OPTOMETRIC EDUCATION

The Journal of the Association of Schools and Colleges of Optometry

Volume 51, Number 1
Fall 2025

Elevated Intraocular Pressure After Cataract Surgery

Comparing Self, Peer, and Faculty Assessments Within an Interprofessional Hybrid Course

Perceptions and Attitudes of Optometry Students Towards the Use of Artificial Intelligence in Education and Practice

Using Kern's Method to Develop Asynchronous E-Learning for Clinical Curriculum

Improving Sight, Research, and Cultural Competency: The Guna Indian Project

Bridging the Divide Strategies to Improve Equitable Access to Quality Eye Care Services Globally Through Collaborative Optometric Education

ALSO INSIDE

Editorial: Fifty Years of Optometric Education: A Legacy of Learning

ASSOCIATION *of* SCHOOLS *and* COLLEGES *of* OPTOMETRY

Optometric Education: Volume 51 Number 1 (Fall 2025)

Table of Contents

Articles

PEER REVIEWED

Using Kern's Method to Develop Asynchronous E-learning for the Clinical Curriculum: One Facility's Experience

Jonathan Bradley, OD, FAAO, Jessica Johnson, OD, FAAO, Guadalupe Mejia, OD, FAAO, Lara Pedretti Staley, OD | Optometric Education: Volume 51 Number 1 (Fall 2025)

Abstract

The authors present their experience using Kern's Six Step Process in developing an asynchronous e-learning module targeting gaps in foundational knowledge at an early stage in the clinical rotation. Toward the goal of increasing efficiency in the learners' mastery of critical RNFL Thickness OCT analysis, learners showed improvement on the post-test of foundational concepts as part of the formal needs assessment and provided positive feedback. The process and concept are analyzed in relation to contemporary educational theory including critical thinking in clinical reasoning, Bloom's taxonomy of cognitive development, and cognitive load. This process could be upscaled to target more concepts for learners throughout the world by developing a web-based delivery application. For context, the pretest and video portion of the learning module are presented.

Keywords

clinical rotations, critical thinking, curriculum, learning modules, Retinal Nerve Fiber Layer (RNFL) Thickness

Introduction

Critical thinking is a desirable skill in optometric clinical learners. The 2019 ASCO Optometric Education Global Summit identified recruitment of students who exhibit critical-thinking skills as one of the opportunities in future development of optometric education.[1] Critical thinking is often identified as a component of clinical reasoning,[2] and clinical reasoning is a goal of most, if not all clinical curricula throughout the world.

The National Council for Excellence on Critical Thinking and Education Reform defines critical thinking as "…conceptualizing, applying, analyzing, synthesizing and/or evaluating information…as a guide to belief and action."[3] These action words are consistent with Bloom's Taxonomy of Learning, with cognitive skills like application, analysis, synthesis and evaluation positioned higher on Bloom's hierarchy. These more advanced abilities are built on top of the foundational skills of knowing, remembering and comprehending.[4]

Generally, this framework is layered so that the higher on the taxonomy a learner climbs, the greater the mastery of the topic of regard, while attaining the lower levels often helps in attaining the upper levels.[5] An optometric curriculum should be designed with this layering in mind, first calling for knowing, remembering and comprehending foundational concepts before moving on to the higher cognitive skills which allow for critical thinking and clinical reasoning.

A natural conceptual division of pedagogy in optometric programs is classroom learning vs experiential learning in the clinic. Ideally, all taxonomic levels of regard should be taught in the classroom learning phase of the curriculum, while the higher taxonomic functions are reinforced during clinical rotations. But there is a caveat that the learning or relearning of foundational knowledge will be facilitated as needed before moving on to guided and intentional practice the learner needs to master those higher functions.

By the clinical phase of the education process, the lower taxonomic strata tend to become known simply as “background knowledge,” and two things may be evident to clinical preceptors about background knowledge. First, background knowledge can and should be itself layered with simpler concepts preceding higher concepts. Though intuitive enough, this principle of building complexity over time decreases the intrinsic cognitive load which is thought to enhance learning.[6] Second, clinical preceptors are often faced with handling knowledge gaps as some learners may not always present with adequate foundational knowledge. In that event, the preceptor’s responsibilities include helping the learner identify any gaps in foundational knowledge that interfere with clinical reasoning, assisting in correcting those knowledge gaps, and facilitating the higher levels of clinical reasoning that follow.

