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AN INSERVICE MODEL TO IMPACT LIFE SCIENCE CLASSROOM PRACTICE: PART ONE

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A model inservice program built on a theoretical foundation for changing behavior incorporates both teachers' knowledge, their attitudes as well as what they do. What teachers do in the classroom depends on both what they know and how they feel about what they know. Changing what teachers know and do is accomplished in a three phase sequence, awareness, arousal and action. In the awareness phase, teachers are confronted with their knowledge needs. In the arousal phase, teacher generate interest in using what they know. Action is reflected in what teachers do and is reinforced when they have time to reflect on that action, its effect, its value and acceptance.

Introduction

A model inservice program built on a theoretical foundation for changing behavior incorporates both teachers' knowledge, their attitudes as well as what they do. Presented here is the model and an evaluation of its use with seventh grade life science teachers involved in an institute designed to enhance their instruction.

What teachers do in the classroom depends on both what they know and how they feel about what they know. Their science knowledge base, their perceptions of students and the expectations of their schooling context are three key components of their knowledge and attitudes. Green (1984) aptly described the complexity of factors that influence what a teacher does:

Teachers work in multiple contexts, ranging from the immediate contexts

of their classrooms to the larger contexts of political and social life. There is the immediacy of the felt encounter, the memo, the workbook, the blackboard, the bell. There is the appearing, the voices sounding, the calls to accountability. There is the community or the protesting parent, now by a group of parents or a school board or a district office; and, somewhere in the distance, there are the state and federal agencies with their regulations and requirements, there determinations of what is happening and what ought to happen within the schools. (p. 1)

And in this complicated context, teachers must teach. Green's (1984) picture of teachers and teaching is graphic.

Teaching is triadic, most of us know;

it involves someone teaching something to someone - or I would prefer to say enabling someone to learn how to learn ... the living being who is the teacher intentionally trying to provoke persons to reach beyond themselves, to become different, to enter a state more desirable than the one they are presently in ... (p. 2)

Critical to the complexity of teaching is role of the teacher - what the teacher is and what the teacher does. Combs (1965) described what a good teacher is and does as one who has the following attributes:

Rich extensive available perceptions about his subject field ... the good teacher is not stupid.

Accurate perceptions about what people are like ... teaching is a human relationship.

Perceptions of self leading to adequacy ... the behavior of a teacher is a function of his concepts of self.

Accurate perceptions about the purpose and process of learning ... behavior always has direction.

Personal perceptions about appropriate methods for carrying out his purposes ... the methods teachers use must fit the kinds of people they are. (p. 20-23)

What science teachers do in their classroom depends on what they know about life and science teaching as well as their beliefs about this knowledge of three factors - their subject, their students and the expectations of their schooling context. Thus a teacher's beliefs determine what the teacher does.

There is clear evidence that what teachers do is highly correlated with their beliefs (Harvey, 1968; Loree, 1971). Crawley (1989) found that their attitude toward a behavior was the single best predictor of that teacher's intention to engage in that behavior.

Factors that affect what teachers do may

be labelled as internal or external. Based on Koballa's (1988) interpretation of Ajzen and Fishbein's model of reasoned action (1980), what teachers know and wish to do are internal factors that help interpret the teacher's behavior. These factors are internal to the individual teacher. They may be personal motivations ("What is in it for me?") or described as the "want-to-do's" that guide teachers' actions.

However, what teachers do may indeed be at variance with their internal desires because of the expectations of the schooling context. These factors are external to teachers' personal beliefs. They include concern for "who wants me to do it" and "what factors keep me from doing it." These external "got-to-do's" must be taken into account in understanding teaching behavior. For example, Smith (1971) noted that teacher behaviors will likely not change if the new knowledge does not help students to improve. A new teaching strategy is likely to be discarded if it does not help teachers achieve goals which are consistent with their internal and external expectations. As Smith stated:

... teaching will not be improved if the skills taught in teacher education programs have no greater influence upon pupil learning than the skills teachers ordinarily use. To resort to an analogy, there would be no point in teaching the farmer to change his practices if the new practices increase productivity of the land by zero amount. (p. 4)

Thus cooperative learning may be understood but not used if it is perceived to be in conflict with the schooling expectations.

