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ABSTRACT

Levels of use of the innovation represent behaviors demonstrated by individuals as they grow in the process of innovation implementation. Eight levels of use have been defined, ranging from lack of knowledge about the innovation through highly sophisticated, impact-oriented use. Operational definitions include seven categories of adopter knowledge and activity. A Level of Use Interview procedure has been developed, which assigns a level of use to any individual with respect to any specified innovation. Reliability and validity have been established. Levels of use are useful to administrators, evaluators, and researchers responsible for facilitating, monitoring, and/or evaluating educational change. (Author)

LEVELS OF USE OF THE INNOVATION: THE CONCEPTUALIZATION AND MEASUREMENT OF A VARIABLE USEFUL FOR ASSESSING INNOVATION IMPLEMENTATION BY INDIVIDUALS

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LEVELS OF USE OF THE INNOVATION: THE CONCEPTUALIZATION AND MEASUREMENT OF A VARIABLE USEFUL FOR ASSESSING INNOVATION IMPLEMENTATION BY INDIVIDUALS[1,2]

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Program developers, administrators, evaluators, and researchers spend a significant amount of time studying educational change, more specifically, the effects, problems, issues, and results of the large variety of product and process innovations that are in use throughout the country. One problem that persists in most of these studies is how to conceptualize, and then to measure, the differences in the ways individuals use a given innovation. Administrators need to know the degree of implementation if they are to make intelligent decisions about resources, support, and training; evaluators need to know the extent and quality of use if they are to validly assess the effect of the innovation; and researchers need to determine if, in fact, a treatment is being used by the entire treatment group and is not being used by the control group if they are to make valid conclusions.

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[1]Paper presented at the annual meeting of the American Educational Research Association, New York, April 8, 1977.

[2]The research described herein was conducted under contract with the National Institute of Education. The opinions expressed are those of the author and do not necessarily reflect the position or policy of the National Institute of Education, and no endorsement by the National Institute of Education should be inferred.

Educators have not been unaware of the need to assess degree of implementation. Evaluators Alkin and Fink (1974) and Eichelberger (1974) emphasize the importance of including a measure of degree of innovation use in program or product evaluations. They reason that there often exists as much difference among teachers using the same program as among those using different programs. Such was found to be the case in an RBS study of classrooms implementing Individually Prescribed Instruction (IPI): there was as much difference in instructional procedures among IPI teachers as between IPI and non-IPI teachers (Evans & Sheffler, 1974). An evaluation by Pedee (1971) of the effects of differentiated staffing resulted in no significant differences; further study of the sample schools indicated that there was actually no difference between control and experimental schools in the kind of staffing being used (Jones, 1973). The lack of knowledge about degree or quality of implementation created a distinct handicap in both these instances, and this lack is just beginning to be recognized and understood.

To date, most solutions for measurement of implementation have involved specific attention to the innovation and its characteristics. Stallings and Kaskowitz (1974) assessed the degree of implementation of seven planned variation Follow-Through models by determining the developers' definitions of implementation and assessing each classroom situation according to the applicable definition. Evans and Sheffler (1974) developed the Consultant's Diagnostic Instrument, which assesses the degree of implementation of IPI Math by focusing on organizational and instructional items expected to be present when the program is in use. The Southwest Regional Laboratory and the Wisconsin Research and Development Center have both been involved in measuring the implementation of programs they have developed.

A unique approach to the problem of conceptualizing and measuring the degree and quality of implementation has been developed by the Procedures for

Adopting Educational Innovations Project of the Texas R&D Center. Rather than focusing on a specific innovation, the project has conceptualized a generic implementation variable that describes the performance of an individual who uses an innovation. Growth in innovation use is viewed as following similar steps, regardless of the innovation. The variable, Levels of Use of the Innovation, is an important dimension of the Concerns-Based Adoption Model, a model of innovation implementation that describes both the affective and behavioral components of an individual's approach to using an innovation (Hall, Wallace, & Dossett, 1973).