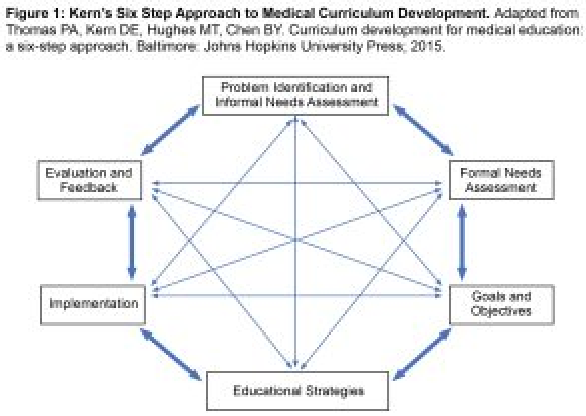


Figure 1: Kern’s Six Step Approach to Medical Curriculum Development. Click to enlarge

From this perspective, the clinical educators at three optometric clinics within the VA Illiana Healthcare System set out to ensure their students begin the clinical rotation prepared to maximize development of critical thinking as it relates to a single clinical skill – interpretation of retinal nerve fiber layer thickness (RNFLT) optical coherence tomography (OCT) – by utilizing Kern’s Six Step Approach for medical curriculum development.[7] Kern’s approach is presented in **Figure 1**. The three involved clinics are in different geographic areas within Central Illinois and host clinical learners from five different schools of optometry, each school with a different start date for clinical rotations and two of the three clinics hosting students from multiple schools simultaneously. Depending on the school, rotations lasted 3 to 4 months.

Step 1. Informal Needs Assessment

Some, but certainly not all, students send a letter of introduction to their assigned optometry clinic prior to a clinical rotation. Unfortunately, this is often the only information the preceptor receives regarding the learner’s educational progress, strengths and weaknesses.

Anecdotally, within these introductory letters, learners sometimes indicate OCT interpretation as a self-assessed target area of growth. There may be three reasons for this. First, the presence of OCT in optometry clinics in the US has become ubiquitous and OCT sales world-wide are increasing,[8] therefore there is a need for clinical trainees to have mastery of this technology. Secondly, critical analysis of OCT, particularly RNFLT OCT, requires a high degree of training and critical thinking to discriminate against a host of potential confounding factors.[9,10,11,12] Lastly, teaching experience in these clinics suggests that learners are unable to interpret these scans competently. Improvement in foundational understanding would be helpful, with the ultimate goal of overall skill mastery.

Critical analysis of OCT requires higher level taxonomic functions that are likewise reliant on lower levels of background knowledge, with mastery often depending on clinical experience. One aspect of the informal needs assessment included observation of and conversation with clinical learners. This led the authors to devise, by open conversation, a list of four concepts that could be considered foundational to the higher-level skills of critical OCT analysis. These four foundational concepts are represented in **Table 1**.

TABLE 1
Four concepts identified to be foundational to mastery of critical analysis of RNFLT OCT. RNFL=Retinal Nerve Fiber Layer. RNFLT=Retinal Nerve Fiber Layer Thickness. OCT=Optical Coherence Tomography.

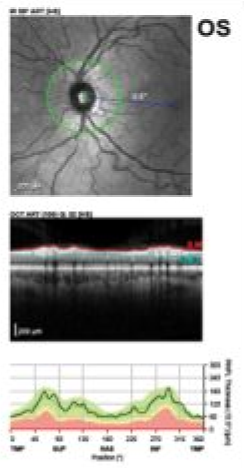
	Foundational Concepts Necessary for Critical RNFLT OCT analysis and how they relate to example OCT 1. Fundus Location of RNFL Scan: Do learners understand that the green circle in the top image is the location of the scan in the middle image? 2. Identification of Retinal Blood Vessels on the RNFL OCT Scan: Can learners identify blood vessels as landmarks in the middle image? 3. Positional Relationship Between RNFLT Graph and RNFL OCT Scan: Do learners understand that a location on the lower graph translates to a position directly vertical to that location on the middle image? 4. Identification of RNFL Layer on OCT: Can learners identify the boundaries of the RNFL on the middle image if not labeled?

