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CREATING SIGNIFICANT LEARNING EXPERIENCES ACROSS DISCIPLINES

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Abstract. The purpose of this study was to use Fink's (2003) taxonomy of significant learning to redesign courses and assess student learning. Significant improvements were found across the semester for students in the six courses, but there were differences in which taxa showed improvement in each course. The meta-analysis showed significant, positive changes across disciplines in the areas of foundational knowledge, application, human dimension, and learning how to learn. This study provides support for Fink's taxonomy in which significant learning can be achieved through course redesign.

Keywords: *assessment, course design, Fink's taxonomy, interdisciplinary*

In 2003, L. Dee Fink introduced a new integrated approach to college course design that he believed would help teachers create learning experiences that would result in significant changes in students' lives. This article describes the work of six faculty members across four departments to assess the effectiveness of Fink's approach across different disciplines in the college curriculum.

The foundation of Fink's approach to designing college courses is the development of goals based on a taxonomy that goes beyond rote knowledge, or even application of skills, toward the development of reflective students who are responsible for their own learning. His taxonomy of learning grows from the traditional taxonomy of Benjamin Bloom et al. (1956), but goes beyond it in several ways. Whereas Bloom's taxonomy centers on the cognitive level of learning, Fink has added elements related to human interaction and motivation that he believes are important in creating learning that will change students in significant ways. His taxonomy includes six categories of learning, each of which affects the student in a different way:

1. Foundational Knowledge (FK) is the basic knowledge of course-specific information and ideas. These most basic concepts are necessary for acquisition of other, more advanced types of knowledge.
2. Application (A) encompasses learning how to engage with the development of new skills. Critical, creative, and practical thinking are included in this category.
3. Integration (I) refers to the ability to make connections between specific or universal ideas. This includes making connections among different parts of life, such as work, school, and social life.
4. Human Dimension (HD) is the name given to the category that encompasses students learning something new about themselves or others. This human discovery helps students understand why people behave the way they do and helps them shape new self-descriptions or ideals.
5. Caring (C) about others, issues, or concepts is accompanied by change in feelings, interests, or values. When students care more, they become more motivated to continue learning.
6. Learning How to Learn (LL) transpires whenever students learn new skills that

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help them become better learners. This type of knowledge allows students to continue to learn in the future and to learn more effectively.

A second change from Bloom's taxonomy is that the structure of Fink's is circular rather than hierarchical (Bloom et al. 1956; Fallahi and LaMonaca, in press; Fink 2003). Fink states that any time one of these areas of learning is improved, the student's ability to improve in every other area is enhanced. The purpose of the circular structure of the taxonomy is to illustrate that learning is multidirectional. For example, an increase in caring about a subject will lead to more impetus to learn foundational knowledge. An increase in integration skills will help students learn more about themselves, which falls under the human dimension.

Fink believes that an integrated course, in which learning goals, teaching and learning activities, and feedback and assessment are aligned, is the best approach to creating a significant learning experience. The first step in Fink's model of course design is the development of goals based on these six areas of growth and accomplishment for students. Then using a backward method of course design (Wiggins and McTighe 1998), the instructor selects appropriate student assessments that relate to the goals within those six areas. Focusing on student outcomes prior to designing instruction or "thinking backward" is an approach to problem solving that is not new to educators (Polya 1945; Tyler 1949). In doing so, instructors can plan a course based on the desired results or outcomes sought, as opposed to simply covering course content. Once instructors have defined appropriate outcomes and assessments, they consider instructional strategies and design specific learning activities. An integral aspect of Fink's model of course design is this alignment among learning goals, student assessment, and learning activities.

The purpose of this study was to apply Fink's approach to course design and to develop measures that would allow us to assess learning across Fink's six taxa for each of our courses. Using those measures, we taught our courses with the redesign, using the measures as a pretest and posttest to quantify the learning that took place within the semester. We predicted that students in the redesigned courses would show significant learning across the six taxa.

Method

Participants

Instructors for five undergraduate classes and one graduate class in four different disciplines participated in this study. These courses included:

1. psychology: two classes of Lifespan Human Development (with two different instructors) and The Psychology of Early Childhood;
2. special education: Instructional Programming for Students with Exceptionalities in Special Education;
3. biology: Concepts in Biology;
4. biomolecular sciences: Anatomy and Physiology I.

