tape-recorded interviews and a correlation between interview ratings and ratings by ethnographers, who spent a full day with a sample of teachers, of 0.98 (Hall & Loucks, 1977). In addition, longitudinal studies indicate that there is a gradual movement of users from lower levels of use to higher levels of use as a function of the length of time an innovation has been used (Loucks, 1978).

The comprehensiveness of this framework is an asset to the researcher who is studying the implementation process in depth. But, the complexity of the scale and the measurement technique may prove to be a liability to the researcher who is only interested in assessing the relative "purity" of experimental and control groups. This paper presents an abbreviated form of the scale for use in such situations.

A second drawback of the original framework in research on curricula is that it is designed to measure the level of use of a single innovation while a typical curricular "innovation" actually consists of a "bundle" of independent processes and ideas. The Level of Use Training

Manual recognizes this problem but the suggestion of using separate, complete interviews for each of the separate innovations is not entirely satisfactory (Loucks, Newlove, & Hall, 1975, pp. 30-32). This paper proposes the use of "sub-interviews" within the main interview to assess the level of use of each of the components of interest in the curriculum innovation bundle.

A more serious problem in the use of the original level of use framework is that there is no formalized strategy for assessing the extent to which the innovation is used in the classroom. The importance of this aspect of measurement is emphasized by the study of Gross, Giacquinta, and Bernstein (1971) in which direct classroom observation indicated that teachers behaved in accordance with the expected role only about twenty percent of the time. These teachers may have been implementing the innovation at a mechanical level or even a routine level but the extent of their implementation was low. Loucks, Newlove, and Hall (1975, pp. 31) use one or more questions at the beginning of the interview to assess the extent of use of the innovation but only to separate users from nonusers. This paper expands on this technique to assess the extent of use of the total curriculum package and the various separate innovations of interest.

## Levels of Curriculum Implementation

There appear to be two independent factors that must be considered in accounting for the variation observed in teachers' actual use of a curriculum innovation in a classroom situation. The first is the fidelity of use of the innovation or the degree to which the original intentions of the instructional designer are followed in implementing it. The second is the degree of use or the proportion of appropriate instructional time that is devoted to the use of the innovation.

The fidelity of use factor is very difficult to define and measure accurately. In their review Fullan and Pomfret (1977) indicate that the measurement of levels of use of an innovation proposed by Hall and Loucks (1977) takes the measurement of the fidelity of implementation to its logical and methodological conclusion. This method, modified to reduce its complexity and to permit the separate assessment of the various separate assessment of the various separate innovations inherent in a cur-

riculum innovation, is the one proposed in this paper.

The degree of use of an innovation is also difficult to measure but it must be considered. Teachers vary in the extent of their use of an entire curriculum package. Some teachers will use one curricular package throughout the year with all of their students. Others will limit the use to certain students or certain segments of the course. Teachers also vary in the extent to which they implement the various features features or innovations inherent in a curriculum innovation. This is a particularly important consideration in such recent curricular innovations as the Intermediate Science Curriculum Study (ISCS) materials and the Individualized Science Instructional System (ISIS) materials which are specifically designed to provide the teacher with the flexibility of implementing or not implementing such important features as: self-pacing, self-sequencing, self-diagnosis and prescription of remediation, branching, and self-evaluation. Thus it is necessary to measure both the degree of use of the entire curriculum package and the degree of use of the various separate features or innovations inherent in the package to account for the variability encountered in actual use.

The methodology described below uses separate scales to measure the two factors: the degree of use and the level of use. These two scales form a degree of implementation (DoI) matrix. One DoI matrix is produced for the overall program and one for each of the innovations inherent in the program.

## Definition of the Modified Level of Use (LoU-Mod) Scale

The fidelity of use of an innovation is measured using a modified form of the Level of Use (LoU) Scale described by Hall et al. (1975) and Loucks (1977). The modified Level of Use Scale (LoU-Mod) distinguishes between four discrete levels of use of a curriculum innovation: mechanical use, routine use, refinement, and modification. The scale points of the LoU (Mod) are defined in Figure 1. The first three levels are essentially the same as those of the original LoU Scale. The fourth level, modified use, is used to characterize situations in which the user has made substantial changes in the overall program or innovative feature so that the instructional intent is altered.

Figure 1: Definition of LoU-Mod Scale Points

| LoU-Mod Scale Points | Definitions |
|---|---|
| Level A - Mechanical | The state in which the user is primarily concerned about the day-to-day mechanics of use. There is little time for reflection. Changes are made to meet user needs rather than student needs. |
| Level B - Routine | The state in which the use of the program or feature has stabilized. Few changes are made. Little thought is given to improving its use or impact. |
| Level C - Refinement | The state in which the use is varied to increase its impact on students. The variations are based on the user's knowledge of the short and long term effects of the program or feature on students and its demands on them. |
| Level D - Modification | The state in which the user has substantially modified the program or feature so that it no longer meets the original intent. |

Several scale points of the original LoU Scale have been deleted or shifted to the degree of use dimension. The scale points "non-use" and "integration" have been shifted to the degree of use scale. The scale points "orientation" and "preparation" have been deleted since they represent various levels of preparation for use rather than actual use and so are of little interest to a researcher attempting to assess the "purity" of the experimental and control groups. Another scale point that has been deleted is "renewal". This scale point is used to characterize an individual who is currently using the innovation but who is seeking alternatives to replace the innovation. Since such a person is still actively using the innovation in the classroom, the value of identifying this category of users seemed marginal and this scale point was deleted from the LoU-Mod.