Table 1: Four concepts identified to be foundational to mastery of critical analysis of RNFLT OCT. Click to enlarge

One concept that must be understood for much of this critical analysis is scan location. It was observed that clinical learners are apt to think the RNFLT scan is a scan of the nerve head itself rather than a circular, peripapillary scan. After all, the scan and resulting graph are presented in a linear fashion and so a circular RNFL scan is not as intuitive as a macular scan, for example. This discrepancy may be due to the clinical learner’s understanding that a macular scan is typically acquired as a line raster vs the RNFL scan which is acquired in a circular fashion. Therefore, this knowledge gap could be an unperceived need for clinical learners, as they may have never questioned if these scans are acquired differently.

Another foundational skill that can be challenging for clinical learners, but vital for critical analysis, is the identification of retinal blood vessels in the RNFLT scan. This is an important skill as vessel branching pattern may play a role in RNFLT[13,11,14] and many small artifacts will be found adjacent to blood vessels.[15,16,17,18]

Similar to being able to identify retinal blood vessels and adjacent artifacts, it is crucially important for clinical learners to correlate a potential artifact from the scan with the location on the corresponding graph. This skill was included in the list of necessary foundational concepts.

Lastly, the authors identified RNFL identification, or differentiation of RNFL from non-RNFL, as a foundational skill often underdeveloped in early clinical learners. This is important because segmentation errors are a significant source of artifact in RNFLT results and need to be examined critically.[18] This can only be done if the clinician can identify the RNFL without relying exclusively on automated segmentation.

Step 2. Formal Needs Assessment of Targeted Learners

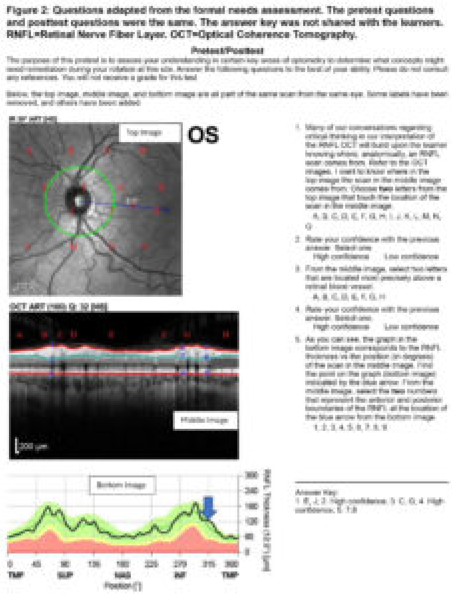


Figure 2. Questions adapted from the formal needs assessment. The pretest questions and posttest questions were the same. The answer key was not shared with the learners. RNFL=Retinal Nerve Fiber Layer. OCT=Optical Coherence Tomography. Click to enlarge

As part of the formal needs assessment prescribed by Kern et al.,[7] the authors developed a test to evaluate the clinical learners' understanding of these foundational concepts. This test has been adapted for publication and is presented in **Figure 2**. Early versions of the test were paper-based, but a computer-based version was subsequently developed and administered using standardized images. The earlier paper test presented questions as text and allowed respondents to circle labels and draw arrows to structures. This modality was abandoned in favor of the more standardized computer version which presented textual questions provided as multiple choice or multiple response multiple choice. To determine if current teaching strategies were effectively remediating these concepts, the test was given to a cohort of eight students as a post-test at the completion of rotation through the VA Illiana clinics. In this way, if a learner failed a question or indicated low confidence with a correct answer, it showed that not only did the learner likely enter with a knowledge gap, but that knowledge gap was not effectively remediated during the learner's rotation. If a learner correctly answered the question and noted high confidence with the answer, that student was identified as having passed that question. Participation was voluntary and students were made aware that the results would not impact their summative evaluation for the rotation. The results of this phase of the curriculum development are shown as rates of those learners who passed each question in **Figure 3** and show some knowledge gaps persisted throughout the rotation. These results prompted the development of a teaching strategy to target these knowledge gaps.

With the understanding that participation was voluntary and the results would not impact summative assessment for the rotation, the test was then administered as a pretest at the start of the rotation for subsequent cohorts totaling 14 clinical learners. As seen again in **Figure 3**, a lower percentage of learners passed each of the tested concepts than for the previous cohort who took the test at the end of the rotation. These results indicated two important findings: 1) students were starting with knowledge gaps in these foundational concepts, and 2) despite some knowledge gaps persisting for some students, completing a rotation through a VA Illiana optometric clinic was overall helpful in bridging these gaps.