Redesign and Assessment

Each of the instructors used the course design methodology proposed by Fink (2003) to meet specific objectives inspired by the taxonomy. The Fink course design methodology includes three phases. In the Initial Phase, the instructor addresses topics such as the situational factors of the course (e.g., size, location), the goals of the course, how the instructor will know if the students met those goals, and how the course will run to help the students meet those goals. This phase is critical as it establishes the backward design of the course, (i.e. working from the end goals back to the learning activities). In the Intermediate Phase, the instructor chooses the topics to be covered and assembles the learning activities into an integrated whole. In the Final Phase, the instructor chooses a grading scheme and considers possible stumbling blocks to the success of the design.

Three instructors redesigned and implemented their individual courses during the spring 2005 semester. The other three instructors implemented their redesigned courses in the fall 2005 semester. During the redesigned semester, instructors administered pre- and postsemester evaluations. Each test measured learning in all six taxa (FK, A, I, HD, C, and LL) based on the goals of each individual course. The format of each assessment tool is shown in table 1.

Data Analyses

Within each course, we compared the scores from the pre- and postsemester assessments using paired (by student) *t* tests. Only students who completed both assessments were included in the data analysis. All statistical analyses for individual courses are shown in table 2.

We also performed a meta-analysis across courses to determine if this course design approach was effective overall. To do so, we compared the average pre- and postsemester scores (standardized as a percent of the total available points for each taxon in each course) using each course as a replicate with a *t* test. These results are shown in table 3.

Results

In the following section, each instructor describes the reasons behind the decision to redesign a particular course, the methodology of the redesign, and the outcome.

Lifespan Human Development: Carolyn R. Fallahi

Lifespan Human Development is a course requirement for both psychology and education majors. It is an ambitious course in that the major developmental milestones and theories are covered throughout the lifespan. Prior to the redesign, the course was bogged down with content. It was not unusual to cover parts of lifespan development only superficially because no one could possibly cover all of the major areas of development throughout the lifespan. The redesign of this course was based on Fink's (2003) taxonomy in the hopes of increasing fundamental skills and higher-order learning.

Some of the basic changes I incorporated into the redesign include the following:

1. *Less emphasis on course content (FK)*: There was more emphasis on basic concepts and theories as opposed to large amounts of information.
2. *Active versus passive learning*: The redesign involved more active learning and getting away from the traditional lecture-hall format. Students frequently divided into small groups and actively worked with their team members on many different course-related problems. Students were presented

TABLE 1. Mean Differences on Exam Scores and Final Course Grades

Taxon	Lifespan Development	Instructional Planning for Students with Exceptionalities	Concepts in Biology	Psychology of Early Childhood	Anatomy and Physiology I
Foundational Knowledge	Multiple-choice questions surveying course content	Fill in the blank items, multiple-choice questions, and matching vocabulary words to their definitions	Multiple-choice questions surveying course content	Multiple-choice and essay questions surveying course content	Multiple-choice questions surveying course content
Application	Essay questions on two case studies scored on knowledge and quality of response	Identification of the purpose of various components of educational planning, listing examples of each	Written explanation of a news story about biology and an explanation of what information was left out of the news story	Essay questions applying concepts to children's behavior	Essay questions related to a case study
Integration	Case study of a bullied child —students generated possible solutions to the problem; scored on student's knowledge and quality of response	Read a case study and developed appropriate accommodations or modifications for learning	Written explanation of the relevance of the biology news to other biology topics and the student's own life	Essay question interrelating issues in child psychology	Multiple-choice questions
Caring	Likert scale assessment of level of caring and interest regarding topics covered in class	Response to an article on the topic of equity and excellence in education	Likert scale assessment of students' opinions about their interactions with peers	Likert scale assessment of students' attitudes about young children	Multiple-choice questions
Human Dimension	Likert scale assessment of new knowledge about self or human beings in general	A brief written reflection on personal attributes, strengths, and needs pertaining to collaborating in educational planning	Likert scale assessment of students' opinions about their thoughts and feelings regarding biology topics	Likert scale assessment of students' confidence in ability to interact with young children	Multiple-choice questions
Learning How to Learn	Magazine article used; students asked where they could get more information on this topic; scored on knowledge and quality of response Likert scale assessment of comfort level with research tools	Statements pertaining to self-directed learning and self-reflection; Likert scale used	Written explanation of why students do or do not trust the source of biology news and a presentation of additional sources used to understand the biology news	Likert scale self-appraisal of ability to find needed information; evaluation of a news article and submission of additional articles on the same topic; knowledge of resources to help children	Multiple-choice questions