There are a variety of behaviors that are characteristic of the various levels of use of an innovation. The original LoU Scale describes seven different categories of behaviors that vary from level to level. These categories are: knowledge, acquiring information, sharing, assess-

Figure 2: The LoU-Mod Chart

| DEFINITION OF LEVEL OF USE SCALE POINTS | BEHAVIORAL CATEGORIES | | |
|---|---|---|---|
| | INFORMATION SEEKING | EVALUATIVE BEHAVIOR | STATUS REPORTING |
| LEVEL A - MECHANICAL<br>The user is primarily concerned about the day-to-day mechanics of use. Little time for reflection. Changes made to meet user needs rather than student needs. | Seeks information about management-related topics as scheduling, timing, and logistics and ideas to reduce the time and effort required of the user. | Evaluates use with respect to problems of logistics, management, time, resources, equipment, schedules and general reaction of students. | Reports that logistics, time, scheduling, resource organization, etc. are the focus of most personal efforts to use the program or feature. |
| LEVEL B - ROUTINE<br>The use of the program or feature has stabilized. Few changes are made. Little thought is given to improving its use or impact. | Makes no particular effort to seek new information or ideas. | Limits evaluation to that which is administratively required. Little attention paid to findings for the purpose of changing use. | Reports that personal use is proceeding satisfactorily with few, if any, problems. |
| LEVEL C - REFINEMENT<br>The use is varied to increase the impact on students. The variations are based on a knowledge of the short and long-term effects and demands on students. | Seeks information, ideas, and materials to serve as the basis for changing use to affect student outcomes. | Evaluates own use of the strategy or program for the purpose of changing current practices to improve student outcomes. | Reports varying program or feature in order to modify student outcomes. |
| LEVEL D - MODIFICATION<br>The user has substantially modified the program or feature so that it is no longer the same as the original. | Seeks information, ideas, and materials to implement major changes. | Analyzes strengths and weaknesses of current practices for the purpose of implementing major changes. | Reports substantial change and modification to the program or feature. |

NOTE: A modification of the original LoU Chart devised by Hall et al. (1975)

ing, planning, status reporting, and performing. The simplified LoU-Mod Scale retains only three of these categories: information seeking, evaluative behavior, and status reporting. The various categories and behaviors characteristic of each level are summarized in Figure 2. The behaviors outlined in this figure form the basis of the assessment of an individual's level of use of an innovation. The focused interview, described below, is designed to elicit responses that describe the respondent's typical behaviors in each of these behavioral categories and thus allow the interviewer to determine the actual level of use of the innovation by the respondent.

The LoU-Mod Scale is used to describe the level of overall use of a curriculum package and the levels of use of the various separate innovations or features that are inherent in the curriculum package.

Definition of the Degree of Use (DoU) Scale

The variation in the extent to which a curricular program or feature is used in the actual classroom situation is described with respect to the Degree of Use (DoU) scale. The extent to which a teacher actually uses an innovation is essentially independent of that teacher's level of use of that innovation. For example, when a teacher implements an innovation such as self-pacing of instruction the teacher may demonstrate a routine level of use of that innovation, but for one reason or another may choose not to implement that innovation in the classroom on a regular basis.

The scale points of the DoU scale are defined in Figure 3 and range from non-use of the innovation to integrative use. The selection and definition of these scale points are arbitrary and they were chosen so as to keep the scale as simple as possible yet provide the necessary information for a researcher interested in determining the "purity" of experimental and control groups. The "partial use" scale point can easily be separated into three scale points to indicate: regular use by a portion of the class, irregular use by a portion of the class, and irregular use by the entire class.

Two of the scale points, "outside use" and "integrative use," require further explanation. These apply only to the individual innovative curricular features and not to the curriculum package as a whole. They are used to describe situations in which students are exposed to the innovative curricular features of interest in classes other than the one that is the

Figure 3: Definition of DoU Scale Points

| DoU Scale Points | Definitions |
|---|---|
| Level 0 - Non-Use | The program or feature is not used at all. This scale point includes past users who have no definite plans to use it on a periodic basis. |
| Level 1 - Outside Use (for program features only) | The feature is not used in the classroom in which the program is implemented but the students are exposed to the feature in other classes they attend. |
| Level 2 - Partial Use | The program or feature is used to a limited extent. A program is used by less than 80% of the students or for less than 80% of the available instructional time. A feature is used with less than 80% of the students or in less than 80% of the suitable situations. |
| Level 3 - Regular Use | The program or feature is used on a regular, continuing basis with at least 80% of the students and for at least 80% of the available instructional time (programs) or suitable situations (features). |
| Level 4 - Integrative Use (for program features only) | The feature is implemented in the classroom at level 2 or 3 and the students are further exposed to the feature in other classes they attend. |

main focus of interest. The usefulness of these scale points can be best illustrated using an example. Suppose a researcher was studying the effect of a science unit on students' critical thinking skills. His results would be meaningless if he failed to ensure that students in the experimental and control groups were not receiving instruction in critical thinking skills in their other classes.

Determining the degree of use of an innovative feature can be quite troublesome since certain innovations are not meant for continuous classroom use but rather when the situation arises. For example, the self diagnosis and prescription feature of the ISCS program is only implemented when a student reaches the appropriate section of the instructional materials. Classroom observation is a very inefficient method of assessing the degree of use of such innovative features. An interview with the teacher or a student is much more efficient but the

interviewer must have the expected level of use of the innovation clearly in mind to be able to rate the actual degree of use correctly.

Measuring Levels of Curricular Implementation

Measuring the level of curricular implementation involves three stages. These are: selecting and operationally defining the separate innovations of interest within the curriculum package, interviewing the teachers, and rating the degree and level of implementation. The procedures for each stage are outlined below.

Defining the Separate Innovations of Interest

Curriculum innovations, particularly those developed with public rather than private support, tend to be relatively complex, incorporating several innovative features, which distinguish them from more traditional programs. These innovations range from content and content emphasis through classroom organization and climate to new roles for the students and teacher.

Descriptive literature and teachers guides are often the best references for the researcher in determining which specific innovations are inherent in the curriculum package and in defining them. However, the researcher is well advised to talk with users of the package and spend some time in a classroom where the package is being implemented because there may be significant discrepancies between the developers original intentions and the final product.

In most cases an analysis will indicate that the curriculum package incorporates a large number of separate innovative features. In these situations the researcher must be selective and consider only those features that may have a significant effect on the dependent variable in question. The focused interview will become too long and cumbersome if it includes questions relating to more than five separate innovative features.

The researcher must be careful to operationally define the innovation to be assessed in terms of specific classroom behaviors. Unless the interviewer has a clear idea of what the researcher means by the innovation and can communicate this to the teacher being interviewed, the subsequent rating of the degree and level of use will be meaningless. How-

ever, the definition must not be too tight because there is always a certain amount of modification of an innovation when it is implemented (Fullan & Pomfret, 1977, p. 357).

Conducting the Interview

The degree and level of use of a total curriculum package and its innovative features are assessed using information supplied by the teacher during a focused interview. This interview uses a branched format and, with a skilled interviewer, resembles a casual conversation with the teacher about how the program is working in the classroom.

