The Integrative Track at SUNY State College of Optometry

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Abstract
This paper discusses the theory and implementation of curricular changes at the SUNY State College of Optometry regarding the courses of the Integrative Track. In response to the changing requirements of optometric clinical education, timely integration of basic science and clinical practice are essential in order to achieve the necessary attributes of a graduating Doctor of Optometry. By beginning this process early in the student's education where expanding clinic experiences are discussed in small group settings, the interns are able to connect to the curriculum in meaningful ways. Improved critical thinking and development of independent learning styles are goals of the courses in the Integrative Track.

Key Words: optometric curriculum, integration, critical thinking

Introduction
The practice of optometry requires integration of knowledge. In performing an optometric exam, the clinician must synthesize information from the biological and vision sciences, which serve as the knowledge base and foundation necessary to provide good patient care. In addition, multiple influences from the patient's life, including general health, socioeconomic status and cultural factors impact care directly. Optometric education programs that teach and support an integrative approach can prepare students better for what will be required of them when they graduate.

The expanding scope of optometric practice together with the increased knowledge base supporting it requires fitting more material into an already crowded four-year optometric program. More relevance and efficiency in teaching is necessary to avoid overburdening students with excessive time spent in the classroom. This places an increased emphasis on programs to remove material that does not develop the optometric practitioner. One way to support the relevance of classroom learning to optometric practice as well as enhance educational efficiency is to provide a more integrative approach to teaching. This is consistent with recent changes to the National Boards, in which questions are constructed in a fashion that places basic science information within the context of clinical cases.

The Integrative Track at SUNY State College of Optometry was created to respond to these educational challenges. In this paper, we discuss the creation and implementation of the track, which takes place during the first three years of the optometric curriculum.

Prerequisites for optometric professional programs require the entering student to devote a good deal of his or her undergraduate years to studying basic sciences. In traditional optometric curricula, early courses consist of those in the biological and vision sciences, which are likely to be discipline rather than clinically based. The entering student may become frustrated, perceiving optometry school as a continuation of undergraduate education, with the di-
rect relevance to optometric practice being difficult to discern. This may lead to superficial, rather than deep learning on the part of the student, with the importance of the material not being appreciated until it is encountered later in the curriculum.

Timely integration is vital to success. Waiting to emphasize an integrative approach until the student enters clinical internship places the student at a disadvantage. The student who was used to learning material in isolation is now called upon to think using an integrative approach. By introducing integrative teaching at the outset, students are more likely to become proficient in the manner of synthesizing information and thinking critically, both of which are attributes of a successful practitioner. Before discussing the Integrative Track in detail, we review some of the literature on integrative education in the health sciences.

**Literature Review**

Integration is not new to optometric or medical curricula. With the advent of changes in most healthcare curricula from a traditional model (i.e., where preclinical didactic courses are followed by exclusively clinical instruction) to one that integrates the clinical and basic sciences throughout, the inception of an integrative curriculum provides a vehicle for students to immerse themselves in integrative activities appropriate to their level of experience. As it is no longer enough to provide our interns with pure content, we must also model ways to organize this information and introduce problem-solving strategies appropriate to a healthcare profession. While reviews of outcome assessment have shown that strict problem-based learning (PBL) curricula have not resulted in consistent improvements in knowledge base and clinical performance, the positive contributions of PBL small group tutorials in a hybrid curriculum cannot be denied. These improvements have also been evident in programs embracing horizontal and vertical integration of material, and have been found across the healthcare professions (including medicine, dentistry and nursing) as well as other disciplines. Efforts are being made in many medical school curricula to reintroduce basic science concepts later in the clinical years to enhance relevance in light of the intern’s clinical expertise, while most curricula have also introduced earlier clinical exposures.