TABLE 2. Within-Semester Pre- and Posttest Means across Fink's Taxonomy

	Lifespan Development (Dr. Fallahi)		Lifespan Development (Dr. Wood)		Instructional Planning for Students with Exceptionalities		Concepts in Biology		Psychology of Early Childhood		Anatomy and Physiology I	
Taxon	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Foundational Knowledge	9.65	19.88*	9.73	12.67*	7.72	10.36*	9.38	11.28*	12.31	15.15*	5.81	6.13
Application	3.14	5.54*	1.46	1.60	2.00	9.82*	4.00	4.38	9.09	9.57	3.88	9.88*
Integration	3.04	5.46*	1.73	1.60	11.64	14.55*	3.90	5.00*	2.28	3.00	5.44	5.13
Caring	36.56	38.11	5.14	4.82	14.18	18.09*	2.21	2.97*	2.81	3.07*	2.88	3.25
Human Dimension	26.46	38.31*	4.58	4.79	6.55	8.18*	16.72	19.28*	4.23	4.30	3.75	4.25
Learning How to Learn	19.65	20.19	4.59	5.24	6.95	11.00	21.90	25.41*	4.08	4.18	5.63	5.25

*Postsemester means are significantly different from the presemester mean at $\alpha = .05$.

TABLE 3. Meta-analysis Results Comparing Pre- and Postsemester Means as a Percent of Available Points across Fink's (2003) Taxonomy

Taxon	Presemester *M*	Postsemester *M*
Foundational Knowledge	0508	0668*
Application	0400	0607*
Integration	0503	0618
Caring	0640	0740*
Human Dimension	0613	0683
Learning How to Learn	0520	0595*

*Postsemester means are significantly different from the presemester mean at $\alpha = .05$.

with A- and I-based problems, usually a case study, and worked together to solve that problem. To solve that problem, students were forced to be interdependent on their fellow team members to come up with the answer. This form of small group activity helped to enhance learning by creating an atmosphere where the success of the group was dependent on both the students and the instructor. I hoped that this process would not only teach students about lifespan development but also strengthen the LL component in Fink's taxonomy.

3. *Relating course content to students' own lives and other real-life problems*: Another goal of this course involved learning about the human condition and caring about others. Students were given case studies and asked to provide insight into the problems presented. To do an effective job, students needed to apply and integrate the information they had learned. They needed to break the problem into components and rely on each other to properly research each component. Students brought their information together and provided a written and oral presentation on the case study. To do well on the assignments, each group member needed to provide research on their topic (FK and LL); show evidence of A and I; and provide insight into how they had learned more about the human condition (HD and C). I provided several of these case studies on various topics throughout the semester.

The redesign led to significant improvement during the semester in FK, A, I, and HD, but neither LL nor C.

Lifespan Human Development: Rebecca M. Wood

For this course redesign, I added two assignments intended to promote significant learning of and caring about the material, the skill of locating and reviewing research articles, and a student's ability to work with others to complete a complex project.

For the first assignment, students wrote a reflection paper about an in-class activity that simulated some physical changes associated with old age (Beville 2002a, 2002b). To simulate arthritis, students donned surgical gloves filled with popcorn kernels, and the first two fingers of the dominant hand were taped together. Students also wore glasses smeared with Vaseline and earplugs to impair their vision and hearing. The students were then asked to engage in dining and recreational activities. For dining, they used plastic utensils to cut jellybeans and make peanut-butter sandwiches. For recreation, they made crafts that involved peeling the paper off of stickers to expose the adhesive before placing them onto a paper plate to make a design. For the reflection paper, students answered questions such as "Do you feel that you understand what day-to-day life is like for an elderly person (considering the physical declines associated with old age)?" These activities were designed to make students think about the changes that can occur in old age and to ponder the challenges faced by the elderly (the taxa addressed were FK, C and HD).

