



NURSING PAPERS

SPRING 1974

NEEDED: A COMMON DENOMINATOR

BEHAVIORAL OBJECTIVES:
SOME PERSPECTIVE, PLEASE!

DELPHI TECHNIQUE FOR PREDICTING EVENTS
IN NURSING EDUCATION

ERROR MODELING IN SKILLS LEARNING

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SPRING, 1974

Readers and friends have responded warmly to our new quarterly appearances. We hope that the qualities of dialogue and communication will continue to quicken accordingly.

"Query and Theory", a new column, begins in this issue. Over ninety persons have sent us their names as possible respondents, and we have received *three* questions. Our profession seems to have answers but none of the questions! If you wish to describe a problem in research, education or practice, please send it to the editors.

Two of the articles that follow are accompanied by responses. Thus, we have a paper on behavioral objectives by Carolyn Attridge with Helen Niskala responding, and an article by Margaret Munro on post-diploma baccalaureate education with responses by Jean Hill and by Patricia Hayes and Joanne Boyd. Should you wish to plunge into either of these discussions, or to respond to any of the contents, simply send your thoughts along to us.

The issue of "Summer, 1974" will be devoted to "The Expanding Role of the Nurse: Her Preparation and Practice". Each university school of nursing has been asked for a statement of current ideas and activities in this regard, and responses have begun to arrive. We anticipate an important contribution to this controversial and complex problem.

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NEEDED: A COMMON DENOMINATOR

BY MARGARET F. MUNRO

Assistant Professor of Nursing, University of Toronto
Chairman, Post-diploma Baccalaureate Program

GENERALLY, some degree of tension may be expected to exist between students and teachers in any school. One group is striving to gain the understanding of ideas and concepts to which the other group appears to hold the key. Students seek to attain standards set by teachers; teachers seek to impart knowledge sought by students. Such is the world of education and these tensions serve to keep the process alive and exciting.

However, when the tensions rise to higher levels and encompass strong expressions of dissatisfaction with a program, disillusionment with subjects, and dissonance in values between learner and teacher, then the process of education becomes a contest filled with frustration and lacking in a sense of achievement.

This article is a consideration of a situation in our school in which staff-student relations had become strained and in which there appeared to be unknown factors operating. Some of the data collected are probably peculiar to our local scene but I believe the issue of differences in philosophy of nursing education between faculty and students is of broader application.

THE UNKNOWN ELEMENT

Our faculty began to experience this increased tension between themselves and students in the post-diploma baccalaureate program during the late 1960's. Early measures to deal with the problem included annual and extensive revisions of the content and approach in many subjects, substitution of other subjects where appropriate in terms of our philosophy, and expanding the choice of electives within the existing limits of the program.

All of these actions produced some semblance of satisfaction on both sides, but this state seemed tenuous and tentative at best. We were still left with the sense of having alleviated some of the apparent tensions in the program without having fully identified their source. We began to suspect that the problem involved some conflict between values or goals held by students and by staff. We felt we needed to know more about our students and their values and goals in order to examine the question of philosophical base for education from their point of view.

In 1970 it was decided to undertake a study of students then enrolled in the post-diploma baccalaureate nursing program and of graduates of the three preceding years of the same program. As a faculty we sought to learn if there were common features among the students and graduates which might help to identify the sources of tension and discontent. The study was centred on a questionnaire to be completed and returned by the participants. Data were organized into four main sections: personal background — age, previous education, experience, etc; possible stress factors — dependents, employment, academic pressures; program expectations and evaluations — personal expectations and objectives, subject evaluation, concept of the school's philosophy, curriculum recommendations; reaction statements relating to: program structure, personal feelings and goals, perceptions of the teaching staff. Respondents were identified by the program year in which they were registered, with graduates of the three previous years being combined as a single group. Perceptions of individual subjects were evaluated on a five-point scale of perceived value to the student's learning and on a similar scale of liking or sense of enjoyment for the student.

A FIRST GLIMPSE

Some of the features that came to light as the data were analyzed proved insignificant because of a lack of uniformity. For instance, there did not appear to be a consistent pattern of reaction to the course among married or single students, working or not while at school, in any of the classes surveyed. Other features appeared important because of their uniformity. The majority of respondents in each class indicated anxiety about their academic ability, the desirability of having more electives, and a mid-scale measure of satisfaction, or dissatisfaction, with the first-year nursing subject. Of particular interest to us was a noticeable division of students according to expectations on enrolment into those expecting to be better prepared for a functional role and those who expected to have general nursing knowledge increased. Of further interest was a high correlation between the former expectation and specific unmet objectives such as becoming a good nurse educator or administrator, having more program emphasis on teaching and administration skills.

Gradually, we developed a composite picture of the diploma graduate nurse who undertook to obtain a baccalaureate degree in our school. We also began to clarify and confirm the area of nursing education philosophy as a main source of tensions.

We found that correlations existed between the program year of the student, the recency of her diploma graduation, her age, and the

amount and type of nursing experience she had.(1) Our first-year students appeared to have entered the program consistently sooner after receiving their diplomas than those in either the third year or the graduate group. Hence they were also more homogeneous in age and in experience. Many had worked for one year or less before entering the program, while their predecessors had often attained higher levels of teaching or administrative responsibility in the interim between diploma and degree programs. However, despite this growing homogeneity we confirmed the existence of a broad mixture of ages and experience within the total membership of the post-diploma program.

Data analysis had revealed that anxiety about their academic ability or achievement ranked high in the possible causes of stress for students in all groups.(2) The fact that some of our students had not completed Grade 13, or had completed it some years previously, seemed to validate their expressed anxieties about potential failure. However, graduates of the basic program who had been included in a previous study also registered this same anxiety.(3) So the question remained whether the degree of anxiety was common to all students or intensified in relation to these students' perception of their abilities. Did successful completion of a diploma program in nursing facilitate transition to a baccalaureate program or did it provide a source of tension and increased uncertainty about expected performance?

A CLOSER LOOK

As we examined the data further there was a pattern of dissatisfaction in each class group with first-year nursing, biological chemistry, and biology. Difficulty in adjusting to study seemed greatest in the first-year students, and negative reactions to the sequence courses dealing with broad nursing concepts and practice were indicated by all groups. As we sought to analyze the findings, we saw that these features appeared related to some principles of learning and some characteristics of the adult learner.

If we applied the principle that learning is the discovery of personal meaning and relevance of ideas,(4) the students' difficulties and dissatisfactions with some courses became more understandable. Subjects which dealt with unfamiliar concepts in the physical and social sciences were not always well liked but they did tend to be highly valued. These subjects encompassed topics which were difficult, but students perceived an intrinsic value in this learning. However, the sequence courses in nursing concepts were given less favourable ratings in both liking and value. Apparently our approach to the subject with which they identified themselves contributed to

the students' stress. Were we beginning to clarify the basis of the problem? Was the faculty's concept of baccalaureate education in nursing very different to that held by the students?

THE CRUCIAL FACTOR

A significant number in each class group expected to be prepared for specific functional roles in nursing, believed this to be part of the baccalaureate program, and indicated disappointment in not achieving this objective during the course of their studies with us.(5) When we acknowledged the desire of the adult learner to see immediate applicability of learning, as Knowles identifies it,(6) we added further to our understanding of the situation. We found that a higher value was placed by the students on courses dealing with skills in administration and teaching than on courses dealing with nursing theories and concepts.

It became apparent that much of the problem lay in the area of dissonance in values. Our students had completed one program of preparation for nursing practice only to find that society appeared to demand a higher level of education to assure job security. They were oriented to an employment structure which rewarded excellence in practice by vertical promotion into positions requiring specific functional skills. Now in pursuit of those skills they were involved in an educational system which deemphasized them in favour of further learning of underlying concepts and generalized principles of nursing practice.

We looked again at the students' concept of our philosophy of nursing. Here was a great diversity. About twenty-five per cent of each class saw the baccalaureate program as designed to prepare a professional person,(7) this position being consonant with our philosophy. About ten per cent saw the program as preparing nurses for specific positions.(8) However, more significant to our question of tensions was the finding that twenty to thirty per cent of each class group were unable to state any concept of our philosophy.(9) Did the staff-student tensions arise over differences in values and goals? Did the faculty fail to communicate its philosophy clearly to incoming students? Or was the problem a combination of these factors? If students enrol in a program unaware of its values and goals how can they know if it is the program they want or need?

