

# ANATOMY IN THE NURSING CURRICULUM: A COMPARISON OF TEACHING APPROACHES

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Since its inception in 1959, the Faculty of Nursing at the University of New Brunswick has based its program on an integrated curriculum model. Curriculum threads such as anatomy, pharmacology and nutrition were included with appropriate nursing content throughout the program. Over the years, faculty members readily accepted the premise that knowledge could be better stored and utilized if it were related to and presented with its "mother content".

However, as several hundred students graduated over the subsequent two decades, they frequently expressed concern that their knowledge of anatomy was inadequate. Faculty members' review of this situation raised further questions. Was this phenomenon due to the students' lack of study and review? Did faculty members expect students to acquire anatomy knowledge on their own? Was the integrated curriculum merely another untested "bandwagon"? Does blocked content provide a better basis in certain content areas? Anxious to rectify any curriculum inadequacies, but also to be cautious in making curriculum decisions based on fact rather than fancy, faculty members implemented the following plans.

1. To initiate a compulsory course in "Human Anatomy" which would be given in the second term of the first year of the nursing program, beginning with the freshman class of 1981.
2. To continue the integrated anatomy approach with all classes that entered the program before 1981.
3. To evaluate and compare the effects of the integrated and the segregated approaches over a time span of five years.
4. To utilize the findings as one measure in determining which anatomy systems were effectively covered.

## Literature

The blocking or segregating of specialized content in nursing curricula began at the turn of the century. It provided a means to formalize and expand the knowledge base of the nursing profession (Longway, 1972). This blocked

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content was organized around the medical model which remained the basis for nursing education until the early 1960s. About this time, the need to focus nursing care more on the individual patient rather than on a disease entity gave rise to the integrated curriculum model (Jourard, 1962; Longway, 1972). Pardue (1979) and Styles (1976) both accepted the National League of Nursing's definition of the integrated curriculum as a "blending of the nursing content in such a way as the parts or specialties are no longer distinguished".

The 1960s and early 1970s saw most nursing programs achieve "integration" with obvious success in relation to the goal of individualizing patient care. Another positive aspect of the integrated curriculum was a supposed "reduction in repetition and duplication of content" (Pardue, 1979). However, there is very little in the literature regarding "student satisfaction", "student learning" and "the application of theory to nursing practice", in an integrated curriculum. Styles (1976) acknowledged that students have been disillusioned by the "integrated curriculum". Their unmet need for the "cold facts, technical skills and the drama of the life-death environment" left many of them feeling inadequate upon graduation.

Pardue (1979) cited Bailey, MacDonald, Frederick and Claus whose findings indicated that problem-solving skills, creativity and a broad perspective of the nursing profession were improved by an integrated curriculum. However, Stone and Green (1975) found that students from a blocked-content class obtained better results on state board examinations than did those from the integrated-content class. Pardue's (1979) own study found no significant difference in critical thinking between groups from the integrated and blocked curricula, but the students from the latter programs did perform significantly higher on their state board exams. However, as Pardue pointed out, those examinations were based on the medical model; therefore, the higher scores of the blocked-curricula group would be expected.

Knowledge of anatomy has long been considered important to the nursing student. Murphy and Backlund (1964) believe that it is a necessary basis to the understanding of body systems in health and illness. Kinsinger (1967) identified anatomy theory as a necessary "framework for building medical vocabulary" and a base for all students in the health profession. However, his second premise was that this course could be better taught by experts in that area and that nurses should teach what they know best - nursing. As early as 1957, Thompson and Leavell maintained that anatomy in the nursing curriculum should emphasize the function and the "dynamic state" of the body rather than just the "nondynamic details" one would acquire in a pure anatomy course.

Aside from the obvious place anatomy theory has in the health professions, only two studies showed concern for the educational process or teaching method best suited to its mastery and retention. Treble (1975) found that the

use of behavioral objectives in an anatomy-laboratory course facilitated long-term retention. Imbos, Drukker, van Mameren and Verwijnen (1984) compared a group of medical students who had taken conventional anatomy courses with a group from the Maastricht problem-based curriculum. The students in the problem-based curriculum who studied independently, initially achieved lower scores on anatomy tests. However, this phenomenon was followed by a steady increase in knowledge over the years. By the end of the programs, the problem-based group achieved higher anatomy scores than did its counterpart in conventional courses.