An explosion of information has necessitated the incorporation of appropriate access to and organization of material (informatics), as well as emphasizing the application of new information and use of technology to patient care in the form of an evidence-based medicine model. Although most incoming professional students are comfortable with technology, they often do not possess the ability to recognize that which makes an information source “high quality,” and look to their professors to feed them the “necessary” material. The independent pursuit of knowledge and active lifelong learning are goals of any integrative curriculum, and these skills must be taught and applied for the curriculum to manifest positive outcomes. The motivation to learn independently can be linked to the integration of the student into the clinical setting, and through instructors modeling the application of basic science constructs in these situations. While students may respond differently to small group, problem and inquiry-based learning approaches, the goals of this type of curriculum structure (including information integration, collaborative learning and self-directed learning) are the same requirements of well-prepared healthcare providers. Assessment of success must not assume that because some don't respond positively, the curriculum is a failure. Rather, ways of reaching all students to achieve positive results or choosing those who will get the most out of the curriculum must be explored. There currently exist in other successful optometric curricula courses incorporating many of the same goals of SUNY’s Integrative Track using case-based learning for teaching problem-solving and integration. The difference here is that much of our emphasis will be on incorporating actual patient observation and interaction into our case discussions.

In summary, small group activities that link content introduced in basic science courses to clinical observation and patient care, and which provide the opportunity to integrate both vertically and horizontally in the curriculum via modeling of reasoning, provide a strong complement to integrative didactic instruction. This is the basis for the implementation of the Integrative Track.

**Integrative Track at SUNY State College of Optometry**

While the integration of existing courses was a necessary part of creating a more integrated curriculum, it was felt that creating a specific Integrative Track would strengthen the goal. Recognizing the importance of starting early, and continuing throughout the professional program, a track was created, similar to other tracks (i.e., Ocular and Systemic Disease, Visual/Perceptual/Sensorimotor and the Clinical Examination), which would thread throughout the three years and be geared toward refreshing and integrating material already taught. Therefore, the Integrative Track serves as a vehicle to tie together important aspects of the curriculum, without adding new material. It is presently at the end of its third year of implementation. At the time of writing, current first-year students have completed a full year of the track, while current second-year students are completing a second year of the track. The current third-year class has completed three years of the Integrative Track.

To underscore the clinical relevance, the courses within the track, which are named Integrative Seminar (IS), heavily utilize case-based teaching. Throughout the first three years of the curriculum, each IS employs a combination of small group and clinic exposure and a lecture component in the first two years only. The intern’s clinical exposure and responsibility is increased over the course of the three years. There is a Course Coordinator for each year of the Integrative Seminar and a wide variety of additional faculty involved, including those from both basic and clinical sciences. The following is a year-by-year description of the Integrative Track at SUNY State College of Optometry.

**First-Year Integrative Seminar**

The course runs three hours per week, comprising one hour each of lecture, seminar (small group) and clinic. A weekly topic is presented in lecture, which is then discussed in seminar and clinic. This serves to reinforce the topic
in different venues. The groups consist of approximately 12 students and are led by a clinical faculty member. Lecture topics start by considering the patient as a whole before going on to evaluate the eyes and visual system. Some of the topics include: overall patient observation (including patient orientation to time, place and situation, general observations such as gait, visual behavior, dress, hygiene, communication style, etc.), patient health history, use of information technology in patient care, history of the optometric profession, visual acuity testing, clinical decision-making, clinical applications of anatomy and physiology, optics, ethics, and evidence-based patient care. In an effort to strengthen integrative learning, these topics loosely parallel those which students are currently learning in their didactic courses. Accordingly, efforts are made in didactic courses to incorporate cases to illustrate application of basic science concepts.

The first-year IS not only combines basic science material with clinical observations but also makes an effort to develop clinical reasoning by linking it early on with its basic science foundations. This new approach embraces a re-orientation in clinical education and includes improvement in teaching efficiencies by encouraging independent, student-guided use of information technology.