The second assignment was a group project in which students designed a toy (Neysmith-Roy 1994). Groups of students were assigned to one of the following age ranges: early infancy, later infancy, early childhood, middle childhood, or late childhood. The students considered the motor, perceptual, cognitive, and social capabilities of children within the age group to which they were assigned. Further, they were required to convince me that their toy was age-appropriate by citing empirical evidence that the components of their design could be used by children of that age. At the end of the semester, students handed in papers describing their projects and presented posters to the rest of the class. This project addressed the taxa of FK (the students had to understand the capabilities of children of a certain age); I (they had to integrate knowledge about children's capabilities in the motor, perceptual, cognitive, and social domains of development); A (students used their knowledge to design an age-appropriate toy and cooperated with their group to complete the project); and LL (students found and summarized empirical articles and applied the information to a relevant problem).

There was a significant increase in FK from the beginning to the end of the semester. No significant differences were found between the pre- and posttest scores for the remaining taxa.

Instructional Planning for Students with Exceptionalities: Joan M. Nicoll-Senft

Perhaps the greatest challenge of this course is the degree to which students differ in their background knowledge and teaching experiences. In a typical semester, approximately one-third of the students enrolled in this course are experienced general education teachers. Another third of the class is made up of students who recently received a general education teaching certificate in either elementary or secondary education and are pursing a master's degree prior to beginning their teaching career. The remaining students are postbaccalaureate students with little or no training or experience in teaching. Because this is a course that leads to special education teacher certification, there are specific competencies dictated by state and national standards that must be mastered through the course regardless of students' prior training or teaching experience.

Prior to the course redesign, the course content was disconnected. I relied primarily

on lecturing, which was an ineffective strategy given the diversity of students enrolled in the course. I redesigned the course using Fink's (2003) taxonomy to differentiate instruction for my students and connect the course content to actual teaching situations.

I used a problem-based learning (PBL) format in the redesign of the course. Students were assigned to permanent heterogeneous groups during the first class meeting. Group assignment was based on each student's prior teaching experience and the grade level they currently taught or were interested in teaching. Students were assigned to one of four groups: early childhood, elementary, middle school, or high school. Each group consisted of four students, and each included at least one full-time teacher. The other group members had expressed an interest in teaching at that grade level but had little to no teaching experience.

I developed three problems that became the framework for the course. Problems were developed based on actual situations I have faced as a teacher, administrator, or independent educational consultant. The design of engaging, complex problems is central to PBL, as these problems form the foundation of ongoing student work. Problems were introduced to students at the beginning of each unit of study throughout the semester. Each problem contained a scenario description, suggestions for sharing student work related to the problem, a description of the product or outcome, and essential questions related to the problem.

Prior to the introduction of each problem, I gave students a brief pretest that assessed students' prior knowledge and interests pertaining to each problem. These pretests were not graded and provided me with information for future grouping of students outside of their permanent groups based on their prior knowledge and interests.

My role as a teacher shifted from covering course content to that of a facilitator of student learning. Every week I spent class time meeting with each group to answer questions and assist students in their ongoing progress. In this capacity, I assisted students in identifying and locating resource material pertaining to their problem and often gave students feedback on their individual and group work. As my role changed, so did the role of the students. Students were no longer passive learners and instead became active problem solvers. The redesign of this course using PBL resulted in significant improvements in student learning in four areas—A, I, HD, and LL—but not in FK or C.

Concepts in Biology: Jack T. Tessier

"Concepts in Biology" is a general biology class for students seeking certification to be elementary teachers, a group of students who are typically intimidated by science classes. Around seventy students take the class each semester, and it is offered in an auditorium-style room.

In previous semesters, I developed a teaching strategy called peer teaching in which students took responsibility for teaching some material to peers in a full classroom setting (Tessier 2004) or in small groups (Tessier 2007). Whereas this approach actively involved students in the classroom, the focus was still primarily on the facts of the discipline and did not help the students to see the importance of biology to their lives. Therefore, I modified the design of this course to encourage the students to use their knowledge by considering current news and case studies.