THE LARGER ISSUE

If the approach to nursing taken in a baccalaureate program is not apparently different in breadth and depth than that taken in a diploma program perhaps both levels of education need to examine their basic values and their translation into courses. If diploma gra-

duates feel they must attain a baccalaureate degree before having a place of worth in the nursing profession we face a challenge to re-examine the rationale of having two forms of basic nursing education.

Diploma graduates entering a baccalaureate program in the same discipline face a unique and difficult challenge. They have to make changes in their philosophy of that discipline and also change some of their values. They must develop a sense of themselves as being ready to initiate change and to challenge practices which they may have previously accepted. They must learn to identify their own learning needs and then proceed to find ways of meeting these needs. They must learn to use their previous learning experiences to advantage in solving new problems and in expanding into a new role.

Similarly, the faculty working with these students faces a challenge. We must help them to attain a new approach to nursing while retaining a sense of the values of their former approach. We must encourage them to move out into independent thinking without threatening their sense of security. We must help them to realize that a new philosophy will feel different from the old familiar one and must be able to communicate our educational beliefs to them. If we can find a common denominator of values on which to build a learning situation with the students, and if our goals and the students' are consonant, reasonable and reachable, the process of education in which we are engaged should have the right degree of tension to keep it alive and purposeful.

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TWO RESPONSES TO "NEEDED, A COMMON DENOMINATOR"

The paper, "Needed, a Common Denominator", states a common dilemma in continuing education in nursing. Munro's initial comment that "one group is striving to gain an understanding of ideas and

concepts to which the other group appears to hold the key" may be a basic fallacy. It pre-supposes knowledge of and a desire to achieve the educational goals held by university faculty and acceptance of the underlying educational philosophy. However, twenty to thirty per cent of the students in the study were "unable to state any concept of our philosophy" and another ten per cent saw the program goal as preparation for a specific position. Therefore, a major cause of the tension may be due to incongruence of goals perceived by students and faculty. Apparently, students seek to enter a door to which the faculty do not the key, or to which they are perceived to refuse admission.

The confusion of goal perception is common within the nursing profession, the health care field and the general public. The lack of a clear and unambiguous statement of differences between program goals and functions logically expected of graduates from each continues as a major source of friction.

A second cause may lie in the concept of the nurse as a doer, rather than a thinker. The student and graduate are praised for taking the "correct" action or making the "right" decision with no question raised as to the conceptual base for the action or decision. In fact, to query the rationale for either may result in censure, thus reinforcing the concept that a theoretical base is useless or at best unimportant. In contrast the university demands that the student become a thinker, that she learn to value the process of thinking more highly than the product; a reversal in her value system which may result in tension. The demand for change may partially account for the high level of anxiety about her ability to achieve academic success.

A third possible source of tension may lie in the difference in teaching-approach. Most of the teaching experienced by the graduate nurse has required that she be a recipient learner, rather than an active discoverer of concepts or new relationships. Within the university, she may be challenged for the first time to be self-directing, to set her own goals for learning and actively participate in evaluation of her progress. She is urged to question, to explore widely, to forego closure until all the data is gathered and analyzed, which may be frustrating to a doer.

If nursing initially is perceived as following prescriptions designed by someone else, it may be difficult to see it as intellectually challenging. Therefore, the challenge must lie elsewhere: in non-nursing courses or in functional areas.

Part of the problem may be the failure of the faculty to begin with the learner as he is and provide the time and guidance needed by him to gain new perceptions, develop new values and learn a new way

of thinking. Before one can use the key, he must identify the door he wishes to enter. Miss Munro is to be commended for presenting the issue clearly and concisely.

E. Jean M. Hill,
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Of critical importance in any education program is the identification of a "common denominator". Although nursing education is focused on a belief in nursing one must also consider the educational philosophy incorporated into the transmission of that belief. The crucial factor in Munro's paper is the accomplishment of change in a belief system.

If one believes that a personal philosophy develops over time then changes in that philosophy take time. To support a change of focus in the beliefs of post-basic nursing students there also has to be mutual understanding between educators and students. Consequently to achieve mutual understanding over a period of time there has to be openness on the part of both faculty and students. This objective has to be built into all aspects of a program.

The key to openness in a program lies in the educational beliefs of the faculty. Therefore where a faculty believes that they impart knowledge and set standards it infers a one-way flow to students. Surely we are all learners! The adult learner requires guidance and counselling in transference rather than a negation of all previous learning.

Among university nurse-educators there is a growing indication that previous non-university nursing education has limited value. Considering that the post-basic nursing student is a product of a diploma program it is no small wonder that the covert inference of limited worth would produce negative student reaction.

Finally the value of a baccalaureate degree has to be examined in terms of the market place. The post-basic student knows that upward mobility in the nursing profession requires a degree. This student is also aware that functional courses have greater economic benefits. It is surely preferable to use this incentive positively.

Except for the method of manipulating students to agree with "our" beliefs we fully concur with the final arguments in Munro's paper.

Patricia Hayes, Joanne Boyd,
School of Nursing,
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BEHAVIORAL OBJECTIVES: SOME PERSPECTIVE, PLEASE!

BY CAROLYN B. ATTRIDGE*

... behavioral objectives are a way of thinking and can not be intrinsically good or bad. What makes them desirable or not is their application. (Haberman, 1970, p. 394).

THE behavioral (instructional, educational) objective approach to curriculum and instruction is both rational and, in theory at least, simple and straightforward. Essentially this approach advocates the precise specification of the desired goals of an educational program, course, unit or class, etc. in the form of unambiguously defined, observable and measurable, terminal learner behaviors. These previously delineated goals are then used to guide the selection and organization of content and learning experiences. They also serve as criteria by which students are evaluated and the effectiveness of the curriculum can thereby be assessed (Popham, 1969, p. 35; Eisner, 1967, p. 250).

To take issue with this widely accepted approach is to invoke a two-fold risk. First to quarrel with such an overwhelmingly logical approach to curricular matters, one that has so well succeeded in establishing at least theoretical direction to many educational programs, is to lay oneself open to accusations of irrationality, an undesired, and hopefully undeserved, descriptor. Second, and more important, it is possible that faced with a position which questions the whole-hearted acceptance of the behavioral objectives concept, frustrated and objective-weary nurse-teachers may too quickly opt for some other approach and lose the benefits that these valuable tools can provide.

Yet it is the purpose of this article to raise questions about the behavioral objective movement, and movement it appears to have become. But it must be stressed here that it is not so much the concept itself that I propose to query, as its application, and most particularly, its application in nursing education. It is my hope to bring perspective

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to the behavioral objective issue, to assist nurse-teachers to examine more critically the implications of its complete adoption that they may better use this approach to maximize its inherent advantages and minimize the potential hazards it may entail.(1)

Nursing Education first jumped on the behavioral objective bandwagon in the 'fifties. Since then, nurse-teachers have spent an inordinate number of man-hours producing more or less defensible behavioral objectives according to the gospel of Bloom, Mager and Krathwohl, with commendable, but too often, uncritical persistence. If we have reservations about their development and use, these are little evident in the nursing literature, nor are they evident in the curriculum practices of most schools of nursing. The arguments prevailing in the general education literature (Eisner, 1967; Kleibard, 1968; Atkin, 1968; Popham, 1968) over the implications and effects of the behavioral objective approach have little counterpart in nursing education, though we have been working intensively with this concept for well over a decade. Why is this?

It is typical of nursing education, and indeed a very human characteristic, that when we find a valuable and useful idea, approach or tool, we overuse it. We seem to suspend critical judgement; we try to make it fit every circumstance or make every circumstance fit it. No where is this so evident as in curriculum planning in schools of nursing. We select a useful concept or principle and attempt to force all content and experiences into its particular framework. Thus it was with Virginia Henderson's (or Maslow's) concept of needs; so it is with our use of behavioral objectives. Needless to say not everything will fit; if it does, it begs serious examination.

A CLOSER LOOK

The advantages of behavioral objectives are widely acclaimed. They provide direction for curriculum development and teaching; they facilitate learning by the student; they provide guidance for evaluation of curriculum outcomes. But do they? The arguments in their favour are essentially logical in nature and are most believable. Conceptually, behavioral objectives make sense. What happens in practice, however, in the application of the concept, is not always what one would expect. As Eisner points out the real value of objectives in curriculum development, teaching and learning is, in fact, an empirical problem and

... if one consults the research literature to identify studies which demonstrate that educational objectives when clearly specified facilitate the construction of curriculum, learning or teaching, one finds that such studies at best, are inconclusive (Eisner, 1967, p. 277).

Let's look at these logical arguments in favour of objectives and at some of the related research.