Inservice programs exist to help teachers improve their teaching. An analysis of the impact of inservice must extend beyond the "knowing about" to the actual classroom practice over time. If teachers are to use their knowledge, they must have access to

that knowledge (the internal) and the option to use it (the external). The teacher must know and choose to use that knowledge. Rath (1965) highlighted the importance of this choice when he wrote:

We are saying that if ... adults ... are to develop values they must develop them out of personal choices ... these choices, if they are to possibly lead to values, must involve alternatives which (1) include ones that are prized by the chooser; (2) have meaning to the chooser, as when the consequences of each are clearly understood and (3) are freely available for selection. (p. 36)

Koballa (1988) emphasizes this rationality of choice when he wrote:

According to the model, it is supposed that the intention to perform a certain behavior is a function of the weighted attitude toward performing the behavior and the weighted subjective norm. (p. 479)

Knowledge is not the only factor that guides behavior. In describing the challenge of moving beyond knowing to doing, Combs (1965) wrote:

... helping people to discover the personal meaning of information so that they behave differently ... Research has shown that both good teachers and bad know what they ought to do. Most of us are like the old farmer who, when he was asked why he was not using modern methods, replied ... "I ain't farmin' now half as well as I know how!" (p. 27)

Thus a program to enhance teachers' biological and pedagogical knowledge, influence their beliefs and change their practices must include both short and longer term goals. The short term goals of an inservice program are to help teachers enhance their science knowledge base and their teaching strategies. In addition, it should alter their feeling about science,

teaching and their students. A longer term goal of inservice is to modify the teachers' practices in their classrooms where they see a discrepancy between what they know and what they do and choose to change.

The challenge is to construct a model for an inservice program that will have a substantial impact on the science knowledge base of teachers and demonstrate ways they can involve students with that knowledge. An effective inservice program should give them options to select ways that they believe will fit the expectations of the schooling context. The program needs to provide opportunity for teachers to acquire new knowledge and beliefs about its usefulness (the internal "want-to-do's") within the context of their schooling expectations (the external "got-to-do's") to translate these beliefs into action.

The Model

The inservice model is grounded in the work of Fuller (1969) and is intended to help change biological and pedagogical knowledge, personal beliefs and classroom practices. Three phases comprise the model: Awareness, Arousal and Action.

1. Awareness Phase

In the Awareness Phase, teachers are confronted with their personal knowledge about science, students and teaching. Defining the domains of awareness requires an examination of what a science teacher needs to know. Fundamental to good science experiences for students are teachers who know the science content being studied. Teachers know that their personal lack of biological knowledge hinders student success (Maben, 1973). The more science knowledge teachers have, the better their students achieve (Denton and Smith, 1984). It is important to note that typical undergraduate preparation for science teachers provides them with only a very limited

access to science knowledge. Smith (1969) graphically described this problem as follows:

Several years ago, before the knowledge explosion had been reflected in the curriculums of the universities; Hocking pointed out that the Harvard University catalog contained over 1200 courses and that a student could hope to take only a few of them. If it is assumed that 120 credit hours are required for a bachelor's degree and that each course is a three-hour course, the student would take a total of forty courses in his college career ... forty courses out of 1200 is not impressive. (p. 116)

In addition to the restricted access to biological knowledge, the constant changes and new developments in biology unfortunately result in teachers trying to function with a limited and outdated biological knowledge data base.

But, of course, teachers are more than transmitters of knowledge. They are the key interactor with students. Knowledge of how to be effective in these interactions is a second domain of awareness. Teachers who are clear in their role of being positive, purposeful, enthusiastic and proud of their profession contribute to students who are likely to be equally successful (Rath, 1966). Carlson (1989) found a clear relationship between teachers' choice of instructional strategies and their subject knowledge. The more comfortable they were with the subject matter, the more open they were to student questions and "risky" discussions.