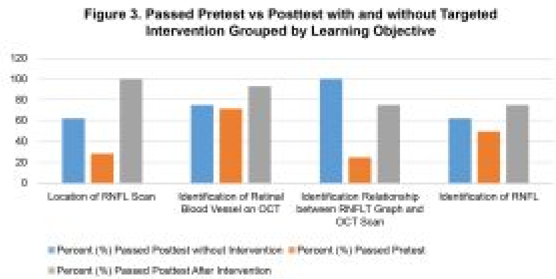


Figure 3: Passed Pretest vs Posttest with and without Targeted Intervention Grouped by Learning Objective. Click to enlarge

It is important to highlight that this test assessed foundational knowledge, the knowledge needed to gain the skills necessary to critically analyze the RNFLT OCT, rather than assessing the skill of critical analysis itself. Assessing critical-analysis skills was outside of the scope of this curriculum.

Step 3. Goals and Specific Measurable Objectives

TABLE 2

Learning objectives developed for the learning module on RNFLT foundational concepts. It should be noted that Objective 3 tests both the concept of positional relationship between RNFLT graph and RNFL OCT scan as well as identification of RNFL on the RNFL scan.

RNFL=Retinal Nerve Fiber Layer. OCT=Optical Coherence Tomography.

Learning Objectives: By the end of the learning module, the learner will be able to... 1. Identify the fundus location of the RNFL OCT scan. 2. Identify retinal blood vessels on the RNFL OCT scan. 3. Identify the boundaries of the RNFL at a locus corresponding to a given locus on the RNFLT graph.

Table 2 Learning objectives developed for the learning module on RNFLT foundational concepts. Click to enlarge

With the goals of shifting the learning curve and helping clinical learners conceptualize data presented in the RNFLT OCT report, learning objectives were developed. They were written in the SMART Goals format, being Specific, Measurable, Achievable, Relevant and Timebound.[19,20] These learning objectives, based on the targeted foundational concepts, are listed in **Table 2**.

Step 4. Educational Strategy

The formal needs assessment underscored the need for remediation at the start of a learner's clinical rotation. However, the authors found it unrealistic to personally remediate each student at the beginning of each rotation because each clinic has multiple students from different schools, and students from different schools have different rotation start dates yielding an unreasonable teaching workload in a busy clinic.

As a solution, an asynchronous e-learning module was chosen as the best educational strategy. The video portion of the module was created by the lead author, using Heidelberg Spectralis OCT images obtained through informed consent and processing those images through Procreate on iPad Pro. Animations were also added using Procreate and a second-generation Apple Pencil. Both testing and the learning module were delivered to participating learners using web-based teaching.

Both the pretest and the learning module have been edited for a wider audience and are available for review by readers. The pretest/post-test questions and answer key are shown in **Figure 2**, while the video portion of the learning module is presented as **Figure 4**.

https://journal.opted.org/wp-content/uploads/2025/11/FA25P260Figure4-1.mp4

Figure 4. Video portion of learning module. RNFLT=Retinal Nerve Fiber Layer Thickness. Click to play.

Step 5. Implementation

To minimize the impact of guessing correctly on multiple choice questions, success was defined by simultaneously answering a question correctly and also indicating high confidence with that answer (questions one and two). Students who failed any question of the pretest were invited within the orientation period of clinical rotation to participate in the e-learning module.

Step 6. Evaluation and Feedback

The learning module included knowledge checks on all targeted concepts. These knowledge checks included the same questions as before and acted as a post-test at completion of the learning module. Following module completion, all students successfully identified the fundus location of the RNFL scan. Improvement from pretest scores was seen for all other questions. **Figure 2** also shows these results compared to results of pretest and post-test without intervention.

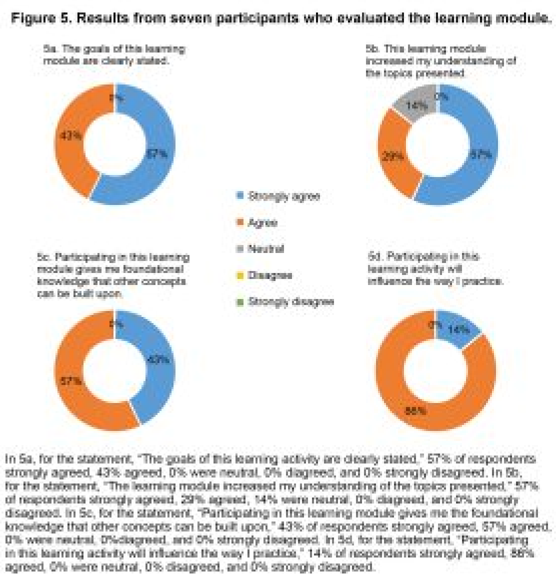


Figure 5: Results from seven participants who evaluated the learning module. Click to enlarge