### **The Purpose**

The purpose of the project was to determine whether or not a segregated course would significantly alter the anatomy knowledge levels of basic baccalaureate nursing students.

The question to be answered was: Would there be any difference in anatomy-knowledge levels, either general or of specific systems, between the integrated- and the segregated-approach groups; a) by the end of the baccalaureate program, b) on a year-by-year basis?

### **Method**

#### ***Population***

All of the nursing classes in the baccalaureate programs between September, 1980 and June, 1985 were asked to participate in the study. The 53 students who had entered in program in September, 1980 were labelled the "integrated-approach group", and the 63 students who entered the program in September, 1981, the "segregated-approach group". These two groups of students were used for testing the independent variable in the study and were tested yearly (see Table 1). Student groups that had entered the program before September, 1980, and after September, 1982, were also tested yearly. However, the data from these 505 students were used only in analysis of the test items in the measurement tool, a 48-item multiple choice anatomy quiz.

#### ***Variables***

The independent variable in this comparison study was the mode of teaching anatomy to each of the two groups of students. The study was not able to control for other variables such as repeating students, individual instructor effect, or for the number and ability of students who participated.

**Table 1**

***The Difference of Mean Overall Scores Between the Integrated (I) and Segregated (S) Groups***

	Year of Program	Year <sup>a</sup> Tested	n	Mean <sup>b</sup>	S.D. <sup>c</sup>	p <sup>d</sup>
I	1	1981	53	18.45	3.93	
S	1	1982	63	21.76	5.16	0.000*
I	2	1982	40	20.50	4.79	
S	2	1983	53	21.00	4.20	0.549
I	3	1983	25	23.00	4.28	
S	3	1984	47	23.28	4.06	0.788
I	4	1984	33	23.12	4.55	
S	4	1985	34	23.62	4.81	0.666

a) Anatomy quizzes were done at the end of each year so 1981 refers to class of 1980-81 etc.

b) Mean overall scores are out of a maximum possible score of 48 and are rounded to two decimal places.

c) Standard deviations are rounded to two decimal places.

d)  $p < .05$  on a two-tailed t test; significant values are marked with \*.

The dependent variable was the anatomy-knowledge level of the two student groups, as evidenced by their scores on the anatomy quiz.

***The integrated-approach group***

For the students in the "integrated" group, any anatomy instruction was given in conjunction with relevant nursing content. There was no formal plan for how the anatomy thread would be applied across the program. Individual instructors gave as much information as they felt necessary to lay a basis for patient assessment or disease entities. This group used Evans' (1976) *Anatomy and Physiology* as their text for use throughout the entire baccalaureate program.

***The segregated-approach group***

For students in the "segregated" group, anatomy instruction was given in the form of a separate course. Three hours of classes per week, over a 13-week term, covered the following 12 systems: the cardiovascular system, the endocrine system, the reproductive system, the respiratory system, the nervous system, the special senses, the urinary system, the lymphatic system, the skeletal system, the muscular system, the integumentary system and the digestive system. The students were taught by a team of faculty members, each

covering one system with enough time allotted to provide depth of detail. A midterm test and a final exam were used to evaluate the students' level of knowledge in this compulsory course. These tests had no relationship to the 48-item quiz used in the study. This group used Spence and Mason's (1979) *Human Anatomy and Physiology* as a text for their course and as a reference throughout the remainder of their program.

Both the integrated group and the segregated group had access to the audiovisual aids in the self-instructional laboratory. In addition to the authors, many of the same faculty members who had taught the integrated anatomy content taught one of the body systems in the anatomy course. In their second year, members of both groups were required to successfully complete a physiology course taught by the Biology Department. However, this course contained a negligible amount of anatomy content particularly in relation to the systems covered by the segregated course given by the Nursing Faculty. It was felt that this course would have minimal interference as a confounding variable in this study.