CURRICULUM DEVELOPMENT AND TEACHING

The specification of behavioral objectives, it is said, enables the teacher to choose wisely what should be in the curriculum and in what sequence. Through inference from these specific goal descriptions, the teacher can plan more easily the "tactics of instruction" (Gagne, 1964, p. 38). Objectives also permit preassessment of students — the pretesting for entry behaviors, which allows the teacher to determine the student's status in relation to terminal goals and to avoid reteaching what is already learned. (Popham, 1970, p. 14). They serve as guides for the teacher to facilitate the selection of appropriate student practice opportunities. When one knows what behavioral outcome is desired, opportunities for relevant practice during the instructional sequences which follow are more efficiently provided (Sullivan, 1969, pp. 69-70). They promote the individualization of instruction. Once terminal behaviors are identified, individual students' needs can be assessed and their instructional programs adapted accordingly.

These are only some of the logically well-supported claims for the use of behavioral objectives in curriculum and instruction. Yet little empirical evidence exists to support them. In fact some evidence seems to indicate that despite the values inherent in objectives, teachers, in reality, *do not know how to use them*. For example, Popham (1967), in several studies, compared the performance of groups of experienced teachers in promoting learners to attain prespecified behavioral objectives, with that of housewives and college students who had no teaching experience. There was no significant difference favouring the experienced teachers and his conclusion was "... that experienced teachers are simply not more experienced at accomplishing prespecified behavior changes in learning" (Popham, 1969, p. 45). Similarly, Baker (1967) reported a study where groups of teachers were respectively presented with sets of behavioral and non-behavioral objectives — the former derived from the latter. No difference in the performance of teachers using each type of objective was detected. A follow-up question revealed that the teachers using behavioral objectives were unable to recognize test items relevant to their specific objectives and again it was concluded that teachers did not know how to handle precise objectives.

It seems, and this is surely common sense, that teachers do need training to learn how to best use behavioral objectives. The mere statement of numerous objectives is of no use in itself. Objectives

must "... serve as a referent for instruction which leads to their attainment. . ." (Sullivan, 1969, p. 70) to be of any value in the improvement of teaching. How true is this in nursing education? We certainly are prodigiously producing objectives in large quantities. Do *we* use them to guide instruction? Do we know how to use them? Are we even aware that we may not know how to use them so that we may seek to compensate for this deficiency?

Other questions must also be raised here. If teachers are trained to teach efficiently to precise behavioral goals, what other effects upon instruction might result? For example, what about teacher spontaneity and flexibility? What about the unplanned, unpredictable and often productive side-effects of learning experiences? Would these be reduced? Should they be reduced? Questions like these can and should be answered through empirical evidence before we commit our energies to this approach entirely.

STUDENT LEARNING

Behavioral objectives, it is also maintained, if presented to the students, facilitate student learning. Mager suggests that they provide the student with the "... means to evaluate *his own* progress at any place along the route of instruction" (Mager, 1962, p. 4) Gagne (1965) too, supports the contention that attainment of desired learner outcomes may be increased by telling students the objectives prior to a unit of instruction. Here again, logically, one can present a strong case. Objectives provide the student with direction to his learning; they serve as advance organizers to the organization of subject matter; they provide feedback to the learner as he reaches specific goals; they enable the student to manage his time better since he is aware of desired outcomes, and they may act as reinforcers—the mastery of the objective itself proving rewarding to the interested student (Duchastel and Merrill, 1973).

Yet again, little empirical evidence exists to support these arguments. A recent review of research studies examining the role of behavioral objectives in the facilitation of student learning revealed very mixed findings (Duchastel and Merrill, 1973). Some indication was found that students *must* themselves believe in the importance of objectives if they are to have any effect. For example, students used objectives more effectively once they had written examinations obviously referenced to their course goals. (Tiemann, 1968). Other findings suggested that their effect related to the type of learning desired, or to the type of student involved. For example, in one study, objectives were found to have a neutral or interfering effect with the learning of problem-solving tasks; in another they

served to reduce the reasoning ability of students; and in still another, they lowered the students' anxiety level. Other studies indicated that objectives, unaccompanied by other differences in the teaching-learning sequence, seemed to have little impact on students' organization of their time. The strongest conclusion that could be formed on the basis of findings from these studies was:

. . . objectives sometimes help and are almost never harmful. Therefore, if the provision of objectives is relatively inexpensive, one might as well make them available to students (Duchastel and Merrill, 1973, p. 63).

Not a very strong summary statement! Perhaps it serves to illustrate the complexity of the objectives issue, and that what should logically happen with the implementation of an apparently rationally sound educational concept, does not always occur.

EVALUATION OF CURRICULUM

The potential value of behavioral objectives as guides for the evaluation of students and therefore of curricular outcomes is difficult to argue. When stated according to recommended format (Mager, 1962; Cohen, 1966; Esbenson, 1967; Briggs, 1970) each objective includes three criteria. The 'given what' criterion specifies the *conditions* under which the student will exhibit the desired behavior — that is, the material he must work on or the problem he must solve or the resources he can use, etc. The 'student does what' criterion indicates precisely what it is the student will perform under those conditions. The 'how well' criterion, though most difficult to define and therefore often excluded, describes the level of performance that will be considered minimally acceptable under the specified conditions (Briggs, 1970, pp. 19-20). If these three criteria are met, then implicit within every objective is its means of evaluation. The measure of student performance obtained in relation to the objectives, is a measure of the effectiveness of a given curriculum.

Literature abounds on the use of objectives for the development of tests and other evaluation techniques (Bloom, 1956; McGuire, 1963; Briggs, 1970; Bloom *et al.*, 1971). Yet there is a dearth of research on how behavioral objectives are actually used by teachers and others in the evaluation of students and curricula. Despite this lack several questions can be posed here which have particular relevance to nursing education. How closely do our evaluation techniques, particularly those concerned with the less controlled and less well-defined clinical performance of students, measure, in level and kind, the behaviours pinpointed by our objectives? Do our evaluation methods assess

only those objectives we have specified or do they in fact assess qualities not represented in our statements of goals? If the former is true, is there not danger we will miss important student learning not represented by our objectives? If the latter, how fair is this to our students (see discussion of validity below)?

Our use of objectives as tools for the evaluation of curricula begs consideration. It is my experience that in nursing education we use objectives primarily to evaluate students, not curricula. We do not tend to view high failure rates as a measure of ineffective curricula and instruction but are more prone to focus on student weaknesses or other factors as the villains in hand. The advantages of objectives in fostering curriculum revision and improvement of instruction are thus reduced. It is also possible that the undue emphasis we might place on behavioral objectives could blind us to other important factors which must be considered in the evaluation of curriculum. Factors such as faculty fatigue or satisfaction, faculty attitudes, student attitudes, undue costs, reactions of staff in clinical fields, community effects, etc. may contribute positively or negatively to the overall evaluation of the effectiveness of a program. We cannot rely on measures of attainment of behavioral objectives alone.

Other questions deserve scrutiny here but it is not within the scope of this article to give them the attention they warrant. (2)

SOME FURTHER PROBLEMS

A number of other problems related to the behavioral objective approach remain as yet unsolved. For example, how many objectives are necessary or feasible for a given instructional sequence, class, course, etc., and by what criteria should this be determined? (Popham, 1969, pp. 53-55). Are the psychological processes of human beings adaptable to the precise logical process advocated by the behavioral objective approach to curriculum development? Is this approach the best way? Is it the only acceptable way? (Eisner, 1967, pp. 364-365) What limits do different kinds of subject matter place on the use of behavioral objectives? (Eisner, 1967, p. 362) These problems and others have been aptly dealt with elsewhere. Perhaps the problem which should result in the greatest reservations about behavioral objectives is that of validity — the validity of the behavioral statements chosen by curriculum developers and teachers to represent the desired outcomes of their programs. This problem is discussed in some detail below.

VALIDITY

The question of the validity of behavioral objectives, although it has been touched upon by some of the critics of this approach (Eis-

ner, 1971 ; Kleibard, 1968 ; Ebel, 1967 ; Grobman, 1970), has received comparatively little attention in the objectives literature. Yet because of its implications for the validity of the total educational process based upon them it is of paramount importance. What about validity?

Generally speaking, experience shows, in developing curricula we tend to start from rather global aims or purposes as to what our students should learn and what our programs should do to help them learn. It is from these wide, all-encompassing goals that our precise and measurable statements of terminal student behaviors are derived, and it is our assessment of our students in light of these specific behaviors that informs us of our success in reaching our overall goals. Questions of validity enter into this process at several points.

