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# Interdisciplinary Education In Dental Hygiene: A Pilot Project

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## ABSTRACT

*This study describes a five-hour interdisciplinary experience involving sophomore dental hygiene students, dental hygiene faculty and medical technology faculty. This experience met the objectives of interdisciplinary teaching while reinforcing and expanding on a present topic in a four-year dental hygiene curriculum.*

*The results of this experience are documented by pre- and post-testing and student evaluations. Statistical analysis of the test results along with student commentaries support interdisciplinary education as a viable and positive teaching approach. Student ability to correctly answer topic-related cognitive questions increased significantly while their understanding of the medical technology profession and its relationship to dental hygiene also developed.*

*The experience was included within the framework of the pre-clinical dental hygiene course which kept the implementation efficient and perhaps contributed to its success. This pilot project was a positive step toward continued interdisciplinary experiences between the dental hygiene and medical technology programs and created enthusiasm for expanding the experiences in the future to include the other health programs.*

## INTRODUCTION

Interdisciplinary activity is a "collaborative

action among disciplines whose interdependence is necessitated by problems or projects, the solution of which requires achievement of goals which could not be achieved without such collaborative efforts."<sup>1</sup>

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A number of articles have been published describing interdisciplinary education in the health sciences. However, few academic institutions have implemented this approach in their curricula. Allied health educational programs have taken a predominantly mono-disciplinary approach, preparing students to function only within the well-defined boundaries of their own profession. Currently, students in different health professions can complete their educational program without an understanding of or an appreciation for the contributions of

other health professionals in delivering quality patient care.

In one of the most referenced articles on this subject, written in 1971, Leininger challenged universities to find new ways of implementing interdisciplinary health education so that students might develop a collaborative approach to health care delivery.<sup>2</sup> She predicted that "the quality of health services should improve as health disciplines become more knowledgeable, comfortable and understanding of each other."

In practice, the ideal way to provide quality patient care is through a team approach. Recently much has been written and discussed about holistic medicine. Although this treatment of the whole person is preferable, this approach is not widely accepted, perhaps because our educational programs have not taught the necessary interdisciplinary concepts.

A practical solution to the inconsistency between training and practice is essentially the responsibility of health science educators. Interdisciplinary teaching is one tool available to resolve this inconsistency. According to Yeaworth, the objectives of interdisciplinary education are to "improve communication among disciplines; increase understanding by each profession of the other professionals' roles, educational preparation, practice expectations, and skills; and provide an opportunity to redefine and clarify roles to improve the utilization of all professionals."<sup>3</sup>

This paper describes a pilot study conducted by dental hygiene and medical technology educators utilizing these objectives of interdisciplinary education.

## LITERATURE REVIEW

Dentally-related professions have, through various programs, emphasized a team approach to meet patient dental needs. The DAU (Dental Auxiliary Utilization) programs and the TEAM Training in Expanded Auxiliary Management) programs brough individuals together to work interdependently to accomplish tasks better and more efficiently. Through these periods, dental hygiene has strained to find its niche. Dental hygiene is unique among the dental disciplines because of its independent/depend-

ent nature.

Educational programs for dental hygienists have been almost totally mono-disciplinary or limitedly expanded to offer experiences within other dental disciplines. This is understandable as dental hygiene curricula, especially two-year programs, allow little room for elective experiences. Also, dental hygiene has been restricted in its thinking, being under the "bubble umbrella" of dentistry. More recently, however, many educational institutions have given dental hygiene programs an opportunity to explore their similarities with other health professions by placing dental hygiene programs within the broader institutional structure of Allied Health or Health Science Programs.



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Of all the health professions, nursing has been the most successful in seeking collaboration among other health care professions. In 1979, the National League for Nursing adopted a goal to "seek to identify mutual responsibilities among health professionals."<sup>4</sup> One suggested means for accomplishing this goal is interdisciplinary education.

Most of the interdisciplinary experiences, documented in the literature have included nursing and medical students. Kindig reviewed highlights of interdisciplinary experiences for medical students at various universities in the 1960s and early 1970s.<sup>5</sup> The number of disciplines and of students as well as the discipline "mix" in interdisciplinary teaching has varied widely. Approaches to teaching have ranged from one-day conferences to eight week,

eight hour-a-day courses; from elective evening discussion groups to required clinical experiences. The topics have ranged from care of the elderly to improving communication.