Peer teaching continued to be present in this design, but the in-class questions that students worked on were application-based. In each unit, we also considered the content, relevance, and completeness of a piece of current biology news. Each unit ended with a case study in which students used the information they had acquired during the unit to make decisions about various cases.

The in-class questions were graded and students' scores were modified by a peer evaluation from the members of their group. Exams were made up of a sample of the questions that they worked on in groups during class. At each exam day, students turned in a piece of biology news that they found along with a report describing the biology topics, indicating how they were relevant to their lives, pointing out shortcomings of the article, stating what information was used in evaluating the credibility of the news source, and accompanied by additional sources that helped the student understand the biological topics in the news story.

Student opinions based on a mid-semester course evaluation suggested the following impressions. Fifty-eight students completed the voluntary evaluation form. Forty-five indicated that the peer-teaching in groups helped them learn, whereas only one indicated that the peer-teaching was not helpful. Other students specifically mentioned that the in-class news and news reports, case studies, and fact-based questions helped them learn. Only five students felt that the lack of lectures hindered their learning. Based on suggestions made at mid-semester, I added time for review to the news story and case study days and added a brief oral introduction to the application questions addressed in class.

The redesign led to significant improvement during the semester in FK, I, HD, C and LL, but not in A.

The Psychology of Early Childhood: Laura E. Levine

Prior to this redesign, I taught this course using a lecture and discussion format. My concern was that the students were too passive. I wanted them to take control of their own learning by developing their own goals and methods for observing young children. In addition, I wanted to make students aware of the difficult issues that face young children and their families today, rather than only focusing on pure research.

In the redesigned course, I alternated lecture-discussion classes (FK) with group-based classes. I focused my presentations more clearly on issues such as poverty and mental health (C). Each student observed a child between the ages of one and seven years (A and HD). Students formed teams of four, with each student observing a child of a different age (HD).

During the first weeks students learned how to observe and assess young children and how to find useful and legitimate information from written sources (LL). When we began a new topic, students handed in a list of four questions and aspects of the topic from the assigned reading that they might want to investigate with the children they observed (FK, A). After I introduced the topic in class (FK), the teams worked together to develop their own observational assignments (LL). The teams were able to search online for research ideas to carry out with their

own children. The next two classes were discussions on these topics based on the assigned readings. During the fourth class team members brought in their results and planned their papers to hand in during the following class period (I). Team members carried out peer evaluations and discussed how to improve their performance for the next assignment (HD).

Each team handed in a group paper providing the research background on the project they carried out and described the developmental changes they saw in their four children. Individual papers reported the specific activities and results with each child (FK, A). At the end of the semester, students chose between writing a final paper or a take-home final exam designed to integrate material from the entire semester (I).

Both FK and LL increased significantly from the beginning of the semester to the end. Changes in A, I, HD and C did not achieve a significant level.

Anatomy and Physiology I: Cheryl L. Watson

Anatomy and Physiology I, based on the nervous system, was a traditionally taught course using multiple-choice exams to test a wealth of foundational knowledge and physiological processes. Lecture exams, primarily on physiology, were given separately from the laboratory exams, which are largely anatomical. The examinations were not cumulative, in part because of the volume of material, which included the names of bones, bone features, muscles, muscle attachments and actions, nerve plexi, and brain functional areas. As ideal as it would be, the redesigned course could not be comprehensive, for the same reason. I chose, instead, to form a "thread" of knowledge, which would be drawn from each of the areas taught. I used the arm, its bones, muscles, muscle attachments and actions, nerves, neuromuscular junctions and muscle contraction, in a series of application problems throughout the semester. I gave some of these assignments as homework and some as essay exam questions. Some of the questions were: (1) When you pick up a cup from the table, what bone articulations occur? (2) When you pick up a cup from the table, which muscles are used and where are they attached? Which muscles contract and which relax? (3) Describe which nerves are used to pick up a cup and describe the process from the action potential to the neuromuscular junction. This thread continued throughout the semester, concluding on the final examination. For the arm, students were required to remember all the foundation material of the bones, muscles, nerves, brain, and how to use them.