### *The instrument*

The computer-marked multiple choice questionnaire was prepared by the authors. The same 12 systems that constituted the anatomy course were used as the basis for the test. In turn, four questions were developed for each system so that the 48-item test could be completed by students in a 15 - to 20 - minute sitting. In an attempt to evaluate depth of detail, the four questions were prepared at increasing levels of difficulty, as based on the judgement of the authors.

### *The testing*

The student groups were tested at the end of their academic year. The students were advised that completion of the questionnaire implied their consent, so that, although they were tested in year-groups, individual participation was strictly voluntary. Anonymity for individual students was ensured by the random distribution of computer-response cards that had been pre-coded so as to identify only the year, class and number of students participating in each year-group. No attempt was made to follow individual student progress across the program.

### **Data Analysis**

Two types of scores were obtained from the computer response cards: overall scores and system scores. The overall score was the sum of all the questions answered correctly, with a maximum possible score of 48. Each



system score was the sum of the four questions in each of the 12 systems, with a maximum score of four.

Analysis of Variance was used to determine differences and similarities between the groups. The level of significant differences was set at  $p < .05$  on a two-tailed t test.

## **Findings**

1. The mean overall scores at the end of the first year showed a significant difference between the groups, with the segregated-approach group having the highest scores (see Table 1).

The mean scores of individual systems at the end of the first year showed a statistically significant difference (\*) in six of the 12-body systems (see Table 2). The segregated-approach group had higher scores on five of those six systems.

2. At the end of years two, three and four, there was no statistically significant difference between the integrated- and segregated-approach on the basis of the mean overall-scores (see Table 1).

At the end of years two and three, there were no significant differences between the integrated- and segregated-approach on nine of the 12 system scores. Of the three systems with significant differences (\*), the segregated-approach group had higher scores on two; the special senses and the lymphatic system in the second year, and the respiratory and the lymphatic systems in the third year.

At the end of year four, only the skeletal system score differences were significant with the integrated-approach group having the higher scores (see Table 2).

## **Limitations**

1. The reliability and validity of the test instrument were not established prior to testing. However, an after-the-fact item analysis was done on all the quizzes.

2. The same instrument was used repeatedly with only a one-year interval between testings.

3. The number of students in the same class who participated from year to year varied (See Table 1).

## **Discussion**

At the end of their first year, the segregated course group outscored the integrated group by a statistically significant difference. However, one would expect these results when comparing first year students in a program, as the integrated group had little classroom and clinical experience to counteract the intensive anatomy course received by the segregated group. The similarity

**Table 2*****The Differences of Mean System Scores Between the Integrated and Segregated Groups***

System	Year 1	Year 2	Year 3	Year 4
Cardiovascular	.233 <sup>a</sup>	-.064 <sup>b</sup>	.037	.118
Endocrine	.303	.106	-.277	-.097
Reproductive	.148	-.291	.231	-.079
Respiratory	.913 <sup>ac</sup>	.296	.682 <sup>*</sup>	.450
Nervous	.454 <sup>*</sup>	-.005	.198	.158
Special Senses	.491 <sup>*</sup>	.489	.202	.285
Urinary	.112	-.222	-.319	-.090
Lymphatic	.933 <sup>*</sup>	.411 <sup>*</sup>	.699 <sup>*</sup>	.161
Skeletal	-.414 <sup>*</sup>	-.573 <sup>*</sup>	-.575 <sup>*</sup>	-.683 <sup>*</sup>
Muscular	.574 <sup>*</sup>	.011	-.219	-.120
Integumentary	-.327	.116	-.159	.009
Digestive	-.111	.225	.240	.386
Overall Score	3.309 <sup>ad</sup>	.500	.277	.500

a) Mean system-score differences are out of a maximum possible score of 4.

b) (-) values indicate the scores in the integrated-approach group were higher than those in the segregated-approach group.

c) \* indicates the difference is statistically significant using Analysis of Variance technique with  $p < .05$  on a two-tailed t test.

d) Mean overall-score differences are out of a maximum possible score of 48.

between the groups' overall mean scores at the end of the second, third and fourth years could be explained by several factors. First, as the students progressed through the program, the cumulated clinical and classroom exposure, in effect, caused an equalization of anatomy knowledge between the two groups. Secondly, those in the segregated group were beginning to forget their anatomy theory gained from the course and were retaining only that part that related to their clinical and classroom experience. Finally, the measurement tool was not obtaining an accurate estimate of the students' knowledge levels in that a cumulative effect on scores resulted from the repeated use of the same tool and the more difficult levels of items within each anatomical system were too difficult for either group thus reducing the sensitivity of the tool. This latter reason could also explain why all of the student groups segregated-approach achieved very low scores.