Learners who took the pretest, completed the module, and took the post-test were also invited to share their perceptions of the learning module. Seven of eight students provided feedback, and the results of this feedback (**Figure 5**) were positive. These evaluations demonstrated that: the learning goals were clearly stated, there was strong agreement the module was helpful, the skills covered were those that other skills could be built on, and the targeted concepts are important to clinical practice.

Kern's Six Step Approach advocates for curriculum evaluation to promote continuous improvement. Despite the positive feedback from students, evaluation of test results shows a trend that will need to be addressed in future iterations of this module as it is clear the module targets two of the four concepts disproportionately. While the concepts of fundus location of the RNFL scan and blood vessel identification showed marked reductions in knowledge gaps following participation in the learning modules, gains made for the other two concepts – relationship between scan and graph as well as RNFL identification – were less robust. Because the pretest, learning module and post-test were all administered within the first 2 weeks of the rotation, no doubt, the failure rate would continue to drop by the end of the rotation. However, the goal here is to minimize knowledge gaps at the rotation's start, so revising this learning module further would be advisable.

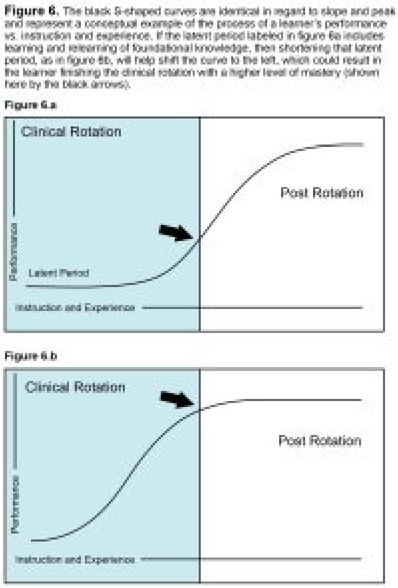
Discussion

Speculating on why knowledge gaps persist past the classroom phase of education is difficult. There are many possible reasons a student may move into clinic with deficiencies in background knowledge. One possible source of these knowledge gaps is prioritization. With so many different modes of practice awaiting the clinical optometric learner, including primary care, disease, contact lens, low vision, pediatrics and binocular vision, it would be difficult for any educational program or any learner to effectively prioritize the information that will be most needed for an individual clinical rotation from the vast breadth of topics taught. Other reasons may include individual learner inefficiency or a lack of review prior to rotation start, though further study would be warranted. It should also be considered that the learners evaluated here are part of the COVID generation of learners, so there is a possibility these students have knowledge gaps due to disruptions in education caused by the pandemic.

During a patient encounter, when a preceptor probes for prior knowledge and finds the student has a knowledge gap, the preceptor has three choices. The first is to teach only the prior knowledge. This means the higher-level concept that should have been taught must wait until the next time it is encountered in the clinic by that student and there is a chance it will not be. At a minimum, this tactic delays mastery. The second option is to reteach the concept and then teach the broader concept that is built on that knowledge, effectively teaching two concepts rather than one. This is not only time consuming, and often prohibitively so, but also serves to increase the intrinsic cognitive load of the concept at hand, reducing the chances it will be understood, retained or utilized.[21] Concepts taught in this manner may need to be retaught in the future. For this reason, it is widely recommended that clinical educators resist the urge to teach multiple concepts per patient encounter, instead focusing only on a general rule.[22,23] The third choice is for the preceptor to assume the role of facilitator rather than teacher and to assign the foundational concept as homework for the clinical learner to review on their own. However, assigned learning needs to be assessed to ensure the learning occurred, so this option requires the preceptor revisit the topic later with the learner. Should this occur in a clinic with multiple learners, it may only serve to postpone the discussion. The broader topic could then be taught, but at a time when it is less relevant to the learner as the patient encounter has passed. Again, with this choice, mastery is delayed. A more efficient solution than any of these might be for the clinical learner to eliminate the knowledge gap before ever seeing the patient.