The interview consists of two major parts. The first relates to the general level and degree of use of the entire curriculum package. The second portion deals with the specific features or innovations of interest and is repeated for each of them. The suggested interview protocol is given in Figure 4. The wording of the questions and transition statements need not be followed exactly but the interviewer must be sufficiently knowledgeable about the rating procedures to probe more deeply when the appropriate information has not been forthcoming. An annotated transcript of a sample interview is provided in Appendix 1.

The length of an interview varies from 10 to 35 minutes depending on the number of specific innovations assessed, the talkativeness of the respondent, the skill of the interviewer, and the degree and level of use of the innovations. The interviewer should, if at all possible, tape record the interview so that more than one individual can rate the degree and level of use.

The training manual for the original LoU scale (Loucks, Newlove, & Hall, 1975) is recommended reading for researchers who plan to make use of this technique. It contains many valuable ideas and suggestions.

Figure 4: LoI Interview Schedule

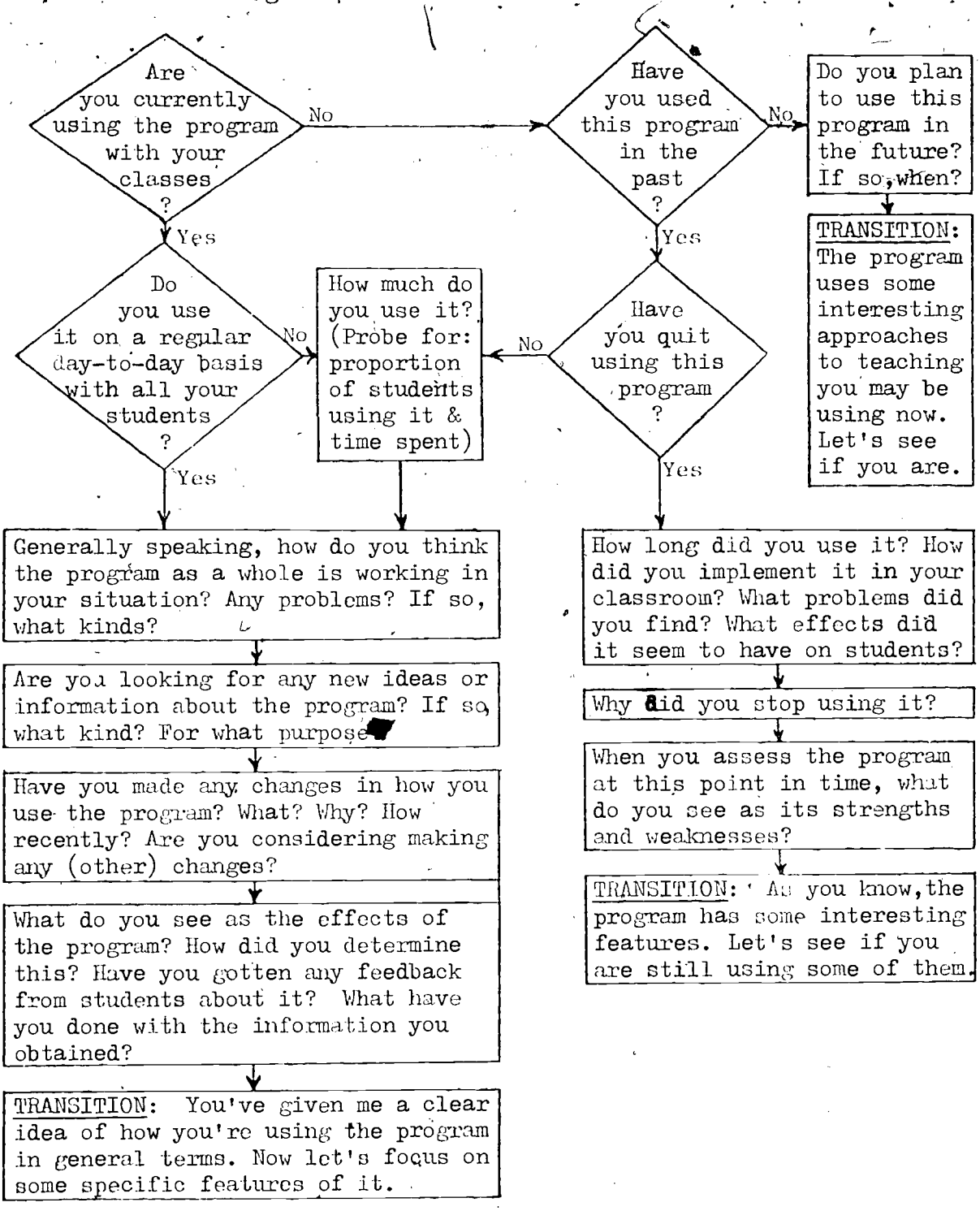
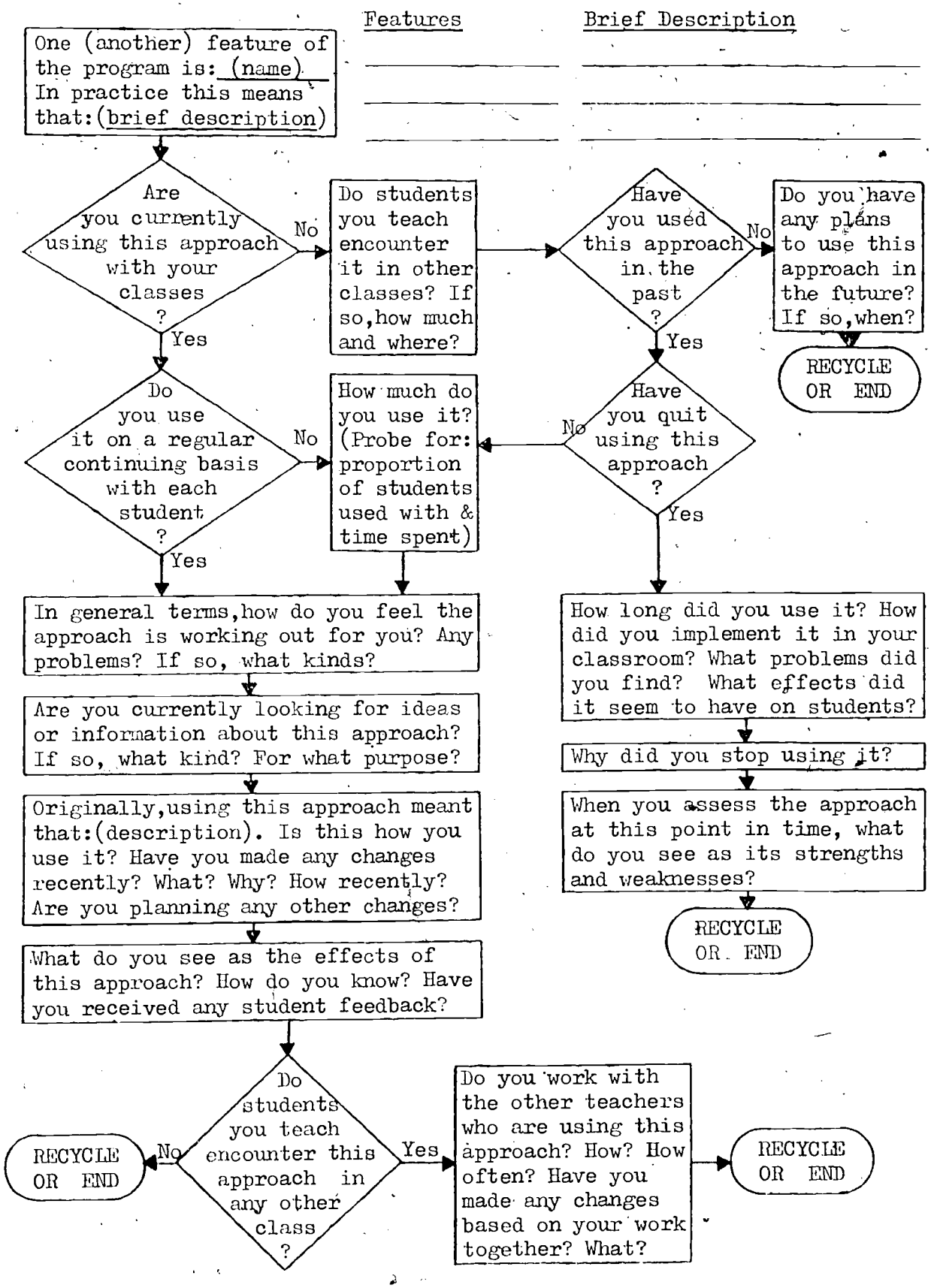