The clinical component of IS consists of students observing examinations for one hour in Primary Care and specialty clinics throughout the year. They are paired with interns and preceptors who reinforce weekly topics and apply them to the observed cases. In the seminars, the students share cases they find interesting that pertain to the weekly topics. Students are expected to pursue topics of interest on their own or with the help of the faculty member assigned to their group.

In the course of case-based teaching, an effort is made to employ what we refer to as a “bottom-up approach.” In view of the rudimentary clinical knowledge base of a first-year optometry student, discussing cases in the more common fashion using clinical findings and terminology is apt to lose the student. Instead, we use as a starting point material that the student has previously learned in science courses and apply it to the case at hand.

For example, consider the case of a patient with Adie’s pupil. A “top-down” approach to the discussion might give the diagnosis, the pupil test in light and dark, the finding of anisocoria, and the appearance of the iris in the slit lamp. Given this information, the student might be asked how a lesion in the pterygopalatine ganglion can account for these findings. However, because the student has not yet been exposed to any of this clinical information, the question is less meaningful than it would have been given later in the curriculum. In fact, the faculty member would have to explain all the terms before the student could answer the question. In using a bottom-up approach, the instructor starts by asking the student to describe the basic anatomy, which the student has already learned (horizontal integration), and works up to the clinical diagnosis. For example, the instructor might ask the student to describe the anatomy of the iris, and the neuromuscular elements that affect pupil size in light and dark. This would include a discussion of the anatomical structure of the ciliary ganglion and how it affects the pupil. Next, the instructor would ask how the pupil size would change if there were a lesion in this region. Then, given this condition, what would be the pupil’s response in a light and dark environment? The discussion could then lead to what would be the effect of pharmacological interventions on this condition.

A “bottom-up” approach to discussing cases may be a less familiar method of teaching for the clinician, who is more accustomed to thinking first in terms of patient history and findings and recalling the basic science elements in order to arrive at a diagnosis. In contrast, the method employed here starts where the student is and avoids using technical terms, which the student has not yet learned. Technical terminology can be introduced at the end of the case discussion. Thus, a new way of looking at previously taught information is introduced with the intent that the student will learn about it in more detail later in the curriculum (vertical integration).

Second-Year Integrative Seminar

The course also runs for three hours per week and is divided into seminar, clinic and “half-class” sessions consisting of about 35 students. The course is structured differently from the first-year model, as students are armed with a greater knowledge base. An increased emphasis is placed on active learning. Instead of being in clinic for just one hour per week, students are assigned to clinic for a three-hour period every other week. On alternate weeks, they participate in a two-hour seminar and one-hour half-class session. This schedule gives the students the opportunity to follow a case from beginning to end, rather than having only a partial one-hour exposure to the case. The clinical experience is more hands on. Students work as scribes, performing electronic medical record (EMR) recording as well as assisting with elementary testing in concert with third- and fourth-year interns and assisting patients as they make the transition to the dispensary or to make follow-up appointments. Pairing junior and senior students in clinic fosters peer learning, which is a key component of second-year IS.

In seminar, students present cases they have seen in clinic, which are then discussed in the context of material learned in their other classes. Discussions stress clinical decision-making and critical thinking. Alternatives to the diagnosis and plan for their cases are discussed and students are asked to justify their decisions based on material they have learned in their didactic courses. Volunteer patients participate in seminars to help students learn communication skills and history-taking with actual patients. Special topics are sometimes introduced, for example, conducting a practice exam in Spanish on a Spanish-only speaking patient.

Second-year IS differs from the first-year program in that there are very few formal lectures. Rather, in half-class sessions, students address questions regarding cases for which they need to apply basic science knowledge in the formation of clinical assessments and decisions. Both basic and clinical science faculty are present to guide the discussion. Topics have included amblyopia, apoptosis, diabetes, refractive surgery evaluation and macular pathology. All of these topics are discussed.
with respect to didactic information that has been introduced in other tracks. Because of the increased knowledge base of a second-year student, a strictly "bottom-up" approach need not be used exclusively. Students are more familiar with clinical diagnoses, and questions can be designed with that in mind. Here is an example of a question that the students must address.