The literature search showed limited inclusion of dental hygiene students. At the University of Pennsylvania, dental hygiene students were excluded from an interdisciplinary course while dental students and students from six other professions were included.<sup>6</sup> Inclusion of medical technology students is even less frequent. Only one reference was found regarding an interdisciplinary course which included dental hygiene and medical technology students.<sup>7</sup>

The University of Maryland in 1981 developed an "experience" for dental hygiene and nursing students.<sup>11</sup> Nursing students were given an orientation to the dental hygiene clinic and oral anatomy. Then pairs of nursing and dental hygiene students provided a lymph node and intra-oral examination for residents of a nursing home. The result of this experience was that dental hygiene students realized, sometimes for the first time, what the nursing role entails. Nursing students commented the experience "made me realize the importance of oral hygiene" and "taught us how different disciplines work together."

Some university-based dental hygiene programs have integrated their students with dental and other health profession students in basic science lecture courses. This approach often has been unsuccessful, which may be due to a lack of identification and direction of the varied student needs or to inappropriate objectives. For example, rather than adhering to the objectives of interdisciplinary education, the primary objective of an integrated course may be budgetary — larger classes mean fewer faculty resulting in cost reduction. Even when educators are committed to an interdisciplinary approach, lecturing to large, multi-disciplinary groups or merely telling students about another profession do not satisfactorily meet the objectives of interdisciplinary education.<sup>6</sup>

Of all the articles reviewed, only two of them statistically measured changes affected by interdisciplinary teaching. Lynch studied the effect of learning strategies on student percep-

tions and achievements.<sup>8</sup> She found group consensus examinations had a significant positive effect on the student perceptions regarding clarity and importance of course topics as well as on their achievement on unit quiz scores. Mazur's research project used numerous pre- and post-test evaluation instruments over three years of classes.<sup>9</sup> He concluded that the most practical and productive time for students to learn interdisciplinary teamwork is during their clinical phase of training.

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One barrier to interdisciplinary teaching is simply the lack of understanding and appreciation for the contributions of different health disciplines. The teachers of today probably have been educated in a mono-disciplinary system and are limited to a mono-disciplinary work environment. Therefore, they are unprepared to demonstrate to their students a model for interprofessional relationships. This makes it difficult for educators in health disciplines to meet challenges such as Busse proposes: "to assist students to gain an understanding of their role in the health care system."<sup>10</sup>

Interdisciplinary education is not an easy concept to implement because each discipline has its own needs and constraints. Articles have been written about developing interdisciplinary programs. Connelly outlines basic organizational considerations.<sup>1</sup> McPherson discusses three stages of interdisciplinary education development.<sup>12</sup> Yeaworth proposes a continuum type of development from a mono-disciplinary course to one in which all participating disci-

plines share equally in the planning and implementation.<sup>3</sup> He also notes the influence of the hierarchial nature of the health professions on eagerness to participate in interdisciplinary education.

Professions which have high prestige are drawn more toward associations within their own groups. Wieczorek describes three levels of responsibility: speciality, disciplinary-intraprofessional and interdisciplinary-intraprofessional.<sup>1,3</sup> To move to the third level, a teacher must be secure in all aspects of the first two.

## METHODS

Building renovations at Marquette University brought the Allied Health Science Programs closer together in 1981. This presented opportunities for informal communication, especially between dental hygiene and medical technology faculty as the offices and laboratories share the same floor. As faculty got to know one another, a sense of some "sameness" developed and the idea of an interdisciplinary experience for the students in the two programs evolved.

The initial idea was to develop an elective course for the Allied Health Programs which would include: dental hygiene, medical technology, nursing and physical therapy. The approach envisioned was similar to the case studies and discussion course developed at the University of Minnesota.<sup>7</sup> After realizing the problems of coordinating curricula, faculty, student schedules and budgets, a more simple, controllable pilot project was designed for the sophomore pre-clinical dental hygiene students.

The objectives were to:

- Improve communication between the dental hygiene and medical technology programs.
- Increase understanding of the medical technology profession.
- Recognize and appreciate the role the medical technologist in the diagnosis of diabetes mellitus.
- Reinforce and build upon the dental hygiene student's basic science background.