At the end of the first year, the segregated-approach group achieved significantly higher scores in five of the 12 anatomical systems (see Table 2). This could be explained by the fact that, of these five, only the respiratory system had been normally taught in the first year of the integrated-curriculum model and

the other four represented new material. On the other hand, the integrated-approach group scored higher on three systems, although only one of these was at a significant level. All three of these had been taught in the integrated-curriculum model and together with some physiology had been related to the stressor of "immobility". Perhaps in this context the anatomy information was better retained over a longer period of time; this could also explain why the skeletal system consistently showed the integrated group achieving higher scores at a significant level ( $p < .05$  on a two-tailed  $t$  test) throughout the four-year program.

Concerning additional differences found between the systems scores in the second and third years of the programs, the segregated-course group surpassed the integrated group on respiratory system scores again in the third year. It is not known why. The superior scores on the lymphatic system that were achieved by the segregated-course group members for the first three years but not in the fourth year are best explained by the lack of content provided to the integrated group until their final year of the program.

The identical anatomy quiz was used repeatedly for all of the testings in the five year period. It was felt that this would provide a high level of consistency of measurement across the groups. It was recognized that repeated writings would have a certain cumulative effect on the scores in later years. However, all of the groups were equally exposed to this repetition.

The researchers did not account for the marked degree of variation in the number of student participants from year to year (see Table 1). However, this was an effect of the voluntary nature of the study and was beyond the control of the researchers.

The reliability and validity of the measurement tool, the 48-item multiple choice anatomy questionnaire were not pre-tested because of time restraints. However, an after-the-fact item analysis was carried out on all of the 853 quizzes. The easiest questions were substantiated in 11 of the 12 systems and the most difficult ones in nine of the 12 systems.

Overall, the results of this comparative study suggest that after the obvious expected differences at the end of the first year in which the course was given, there was essentially no difference in anatomy knowledge levels between the integrated-curriculum model group and the segregated-anatomy course group over a four-year baccalaureate nursing program.

Also, over the five years that the course was given, many complaints were voiced. Students found the anatomy course content boring, meaningless and isolated. This was substantiated further by their low grades. Faculty members



found that teaching pure anatomy was difficult and uninteresting at best. In response to this dissatisfaction, a more practical approach to anatomy education was implemented as soon as the data for this comparison study was obtained. In the 1985-86 year, anatomy was combined with physical assessment and taught by two faculty members with expertise in that area.

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## RÉSUMÉ

### **L'anatomie au programme de sciences infirmières: comparaison de deux démarches pédagogiques.**

On a comparé le degré de connaissances en anatomie des étudiants de baccalauréat en sciences infirmières formés selon deux démarches différentes, soit l'intégration des données anatomiques aux autres matières et l'enseignement de l'anatomie comme matière distincte. Les observations ont porté sur une période de cinq ans. La technique d'analyse de variance a été

utilisée pour déterminer les différences significatives à  $p < 0,05$  (test bilatéral). L'étude a démontré, pour ce qui est des résultats globaux, qu'il n'existait de différences importantes entre les groupes qu'à la fin de la première année—soit immédiatement après le cours d'anatomie du groupe bénéficiant d'un enseignement distinct. Les différences importantes observées entre les groupes au chapitre des résultats obtenus pour des systèmes particuliers portaient sur six des douze systèmes à la fin de la quatrième année. Les résultats indiquent que l'intégration de l'enseignement de l'anatomie aux autres cours est tout aussi efficace sinon plus que l'enseignement de l'anatomie sous forme de cours distincts.

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