Strengths

This pedagogical approach works for several reasons. Targeting these knowledge gaps is important as they hinder a learner's journey to mastery of critical analysis of RNFLT OCT results. Classically, this process of gaining mastery is distilled down to an S-shaped curve.[29,30] This idealized curve is presented in **Figure 6a**, with the early latent period representing little to no progress towards mastery, building to an upward slope representing gains in mastery, before plateauing as mastery is achieved.



Figures 6a & 6b. Click to enlarge

This is a conceptual simplification, but one that helps to illustrate a few simple points. To begin with, everything that happens before the plateau has the potential to negatively impact the patient as well as the preceptor. For the patient, the risk of medical error is higher, while the preceptor, whose responsibilities include patient safety and educating the student, will see decreased efficiency in both of those tasks. At a minimum, this results in increased chair time and with patient harm resulting in the worst case. Similarly, a clinical rotation is of a specified duration, and if it ends before mastery is achieved, then the consequences may be felt by the learner or by society at large, with the learner being less prepared to reach full professional potential while future patients bear the risk of being cared for by a provider who is less than maximally prepared. Lastly, as represented in **Figure 6b**, these scenarios can be mitigated by shortening the latent period and shifting the curve left.

Shifting the learning curve was a goal of this learning module. Rather than simply “teaching to the test” by providing the answers to the test questions, this e-learning module teaches concepts. It uses animations, which have been found in previous studies to be more engaging when teaching medical concepts.[24,25] Further, it otherwise complies with Mayer’s Multimedia Principles to reduce extraneous cognitive load and facilitate understanding.[26,27,28]

Limitations

One deficiency in this pedagogic approach is the formats used to test the learners were not consistent throughout. Testing and video delivery evolved over the span of curriculum development with the goal of maximizing automation. A consistently high level of automation would be needed if implemented in a larger test population.

Device type is also a limiting factor as some devices may not display graphics as clearly as others. However, as part of the curriculum assessment, students were invited to share open-response feedback regarding what could be done to make the module better, and the issues of image size or image quality were not identified as an improvement opportunity by any participating learner.

Additionally, the video portion of the module is a first draft and needs refining. The current iteration is geared heavily toward users of the Heidelberg Spectralis OCT, which is employed in all three teaching clinics. As proof of concept, however, this module succeeds in teaching the targeted topics and is functional enough even for interested outside users and clinics using OCT platforms other than Heidelberg.

Some of the pretest questions employed here are, unfortunately, necessarily complex. Earlier versions involved the learner drawing arrows and circling structures, but this approach was abandoned due to possible ambiguity in responses. Multi-select multiple choice questions were ultimately designed as they enabled less variability of answers. The concepts covered here are conceptually complex, which resulted in multiple choice prompts that were more difficult to understand.

It has been noted that decreasing extraneous cognitive demand improves understanding of the questions and concepts. Expecting students to complete this learning while balancing a heavy patient load is impractical and experience shows this can lead to poor comprehension of the questions and the learning module. If given after the learner begins seeing patients in the clinic, protected time should be given to complete the task, or it should be assigned to do after clinic hours. Even so, it should be expected that there will still be students who require face to face remediation, though the goal is to minimize this need.

This learning module is designed for learners beginning a rotation in a clinic with a high proportion of ocular disease as opposed to a contact lens clinic or a pediatric/binocular vision clinic. The participating VA clinics are heavy in ocular disease. However, only VA clinics were involved and other clinic modalities, such as private practice clinics or other government administered clinics, may have different outcomes if implementing such a learning strategy. Similarly, learner outcomes could be impacted by the students' rotation experiences preceding the clinical rotation that utilizes this strategy. It is not clear if all students in all clinics would have the same benefit from this educational strategy.

There are some unanswered questions. First, does starting a rotation with a better grasp on foundational concepts translate into more efficient mastery of the critical thinking that builds on foundational knowledge? This is presumed to be the case, but this question was not directly addressed in any of the steps of curriculum development here. Second, would the lessons learned in this scenario benefit clinical optometry trainees at large? The authors see evidence for this, but more reporting may be needed. And third, are there other common gaps in foundational knowledge holding learners back in their progress towards critical thinking as applied to other concepts and disorders? Here again, the authors believe the answer is yes, but there is certainly room for further study.