The director of the medical technology program, two medical technology faculty and the dental hygiene pre-clinical course supervisor met numerous times beginning one year prior

to offering this experience. Physical faculties (space and availability), time (within the semester, days and hours), faculty availability, budget for materials and appropriate interdisciplinary cases were discussed. The final consensus met the needs of both departments.

As planning progressed, the faculty who taught the basic science courses to the dental hygiene students were consulted, and one basic science faculty member compiled case-relevant course materials and information. These were used to provide background information for faculty and students. Two junior dental hygiene students also were consulted and provided input on the value of the project and teaching methodology.

All of the sophomore dental hygiene students (N = 38) and the three dental hygiene faculty in the pre-clinical course participated in the program. A case study on diabetes mellitus was selected for the following reasons. More than eleven million people in the United States are affected by diabetes.<sup>14</sup> Due to this high incidence, a dental hygiene student will more than likely encounter a patient with this disease and, therefore, needs to understand the implications of diabetes for dental treatment.

Because the students already had taken courses in biochemistry and microbiology, they had fundamental knowledge regarding the biochemical processes associated with this disease. In addition, their basic biology course (Biology 090) provided some laboratory experience using a spectrophotometer and staining and culturing microorganisms. Finally, since procedures could be performed which involved many areas in a diagnostic medical laboratory, this case study allowed the students to correlate aspects of clinical chemistry, hematology, microbiology and urinalogy.

One week prior to the interdisciplinary laboratory experience a spontaneous pretest was administered to the students. The pretest consisted of seven multiple choice questions. Some questions had several correct responses for a total of 17 correct answers. Students were tested on the diabetes disease process and laboratory testing. A discussion, presented by the dental hygiene pre-clinical supervisor on the

dental implications of diabetes mellitus, followed. The students then were given a four-page handout describing all aspects of the scheduled laboratory experience and an assignment to review information received in previous courses on diabetes mellitus.

The students were divided into two groups of 20 and 18 each. This division of the students coincided with their section assignment for the pre-clinical course and was appropriate for the size of the medical technology laboratory facilities. The laboratory exposure lasted a total of five hours with three- and two-hour periods. The three-hour session integrated both lecture and laboratory testing. Forty-five minutes were devoted to a review of the pathophysiology of diabetes and an overview of how a medical technologist evaluates and correlates laboratory data in the diagnosis of disease.

Following this introduction, the students were divided into small groups with either a medical technology faculty or a volunteer medical technology alumnus leader. The procedure for determining blood glucose was demonstrated and each person performed the test with supervision. During the 30-minute incubation period required for this test, each person performed a macroscopic urinalysis using the dipstick reaction. The urine specimen was prepared to give abnormal results for glucose, protein and ketone bodies which are typical findings in an uncontrolled diabetic. Continuation of the serum glucose procedure followed. Using a spectrophotometer, each person identified her results, evaluated the quality control and made the decision whether or not to report the patient's results. The significance of the chemistry and rinalysis results was discussed.

For their exposure to hematology, the students observed microscopic slides with normal red and white blood cell morphology, elevated polymorphonuclear neutrophilic granulocyte (PMN) counts and elevated lymphocyte counts. The hematological abnormalities were discussed in relation to an infection typically found in a diabetic patient.

In preparation for the second laboratory session, a 30-minute presentation was given on

microbiology including discussion of the incidence of oral yeast infections for diabetics, specimen collection, and identification procedures used in clinical microbiology. Correct specimen handling, plate inoculation and streaking for isolation were demonstrated. Each person then inoculated both a blood agar and Sabouraud dextrose agar plate with a prepared specimen of an oral lesion from a diabetic.

The second session was scheduled two days later. This allowed for incubation of the plates and coincided with the students' regularly scheduled pre-clinical laboratory period. Most of the two hours was devoted to identifying the pathogenic microorganisms on the inoculated plates. Each person described the colonial morphology, did a Gram stain and evaluated the microscopic morphology. For exposure to biochemical testing, each student inoculated three phenol red broths — one containing glucose, one maltose and another sucrose. Because a third day was not scheduled and a 24-hour incubation period for the test was needed, the students were assigned to read these fermentation test results and identify the pathogen during their next pre-clinical course period.

At the completion of the second session, a post-test — a repeat of the pretest — was given. Each student also was requested to evaluate the project. They were asked the following questions: Was this experience of value to you? Should it be offered again next year? Comments and suggestions?