First, let us examine content validity. Content validity in this context refers to the degree to which our specific behavioral statements in quantity and kind represent the total universe of behaviors that are bounded within the borders of the more global aims of our programs. For example, what assurance is there that the student behaviors specified in a given unit of instruction validly relate to the overall goals which they are purporting to represent? Can we defend either through empirical or logical means those specific statements we have chosen to represent such desirable, but intangible aims as critical thinking, originality, initiative, responsibility, cooperation and the like? These terms certainly appear in our calendars as goals for nursing programs. How have we validly translated them into precise behavioral objectives?

In fact, the criticism has been levelled that the type of objectives most easily operationalized in the acceptable behavioral objective format, are not those such as the above, but are those which classify at the simpler levels of cognitive or affective process according to tools like Bloom's taxonomy (Bloom, *et al.*, 1956). These are most likely cognitive, rather than affective or psychomotor in nature, as precise measurable cognitive goals are more easily specified than are others (Grobman, 1970, pp. 96-103). These simpler, cognitive statements therefore, tend to dominate our statements of objectives. Moreover, by their very nature as behavioral statements, they represent immediately observable behaviors and therefore are more often related to short-term goals (Grobman, 1970, pp. 100-101). The result is goal statements which tend to concentrate on minutiae and are lacking in items which focus on long-term changes in behavior or other more difficult and complex learnings represented by the upper levels of the taxonomies and areas like those of the affective domain. Goals like the latter which may relate to important overall program purposes but which cannot as yet be behaviorized or

are behaviorized only with difficulty, are thus ignored since teachers are naturally inclined to focus on those outcomes which have been predicted and are written down before them. If these criticisms are true, the potential effect on the overall quality of curriculum and instruction is obvious:

If identification of all worthwhile outcomes in behavioral terms comes to be commonly accepted and expected, then it is inevitable that, over time, the curriculum will tend to emphasize those elements which have been thus identified. Important outcomes which are detected only with great difficulty and which are translated only rarely into behavioral terms tend to atrophy. They disappear from the curriculum because we spend all the time allotted to us in teaching explicitly for the more readily specifiable learnings to which we have been directed (Atkin, 1968, p. 28).

Thus the principle of content validity is violated.

Arguments such as these should be relatively easy to check. Schools of Nursing might simply take their lists of objectives, and classify them as to level and kind according to the taxonomies. It would soon become apparent whether the simpler end of the simple-complex continuum was favoured and whether cognitive objectives appropriately dominated our statements of goals. If this is the case, several possible explanations exist. One is that these less complex behaviours are all we expect our nursing students to know, believe or do and our content validity is preserved. This appears to be unlikely, however, in light of nursing's statements about the desirability of such qualities as creativity, leadership, acceptance and supportiveness in our students — qualities which do not lend themselves easily to behaviorization. Another explanation is that we do in fact expect much more complex and varied learnings but these are not represented by our objectives, behavioral or otherwise, and we ourselves may or may not be aware of the existing gap. If this is so, how do we evaluate our perhaps undefined and unconscious expectations? How do our students know what we expect of them? A third possibility, of course, is that our specified objectives are simply written statements to be put on display as our on-paper curriculum and bear little relationship to whatever guides our instructional and evaluation practices.

The other side of this validity coin provokes the question of predictive validity. Given the assessment of students in relation to their demonstration of specific behaviors under supervised conditions, what proof do we have that the ability to so behave is predictive of their attainment of the overall goals of the program and their continued practice of these in the future? By what reasoning can we

assume that achievement of specific objectives via performance on a pencil and paper test or, for that matter, performance in a supervised patient care setting, is indicative of how the student will behave in some as yet undetermined situation? As Eisner states

. . . I am nagged by the belief that assessing student behavior at the end of an instructional unit does not really predict how he is likely to behave, or think, or experience outside the classroom (Eisner, 1971, p. 171).

Grobman suggests that the student's affective learning, may in fact be the major influencing factor in his willing continued performance of the behaviors we specify:

. . . without achieving some positive affective outcomes, at least through the level of valuing, achievement of any other goals in the cognitive and psychomotor domains may be precluded (Grobman, 1970, p. 96).

Yet how many of us can or do explicitly define the attitudinal learnings we wish our students to achieve, and assess these as predictors of the attainment of the overall goals of the program? And how many of us follow up our graduates to assess whether their attainment of our behavioral objectives was in fact a valid indicator of the attainment of the desired outcomes of our programs?

How can we increase the validity of our statements of objectives? We can at least examine critically the objectives with which we are already working. Do they in fact accurately represent the broad overall aims of our programs? Or are there areas missing or lacking in the emphasis they deserve? Can we logically, or through research evidence support the terminal behaviors we have chosen? Or do they just 'sound good'.

We can also question our use of the behavioral objective format exclusively. Certainly use it where it is most appropriately used. But recognizing that some rather vague, nebulous and perhaps internal characteristics are nevertheless desirable in our students, can we not be flexible enough to admit these as yet imprecise, less easily measured and often long-term objectives to our statements of goals? Surely we have room for both; surely we can afford to lose sight of neither.

Notes

- 1 Some of the arguments reviewed here have been put before nursing previously (N. L. N., 1970). Reiteration and further elaboration of the objectives issue would appear to be in order, however, that we might develop a healthy sense of caution in our application of this approach in nursing education.
- 2 For example, criterion-referenced evaluation versus norm-referenced evaluation deserves close examination by nurse-educators.

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A RESPONSE TO "BEHAVIORAL OBJECTIVES: SOME PERSPECTIVE, PLEASE"

Ms. Attridge is to be complimented upon her exploration of issues about the use of behavioral objectives in nursing. Her queries about the behavioral objective bandwagon centre about the need for critical assessment regarding their use in as far as they contribute to curriculum development, teaching and learning. Attridge, in citing pertinent objectives, notes that little empirical evidence exists to support arguments regarding their use (Duchastel and Merrill, 1973). Her suggestions that nursing educators investigate the usefulness of behavioral objectives give support to others who have raised similar questions (Cooley, 1972; 1973). The writer and some of her colleagues at the University of Alberta School of Nursing have often wondered whether behaviorally-stated objectives foster student dependency rather than student independence, creativity, spontaneity, and flexibility. Faculty, concerned about assisting students to learn how to cope in a world of change, support Ebel's (1967) position that "education should be viewed more as a means of increasing the resources of an individual as he seeks to choose his own behaviors wisely" (p. 263).

Other concerns expressed about the short-comings of the behavioral approach are the base number of statements required, the emphasis on low-level cognitive performance with no necessary inferences regarding mental processes or learning in the cognitive domain, and the fact that most cognitive statements are considered without including the associated affective outcomes. One might also question whether affective objectives can be stated without considering cognition as these do not exist in isolation of one another.

While Attridge questions the use of behavioral objectives in nursing education on the basis of the experience in general education, one can question the application of these generalizations to nursing education. Perhaps the dilemma of whether or not and when to use behaviorally-stated objectives in nursing can best be resolved by nurse educators undertaking research into their use. C.A.U.S.N. members might investigate the function of behavioral definitions as they provide direction for curriculum development, learning and teaching.

For example, one group might document student behaviors which are observed concomitantly to the achievement of stated behavioral objectives. Another group might document student behaviors arising from the student's attempts to meet her own learning needs. Definitive research may reveal the usefulness of behaviorally-stated objectives for particular aspects of curriculum development and student learning experiences.

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The writer wishes to thank Donna Cooley and Pauline Kot for sharing their beliefs about the use of behavioral objectives in nursing curricula.

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THE DELPHI TECHNIQUE: A POSSIBLE TOOL FOR PREDICTING FUTURE EVENTS IN NURSING EDUCATION

BY LILLIAM BRAMWELL AND ELAINE HYKAWY*

THE twenty-seven year interval since World War II has witnessed far-reaching change in social, economic, and political institutions. The literature indicates no deceleration of this process (Doyle and Goodwill, 1971; Enzer, 1971). In fact, Toffler suggests that we are now experiencing "... the dizzying disorientation brought about by the premature arrival of the future ..." (Toffler, 1971, p. 11). The transition from a fatalistic acceptance of the inevitability of future events to a more positive consideration of "futures" planning is quite recent. "Once we think of futures as events which are at least partly subject to choice and control, we can work toward improving long-range planning" (Helmer, 1970, p. 1).