Figure 4 (continued)



Rating the Interview

The Level of Implementation rating form (Figure 5) was designed to assist the rater in processing the information gathered from the interview. The interview may be considered to consist of several segments. The first segment relates to the use of the overall curriculum package. Subsequent segments refer to the use of the various innovative features of interest. The aim of the rating procedure is to assign to the interviewee separate levels and degrees of use for each segment.

Determining the DoU for each segment is relatively straight forward. The rater assigns a particular DoU based on the definition of the various DoU categories and the interviewee's statements during that segment of the interview.

If the interviewee is using the program or innovative feature, the rater must also determine the LoU-Mod rating for the interview segment. This is somewhat more difficult since there are three behavioral categories to consider: information seeking, evaluative behavior, and status reporting. A separate LoU-Mod rating is made for each of these behavioral categories and then an overall LoU-Mod rating is made for the interview segment. The suggested procedure is as follows: when a statement is made that appears to place the interviewee at a certain level of use for a particular behavioral category, a tally mark is made on the rating sheet by the appropriate number. If the statement may be interpreted as applying to more than one level of use, separate tally marks are made for each. Once the interview segment is over, the rater must assign a LoU-Mod rating for each behavioral category and decide on an overall rating. These decisions should not be based solely on which LoU-Mod has the most tally marks since one statement may be more significant than the others. However, the tally marks do help provide evidence for a decision. In making these decisions, the rater must remember that each behavioral category and the overall LoU-Mod should be rated independently. Often an individual will have different LoU-Mod's for the different behavioral categories.

Two special designations are provided at the bottom of the rating sheet, ND and NI. The ND rating is used for those situations in which the interviewee reports doing nothing in that behavioral category. The NI rating is used to indicate when there is not sufficient information

Figure 5: Level of Implementation Rating Sheet

Interview Data: Tape #_____ DoI Matrix for:_____

Site:_____ ID #_____

Date: / / Interviewer:_____

Rating Data:

Date: / / Rater #1:_____

Date: / / Rater #2:_____

How difficult was this tape to rate?

Very easy 1 2 3 4 5 Very hard

| DoU-0 Non-Use | | LoU-Mod | | | |
|---|---|---|---|---|---|
| DoU-1 Outside | | A MECH | B ROUT | C REFD | D MODF |
| DoU-2 Partial | | | | | |
| DoU-3 Regular | | | | | |
| DoU-4 Integr. | | | | | |

DoI rating of:_____(program or feature name)

| DoU (Circle one) | LoU-Mod | Info. Seeking | Eval. Behavior | Status Report | Overall |
|---|---|---|---|---|---|
| 0 - Non-Use | Mechanical | A | A | A | A |
| 1 - Outside | Routine | B | B | B | B |
| 2 - Partial | Refined | C | C | C | C |
| 3 - Regular | Modified | D | D | D | D |
| 4 - Integrative | Not Doing | ND | ND | ND | |
| Past User? Y N | No Info. | NI | NI | NI | |

DoI rating of:_____(feature name)

| DoU (Circle one) | LoU-Mod | Info. Seeking | Eval. Behavior | Status Report | Overall |
|---|---|---|---|---|---|
| 0 - Non-Use | Mechanical | A | A | A | A |
| 1 - Outside | Routine | B | B | B | B |
| 2 - Partial | Refined | C | C | C | C |
| 3 - Regular | Modified | D | D | D | D |
| 4 - Integrative | Not Doing | ND | ND | ND | |
| Past User? Y N | No Info. | NI | NI | NI | |

DoI rating of:_____(feature name)

| DoU (Circle one) | LoU-Mod | Info. Seeking | Eval. Behavior | Status Report | Overall |
|---|---|---|---|---|---|
| 0 - Non-Use | Mechanical | A | A | A | A |
| 1 - Outside | Routine | B | B | B | B |
| 2 - Partial | Refined | C | C | C | C |
| 3 - Regular | Modified | D | D | D | D |
| 4 - Integrative | Not Doing | ND | ND | ND | |
| Past User? Y N | No Info. | NI | NI | NI | |

provided in the interview to make a rating. Either the interviewer failed to ask for the information or the interviewee did not provide enough information.

Once the DoU and the overall LoU-Mod have been determined for a particular interview segment, they can be recorded in the matrix on the rating sheet. If code numbers or letters are used to designate the various interview segments, all the DoU's and LoU-Mod's for an interview can be represented on a single level of implementation matrix to provide an implementation profile for that individual. This matrix is also useful in compiling data from several individuals. The completed LoI rating form for the sample interview (Appendix 1) is given in Appendix 2.