The Levels of Use Concept

Levels of Use of the Innovation (LoU) describes behaviors exhibited by individuals from before any knowledge of the innovation exists, through preparation to begin use, through development of skills and knowledges necessary for use to become routine, and finally through refinement, integration, and renewal with respect to use of the innovation (Hall, Loucks, Rutherford, & Newlove, 1975). The eight Levels of Use (see Figure 1) have been operationally defined. Each Level of Use is defined for each of seven categories of innovation user knowledge and activity that cut across innovations. The categories, Knowledge, Acquiring Information, Sharing, Assessing, Planning, Status Reporting, and Performing, provide a wide range of behaviors that can be specified for individuals. In addition, Decision Points have been defined to further delimit differences between the Levels of Use. Operational definitions are displayed on the LoU Chart (Figure 2) (Hall et al., 1975). Two years of cross-sectional and longitudinal studies in schools and universities across the country have verified that these eight Levels of Use exist in individuals as defined, with respect to a variety of innovations.

Figure 1

Levels of Use of the Innovation: Behavioral Indicators

Level of Use		Behavioral Indices of Level
VI	Renewal	The user is seeking more effective alternatives to the established use of the innovation.
V	Integration	The user is making deliberate efforts to coordinate with others in using the innovation.
IVB	Refinement	The user is making changes to increase outcomes.
IVA	Routine	The user is making few or no changes and has an established pattern of use.
III	Mechanical Use	The user is using the innovation in a poorly coordinated manner and is making user-oriented changes.
II	Preparation	The user is preparing to use the innovation.
I	Orientation	The user is seeking out information about the innovation.
0	Nonuse	No action is being taken with respect to the innovation.

Figure 2[3]

The 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 defined 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 stepwise 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 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.	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, N.I.E. Contract No. NIE-C-74-0087.

[3] From: Hall, G. E., Loucks, S. F., Rutherford, W. L., & Newlove, B. W. Levels of Use of the Innovation: A framework for analyzing innovation adoption. The Journal of Teacher Education, 1975, 26(1), 52-56.

Figure 2 (continued)

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 receives skill training in preparation for initial use.
Examines own use of the innovation with respect to problems of logistics, management, time, schedules, resources, 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.
Appraises 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.

The Levels of Use Interview

Levels of Use are measured through a "focused" interview procedure (Loucks, Newlove, & Hall, 1975). The interviewer does not ask a specific list of predetermined, presequenced questions, but rather uses a branching technique derived from the defined decision points which separate each level. This branching technique is illustrated in Figure 3. Further information is gathered by probing for behaviors within the seven categories. The interview follows the flow of ideas reported by the interviewee, making the interview conversational in tone; yet, it yields sufficient information to place the individual at a particular Level of Use.

The Levels of Use Interview was developed through a series of steps involving item writing and Q-sorting to determine the structure of Levels and categories. Questioning strategies to gather the necessary information were tested, revised and retested, and interviewers were trained. Interviews take approximately 20 minutes and are tape-recorded.