Several techniques have been developed to assist in predicting future events. Among these is the Delphi Technique (Helmer, 1966) which is a procedure for organizing and sharing expert forecasts about the future. It has been used in a variety of educational settings (Clarke and Coutts, 1970; Anderson, 1970; Cyphert and Gant, 1970; Doyle and Goodwill, 1971; Jacobson, 1970). No studies using this technique were found in nursing literature, although, individuals have made predictions about future events in nursing education (Burnside and Lenburg, 1970; Mussallem, 1970) and others have recommended that such studies be done (Applund, 1966; Seyffer, 1965).

A survey of the literature showed that the advantages of using the Delphi Technique in forecasting were as follows. It can involve a number of individuals from a wide geographical area while avoiding the disadvantages of the committee method (Campbell and Hitchin, 1968; Clarke and Coutts, 1970; Doyle and Goodwill, 1971). The influence of status and forceful personalities among panel members is eliminated (Cyphert and Gant, 1970; Doyle and Goodwill, 1970) and the problem of commitment to a publicly stated opinion is avoided (Cyphert and Gant, 1970; Doyle and Goodwill, 1970).

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Criticisms encountered included the following. Criteria for the identification and selection of experts have not been established (Anderson, 1970; Campbell and Hitchin, 1968; Cyphert and Gant, 1970; Helmer, 1966; Helmer and Rescher, 1959). Scholars in the same discipline tend to think along the same lines which may cause them to arrive at a consensus of opinion without considering all relevant factors (Boehm, 1970). The process of adapting panelist responses from Questionnaire I for use in subsequent questionnaire rounds may result in inaccurate translations of panelist predictions (Boehm, 1970; Helmer, 1966). And finally, not enough is known about the thought processes that are involved when the future is considered (Helmer, 1966; Weaver, 1971).

Despite these limitations, it has been recommended that studies employing the Delphi Technique be continued in order to further refine the technique and to explore its applications.

THE PURPOSE OF THE STUDY

The purpose of this study was to explore the potential of the Delphi Technique in predicting events of the next fifty years in nursing education. In employing the technique, data were collected about the events that will occur, when they will occur, and the degree of consensus reached by the group on events and time.

DEFINITION OF TERMS

The Delphi Technique is: "... a carefully designed program of sequential, individual interrogations (usually conducted through questionnaires . . .), interspersed with information feedback on the opinions expressed by the other participants in previous rounds" (Helmer, 1970, p. 4).

Experts in this study included persons who are presently involved in nursing education as planners, researchers, or teachers at universities, colleges, hospitals, professional or government agencies.

Consensus means that at least 75% of the panelists (or 10 of 13) agree that a specified prediction will occur within a certain time interval.

Dissenting opinions are predictions which do not fall within the time interval in which the largest number of panelists agree that the event will occur.

LIMITATIONS

The limitations of this study arose from two sources — the Delphi Technique and the sample. The limitations arising from the technique itself were: the inability of individuals to project into the future; the need to think of all other future developments that would affect

nursing education in the future, e.g. technology, health problems, primary and secondary educational systems; the possibility of vague or ambiguous questions; and the possibility of responses being self-fulfilling and/or self-defeating prophecies. Limitations arising from the sample were the small number of panelists and the restriction of panelist selection to Ontario.

ASSUMPTIONS

The following assumptions were held: respondents are competent in the field of nursing education; responses are individual, no advice is sought from other respondents; and responses are based on rational judgment.

METHOD

Sample Selection. Experts were selected on the basis of educational level, rank in educational institution and/or position in agency or organization. All experts who were selected as panelists had at least a master's degree. The selected panel consisted of sixteen members as follows: 7 assistant professors or higher in university nursing programs, 3 directors from diploma nursing programs, 2 directors from nursing service administration in hospitals, 3 executive officers from professional nursing organizations and one nursing consultant from a government agency. There was one refusal to participate from a diploma nursing program director and two non-responses from university professors. The remaining 13 panelists completed the study.

The Delphi Technique. Four rounds, each involving a questionnaire and questionnaire analysis, were conducted in the following manner.

ROUND I

Panelists were requested to make a maximum of ten predictions regarding the future of nursing education in the next fifty years. A grouping and collation of responses was done to reduce the number of predictions to a manageable size.

ROUND II

The predictions were presented and the panelists were asked to predict in which time interval they would occur. The time intervals had been defined by the investigators as 1972-1980, 1980-1990, 1990-2000, 2000-2020, later, and never. Results were tabulated and reported for each statement in terms of number and predictions in each time interval.

ROUND III

Panelists received feedback of their Round II predictions plus the corresponding response from the total group for each statement. If a

panelist's prediction differed from the group response, she was requested to revise her prediction or to support her position. The results were again tabulated and reported for each statement. Statements achieving consensus were announced. Reasons for dissenting opinions were incorporated into the next questionnaire.

ROUND IV

Panelists were asked to reconsider their predictions in view of the dissenting opinions and to revise them if they so desired. The additional predictions that achieved consensus were identified. A description of events that would occur in the future, as predicted by the consensus of the panel of experts, was composed and sent to the panelists.

Reactions to the Delphi Technique were also obtained from the panelists. These were categorized and compared with reactions to the Delphi Technique reported in the literature.

RESULTS

The data are presented in two sections for each round: part (a) describes panelists' reactions to each questionnaire and part (b) describes the results of each questionnaire regarding events, timing, and consensus.

ROUND I

- (a) Of sixteen panelists selected 2 did not respond, one refused to participate, saying that it would be too time-consuming; 2 accepted dubiously, one questioning the time factor and one questioning her own expertise. The remaining 11 accepted without comment, for a total of 13 panelists.
- (b) Of a total number of 120 statements submitted by panelists, 31 were rejected because they were not directly concerned with nursing education. The remaining 89 were grouped by the investigators with assistance in interpretation from an arbiter on statements that were unclear to the investigators. The statements were then combined to form a total of 38 statements for Questionnaire II. This combining and grouping was possible due to repetition and similarity of predictions. Statements that were selected included words and phrases used by panelists so that the original intent could be transmitted and so that panelists would recognize their own contributions. The following 38 statements comprised Questionnaire II.
 - 1. Teacher's role will be that of resource person and counsellor to aid the student towards maximum personal growth.
 - 2. Students will progress through the curriculum as slowly or as rapidly as they are individually able.
 - 3. Students will apprentice with skilled nursing practitioners, who are actively practicing, and who will serve as role models.

4. There will be a return of an internship for specialty services and nursing service will again become involved in the education of nurses.
5. Nursing education will not be as popular to high school graduates.
6. There will be an increased enrolment in basic baccalaureate programs.
7. An increase in the male student population will occur.
8. Nursing educators will be expected to maintain their clinical competence by a return to the practice of nursing.
9. All levels of nursing, diploma and higher, will be exposed to nursing research in their courses of study.
10. Students will learn to give care wherever there are health programs — in space, under water, in the north or in another country. (Electronic translators will permit conversation in any language.)
11. Students will learn to give care in a variety of communities and cultures with persons of all age groups.
12. Nurse educators will become more knowledgeable about social, medical, and economic problems in the developing countries and their effect on nursing care and will communicate this to their students.
13. All education programs will become future-oriented because even now, as they exist, they are obsolete.
14. There will be very few nursing administrative positions available in departments of nursing, freeing nurse educators to teach.
15. Clinical specialization at the doctoral level will develop rapidly.
16. Clinical specialization at the Master's level will develop rapidly.
17. Increasing numbers of nurses will seek graduate education including post-doctoral education.
18. There will be a high percentage of interdisciplinary (core) programs offered to nursing students enrolled in both community college and university programs.
19. There will be a health sciences faculty, multi-disciplinary in nature, which will develop the overall health worker concept.
20. Through co-operative effort, students in the health disciplines will develop community studies and projects.
21. Nursing assistant programs will be upgraded to eventually replace the present diploma nursing programs.
22. All nurses will be prepared in a two-year core program (diploma) at the community college level with ready access to university study — baccalaureate — master's — doctoral levels. (Ladder concept).
23. Certification courses in all clinical specialties will be offered to graduates of core programs (diploma) and degree programs, through both the community college and university faculties of nursing.
24. All nurses will be required to return to school for refresher courses every three to five years in order to assure that their knowledge is current.
25. Nurse-educators in Canada will try to develop programs for graduate students from underdeveloped countries.
26. University schools of nursing will have to give more attention to developing clinical competence in their graduates, e.g. internship.
27. Nursing curricula will consist of a series of problem areas, graded according to depth of clinical judgment required for assessment and nursing intervention.
28. Schools of nursing as they exist will pass away and with them will pass the rigidly imposed structure for nursing education.
29. There will be no classrooms, no classes, no group clinical experience. There will be an enormous resource centre at each centre for nursing education using, in common with other disciplines, computer banks of information, instructional programs, and simulated people.
30. Diploma nursing programs as such will cease to exist and will be replaced by highly skilled technologists in varieties of sub-specialties emerging out of specialized institutions.
31. Psychomotor skills will cease to be emphasized in nursing programs to be replaced by theory in the principles of care particularly related to mental health aspects.