## Utilization of Level of Implementation Data

Researchers studying the processes of implementation will be primarily interested in individual users' level of implementation (LoI) profiles and how these change as a function of time. Hall et al. (1975) have hypothesized that growth in the quality of use of an innovation is developmental for most individuals and the level of use should increase as a function of time.

Those researchers who engaged in summative evaluations or comparative studies of curricula may simply be interested in assessing the "purity" of the experimental and control groups. In these cases, the individual LoI matrices are of little value and further data reduction is possible. This may be done by producing master LoI matrices. One for the overall LoI of the program and one for each of the innovative features assessed. Each cell of these matrices would contain frequency counts of the numbers of users in either the control or the experimental group having a particular combination of DoU and LoU-Mod. Ideally all of the individuals in the control group would be non-users while all those in the experimental group would have a routine or refined level of use and be regular users. Researchers who find considerable variation in the level and degree of use of the various innovative features may be able to devise a research design that allows the assessment of the relative contribution of the various features on the overall impact of the curriculum package. This type of research is rarely done and definitive results would prove invaluable to instructional designers.

## Application of the Methodology

The preceding methodology has been used to measure the level of implementation of the junior high school science program The Natural World (TNW) (Burkman et al., 1975-7). This is the revision and modular adaptation of the ISCS program; Probing the Natural World (Intermediate Science Curriculum Study, 1970-72). The degree of implementation of the overall program and three separate innovative features were assessed. The various separate innovations are defined in Figure 6. These definitions were arrived at based on the author's personal experience with the program in both the development and implementation phase and from a study of various Individualized Teacher Preparation modules developed for the original ISCS program (Intermediate Science Curriculum Study, 1972-74).

Figure 6: Definitions of Features of the TNW Program

| Features | Definitions |
|---|---|
| Self Pacing (P) | The rate at which each student or small group (4 or less) progresses is self determined. The teacher may encourage slow or fast students to work at a more reasonable rate. The use of a time schedule that students must follow is a substantial modification. Lock stepping the entire class constitutes non-use. |
| Self Sequencing (S) | Individual students select which module to start on and the sequence of modules they use. Teacher restrictions on the number of students working on a module simultaneously are permitted as are teacher suggestions as to which module meets a student's needs or interests. Forming permanent lab groups that must jointly plan a sequence constitutes substantial modification. Prespecifying sequences of modules for more than 1 or 2 students constitutes non-use. |
| Self Evaluation (E) | Prior to taking the standardized test for a module students use the self evaluation items to assess their progress. Students should correct their own items and decide which activities, if any, to redo. Teacher scoring of the items is permitted. Using the results for grading purposes or requiring a student to redo activities based on the results constitutes substantial modification. |

Subjects

A total of five teachers using the TNW program were interviewed. Three were teaching in a local school and two were from different locations in the United States. All of the subjects were experienced teachers having taught science for more than five years. For two of the teachers this was their first year of using the program.

Procedure

The teachers were interviewed late in the school year to ensure that their use of the program had stabilized. The interview format followed the one previously described. The local teachers were interviewed personally. The U.S. teachers were interviewed by telephone. Loucks, Newlove, and Hall (1975, pp 38-39) indicate that telephone interviewing is an acceptable procedure and may reduce the inhibitions present in a face-to-face interviewing situation. In each case the interview was tape recorded. An annotated transcript of one of the interviews is provided in Appendix 1. The LoI ratings were done by the author.

Findings

The LoI ratings of the five teachers for the overall program and the three innovative features are presented in Figure 7. The individual teacher's ratings are identified using lower case letters. An examination of the matrix for the overall program indicates that all the teachers

Figure 7: Observed DoI Matricies for the TNW Program

DoI Matrix for Overall Program

| DoU-0 Non-Use | | LoU-Mod | | | |
|---|---|---|---|---|---|
| DoU-1 Outside | | A MECH | B ROUT | C REFD | D MODF |
| DoU-2 Partial | | | | | |
| DoU-3 Regular | | | acd | be | |
| DoU-4 Integr. | | | | | |

DoI Matrix for Self Pacing

| DoU-0 Non-Use | | LoU-Mod | | | |
|---|---|---|---|---|---|
| DoU-1 Outside | | A MECH | B ROUT | C REFD | D MODF |
| DoU-2 Partial | | | | | |
| DoU-3 Regular | | | ad | b | e |
| DoU-4 Integr. | | | c | | |

Figure 7 (continued)

DoI Matrix for Self Sequencing

| DoU-0 Non-Use | e | LoU-Mod | | | |
|---|---|---|---|---|---|
| DoU-1 Outside | | A MECH | B ROUT | C REFD | D MODF |
| DoU-2 Partial | | | | | |
| DoU-3 Regular | | | acd | b | |
| DoU-4 Integr. | | | | | |

DoI Matrix for Self Evaluation

| DoU-0 Non-Use | | LoU-Mod | | | |
|---|---|---|---|---|---|
| DoU-1 Outside | | A MECH | B ROUT | C REFD | D MODF |
| DoU-2 Partial | | | | | |
| DoU-3 Regular | | | ad | | be |
| DoU-4 Integr. | | | c | | |

are regular users of the program and function at a routine or refined level. However, the other matrices indicate that there are considerable variations in the teachers degree and level of use of the different innovative features of the program.

It is always risky to generalize on the basis of the very limited data base. However, it would appear that there are significant differences in how teachers implement a curriculum package in the classroom and that an assessment of their overall level of use of the program is inadequate to detect these differences. Further research is needed to substantiate the existence of these variations, to refine the techniques of measuring them, to determine whether they have important effects on student outcomes, and develop methods of helping teachers achieve those levels and degrees of use that maximize student outcomes.

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# APPENDIX 1

## Tapescript of LoI Interview

The tapescript that follows is a transcript of the actual interview of teacher "b". The interview format follows that of Figure 4 quite closely but not exactly. Some questions were dropped during the course of the interview because the required information had been given in an earlier part of the interview. Comments are provided to assist the reader in categorizing the information provided by the various responses. Where a comment indicates a specific LoU-Mod or DoU category, a tally mark was recorded on the LoI Rating Sheet. The completed LoI Rating Sheet is given in Appendix 2.