The short-range goal was to foster better knowledge and understanding between the two professions and to act as a motivator for further collaboration and interdisciplinary teaching between these programs and eventually with other allied health programs. Partly this has been realized as plans are underway to repeat this project and to add an experience for the medical technology students in dental hygiene. The long-range goal of offering an elective course for dental hygiene, medical technology, nursing and physical therapy students has had a very positive start.

## RESULTS

Of the 38 dental hygiene students who par-

**TABLE 1**

	<b>PRE-TEST</b>	<b>POST-TEST</b>
<b>RAW SCORE RANGE</b>	4-12	9-16
<b>MEAN</b>	8.52	12.86
<b>STANDARD DEVIATION</b>	1.99	1.53

ticipated in the project, 36 were present for both laboratory sessions and completed the pre- and post-test.

Comparison of the pre- and post-test scores showed a significant increase in the students' knowledge of the diabetes disease process and laboratory testing. The pretest raw scores ranged from 4 to 12 correct out of a possible score of 17. The post-test range was 9 to 16 correct.

A *t* test was run to compare the pre- and post-test raw scores. The results were significant at the 0.0001 level. The pretest raw score mean was 8.52 with a standard deviation (SD) of 1.99 while the post-test raw score mean was 12.86 with a SD of 1.53. A comparison of these scores can be found in Table I.

Table II shows the distribution of the raw scores on the pre- and post-test. Each student's score increased on the post-test except one whose score remained the same. It is interesting to note that for the 35 students whose raw scores increased, the percentage increase ranged from 9% to 196%. The mean percentage increase was 61.1%.

Thirty-six students evaluated the inter-

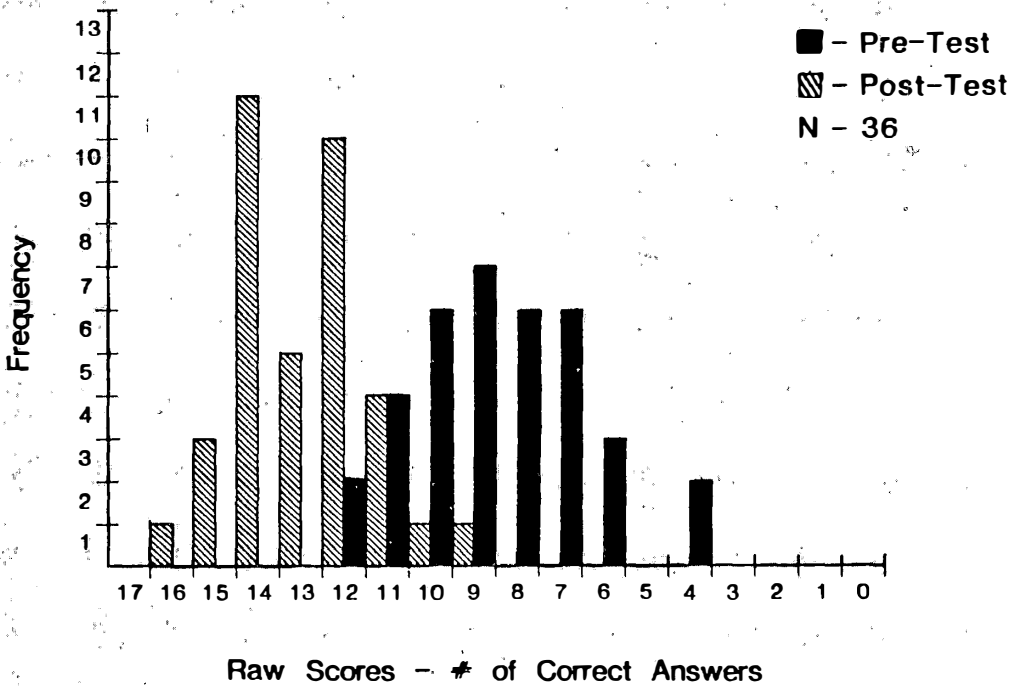
disciplinary experience. Student comments regarding the content included: "I'm not sure if the laboratory was useful but it did make the problem of diabetes more clear"; "I felt I learned a lot about diabetes"; and "This experience gave me a better understanding of diabetes and the complex lab work involved in diagnosing. It made me aware of the precision and care that go into each test, in order to get accurate results."