32. Students will gather information and test their knowledge in their homes, using individual computer consoles for information retrieval and computer assisted instruction.
33. With computer assistance in manipulating patient data for purposes of diagnosing and prescribing treatment, educational programs will focus on prevention, psychological support, and adaptation to environment.
34. Audio-visual devices (video-phone, video-tape, closed circuit TV) will be used to demonstrate and to evaluate nursing care performance.
35. Simulated people with responses programmed by computer will provide laboratory experience for beginning physical and social skills to permit the student to see the effects of nursing intervention.
36. Basic university programs for the preparation of the high school graduate in nursing education will be considered uneconomical and will be phased out.
37. Basic preparation of the registered nurse will no longer include hospital maternity nursing. This will become a continuing education specialty.
38. Standards in nursing education will be set by persons who are not nurses.

ROUND II

- (a) Thirteen panelists indicated in which time interval predicted events would occur. Six panelists qualified their responses and six panelists edited some of the statements.
- (b) Consensus was reached on one statement — number six.

ROUND III

- (a) Panelists reconsidered their predictions in view of what other panelists had predicted and gave reasons for opinions which differed from the majority. One panelist commented on the ambiguity of the statements, and of 13 respondents, 12 stated reasons for dissenting opinions.
- (b) Consensus was reached on twelve additional statements (see Table 1).

ROUND IV

- (a) Reactions to the Delphi Technique were, for the most part, positive, e.g., "Stimulated thinking and discussion about nursing in the future", "forced one to think by self about difficult and complex nursing issues", and, "encouraged futures planning". One panelist felt that the tool had some validity because consensus was reached on a number of events.

Negative responses included "frustrated by the lack of discussion with colleagues", "would have preferred direct interchange", and, "insufficient time for reflection" (mentioned by several panelists). One panelist recommended that the study be conducted on a larger scale with a specific purpose for application of findings.

Panelists suggested that the Delphi Technique could be used in the following ways: to solve problems and make decisions

in nursing service administration, to make man-power predictions, to stimulate discussion groups, to determine the ability of a group to reach consensus, and to determine future-oriented objectives.

- (b) Consensus was reached on two additional statements (see Table 1), for a total of 15 out of 38 statements, all occurring between the years 1972-2000.

DISCUSSION AND CONCLUSION

The present study explored the potential use of the Delphi Technique in predicting future events in nursing education. The technique, as described in the literature and as used in this study, has a number of limitations. Simon (1969, p. 274) has questioned the use of expert opinion, suggesting that expert opinion is better used as guidance rather than as final data. The procedure for selecting experts to function as panel members has not been adequately delineated. Helmer and Rescher (1959) gave two requirements for panel selection, knowledge in the field and degree of accuracy in predictions. The first criterion was followed in this study in that rank at the university and position in the agency were considered. It was not possible to measure for accuracy of past predictions due to lack of developed methods of measurement. Not enough is presently known about thought processes that are involved when attempts are made to conceptualize the future (Weaver, 1971). How much are predictions based upon rational judgment, background knowledge, past experience, intuition, and/or wishful thinking? At the present time there is no reliable method for differentiating between objective and subjective predictions. In other words, it is difficult to separate the "will happen" from the "should happen" (Weaver, 1971.) It may also be argued that personal bias could invalidate judgments and/or the rationality of decision-making, particularly when only those with dissenting opinions are asked to support their position. Finally, even though the predictions are made by experts, consensus is reached, and arguments are rationally supported, unforeseen events such as scientific breakthroughs may render the predictions inaccurate.

The predicted events about which consensus was achieved were similar to those suggested by Mussallem and Burnside and Lenburg, with the exception of those relating to a systems approach and open enrollment. These were not predicted by panelists in this study.

In spite of limitations, the response from panelists was positive (no attrition, expression of interest, and suggestions for potential uses). This suggests that the Delphi Technique merits further study

TABLE 1. CONSENSUS REACHED BY PANELISTS ON FUTURE EVENTS IN NURSING EDUCATION, BY ROUND AND TIME INTERVAL

ROUND IN WHICH CONSENSUS REACHED	FUTURE EVENTS IN NURSING EDUCATION	TIME OF OCCURRENCE				
		1972-1980	1980-1990	1990-2000	2000-2020	LATER NEVER
II	There will be an increased enrollment in basic baccalaureate programs.	X				
III	Nursing educators will be expected to maintain their clinical competence by a return to the practice of nursing.	X				
III	All levels of nursing, diploma and higher, will be exposed to nursing research in their courses of study.	X				
III	There will be very few nursing administrative positions available in departments of nursing, freeing nurse educators to teach.		X			
III	There will be a high percentage of interdisciplinary (core) programs offered to nursing students enrolled in both community college and university programs.		X			
III	There will be a health sciences faculty, multidisciplinary, in nature, which will develop the overall health worker concept.		X			
III	Through co-operative effort, students in the health disciplines will develop community studies and projects.	X				
III	All nurses will be prepared in a two-year core program (diploma) at the community college level with ready access to university study - baccalaureate — master's — doctoral levels, (Ladder concept).		X			

III	All nurses will be required to return to school for refresher course every three to five years in order to assure that their knowledge is current.		X		
III	University schools of nursing will have to give more attention to developing clinical competence in their graduates, e.g. internship.	X			
III	Nursing curricula will consist of a series of problem areas, gradated according to depth of clinical judgments required for assessment and nursing intervention.	X			
III	Schools of nursing as they exist will pass away and with them will pass the rigidly imposed structure for nursing education.		X		
III	Audio-visual devices (video-phone, video-tape, closed circuit TV) will be used to demonstrate and to evaluate nursing care performance.	X			
IV	Certification courses in all clinical specialties will be offered to graduates of core programs (diploma) and degree programs, through both the community college and university faculties of nursing.	X			
IV	Simulated people with responses programmed by computer will provide laboratory experience for beginning physical and social skills to permit the student to see the effects of nursing intervention.				X

and use in other contexts. Weaver states that the Delphi Technique seems to have promising application as a tool for teaching persons "... to think about the future in a more complex way than they ordinarily would" (Weaver, 1971, p. 271). This suggestion was supported by the panelists in this study.

In summary, the investigators would recommend: replicating this study with a larger and more geographically representative sample, combining the Delphi Technique with other future-oriented methodologies, and using the technique for purposes other than prediction.

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A STUDY OF ERROR-MODELING IN SKILLS LEARNING

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INFORMATION feedback, the process of providing information about the correctness or adequacy of a response (Bilodeau, 1966) (1), is regarded as the single most important variable governing the acquisition of skilled habits (Bilodeau, 1966; Irion, 1966). Fitts (1965) proposes a model which distinguishes between internal and environmental feedback loops. In education and/or training, comments from an instructor would be one source of environmental feedback. In addition, in many skills learning tasks, feedback intrinsic to the task would also form part of the information coming from the environment (Irion, 1966). However, in other tasks, clarity of feedback from the task itself is minimal and information from the instructor then assumes greater importance.

Markle (1965) proposes, in regard to the teaching of English, that it may be possible to teach the student appropriate discriminations so that he may become his own observer and evaluator, and, with this self-monitoring behavior, be able to provide his own information and knowledge of results rather than having to rely on environmental feedback. This would be of particular value where feedback intrinsic to the task is low or non-existent.

To enable the student to make such discriminations between correct and incorrect responses in his own repertoire, it would appear that prior information about errors as well as about correct responses would be helpful. This would be consistent with Olson's (1971) view that any form of instructional system is successful to the extent that it provides the learner with an awareness of critical alternatives and how to choose among them.

The view that learners should be supplied with information about errors is, of course, contrary to the generally accepted approach to instruction which emphasizes minimization of errors. In the case of skills learning particularly emphasis on teaching has been on correct performance usually modeled by an expert. In some instances however, the question of whether it would facilitate learning to demonstrate negative as well as positive instances of the behavior in

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question has been raised (Allen and Ryan, 1969; Hunt, 1971; McDonald and Allen, 1967). The use or value of errors in educational practice has, however, been inadequately investigated and the purpose of this experiment was to investigate the possible value of modeling negative instances of certain actions involved in a complex procedure in nursing. The preparation of a surgical dressing tray was selected as the procedure.