An 8-year-old boy presents for an eye exam. He has worn glasses since age 5 and his ocular history is otherwise unremarkable. The spectacle prescription is:

OD -10.75-4.25x180 20/200
OS -5.25-1.25x180 20/30+

Explain the reduction in his VA based on the normal development of his visual system and how clinical interventions might affect this development.

The students work in teams of eight or nine, and each team has to present its answer to the question. It is completely open book, and the students are allowed to bring in whatever notes or sources they have, including being able to utilize online information. This requires them to access previously learned material. Students are not given the question beforehand, only the general topic. The idea is to create a unique type of case scenario, such as the kind they would have to face in clinic. The groups then challenge each other as to who gave the best answer. Groups are graded, in part relative to one another. This helps students learn to critique one another and to respond to critiques on clinically relevant and integrative questions. As in first-year IS, there are no exams and few out of class assignments. Students are evaluated based upon how they perform during class time.

Third-Year Integrative Seminar

Implementation of the third-year IS is coinciding with a significant restructuring of the third-year clinical experience. Recommendations for improving the third-year clinical program were made by an appointed committee in which incorporating the third-year IS course into clinic was a top priority. Third-year Integrative Seminar is a mandatory weekly one-hour course given on the day the intern is in the Primary Care clinic. In addition to case discussions, the interns are challenged to think creatively regarding patient care options and applications. They are expected to reflect on and justify their patient care choices and bring to bear what they have learned didactically and via purposeful searches of the literature with an emphasis on application of evidence-based medicine. Six students meet with the same two faculty members who supervised them in clinic. This helps to integrate the clinical experience with the course, while contiguous placement with the clinical assignment allows issues that have just been experienced to be discussed. The process is supported by the availability of pertinent data from earlier didactic courses (first through third year) which can take the form of texts, articles, Web site links, or other visual aids found on Moodle (our online learning management system) and via Internet access with links from our library homepage to journals, databases and image catalogs. The information that highlights fundamental points can then be used to support the intern's understanding of clinical presentations encountered in patient care. The students must justify their management using this information. Interns are required to develop and present a 10-minute case-based Power Point presentation on a topic they have encountered and list their references. This fosters a deeper understanding of a specific topic while encouraging independent, exhaustive research.

Challenges

The implementation of any new program will expose a myriad of unexpected challenges. Despite previous implementation of integrated curricula elsewhere in optometric education, each institution will encounter its own particular pitfalls. As IS courses have only recently been instituted, outcome data are still in the process of being collected. However, informal feedback has revealed some difficulties. Below are some of the challenges we have experienced so far and have attempted to address.

• First-year IS: A challenge for any new course designed to synthesize existing information (rather than adding new material in a tightly packed curriculum) is assuring that it does not serve as an entry point for material otherwise omitted from the curriculum. In the first year of IS, public health material was added to the course, then, in part based on student feedback, removed during the second administration and placed within the Public Health Track at a more appropriate time in the curriculum.

The first time that IS was offered, seminars were conducted in an open format to incorporate what was discussed in the one-hour lecture and with respect to student experiences in their didactic courses and patient care observations. While this format provided for flexibility in discussions, the lack of uniformity among the individual groups resulted in differing assignments and greater or lesser workloads amongst them. This led to discontent among the students as some felt overburdened by having to do more work than their peers. This has now been remedied, as assignments outside class time have largely been eliminated. Whereas a uniformity of experience cannot be achieved, a uniformity of requirements is desirable.

