Think Tank ...

Optometric educators, we welcome your comments on ...

Critical thinking as related to clinical decision-making and patient care is a specific outcome of the educational process. Many optometric institutions have initiated courses dedicated to teaching critical thinking, clinical decision-making and integration of knowledge. How is the teaching of critical thinking implemented at your institution? What challenges have you faced or what lessons have you learned in this area?

Michigan College of Optometry at Ferris State University

At the Michigan College of Optometry we attempt to integrate the development of critical thinking skills beginning with the earliest courses in the first year of optometry school. Every effort is made at this level to relate basic science to clinical application. One example is developing the relationship between cellular and human anatomy and physiology to normal and abnormal function and the types of treatments that would ameliorate abnormal function. In Geometric Optics, the students are required to maintain a journal in which they discuss one aspect of the subject matter covered that week in an insightful and unique way, thereby solidifying their understanding of those concepts and principles.

Beginning in the second year and continuing into the third year, we have implemented three courses we have named Clinical Problem Solving. In these courses, cases are presented and the students take home PAM-style cases, which are discussed in the next class meeting. The students return to class with diagnoses, treatment strategies and coding and billing plans and answer questions regarding anatomy, physiology and the rationale for their responses. A great number of our courses also include cases designed to illustrate the use of proper history, specific testing and the appropriate thought process to arrive at a correct diagnosis and management plan for the presented case. Some faculty members utilize small groups in which students analyze cases and explain their findings to their classmates. Classmates are able to edit the findings of the group presenting the case, if need be, in a safe environment that facilitates better understanding of the case and condition(s) presented.

Testing is also employed to assist faculty in evaluating how well students are able to use their knowledge in the practical application of concepts and principles through careful test construction.Cases may be evaluated by students making use of multiple choice, short answer or essay questions.

In our clinics, our didactic faculty also precept in the clinic, which facilitates the application of concepts and principles taught in the classroom to actual patient encounters. In clinic, faculty members encourage students to provide their input on the synthesis and analysis of examination findings and to develop and defend the proposed diagnosis and management of a given patient. This provides continuity between the classroom and the clinic, enhancing the ability of our students to employ critical thinking skills in actual patient care, which is the ultimate goal of optometric education.

The overriding challenge in developing critical thinking skills in our students has been overcoming the learning techniques students had utilized in undergraduate education. There, students have survived well in an environment which, for the most part, required only the memorization of facts and in turn repeating them in a testing situation. Given this background, teaching critical thinking skills may be somewhat agonizing for both the students and faculty at the outset. However, almost invariably, as the students progress through the program, great strides can be seen to have been made with regard to the development of the critical thinking skills, which are so imperative in becoming a successful optometrist.

Dean L. Luplow, OD
Assistant Professor

State University of New York State College of Optometry

At SUNY Optometry, one of our educational objectives is to teach students to think critically in their courses and throughout their clinical education and into practice. To improve clinical decision-making we emphasize clinical applications in the didactic courses and reinforce the relationship between the basic sciences and clinical care with our integrative seminar program. The integrative seminar program is a unique element of our curriculum that runs throughout all four years. In years one and two, as students prepare for and enter the clinic, integrative seminars emphasize the integration of didactic

course concepts into the clinical examination.

In year three, the integrative seminar is actually integrated into the clinic as part of a weekly full-day primary care clinical assignment. Third-year primary care clinic at SUNY is organized into units we call "pods," where two clinical faculty are teamed with six students for eight weeks. The integrative seminar takes place during a break in the clinic assignment and offers opportunities for the faculty and students to reflect, discuss and critically analyze patient care plans while reinforcing basic science applications to their clinical experiences. In the fourth year, all students have one quarter of clinic seminar, which offers a grand rounds format for discussing cases and clinical decisions critically.

Our integrative seminar program is a new program, and the first class of students is just completing the full sequence this year. Initial assessments have been positive. The greatest challenges we've faced have been changing the clinic schedule to incorporate the pods with their integrative seminars and changing the expectations on the clinical supervisors. However, with the dedication of the clinical faculty and the cooperation of the clinical administration, the program is functioning so well it is being considered as a model for our specialty clinics and our fourth-year clinical internships.

David Troilo, PhD
Vice President and Dean for Academic Affairs

Southern California College of Optometry

The teaching of critical thinking at the Southern California College of Optometry has been embedded in coursework through the use of asynchronous discussion boards and also through in-person, small group, case-based learning. A critical component to these methods is the ability for students to challenge each other's thoughts and ideas. Some courses require justified responses through the use of peer-reviewed literature.Although critical thinking has been emphasized in many of the preclinical courses at the College, more recently a concerted effort to measure perceived learning outcomes in critical thinking has occurred.