## Interview with Teacher "b"

| Interview | Comments |
|---|---|
| I: Are you using the modular version of The Natural World program? | To determine whether a user or non-user of the program. |
| R: Yes, with all six classes I teach. | Indicates extensive use. |
| I: Do you use it regularly with all your students? | Probing for extent of use. |
| R: Yes, everyone is on this program. | Indicates regular use (DoU 3). |
| I: Generally speaking how do you think the program is working out in your situation? | Probing status reporting LoU-Mod behavioral category. |
| R: I find it good. It works well. The kids are getting quite a bit out of it. They seem to like it. | Reports program is going well with few indications of problems (LoU-Mod S.R. - routine use). |
| I: Any problems? | Probe status reporting. |
| R: Not with the program itself, no. Possibly with class size. The program is good. | Again, indicates no problems. (LoU-Mod S.R. - routine use). |
| I: Have you made any changes recently in how you go about using the program? | Probe for changes that would be indicative of refined or modified use. |
| R: With one class, the weakest class, I sort of paced them a bit at the beginning for the first book or two so they got perhaps a bit more of an understanding of what their responsibilities were in the program. But, after that they were on their own. | The teacher has made some modification of the program. This may indicate mechanical use or refined use. The change is not large enough to be considered a substantial modification. (LoU-Mod S. R. - refined) |
| I: Why did you make this change? | Probe to separate mechanical from refined use. |
| R: Well, they're a weaker class and reading, I think, is part of their problem. They didn't know what to look for. They weren't reading it and understanding it the way they should before they started the experiments. | Change was made to meet student, rather than teacher, needs and was designed to increase the program's impact on students. Strong and clear indication of refined LoU-Mod. (LoU-Mod E.B. - refined use) |
| I: What do you see as the effects of the program? | Probe of evaluative behaviors LoU-Mod category. |
| R: Well, I think the students are a bit more capable now of doing individual work - of collecting and organizing information. Perhaps they're putting a bit more faith in their own ability to do things. | Indicates an awareness of both the short and long term changes in student behaviors. (LoU-Mod E.B. - refined use). |

| Interview | Comments |
|---|---|
| I: How do you know this? | Probe of evaluative behavior. |
| R: Well, from the type of results, the type of questions they ask, the way they set-up and organize their equipment. | Indicates informal evaluation of long term student outcomes. (LoU-Mod E.B. - refined). |
| I: Have you gotten any student feedback about the program? | Probe of evaluative behavior and basis for changes made. |
| R: Yes. I find they like it. Especially the better students who really enjoy this type of thing where they're not tied down to the slower ones and they get a lot out of it. | Generally aware of students' feelings. Indicates some informal evaluation. (LoU-Mod E.B. - refined). |
| I: Are you currently looking for any new ideas or information about the program? | Probe information seeking category. |
| R: No, not really. It is going well now. | Indicates routine level of use for this category. (LoU-Mod I.S. - routine). |
| I: You've given me a pretty reasonable idea of how you are using the program in general terms. Now let's look at some of the specifics. | Transition to focusing on the specific innovative features of the program. |

LoU for the Overall Program:

DoU-3 Regular user of the program

LoU-Mod:

| | | |
|---|---|---|
| I.S. - Information seeking | - | Routine |
| E.B. - Evaluative behavior | - | Refined |
| S.R. - Status reporting | - | Refined |
| Overall LoU-Mod rating | - | Refined |

| Interview | Comments |
|---|---|
| I: One feature of the program that you have mentioned already is self-pacing. This means that the students, either by themselves or in small groups, get to decide how fast they go through the material. Are you using this type of self-pacing with your classes? | Introduction and definition of the feature. Separating users and non-users. |
| R: Yes, I am. | Indicates use of the feature. |
| I: Do you use it regularly with all the students? (pause) You mentioned the one group... | Probe of degree of use. |
| R: Yes, the one group. I kept them together for the fist two books. More | Indicates regular use (DoU-3). This response and previous ones |

| Interview | Comments |
|---|---|
| to get them to read things, to look at their information and to see really what the information means. But, after that, after the first two books, I let them go and I found that they were doing probably as well as some of the other classes. | indicate an overall refined LoU-Mod for self-pacing. The change is not major and was implemented to meet student and not teacher needs. The status reporting category is rated as refined. (LoU-Mod S.R. - refined). |
| I: In general terms, how do you see self pacing as working out? | Further probe of status reporting. |
| R: I think it works out quite well, if your students are capable of reading and know what they want to do. The bulk of the classes have no problems at all. It works well. | Indicates no problems which would normally indicate a routine level of use. However, states qualifications that imply assessment of program and students and the need for matching. (LoU-Mod E.B. - refined & LoU-Mod S.R. - refined) |
| I: Are you looking for any new ideas or information about self pacing? | Probe of information seeking category. |
| R: (pause) I don't follow you. | |
| I: Are you looking for new ideas or are you satisfied with how things are going now? | Clarification. |
| R: Yea, as I said I've been pretty satisfied with it. | Indicates no seeking of new ideas (LoU-Mod I.S. - routine) |
| I: Originally, the self paced approach meant that each student decided for himself his own rate of progress. Is this how you use it? | Probe for any other changes. |
| R: Yes, they work on their own. I will from time to time put little notes on the board as to where I feel they should be at a particular time of year. After a month I might say you should be on your second book. And, they may or may not be at that point. It gives them some way of pacing their time. | Indicates only minor changes but changes that are student, rather than teacher, oriented. (LoU-Mod S.R. - refined) |
| I: Are you planning any more changes in how you use it? | Probe for planning for future changes. |
| R: Not really. I might in another year spend a little more time on the Resource Book as I did this last year. I found that going through the Resource Book itself gave them a bit of information about chemical symbols, | No indication of specific major changes. The change indicated again has a student focus. |

| Interview | Comments |
|---|---|
| chemical reactions and things like that before they start into the program helps. | Note: This is the only point in the interview where one particular modification is mentioned - this teacher has all the students work through the Resource Book before starting the program proper. This is a substantial modification of the use of the Resource Book but, since the use of this feature was not being-assessed, this was not followed up. However, this does indicate the importance of doing the features separately and in detail. |
| I: What sort of effects do you see self pacing as having? | Probe of evaluative behaviors. |
| R: Well, as I mentioned, the students are more assured of themselves. They have a little more confidence in what they are doing. They do something on their own and see it is right, it's good - they've got a positive result. I think this builds up a little more confidence in the student. They are not simply copying notes or something like that. They are achieving some goal. | Indicates some informal assessment of student outcomes. (LoU-Mod E.B. - refined) |
| I: Have you gotten any student feedback about self pacing? | Further probe of evaluating behavior. |
| R: I found my students really like this. In one class, for example, I found about one-quarter of them have finished the program and are started into the grade nine program. They liked it. They worked well and they saw this as a goal: that they could finish and go on. They weren't locked in now for a month with nothing to do. They could move into the third area of the program. | Indicates awareness and some informal evaluation of students' affective states. (LoU-Mod E.B. - refined). |
| I: Do the students you teach encounter this self pacing approach in any of the other classes they take? | Separate integrative users |
| R: Not really, no. | Not an integrative user |