The experimental hypotheses were based on the following propositions derived from theories of skills learning:

1. That cognitive processes utilizing information underlie the performance of a motor skill.
2. That understanding usually achieved through exposition and positive exemplary modeling would be enhanced by information about common errors.
3. That this will lead to enhanced performance of the skill as it enables the learner to choose between correct and incorrect alternatives.
4. That stored information regarding correct and incorrect alternatives is used to assess the performance of others as well as to direct one's own behavior.

METHOD

Experimental Design

The experimental design was a two factor design with repeated measures on one factor (practice), and called for three groups of subjects. It was decided that two groups of subjects would be exposed to the experimental condition (error modeling) and the third group constituted a control. With A as treatment and B as practice the design can be represented as follows:

Treatment	Subjects	Trials	
		B ₁	B ₂
A ₁ (Errors A & B)	23	A ₁ B ₁	A ₁ B ₂
A ₂ (Errors C & D)	24	A ₂ B ₁	A ₂ B ₂
A ₃ (Control)	24	A ₃ B ₁	A ₃ B ₂

Subjects

Subjects were 71 second year Basic Degree students at the University of Toronto Faculty of Nursing. Subjects were all female with an average age of 20 years 1 month. Due to limitations of time, no pre-testing of the subjects in the skill was carried out. It was felt that random assignment to experimental and control groups gave some assurance that any differences in the control and experimental groups would be unbiased with respect to the experimental hypotheses (Campbell and Stanley, 1963). Prior to exposure to the experimental

conditions, all subjects received the same preparatory teaching in relation to asepsis.

Modeling Device (2)

Three video tapes modeling the setting up of a dressing tray were produced. The demonstration variable (Sheffield and Maccoby, 1961) built into the tapes involved the modeling of errors which had been found to occur frequently both in the preparation and application of surgical dressings. Each of these errors were due to the violation of some principle or principles of surgical asepsis and results in contamination of hands or equipment.

The unit of the task was modeled in the same way on all three tapes except for the following variations:

1. Tape 1 — Standard procedure with no errors;
2. Tape 2 — Standard procedure except for the inclusion of two errors A and B;
3. Tape 3 — Standard procedure except for the inclusion of two other errors — C and D.

Video Tape for Discrimination Test (3)

A video tape showing a complete dressing procedure was produced. This tape contains 14 errors which include the four which were incorporated in the modeling tapes. The errors in this tape are executed in a sophisticated manner and, in contrast to those in the modeling tapes, most are not easily detectable except by someone skilled in aseptic technique. The use of this tape is described in the procedure.

Procedure

During the period of preparatory teaching prior to the project being carried out, the experimenter met with the total group of students to explain the plans for the research and request their co-operation.

Modeling — Following the preparatory teaching the modeling tapes were shown to the three groups with methods of utilization held as constant as possible among groups.

Viewing of the tapes was followed by a discussion with each group. Because of the possibility of introducing experimenter bias, the discussions were led by a person who had no other involvement with the research. Guidelines for the discussion were prepared by the experimenter. Briefly, the subjects in the experimental groups were asked to identify the modeled errors, relate them to the principles involved and discuss why they are considered to be errors of application. The discussion in the control group concentrated on positive exemplars of the same principles.

Practice Sessions — These began the day after the modeling tapes were shown. Each subject had two practice sessions or trials during which she was observed as she proceeded through the preparation unit of a surgical dressing procedure by one of six observers.

Six members of the University of Toronto Faculty of Nursing participated in the project as observers. All had had experience teaching and evaluating student performance in the clinical laboratory. An analysis of variance was used to estimate observer reliability. The rationale for this method is discussed by Winer (1970) but briefly is as follows. The procedure is based on the idea that in every measurement there is a true magnitude of whatever is being measured plus error of measurement. Upon repeated measurements of the same object with comparable instruments (in this case, the six observers) it is assumed that the true magnitude remains constant while the error of measurement varies. If the true measurement remains constant the variance within is due to error of measurement and the pooled within person variance is used to estimate this error. With a number of items being measured (in this case, the seven students) the variance among will also be partly due to differences in the true magnitude. The ratio of the variance of effects due to true measurement to the error variance is used to arrive at the reliability coefficient. The estimate of inter-observer reliability from the among and within-subject variance was .949.

In both practice periods, subjects proceeded through the task without interruption for instruction, correction or feedback of any type. Observation was limited to noting the number of times any of the four modeled errors were made by each subject during each practice period. If the same error was made more than once by a subject, it was counted each time it occurred. The number of times the four errors occurred constituted the dependent variable. No other aspects of performance were taken into account.

Discrimination Test — Based on the proposition that stored information about incorrect as well as correct alternatives is used in assessing the performance of others, a test to determine whether the error modeling had increased skill in discriminating errors made by another person was set up.

In this test, given one week after the final practice, the students in both the experimental and control groups viewed the video tape of the complete procedure which has previously been described. The ability of subjects to detect the errors in this video constituted the test of discrimination. Since for each experimental group there were 12 errors to which they had not previously been exposed, it was possible to determine whether the ability to discriminate would extend

beyond the two to which the experimental subjects had been sensitized.

In the instructions to the subjects, no mention was made of errors. They were instructed that they would be asked to evaluate the performance of the nurse in the video and to do this would be asked to complete a "rating scale". Twenty-five items were included on the scale and for each, subjects were asked to give a rating and then to justify the rating they gave. The ratings were actually not used in any way. Rather, the answers given to justify the rating were used to determine whether the subject had noted the error. Thirteen of the items on the scale were such that if the error had been noted, it would be evident in the answer. Returns were coded and were scored independently according to predetermined criteria by another person and by the experimenter. Any discrepancies were resolved while returns were still coded.

RESULTS

Error Scores — Practice Periods

The error scores from the practice periods were first subjected to statistical analyses according to the original design. The analysis of variance which tested a treatment effect, trials effect and treatment X trials interaction is shown in Table 1.

Table 1
Analyses of Variance of Error Scores

Source	Degrees of Freedom	Mean Square	F test	Probability
Between	70			
Treatment	2	25.590	.530	N.S.
Error	68	48.275	—	—
Within	71			
Trials	1	298.845	9.804	.005
T x T	2	61.785	2.027	N.S.
Error	68	30.479	—	—

Table 2
Analyses of Variance of the Total Number of Errors Discriminated

Source	S.S.	D.F.	M.S.	F	P.
Among	14.377	2	7.188	4.692	.01
Within	101.100	66	1.531	—	—
Total	115.477	68		—	—

The results showed only a significant trials effect. The modeling condition did not produce any differences and the treatment X trials interaction did not reach a significant level.

A chi-square analyses of the number of subjects who met a criteria of adequate performance on each of the separate errors was also carried out but none of the chi-square values obtained reached a significant level.

Although there were no reasonable grounds on which to support the idea that modeling errors will decrease their frequency in practice, there was, on the other hand, no evidence that modeling errors increased the frequency of their occurrence.

Discrimination test

A simple analyses of variance was carried out on the total number of errors discriminated by each subject. The analyses appears in Table 2.

Since the F was found to be significant, Duncan's Multiple — Range test (Edwards, 1960) was used to determine which of the means differed significantly from each other. Summary of the comparisons appears in Table 3.

The test showed that the means of both experimental groups differed significantly from the control group mean ($p. 05$) but not from each other.

Similar analyses were carried out on the unmodeled errors only, and on the modeled errors alone.

The results of the discrimination test, which with one exception were in accord with the predicted results, can be summarized as follows:

1. A significantly larger number of errors were discriminated by the subjects in both experimental groups than by the control subjects.
2. Group 1 subjects were able to detect a significantly larger number of the errors that had been modeled for them than either of the other two groups.
3. Group 2 subjects detected more of the errors which had been modeled for them than did the control group subjects but not a significantly larger number than the other experimental group.
4. In an analysis of unmodeled errors only Group 2 subjects exceeded the control subjects by a significant degree.

DISCUSSION

This study is subject to the limitations inherent in experiments under classroom conditions where numerous variables have to be taken into account. Control of variables known or thought possibly

Table 3
Multiple Comparisons Among Means of All Errors

	Control	Exp. Gp 1	Exp. Gp 2	Shortest Sig. Range (P. 05)
Means	4.29	5.18	5.30	
4.29	—	.89	1.01	$R_2 = .718$
5.18	—	—	.12	$R_3 = .755$

to affect learning, such as rote versus meaningful material, expository versus inductive teaching and verbalization by students of principles was taken into consideration since the teaching methods other than the experimental conditions imposed were the same for all students as was the content. Practice periods had to be spaced over a period of days because of limitations of space and observers. This was controlled by allotting subjects from each of the three groups to each practice period.