In the fall of 2010, a pilot course designed specifically to address deeper learning through problem-based learning (PBL) strategies was incorporated into the first-year curriculum.The pilot course utilized a mixture of two hours a week of traditional lecture methods and two hours with learning groups using PBL pedagogy to teach geometric optics. The course promoted self-directed learning, problem-solving through the use of hypothesis testing, idea development and fact-finding. The purpose of the methods was to promote both independent and collaborative knowledge-building. Higher-order learning such as "meaningful processing" was heavily emphasized (e.g., connecting new learning to prior knowledge). An outcomes survey queried student engagement, critical thinking gains, satisfaction with learning and other outcomes. The results demonstrated that there was a strong relationship between engaged learning (measured with six items) and critical thinking skills improvement. Higher critical thinking scores were also related to high student satisfaction scores with the amount learned and also satisfaction with faculty.

The challenges in the course included student dissatisfaction with grading criteria and limited faculty feedback on learning topics. Another limitation was the restricted facilitator time within each group (the faculty facilitator rotated visitations through several groups at one time). A new stand-alone course utilizing a higher ratio of faculty to students with methods more closely matching problem-based learning guidelines will be launched this fall for first-year students.The purpose of the course is to foster higher-order thinking and integration of the basic sciences with clinical reasoning strategies. Outcomes will be assessed for engaged learning, critical thinking and basic science knowledge integration.

Rebecca Kammer, OD, FAAO
Associate Professor

Indiana University School of Optometry

If we accept critical thinking as being "the mental process of actively and skillfully conceptualizing, applying, analyzing, synthesizing and evaluating information to reach an answer or conclusion,"then we would hope that critical thinking would be a part of every course within our curriculum. But we know that in spite of our best hopes, students do not automatically enter into this type of thinking, even as they move into a clinical setting.

A major hindrance to critical thinking is compartmentalization. Yet out of necessity we compartmentalize our curriculum into distinct course subject areas. At the same time, we expect students to take these different pieces and automatically put them together holistically. We know that if this is not done, critical thinking doesn't occur. In an attempt to meet this challenge, the Indiana University School of Optometry has done two things worth mentioning.

First, we have incorporated problem-based learning courses, entitled "Integrative Optometry," into the first and second years of our curriculum. The first-year course is small seminars facilitated by optometry faculty. At the onset of the course, students are given a clinical case. The expectation is that students will individually search into the literature and collectively find out as much about this particular disorder as possible. There is an emphasis on relating the disorder back to basic sciences. A clinical solution is not the ultimate goal, but rather an understanding of the underlying mechanisms of the problem. Individual faculty members do not "teach" the course. Instead they facilitate discussion, as needed, andredirect the search as students delve into thetopic.

In the second year, Integrative Optometry takes the form of a "Reverse PBL." Students are organized in small groups. Each group chooses a clinical topic, constructs the case and guiding questions together with a Facilitator's Guide that is amply referenced. Again, the goal is to relate the clinical case to the

underlying basic science concepts so as to provide both critical thinking skills and the understanding that clinical and basic sciences are on a continuum and not separate.

The second step we took happened approximately four years ago when we reorganized our curriculum with an eye toward grouping courses into four different tracks: Optics, Biology/Disease, Sensory & Motor and Clinical Science. Each track looked at the content and sequencing of subjects within their subset of courses. Courses and their content were reorganized with the intent of integrating subject material for efficiency and flow. At the same time this was going on, the faculty for each track were charged with timing the delivery of material to coordinate subject matter across tracks. In this way, for example, optics material related to prism would be taught shortly before prism was needed in clinical sciences.

Both of these changes were made to facilitate the integration of subject matter, getting students accustomed to conceptualizing, applying, analyzing, synthesizing and evaluating information to reach an answer or conclusion.

Clifford W. Brooks, OD
Executive Associate Dean for Academic Affairs and Student Administration

Northeastern State University Oklahoma College of Optometry

In addition to teaching critical thinking skills in all clinical rotations, the Oklahoma College of Optometry teaches a course, Differential Diagnosis, which is designed specifically to enable students to improve critical thinking skills and clinical decision-making.We also have four Case Studies courses, which are conducted in a grand rounds format. Critical thinking skills and integration of knowledge are taught across the curriculum as a portion of many different courses, including disease, optics, clinical methods, contact lenses, low vision and vision therapy. Some instructors who teach courses early in the curriculum find teaching critical thinking skills challenging, as the students do not yet have much background knowledge. We believe that our clinical program is made stronger by incorporating the teaching of critical thinking skills and integration of knowledge across the curriculum.