Thus, in the Awareness Phase, teachers are confronted with their knowledge about biological concept and with ways or methods to influence students. Knowing what teachers know is an essential prerequisite to changing their beliefs. But awareness itself does not result in change. Knowing that one does not know does not automatically

provide new knowledge.

2. *Arousal Phase*

The Arousal Phase is the time for teachers to acquire new information and insights about science, students and teaching in ways that capture their interests. The greater the insight teachers have, the more likely that this information will influence their beliefs. Hunt and Metcalf (1955) have noted that an essential characteristic of this information is its consistency with the teacher's world of reality:

The critical test of a person's insight is whether they provide him with a set of beliefs about himself in relation to his social and physical environment which are extensive in scope, dependable in action and compatible with one another. (p. 52)

Part of this consistency is the recognition that what new information teachers acquire depends in part on what they want to learn. And part of what they want to learn is that which has personal meaning to them (Combs, 1965). Therefore, it is essential that the Arousal Phase, be characterized by conditions that will enhance the likelihood of having an impact on teachers' beliefs, the basis of their attitudes. There must be respect for individual teachers by having them be key participants in setting the agenda for learning. Through a focus on what teachers perceive they need comes a flexible agenda and a program more likely to fit their needs. Loree (1971) emphasized the need to focus on individual teachers:

It has been long established that exposure to information can serve to form or to alter attitudes under certain conditions. Change is facilitated when the source of information is respected, when the initial attitude is not firmly entrenched, when the communication reflects attitudes that are consistent with the needs of the

receiver and when the communication is acceptable to important reference groups of the receiver. (p. 110)

In these ways the arousal of interest helps build the internal "want-to-do" factors toward initiating change. Embedded in the interests of teachers is the seed of change in practice. But why do not all seeds germinate? All beliefs are not translated into classroom practice. Teachers do not automatically use all that is in their knowledge and attitude data base.

3. Action Phase

In the Action Phase, teachers have the opportunity to translate their interests, (internal "want-to-do's") into behavior in the classroom. It is here that the influence of the expectations of schools - the administrators, peers, resources and students - become more clearly seen. These expectations are all part of the external forces (the "got-to-dos") as they influence choices teachers make. What teachers do are actions based on beliefs. Loree (1971) neatly delineated this link between belief and action:

It seems reasonable to expect that

- (1) A teacher who believes that more efficient learning becomes possible when a teacher can purposefully exhibit a wide range of teaching styles will attempt to vary her style;
- (2) When the teacher's attempts to vary her teaching style are followed by favorable consequences (e.g. her students learn more), the favorable attitude toward flexibility will be strengthened;
- (3) The teacher who has received flexibility training - i.e. the teacher who has learned efficient ways of adapting her teaching style to the demands of the teaching situation - is more apt to be successful in her efforts to vary her style of teaching

and hence more likely to experience favorable consequences from her efforts. (p. 113)

A key element in action is the belief that what teachers want to do will indeed benefit their students. A second element is the linkage between teachers. In a context of mutual support and networking, teachers-helping-teachers enhances success because one's experience tends to have its greatest impact when shared with another (Bettencourt & Gallagher, 1989; Hauslein & Good, 1989; Swift 1989). Practice also reinforces the belief system as confidence is generated through that practice. In adopting an idea or strategy, the reinforcement has a greater impact when there is time to reflect on the effect, its value and acceptance. It is assumed that among many possible indicators, behavior change is one evidence that learning has occurred.

Summary

The model for an inservice program presented here is built a theoretical foundation for changing behavior which includes these three phases: Awareness, Arousal and Action. How useful this model is when applied to the reality of schools, teachers and students will be presented in Part Two of this study. In this second part of the study, the results of using this model with seventh grade life science teachers will be described.

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