LoI for the Self Pacing Feature:

DoU-3 Regular user of self pacing

LoU-Mod: Overall rating - Refined

| Interview | Comments |
|---|---|
| I: Another feature of the program is self sequencing. This means that the students can decide which module to start on and what sequence to go through them. Do you use this approach? | Introduction and definition of self sequencing. Probe to separate users and non-users. |
| R: Yes. I use it on six of the seven modules. One of the modules, I found, took a lot of care in handling chemicals, and accuracy is important. So I prefer that they had done three or four of the other modules before I allowed them to go on to that one. But, with the other six it was entirely up to them what sequence they went in. | Indicates probably a regular user. Modification based on assessment of long term needs and outcomes and is designed to increase the impact of the program on the students. (DoU-3) (LoU-Mod S.R. - refined; E.B. - refined). |
| I: So, with that one exception, you were using it with everyone in the class. You didn't have some students that had a particular sequence that they had to go through? | Probe for degree of use and for changes. |
| R: No. Except for the one class that I mentioned that started on one module, they all selected the sequence | Routine use (DoU-3) definitely indicated. Reference to change mentioned earlier. That change was student oriented to increase impact. (LoU-Mod S.R. - refined). |
| I: In general terms, how do you think this self sequencing worked out? | Probe for status report. |
| R: Well, I didn't see any problem with it. There was nothing where one book had a great dependance on another one. So there was no problem with sequencing. | Indicates feature operating well which is characteristic of the routine level of use. (LoU-Mod S.R. - routine). |
| I: Have you been hunting for any ideas or information about how to change or modify what you're doing? | Probe for information seeking. |
| R: No, I really didn't see any need to modify it. It was working quite well. I was pleased with it and the kids were quite happy. | Indicates no search for additional information. (LoU-Mod I.S. - routine). |
| I: What did you see as the effect of self selecting the sequence? (pause) Or, didn't you see that it had much effect? | Probe of evaluative behavior. |
| R: I really don't think it had too much effect. Like the students looked at taking the easy ones first and that | Indicates that no evaluation of this feature had taken place or the evaluation indicated that it |

| Interview | Comments |
|---|---|
| sort of thing. But, they can't judge from the color of the cover or the name of the book whether it is easy or hard. And, I think they sort of gave up after the first one. They took what was available and what they wanted to do. | had little effect. May indicate either routine or refined level of use (LoU-Mod E.B. routine & refined). |
| I: Do the students you teach run into this approach in their other classes? | Initial probe for integrative use. |
| R: No they won't. Now they may to a small extent in mathematics but I think the testing and so forth there has been pretty well laid out and they are lock-stepped most of the time. | Indicates little or no use in other classes so no opportunity for an integrative approach. |

LoI for the Self Sequencing Feature:

DoU-3 Regular user of self sequencing (minor modifications only)

LoU-Mod: Overall rating - refined

| Interview | Comments |
|---|---|
| I: The last part of the program we want to talk about is the self evaluation part of the program. As you know, there are self evaluation questions at the end of each chapter. The original intent was for the student to evaluate his own progress and make decisions about whether he was ready to go on or he had to go back and redo some things. | Introduction and definition of self evaluation. |
| Are you making use of the self evaluation part of the program? | Probe to separate users from non-users. |
| R: Yes, the students complete them after each unit. Then I ask them to check them and then bring them up to me. I'll look them over, talk about the questions with the student- which ones he got wrong and why - what it should have been and I try to get him to reason why the answer he has is or isn't what he had there. And, I think they accept this. They use this in studying for tests as well. It's to their advantage. They see this as well. | Indicates probable regular use but suggests that there may be a major change relating to strong teacher involvement in the decision making process about whether to proceed or not. |
| I: Do you use this approach with all the students? | Probe of degree of use. |

| Interview | Comments |
|---|---|
| R: Yes. In the odd case I might have to ask the student to go back and redo a particular experiment. But, in most cases, the student sees he is all wrong and decides to go back and redo it and see where he made his mistakes. | Further indication of major modification of the original approach. If the teacher can not convince the student to redo a section, the student may be told to redo it. (DoU-3 regular user) |
| I: In general, how do you think your self-evaluation approach works out. | Probe for status reporting and evaluation. |
| R: It works out quite well. Again, the students coming in they change their ideas as they go through the course. If you evaluate them at different times you get entirely different results. I think by the end of the course they can give you a fairly good evaluation. | Response seems to imply that there are no problems (LoU-Mod S.R. - routine) and some sort of evaluation that indicates student progress in self assessment. (LoU-Mod E.B. - refined). |
| I: Are you looking for any ideas or information about the self eveluation aspect of the course. | Probe of information seeking. |
| R: No, not really. | (LoU-Mod I.S. - routine) |
| I: Originally, the self evaluation approach involved allowing the students to make their own decisions whether to go on or back. Other teachers use the self evaluation questions for grading purposes or check them over and decide for the student whether or not the student should go on. Are you using the original approach or have you made some changes? | Definition of the original approach and probe for any changes. The statement of possible variations was included to avoid giving the impression that the original approach was the only acceptable one. |
| R: I don't grade them on the self evaluations for a term mark. I'll grade them on the book as a whole. I let them mark them and if there are errors I discuss them with the student and between us we will decide whether he should go back and do an experiment - whether he understands what went wrong. If he understands what was wrong and knows, sometimes that is just as good as redoing the experiment. | Indicates two major changes: Although the self evaluations are not given a separate term mark, they are part of the book that is considered and thus are used for grading purposes. Second, the decision making is joint and not just under student control. (LoU-Mod - Modification!!) |
| I: You have moved away from the students making their own decisions and now use joint decision making? | Direct probe of decision making changes. |
| R: Yes. | (LoU-Mod - Modified) Definitely established serious modification. |