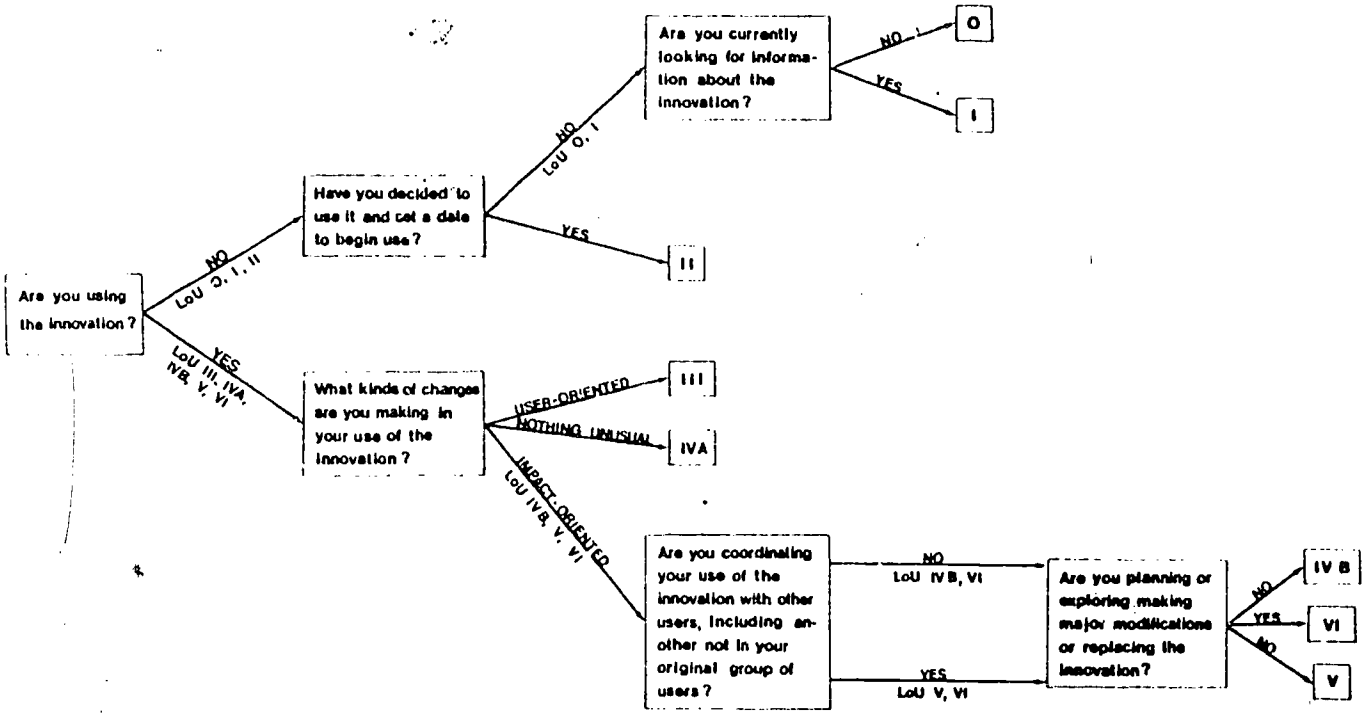
Interview tapes are rated as to the individual's overall LoU and the LoU in each of the seven categories. A rating sheet specifically developed for this task is illustrated in Figure 4. Provision is made for instances in which the interviewee is Not Doing (ND) any of the behaviors in a category (e.g., is not acquiring information about the innovation), or the interviewer failed to elicit the information from the user (NI).

Procedures for Rating and Interrater Reliability

The procedure for rating Levels of Use Interview tapes evolved as the measure was developed and refined. In the first year of the 1974-76 longitudinal studies of innovation at elementary school and college levels, two raters independently listened to each tape and gave ratings for overall LoU and the seven

Figure 3

Overview of Branching Format of the LoU Interview[4]



[4]From: Loucks, S. F., Newlove, B. W., & Hall, G. E. Measuring Levels of Use of the Innovation: A manual for trainers, interviewers, and raters. Austin, Tex.: Research and Development Center for Teacher Education, the University of Texas, 1976.

UTR&D/CBAM, 1976

LEVEL OF USE RATING SHEET

Tape #: Site: Interviewer:
Date: / / I.D. #: Rater:

Level	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Reporting	Performing	Overall LoU
Non-Use D.P. A	0	0	0	0	0	0	0	0
Orientation D.P. B	I	I	I	I	I	I	I	I
Preparation D.P. C	II	II	II	II	II	II	II	II
Mechanical Use D.P. D-1	III	III	III	III	III	III	III	III
Routine D.P. D-2	IVA	IVA	IVA	IVA	IVA	IVA	IVA	IVA
Refinement D.P. E	IVB	IVB	IVB	IVB	IVB	IVB	IVB	IVB
Integration D.P. F	V	V	V	V	V	V	V	V
Renewal	VI	VI	VI	VI	VI	VI	VI	VI
User is not doing:	ND	ND	ND	ND	ND	ND	ND	ND
No information in interview:	NI	NI	NI	NI	NI	NI	NI	NI

Past User ____ Estimated past LoU ____

The amount of information in the interview was:	insufficient for rating	1	2	3	4	5	6	7	very adequate for rating
The interviewee:	does not fit on the chart	1	2	3	4	5	6	7	fits well on the chart
The interviewee:	was very difficult to interview	1	2	3	4	5	6	7	was no problem to interview

Figure 4
The LoU Rating Sheet

categories. If the raters disagreed as to the overall LoU, a third rater rated the tape independently. Overall LoU was determined when the third rater agreed with one of the original raters. Using this procedure, the first two raters agreed upon 66% of the 1,381 interview tapes made in this first year. Another 26% were resolved by the third rater. The remaining 8% were rated collectively by staff members and a consensus rating was made. Traditional reliability coefficients obtained for the first two raters indicated interrater reliabilities of .87 to .96.