Student comments on the value of the interdisciplinary nature of the experience were all positive. Some comments were: "I was able to see the hard work that goes into being a medical technologist and how one's profession can be inter-tied with other professions"; "I really did not understand and appreciate the role of a medical technologist. Now I have some understanding of what types of things a medical technologist does, in addition to an appreciation of how the medical technologist and dental hygienist work together to accomplish a very like goal"; "It's a good idea for health professions to know what other members of the team are doing."

Thirty-two students responded to whether

TABLE 2

COMPARISON OF PRE AND POST-TEST RAW SCORES



or not the experience should be offered again to next year's sophomore class. Twenty-four said yes with no modifications. Several suggested modifications. Most suggestions were to change the laboratory tests as they were similar to those previously performed in their biology course: "I think the material presented could be a little more advanced; possibly build on the Biology 090"; "Maybe you could go into the experiments more because of our background in Biology 090."

One student commented it was interesting but didn't know if it was worth all the effort and the imposition on the "very nice medical technologists." Other students viewed the correlation of the procedures as positive. They commented the procedures were a good review

and although they "had some of the procedures before, we had not put them together in a clinical situation." Many students expressed appreciation, thanking the Medical technologists for their interest, time and "good teaching styles."

**DISCUSSION**

The results indicated that this interdisciplinary pilot project was successful and met the four objectives. Effective communication between the two departments was increased at both the student and faculty levels. In addition, there developed an appreciation and respect for the medical technology faculty's quality of teaching. It was felt the participation of the dental hygiene preclinical faculty acting as



students in all the laboratory sessions set an example of interest and importance for the students. This participation contributed very positively to the success of the interaction.

Further interdisciplinary experiences for the dental hygiene students are planned. The director of the medical technology programs has, for the first time, invited the dental hygiene students to join the medical technology and nursing students' presentations at their career open house. The purpose would be to show how the three professions work together toward total patient care. Also plans are underway to develop a dental hygiene experience for the junior medical technology students.

Written and verbal comments by the students verified a positive attitudinal change and greater understanding of the medical technology profession. The physical location of the activities, the medical technology laboratory, was a factor. Getting out of one's own physical environment and into another is in itself an act of sharing. Connelly states: "Perhaps more than any other form of education, the interdisciplinary effort can be conditioned by the physical location."<sup>1</sup>

The active participation in performing the laboratory tests was also an influential factor in the success of the project. Student comments regarding the repetition of tests from a previous course and suggestions for further depth or a change of tests were considered. Consultation with the biology course instructor revealed the students had performed some of the procedures such as Gram stains, plate inoculation and use of the spectrophotometer, but they had not related these to the diagnosis of diabetes mellitus.

An even more realistic view of the medical technologist's responsibilities would have been realized if each student had performed all the steps of each laboratory procedure themselves. However, because of time constraints, some of the more difficult and time-consuming parts of the procedures were done for them. These included use of an automatic pipetter, pre-set curves for reading the spectrophotometer, preparation of hematological slides and limiting the number and identification choices of the

microbial biochemical tests. This may have left the students feeling laboratory testing is easier than it actually is.

The involvement of the medical technology faculty and chairperson, basic science faculty and junior dental hygiene students in the development of the project proved to be a good approach. Background information provided by the basic science faculty laid the framework upon which students' knowledge of the diabetes disease process could be expanded. Planning discussions focused on the needs of both programs — for example, faculty and student schedules, space availability and objectives. The resulting compromises were key to the success of the project.

The pre- and post-test scores clearly showed the experience increased the student knowledge of diabetes mellitus and medical technology laboratory testing. Not only did the post-test scores significantly increase but also both the range and the standard deviation decreased.

Reflecting on this project, Wieczorek's comments are appropriate and meaningful: "Interdisciplinary teaching requires a profound change in attitudes, values and behaviors for the individuals involved and for the group . . . What is first required is a state of mind in each person combining curiosity with self-confidence, an eagerness to engage in dialogue, the capacity for assimilation and synthesis of knowledge, (and) the security to share one's expertise."<sup>1,3</sup>

## CONCLUSION

The authors believe it is the educator's responsibility to lay the foundation for interdisciplinary professional development and nurture it through example and activities which will foster a collaborative approach to patient care in society.

## ACKNOWLEDGMENTS

The author would like to express her appreciation to the students whose cooperation and positive attitude made this project enjoyable and worthwhile. She is also grateful to all the faculty and medical technology alumni who gave "extra" because of their belief in this project.

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