The results of the initial part of this experiment did not provide support for the notion that developing an awareness of common errors will enable the learner to avoid them in choosing among alternative actions and thus improve performance on a skill. On the other hand, contrary to usually accepted points of view there was no negative transfer effect (due to the modeling of errors) noted.

The discrimination test on the other hand, did provide some evidence in support of the proposition that stored information regarding incorrect alternatives does lead to more acute discrimination than does knowledge of the correct procedure only.

The absence of any statistical difference in the performance of the three groups on the practice trials, raises the question of why the error modeling did affect performance on the discrimination test but not on the performance of the perceptual-motor task. Several alternatives suggest themselves.

First of all there is a question of the adequacy of the information which was supplied. The increment in information provided by the error modeling consisted only of information as to what errors commonly occur. Neither the modeling nor the discussions included instruction as to how to avoid errors or gradually attain competence (Meichenbaum, 1971). It appears that there might be value in adapting Meichenbaum's "coping model" to educational purposes and that such use should be tested empirically.

Another possible reason that no differences were found in the practice trials relates to the transfer of training required in the two

tasks. The perceptual-motor skill required a more remote type of transfer of learning than did the discrimination task which involved perceptual-symbolic responses similar to those called for under the error modeling conditions. In discussing the training of teachers, Hunt (1971) distinguishes between skill in discrimination and performance skill. This may result in the trainee being unable to perform the more complex task even though he can discriminate what is necessary. Because of this distinction, Hunt suggests that training in both discrimination skill and performance skill is necessary, the first being prerequisite to the second. Further, he suggests that one reason for failing at the more complex task, that is, the performance, may be due to inadequate training in discrimination. The distinction made by Hunt (1971) may be a useful one for nurse educators to consider and skill in discrimination in many situations would be a worthwhile educational objective in itself.

Apart from the statistical results of the study, certain observations made during the course of this investigation might also prove of interest to educators. These relate to certain assumptions regarding 'negative instances', 'correct procedures' and continuous corrective feedback.

With respect to the use of negative instances or errors in education, it was noted that, despite expressed concern about using these, they are used frequently for illustrating points to students. This became apparent when material for preliminary teaching and for the discussion groups was reviewed by the experimenter. It seems that, rather than positive instances of the application of principles, illustrations often involved errors. Does this include a prescription of 'Don't do this'? In any case, it seems that there should be an awareness of the frequent use of negative instances for illustrative purposes.

It was also noted that the instructors who participated as observers as well as many of the students, found a situation in which continuous instruction and/or immediate corrective feedback is *not* provided, uncomfortable. The goal of fixating 'correct' procedures is probably closely related to circumstances in the hospital clinical laboratory; however, one can speculate as to how students develop ability to monitor their own performance if they are receiving continuous instruction or correction. Under these circumstances, how and when does the student learn to function effectively on her own?

One last observation but one which appears critical, concerns the difficulties which were encountered when the observers with the experimenter tried to define what behavior constituted an error. After considerable discussion, agreement was reached *for the purposes of the study*. There was considerable difference of opinion as to when

an action was in fact an error and when it was simply an alternate way of applying a principle. Since the contingencies are unobservable, the answer is difficult, but one was left wondering how much was essential and how much was rationalization of a ritual. One could conceive of ways of determining whether an action had actually resulted in contamination of an area. The differences with respect to what would be considered acceptable by one instructor yet not by another, also seems to have some implications for evaluation of student performance.

Notes

1. Bilodeau differentiates between the process of providing information during the course or at the end of a response and the subject's processing of that information. She suggests that 'Knowledge of results' be used to refer to the latter.
2. The term 'modeling' is being used here in a broader sense than in psychological research, where it is the exact reproduction of a response. It is here being used for demonstration of a behavior that illustrates a category of responses all ending in the same contingency-contamination.
3. This video tape has since proven useful as a teaching device, as it stimulates discussion by students of the application of principles and alternate ways to apply principles.

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QUERY AND THEORY

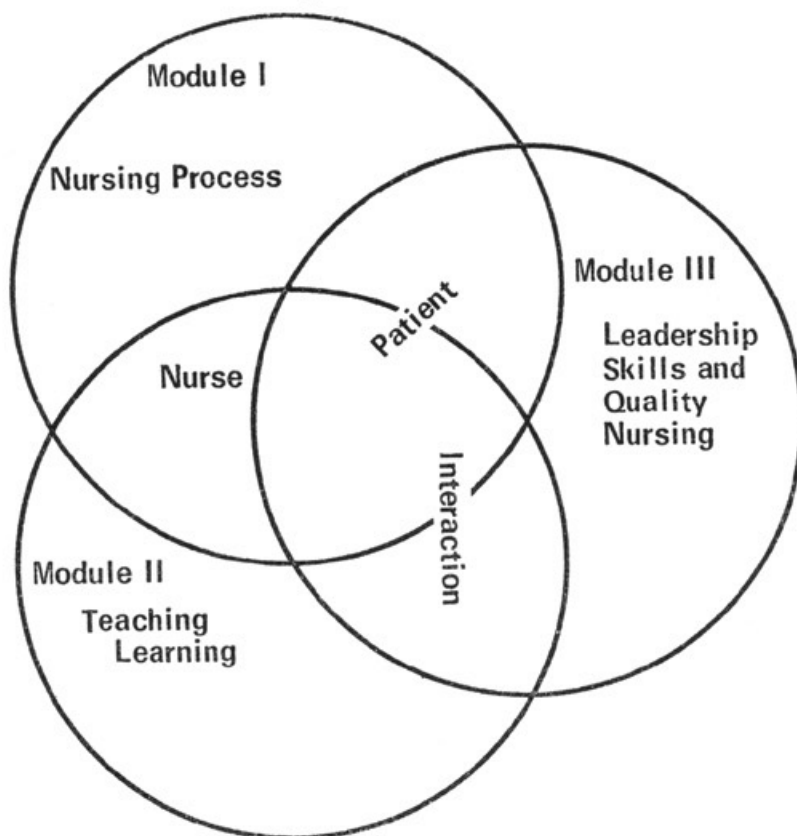
QUERY

What is the content basis for teaching baccalaureate nursing students in a modular format?

THEORY

The following model has been advanced by Thelma I. Potter, Assistant Professor, University of Western Ontario:

Schematic Interpretation of Modular
Integration of Content



QUERY

Activities for a patient on his first post-operative day include:

Bathing

Deep-breathing and coughing

Walking

What plans have you found to be most effective in conserving the patient's energy so that he can walk a suitable distance several times during this day and also accomplish the other objectives set for him?

QUERY

Two types of service are at present unavailable to the majority of individuals and families in any Canadian community:

1. comprehensive health care for families on a continuing basis
2. follow up and follow through of individuals and families after an illness or other type of crisis situation

Physicians are primarily concerned with prevention and treatment of illness and, for the most part, with a focus on the individual. Is the health of families on a continuing basis, — the development of healthful ways of living both at the level of the individual and of the family, of bringing up children to hold health practices which are constructive for their well being, individually and with the family and community, etc., a field which nursing might seriously enter? If we can answer in the affirmative we would not just approve this type of care in theory, but would undertake to develop, deliver and provide the service. Two major questions then arise:

1. Would we undertake to learn about health and behavior which leads to health and to take on questions of health as a field of research endeavor?

There is greater emphasis in our present day health services on development of the health of people as differentiated from the prevention and cure of diseases. Whereas disease can, to some extent, be justifiably treated as a state existing within the individual, health is basically a family phenomenon. And it is a family phenomenon of which relatively little knowledge has accrued in our society. We realize that the factors which prevent disease are not necessarily those which promote health and that knowledge and health are not necessarily related, however we are confounded by our inability to describe health and to define its attributes. We have even come to discard the notion of a continuum for health and illness and to view these as separate although closely related entities. Search for the characteristics of family health is a priority if nursing is to direct its practice to this end, particularly in primary health care.

2. Should nursing mount demonstrations on its own to show the potential of nursing in the provision of health services at the community level?

Should we explore and demonstrate our function in primary care: a group of prepared nurses taking full responsibility for their service and using other professionals on a referral basis or for consultant purposes?

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