• Second-Year IS: Throughout the entire three-year Integrative Track, finding an appropriate venue for holding seminars that allows access to the clinic's EMR system and the Internet has proved to be a challenge. The large lecture halls are not designed for access to these resources, nor do they offer seating suitable for face-to-face group interaction, which is essential for seminars. Alternative locations, such as conference areas located in the library are designed more for quiet study than groups needing multimedia access. Accordingly, securing an appropriate physical location for this new course has been challenging.

Having a one-hour time slot dedicated to half-class sessions has also been problematic for second-year IS. Because these periods are devoted to presentations involving approximately 35 students, overseen by several faculty members, it has, on occasion, been difficult to limit the discussions to the one-hour time period.

• Third-Year IS: This course was introduced in the fall semester of 2010. An effort to incorporate IS into the clinical setting has resulted in a complex restruc-
turing of existing patient care schedules and faculty assignments. It is a task that requires the close cooperation of the College’s Clinical Administration and Academic Affairs departments. Staffing clinics, labs and first- through third-year IS has placed significant demands on faculty manpower. However, the promotion of the small group learning experience is a curricular goal, and thus efforts have been made to allocate appropriate faculty in order to achieve it.

Constraints due to patients arriving late, intern inexperience and patient complexity often results in abbreviated or late seminars leaving less time for meaningful case discussions. Changes in the schedule were piloted and implemented and are currently being assessed for improvement. While incorporating IS into clinic provides an excellent opportunity for real-time learning, it also presents logistical challenges.

Conclusion

Will the Integrative Track create students who are independent learners, provide a more holistic approach to patient care, are more developed in their critical thinking, and more adept in applying basic science principles to clinical practice? This remains to be seen. The College has developed assessment tools, such as a test similar in form to the National Board’s Patient Assessment and Management (PAM). This was given to the graduates of the prior curriculum, and will be given to students who took the new curriculum (including the Integrative Track) for comparison. Traditional means of evaluation, such as National Board scores in addition to faculty and alumni surveys, will continue to be employed to assess the outcome of curricular changes. Additionally, new student course evaluations have been developed to obtain their feedback on whether IS courses are meeting the goals. This survey can be found in Appendix 1. As with any new curricular initiative, modifications will certainly have to be made based upon the results of these assessments.

The College’s mission statement and strategic plan are devoted to developing outstanding optometrists within a professional program that employs innovative and pedagogically sound instructional strategies centered on evidence-based care, critical thinking, and promotion of lifelong learning skills. The Integrative Track is designed to be a crucial component in achieving this mission.

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References

Appendix 1  
Course Survey (Fall 2009) Integrative Seminar

Please answer the following questions, which pertain to Group, Clinic, Lecture, or the course in general.

Indicate which group session you attended:
Tuesday ____ am ____ pm ____ eve
Wednesday ____am _____ pm _____eve
Thursday _____ am _____pm _____eve
Friday _____ am ____pm

**Group**
1. The group sessions were useful in integrating didactic course material with clinical care
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA
2. The group leader was helpful in creating a positive learning environment
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA
3. I was satisfied with my participation in group
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA

Please provide any additional comments you like regarding the group sessions

**Clinic**
1. Participating in clinic was beneficial to my development as an optometrist
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA
2. The interns were helpful to me in clinic
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA
3. Participating in the screenings was beneficial to my clinical development
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA

Please provide any additional comments you like regarding the clinic sessions or screenings

**Lecture sessions**
1. The lecture sessions, assignments, or suggested references were useful in integrating course material with clinic situations
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA
2. Working with other students was a beneficial learning tool
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA

Please provide whatever comments you like regarding the lecture sessions

**Course in general**
1. The course facilitated student attainment of goals described in the syllabus
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA
2. The course was helpful in developing my independent thinking
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA
3. The course was helpful in my getting used to working in a clinical environment
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA
4. As a result of this course, I was more likely to independently use outside resources
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA
5. The course contributed to my ability to present a case in an organized manner
   Strongly Agree   Agree   Neutral   Disagree   Strongly Disagree   NA

Please provide whatever comments you like regarding the course in general