In the second year of the longitudinal studies, an effort was made to reduce the complexities of the rating procedure to make it more cost-effective without decreasing percent agreements and interrater reliabilities. As the interview procedure was refined, it was found that a trained interviewer could often rate the individual immediately after the interview, so the interviewer rating took the place of one of the two ratings. (The interviewer listened at a later time to those interviews that posed some rating difficulties.) Therefore, only one other rater was needed. Using this procedure, interrater reliability on overall LoU rating was .96, with 73% agreement between the two raters. Those tapes that were not agreed upon were discussed by the two raters and a consensus rating was reached. This procedure was utilized in the second year (Fall 1975-Spring 1976) of the two-year longitudinal study.

Finally, it was discovered that ratings given by interviewers had a high percent agreement (87%) with final ratings. It was therefore decided that future tapes would be rated by the interviewer only, with a periodic reliability check made to be certain that standards remained high. This procedure is being used currently; reliability data is not available at the time of this writing.

Validity of the LoU Interview

When the LoU Interview was developed, tentative validity was established by developing interview questions to probe independent yet related behaviors with respect to an individual's Level of Use; a high correlation was found between responses to these questions. However adequate this justification of validity, there remained the question of whether or not an individual's "self-report" of his/her behaviors in a focused interview corresponded with actual performance.

It was first necessary to determine an appropriate strategy for validating the LoU Interview. Use of an innovation cannot be assessed solely by observing classroom behavior. Large amounts of out-of-class time are often spent planning, looking for information, discussing the innovation with others, and organizing for its use. Furthermore, Levels of Use are defined in terms of qualitative aspects of use, rather than the quantity of certain behaviors. It was therefore determined that existing classroom observation instruments could not adequately assess Levels of Use and so validate the Levels of Use Interview. The search for an alternative methodology resulted in the use of ethnography, an approach derived from social anthropology which gathers qualitative data by direct observation of activity and interactions in an ongoing and natural manner (Kist, 1973). Such qualitative data could be amassed for an individual, used to give the individual a Level of Use rating, and correlated with another Level of Use rating assigned as a result of a Levels of Use Interview. In this way, validity could be established by determining whether the interview truly assessed actual behavior.

Because of cost and time factors, a full scale validity study was not possible. However, a limited study utilizing teachers at every Level of Use was undertaken. The study involved junior high school teachers in Kansas and Texas

and focused on the ISCS (Intermediate Science Curriculum Study) science curriculum. Forty-five teachers were interviewed; 17 teachers were chosen for intense ethnographic study, with each Level of Use represented. Ethnographers spent an entire day with a teacher, from the teacher's arrival at school to his/her departure. Ethnographers were not informed of the teacher's Levels of Use Interview rating. An ethnographic protocol was developed describing (1) the classroom in detail, (2) the activities, interactions, behaviors of teacher and students during one complete class period, and (3) a summary of other interactions, activities, and behaviors of the teacher during the day, that related to ISCS.

Independent Levels of Use ratings were made by the ethnographer, by two readers of the ethnographic protocols, by the interviewer, and by a second rater of the interview tape. Two major comparisons (in order of importance) were made to determine validity: (1) between the ethnographer's rating and the consensus interview rating (when disagreements occur, a final rating decision is made by consensus), and (2) between the consensus reader rating and the consensus interview rating. The correlation coefficient determined for the first comparison was .98, indicating that the LoU Interview validly represented what was learned by the ethnographer in a full day of observation. The coefficient for the second comparison was .65, which lent support to the validity of the interview, although at the same time revealing the difficulty involved in conveying sufficient information second hand (i.e., the rough written protocols) to allow an adequate judgment of an individual's LoU.

Use of the Levels of Use Interview

The LoU Interview has been used over the past three years for a variety of purposes. These include the verification of the existence of Levels of Use, longitudinal and cross-sectional studies of innovation adoption in schools and

colleges, monitoring the effects of inservice workshops, and gathering baseline data for curriculum implementation. Figures 5 and 6 illustrate how LoU Interview data can be displayed for a given institution. School A was part of a longitudinal study of team teaching in elementary schools. This particular school is characterized by a high percentage of LoU IVA Routine users; teaming has become part of their routine, and teachers are spending their time and creative energies on other things. In contrast, University A is distinguished nationally for the extensive and sophisticated use made by its faculty of modules for instruction. This is illustrated by the higher Levels of Use evident in Figure 6. The reader is referred to the references for two other papers providing more extensive information about longitudinal and cross-sectional studies utilizing LoU Interview data (Hall, 1977; Loucks, 1976).