| Interview | Comments |
|---|---|
| I: What do you see as the effects of self evaluation? | Probe of evaluative behavior. |
| R: It seems to make the student more aware of what he is capable of doing, what he has produced. He knows whether he is producing what he is capable of. They know that copying the answers from the back of the book isn't doing them any good. And, it brings out perhaps the honesty in them. | Indicates knowledge of the long term outcomes of the program. (LoU-Mod E.B. - refined). |
| I: Have you gotten any student feedback about the self evaluations? | Further probe of evaluative behavior. |
| R: Not too much. I've had students who have questioned the answers in the book quite a bit and they've come up with other possibilities. | |
| I: Is yours the only class in which your students encounter self evaluation? | To detect possible integrative users. |
| R: Well, apart from the science program, I think they use it a little bit in the phys ed department. | |
| I: Do you ever work together with the phys ed department about self evaluations? | Probe of possible integrative use. |
| R: No. We haven't worked together that much. | No integrative use. |

LoI for the Self Evaluation Feature:

DoU-3 Regular user of self evaluation (with major modifications)

LoU-Mod: Overall rating - Modified

NOTES:

1. This interview lasted about 20 minutes.
2. At the time the interview was conducted, the teacher was completing his second year of working with the program. He has worked with a total of eleven classes of students (about 28 per class) in levels 1 and 2 of the program (grades 7 & 8).

# APPENDIX 2

## Completed LoI Rating Form

The LoI Rating Sheet that follows indicates the data recorded and the LoI ratings made for the interview with teacher "b". A complete transcript of the interview is provided in Appendix 1.

# Completed Level of Implementation Rating Sheet

Interview Data: Tape # 03

Site: 01 ID # b

Date: 78/06/02 Interviewer: N

Rating Data:

Date: 78/06/04 Rater #1: N

Date: / / Rater #2:

How difficult was this tape to rate?

Very easy 1 (2) 3 4 5 Very hard

DoI Matrix for: TNW (b)

| DoU-0 Non-Use | | LoU-Mod | | | |
|---|---|---|---|---|---|
| DoU-1 Outside | | A MECH | B ROUT | C REFD | D MODF |
| DoU-2 Partial | | | | | |
| DoU-3 Regular | | | | OPS | E. |
| DoU-4 Integr. | | | | | |

DoI rating of: _____ (program or feature name)

| DoU (Circle one) | LoU-Mod | Info. Seeking | Eval. Behavior | Status Report | Overall |
|---|---|---|---|---|---|
| 0 - Non-Use | Mechanical | A | A | A | A |
| 1 - Outside | Routine | (B/) | B | B | B |
| 2 - Partial | Refined | C | (C////) | (C/) | (C) |
| (3) - Regular | Modified | D | D | D | D |
| 4 - Integrative | Not Doing | ND | ND | ND | |
| Past User? Y (N) | No Info. | NI | NI | NI | |

DoI rating of: Self Pacing (P) (feature name)

| DoU (Circle one) | LoU-Mod | Info. Seeking | Eval. Behavior | Status Report | Overall |
|---|---|---|---|---|---|
| 0 - Non-Use | Mechanical | A | A | A | A |
| 1 - Outside | Routine | B/ | B | B | B |
| 2 - Partial | Refined | (C//) | (C///) | (C/) | (C) |
| 3 - Regular | Modified | D | D | D | D |
| 4 - Integrative | Not Doing | ND | ND | ND | |
| Past User? Y N | No Info. | NI | NI | NI | |

DoI rating of: Self Sequencing (S) (feature name)

| DoU (Circle one) | LoU-Mod | Info. Seeking | Eval. Behavior | Status Report | Overall |
|---|---|---|---|---|---|
| 0 - Non-Use | Mechanical | A | A | A | A |
| 1 - Outside | Routine | (B/) | B | B | B |
| 2 - Partial | Refined | C | (C//) | (C//) | (C) |
| 3 - Regular | Modified | D | D | D | D |
| 4 - Integrative | Not Doing | ND | ND | ND | |
| Past User? Y N | No Info. | NI | NI | NI | |

Completed Level of Implementation Rating Sheet

Interview Data: Tape # 03

Site: 01 ID # 6

Date: 78/06/02 Interviewer: N

Rating Data:

Date: 78/06/04 Rater #1: N

Date: / / Rater #2: _____

How difficult was this tape to rate?

Very easy 1 2 3 4 5 Very hard

DoI Matrix for: _____

| DoU-0 Non-Use | | LoU-Mod | | | |
|---|---|---|---|---|---|
| DoU-1 Outside | | A MECH | B ROUT | C REFD | D MODF |
| DoU-2 Partial | | | | | |
| DoU-3 Regular | | | | | |
| DoU-4 Intégr. | | | | | |

DoI rating of: Self-Evaluation (E) (program or feature name)

| DoU (Circle one) | LoU-Mod | Info. Seeking | Eval. Behavior | Status Report | Overall |
|---|---|---|---|---|---|
| 0 - Non-Use | Mechanical | A | A | A | A |
| 1 - Outside | Routine | (B I) | B | B / | B |
| 2 - Partial | Refined | C | (C II) | C | C |
| 3 - Regular | Modified | D | D | (D I) | (D) |
| 4 - Integrative | Not Doing | ND | ND | ND | |
| Past User? Y N | No Info. | NI | NI | NI | |

DoI rating of: _____ (feature name)

| DoU (Circle one) | LoU-Mod | Info. Seeking | Eval. Behavior | Status Report | Overall |
|---|---|---|---|---|---|
| 0 - Non-Use | Mechanical | A | A | A | A |
| 1 - Outside | Routine | B | B | B | B |
| 2 - Partial | Refined | C | C | C | C |
| 3 - Regular | Modified | D | D | D | D |
| 4 - Integrative | Not Doing | ND | ND | ND | |
| Past User? Y N | No Info. | NI | NI | NI | |

DoI rating of: _____ (feature name)

| DoU (Circle one) | LoU-Mod | Info. Seeking | Eval. Behavior | Status Report | Overall |
|---|---|---|---|---|---|
| 0 - Non-Use | Mechanical | A | A | A | A |
| 1 - Outside | Routine | B | B | B | B |
| 2 - Partial | Refined | C | C | C | C |
| 3 - Regular | Modified | D | D | D | D |
| 4 - Integrative | Not Doing | ND | ND | ND | |
| Past User? Y N | No Info. | NI | NI | NI | |