Kippi D Wyatt, BS, OD
Assistant Dean, Academic Affairs

The Ohio State University College of Optometry

Several years ago, The Ohio State University College of Optometry began a case-based course series to help students learn to apply their coursework knowledge to the clinical environment. Students would work in small groups on cases across a five- to seven-day period. Students took one "Keystone" course at the end of their first year of training and took a second Keystone course at the end of the second year. They learned to assimilate patient history, optometric testingand laboratory test results into a concise and meaningful summary statement called the patient illness script. Students were then tasked with comparing the patient illness script to different disease presentations they had learned in their optometric courses. First-year students completed the case studies by completing a differential diagnosis list, while second-year students also prepared a detailed assessment and plan.

The learning objective was to help students make the transition from the basic sciences to the clinical sciences and to show through sample cases how their basic science education fit into optometric clinical care. Additionally, students learned the process of how clinical decisions are made. During the course, students were constantly reminded that reaching the "correct" case diagnosis was not the goal of the course; completing each step in the examination/diagnosis process was the key. Students must develop a meaningful patient summary that includes epidemiology, temporal pattern and examination key features. Only after these elements are developed and verbalized should comparisons to different disease presentations be made. Additionally, clinical attendings and basic scientists worked side-by-side to oversee student progress on these cases to allow clinicians to revisit basic science concepts and to allow basic scientists to better understand the clinical value of their course elements.

Other than the obvious demand on teaching (12 faculty engaged in course all week long), challenges have been few. Both students and preceptors have enjoyed the case-based learning process. A frequent finding, however, is the tendency for many students to jump ahead and skip important process elements to reach premature closure. When this occurs, often an incorrect diagnosis is found, and certainly learning is always compromised.

Michael J. Earley, OD, PhD
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Gregory W. Good, OD, PhD
Professor of Clinical Optometry
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University of Alabama at Birmingham School of Optometry

At the UAB School of Optometry there is no single, specific or successful approach to teaching critical thinking. Some of our faculty believe that we do not, in fact, teach it. Others believe that it is taught, almost "without thinking," in the clinical setting. A student in a supervised clinical setting is essentially forced to apply his or her knowledge to a real-life situation. The attending witnesses this application of critical thinking and evaluates the student, providing constructive feedback in order to improve performance with each subsequent patient the student sees. The attending is also a safety net to ensure that the patient receives quality care and that each clinical decision is appropriate.

Other instructors emphasize evidence-based decision-making. This includes lecture material as well as assigned readings of keystone significance in the field of study. The challenge is that students are overwhelmed with material and seem reluctant to overcome the daunting task of critical reading/thinking to discern the evidence and consequently lapse into previously perceived notions. The lesson learned is to limit the assigned readings to the most critical and potentially productive material.

Because most students have limited or no previous experience with our subject matter, many faculty believe the only way to engage the students and make them think is to use case examples and ask them what they would/should do in particular situations. In our Business Aspects of Optometry course, for example, the students are told that they are practicing doctors with an employee who is causing some kind of problem. Perhaps the employee has body odor that everyone notices or is constantly late or is caught stealing. The students are asked what they are going to do about it. Is there a best course? Are there legal issues if they consider dismissal? In HIPAA, the hypothetical situation is presented, which might be based on a real case, and they are asked if there is an issue and what they think the outcome should be. There really is nothing better than challenging the student with a case pertaining to the subject and making him or her practice decision-making.

Some faculty have learned that assigning students to prepare written reports really helps identify the cream of the crop. Those students who provide thoughtful answers in a well-written manner show a level of maturity in critical thinking that we attempt to identify. From there, we may encourage residencies, thinking that someone who can write well and think critically would make a great resident and possibly future faculty member.

Here is an example of the essentials of the written assignments:

- **Weekly Assignment**

  At the end of each clinic day, write down three things that you learned as a result of seeing patients that day and e-mail them to me. Also, add one question that came to mind in your patient care. This may be an answerable question that you might wish to review later, or it may be an unanswerable question that would require further research but shows your maturity in thinking.

- **Term Assignment (three per term)**

  Literature Review Instructions

  a. Briefly summarize the article, including the patient base (number of patients studied, age, major inclusion and exclusion criteria), methods and results

  b. Provide three bullet points that you will be able to use to tell your patients in real life

  c. Provide at least one bullet point that was interesting to you that was NOT in the abstract

  d. Write one question that comes to your mind after reading the study (i.e., now that you have answered the question in the paper, what other questions surface in your mind?)

  e. Cite the reference (consider PubMed via www.uab.edu/lister/tools and enter your blazer id/password to have increased electronic access to full articles)

- **Evaluation**

  1. How mature of a thinker are you?
  2. Were you able to get access to literature when indicated?
  3. Did you use the best reference to answer the question? (Asking me or another instructor for help is NOT cheating)
  4. Can you write?
  5. Did I learn something? Did you teach me at least one thing?