The rationale for the redesigned course was that each of the areas of Fink's taxonomy would be addressed: (1) foundational knowledge would be retained; (2) organ system knowledge would be integrated; (3) the use of everyday examples would inspire caring about the material; (4) using the material in their daily life would add a human dimension; (5) using the book and other resources to answer the questions would allow them to learn to learn; and (6) the case studies would require application of academic material.

There was a significant improvement in A. I anticipated that this difference would have been accompanied by an improvement in I because the exercises given were both A and I. However, this was not the case, as changes in I scores were not significant between pre- and posttests. FK, HD, C and LL parameters all reflected insignificant change during the semester.

Because these students were juniors and seniors intending to become healthcare professionals or teachers, it was not surprising that the caring and learning to learn parameters were unchanged, as they come to this course with learning sophistication and empathy. The lack of change in their foundational knowledge was unexpected. It implies that the non-comprehensive nature of the course allowed them to immediately forget what they learned for each of the section exams.

Meta-Analysis Results

For all six courses significant improvement in learning occurred in four of the Fink taxa across disciplines (see table 3). These taxa included FK, A, HD, and LL. Significant improvements in I and C were not found across disciplines.

Discussion

We applied Fink's (2003) model to the redesign of six courses in four different academic disciplines: psychology, special education, biology, and biomolecular sciences. We were able to measure the six taxa, and our courses showed improvement in four of these taxa. Our meta-analysis demonstrated that student learning improved in FK, A, HD, and LL (see table 3). Traditionally, only FK and possibly A are used to assess student learning. Faculty assume changes in the other parameters without quantitative assessment. They are unlikely to incorporate these goals into their course design. However, we found that both HD and LL could be effectively measured and changed. Thus, these taxa can be included as specific goals for student learning.

Although changes in I did not achieve significance in the overall meta-analysis, there were significant positive changes in three of the six redesigned courses. More work is needed to operationalize and apply this concept across disciplines.

The lack of change in C may be because of our student populations who were already committed to psychology, special education, and healthcare professions. In fact, most scores on these pretests already approached the ceiling. Caring did improve significantly in the one lower level undergraduate course in biology.

Impact of Instructor's Focus on Student Learning

Although some of us emphasized all six of the areas of the taxonomy equally, several focused on one area in particular. The results confirmed that what faculty emphasize drives student learning. In Dr. Watson's course, Anatomy and Physiology I, her focus was on application of principles to case studies. Her results reflect this emphasis as there were significant differences in the area of A. In Dr. Levine's course, The Psychology of Early Childhood, her redesign focused on students directing their own learning. She found significant differences for her students in LL. These differences reinforce the fact that course design has a major impact on what students learn.

Limitations

The results of this study may be a conservative estimate of improvement, as the instruments used for the pre- and posttests may have been measuring motivation. At the end of the semester, students with

significant course responsibilities may not have been motivated to complete the measures to the best of their abilities. Future studies may examine pre- and posttest performance using graded assignments, to minimize the impact of motivation (or lack thereof) on performance.

Another limitation of this study was that the results were based on the first semester in which we taught the redesigned courses. All courses are continually works in progress that presumably improve each semester.

Future Research Topics

Future studies might focus on designing measures to assess the impact of this approach on students beyond the final exam. The real test of Fink's (2003) idea of significant learning is whether the learning survives the final exam to become an important aspect of students' lives.

The success of this course design approach within this study invites an evaluation of its use at other institution types and levels. The current study took place at a regional comprehensive university. Additional research should be conducted to assess the efficacy of the approach at community colleges and research universities. Further, this method of course design may have applicability at the elementary and secondary levels. Repeating this type of study at a similar regional comprehensive university would be valuable in determining the generality of the results found in this study.

Conclusion

Overall, Fink's (2003) model of course design appears to be a sound method for higher education faculty interested in creating significant learning experiences for their students. We found that it is possible both to design courses with other goals in mind beyond foundational knowledge and to measure the outcome of these other aspects of learning. Given our country's current educational trend toward accountability and standards, Fink's model offers higher education faculty a comprehensive approach to course design that expands student learning well beyond foundational knowledge.

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