The Levels of Use Interview has shown strong potential as a measure of the degree and extent of implementation of an innovation. A current study is utilizing Levels of Use to monitor a science curriculum implementation from first introduction through district-wide use; another study is comparing LoU to other variables, such as the patterns or "configurations" of innovation use, and teacher classroom behavior. Exploration is underway of its use in selecting research samples, planning staff development activities, and evaluating programs for optimal effectiveness.

Figure 5

LoU Distribution of Individuals in School A
With Respect to Team Teaching, Spring 1976

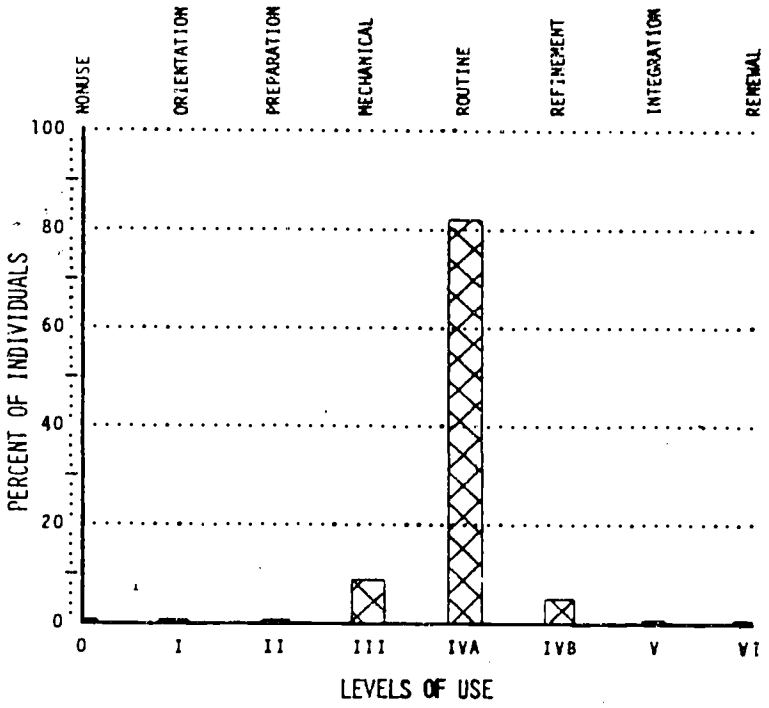
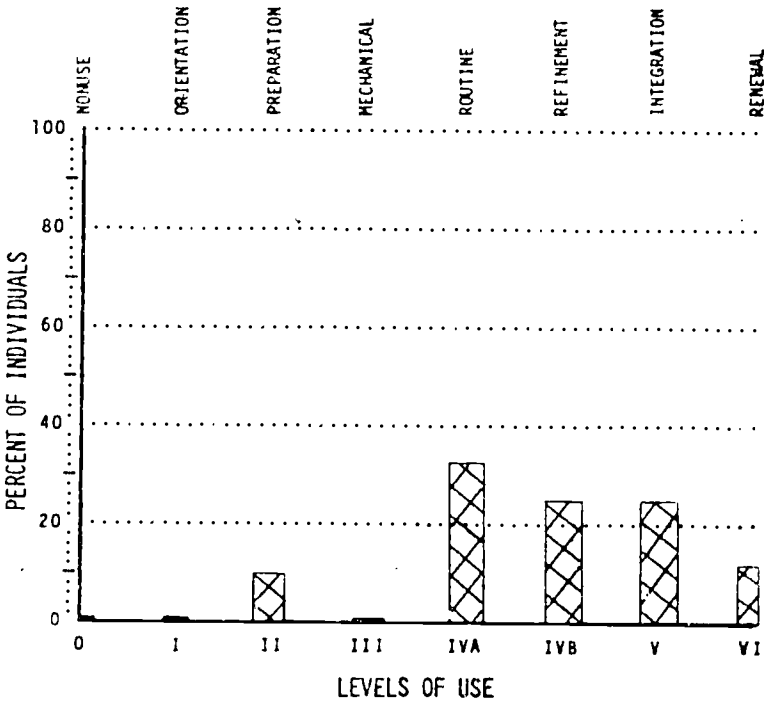


Figure 6

LoU Distribution of Individuals in University A
With Respect to Instructional Modules, Spring 1975



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