Jimmy D. Bartlett, OD
Chair, Department of Optometry

Nova Southeastern University College of Optometry

At Nova Southeastern University College of Optometry, we use critical thinking components in both the didactic and clinical teaching arenas. Activities to develop critical thinking skills are included in all course learning objectives because we believe these skills are crucial for making the transition from student to clinician. Only through proactive processing of information can students apply what they have learned in the classroom to the care of a patient in an exam room. Case studies and problem-based learning scenarios are used throughout clinical training. Both didactic and clinical curricula include learning objectives to stimulate critical thinking, such as:

- embedded questions to challenge students to wider fields of study
- supporting students to compile their own learning portfolio, reflecting their personal philosophy and action plans to achieve goals and to detail successful learning guidelines
- using technology to augment study guides, encouraging students to develop enhanced versions of an area of study, engaging in meaningful, active, constructive learning, such as identifying causal relationships
- promoting collaborative strategies to achieve a community service goal
- including measurement metrics of progress, such as pre-post tests, checklists or the creation of an "expert" lecture by the learner.

Critical thinking by definition is an action term used to describe the proactive processing of information, a useful ability to guide behavior and decision-making. This is precisely the skill that is needed during the critical transition to clinical care. At NOVA, we characterize our teaching objectives as providing the framework for students to learn the skills necessary to go beyond the acquisition and retention of information. Our teaching objectives are to ultimately produce outstanding optometric physicians who are committed to lifelong learning and growth.

Josephine Shallo-Hoffmann PhD, FAAO
Associate Dean for Academic Affairs

Michael Bacigalupi OD, MBA, FAAO
Assistant Dean for Student Affairs

Southern College of Optometry

At Southern College of Optometry we have attempted to give our students multiple guided experiences in critical thinking with didactic courses prior to entering the clinical curriculum. For example:

- The most profound change in the way we model and develop critical thinking in our students is in the manner of presentation of our optics course sequence in the first year. Under the leadership of Dr. John Mark Jackson, this course has been transformed into a team-based learning (TBL) experience in which students work together to look at problems and use what they have already learned to arrive at new solutions. For students who often come out of undergraduate science education that is largely driven by memorization and multiple choice examinations, there can be significant challenges to looking at a situation that does not have a "right answer" and coming to the best possible solution for all the parties involved. This course has been exceptionally well-received by our students and aspects of TBL are being adopted in several other courses.
- Dr. Betty Harville teaches the Clinical Communication & Patient Care course in the fall of second year and Clinical Internship Introduction the following spring. In this course series, students have to work their way through complicated case histories and basic optometric procedures while Dr. Harville challenges them individually by personally acting out patients presenting with various conditions or states of mind. Students are graded with a rubric that assesses their ability to adjust their techniques to the needs of the patient. These sessions are videotaped and reviewed by the entire lab group, with feedback and discussion, allowing all the students in that group to benefit from the experience.
- We have just added a course to the second year, Evidence-Based Medicine, taught by Dr. Sharon Tabachnick. This course requires students to use health sciences literature to research various questions about ocular and visual conditions and critically assess the literature available. As with any valuable growth experience, there have been growing pains. We have learned that requiring the students to be responsible for extensive investigation beyond the classroom requires careful communication about the purpose, expectations and benefits in order to engage the students in deriving solid learning outcomes.

Lewis Reich, OD, PhD
Vice President for Academic Affairs

David A. Damari, OD
Professor
Chair, Department of Assessment

Western University of Health Sciences College of Optometry

Instruction in critical thinking at the Western University of Health Sciences College of Optometry is embedded within the curriculum through didactic and clinical experiences, including group projects, facilitated lessons, clinical case studies and supervised patient interactions. The College of Optometry administers both the California Critical Thinking Skills Test and the Health Sciences Reasoning Test to students at the beginning of their first year and again at the end of their final year. This approach will enable us to measure the extent to which critical thinking skills are being cultivated in students. If increases in scores from year one to year four are not sufficient to indicate that critical thinking skills are meeting the expected entry level competence of new graduates in optometry, we expect to initiate strategies that include, but are not limited to, coursework that explicitly attempts to teach the art and science of critical thinking.

Miki Carpenter, PhD
Director of Assessment

Daniel Kurtz, PhD, OD
Professor
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Send Us Your Comments

Do you have any thoughts or insights related to teaching critical thinking? Send your comments to Dr. Aurora Denial at deniala@neco.edu, and we will publish them in a future edition of the journal.