In summary, the authors and students have found this asynchronous e-learning module useful in remediating the four targeted concepts, setting the stage for more efficient mastery of critical RNFLT OCT analysis. This pedagogical method shows promise and warrants exploration of a community-based solution. Utilizing existing online teaching platforms and building a broader curriculum to help remediate common knowledge gaps, this solution could help clinical learners throughout the world gain mastery more efficiently. This would help not only the learners but would also improve the experience of both current and future patients. It might also decrease some of the educational burden contributing to preceptor burn-out.

Acknowledgments

This project was supported in part by the Veterans Health Administration's (VHA's) Rural Interprofessional Faculty Development Initiative and will be transitioning to the VHA's Innovation Network, or iNet, program as a Spark Idea project aimed at exploring the use of a web-based application to improve mastery by filling foundational knowledge gaps for clinical learners.

The authors offer a special thank you to Jane Lakayil, OD, FAAO; Aimee Beluch OD, FAAO; and all optometry providers at VA Illiana for assisting with curriculum implementation at their respective clinics.

Disclaimer

The authors have no financial interest in Edpuzzle.com. The service is free on a limited basis and does not generate advertising revenue. The authors have no interest in Heidelberg Engineering or any of their products. The views expressed in this discourse do not necessarily represent the views of the VA or the United States.

References

1. Vitek MA, Wingert TA. Results and Action Plans from an Optometric Education Global Summit. Optometric Educ. 2022 Fall; 48(1):50-59.
2. Richards JB, Hayes MM, Schwartzstein RM. Teaching Clinical Reasoning and Critical Thinking: From Cognitive Theory to Practical Application. Chest. 2020 Oct;158(4):1617-1628. DOI: 10.1016/j.chest.2020.05.525
3. Defining Critical Thinking [Internet]. Santa Barbara, CA: The Foundation for Critical Thinking; c2019 [cited 2024 January 23]. Available from: https://www.criticalthinking.org/pages/defining-critical-thinking/766
4. Bloom BS. Taxonomy of educational objectives: the classification of educational goals. New York, NY: Longmans, Green; 1956.
5. Adams NE. Bloom's taxonomy of cognitive learning objectives. J Med Libr Assoc. 2015 Jul;103(3):152-3. DOI: 10.3163/1536-5050.103.3.010
6. Young JQ, Van Merrienboer J, Durning S, Ten Cate O. Cognitive Load Theory: implications for medical education: AMEE Guide No. 86. Med Teach. 2014 May;36(5):371-84. DOI: 10.3109/0142159X.2014.889290
7. Thomas PA, Kern DE, Hughes MT, Chen BY. Curriculum development for medical education: a six step approach. 3rd ed. Baltimore: Johns Hopkins University Press; 2015.
8. Grand View Research. Optical coherence tomography market size, share & trends analysis report by technology (time domain OCT, frequency domain OCT), by application (ophthalmology, oncology), by type, by region, and segment forecasts, 2023 – 2030 [Internet]. San Francisco, CA: Grand View Research; c2025 [cited 2024 Jan 22]. Available from: https://www.grandviewresearch.com/industry-analysis/optical-coherence-tomography-oct-market
9. Chong GT, Lee RK. Glaucoma versus red disease: imaging and glaucoma diagnosis. Curr Opin Ophthalmol. 2012 Mar;23(2):79-88. DOI:10.1097/ICU.0b013e32834ff431
10. Sayed MS, Margolis M, Lee RK. Green disease in optical coherence tomography diagnosis of glaucoma. Curr Opin Ophthalmol. 2017 Mar;28(2):139-53. DOI:10.1097/ICU.0000000000000353
11. Hood DC, Salant JA, Arthur SN, Ritch R, Liebmann JM. The location of the inferior and superior temporal blood vessels and interindividual variability of the retinal nerve fiber layer thickness. J Glaucoma. 2010 Mar;19(3):158-66. DOI:10.1097/IJG.0b013e3181af31ec
12. Moore DB, Jaffe GJ, Asrani S. Retinal nerve fiber layer thickness measurements: uveitis, a major confounding factor. Ophthalmology. 2015 Mar;122(3):511-7. DOI:10.1016/j.ophtha.2014.09.008
13. Resch H, Pereira I, Weber S, Holzer S, Fischer G, Vass C. Retinal blood vessel distribution correlates with the peripapillary retinal nerve fiber layer thickness profile as measured with GDx VCC and ECC. J Glaucoma. 2015 Jun-Jul;24(5):389-95. DOI:10.1097/IJG.0000000000000237
14. Hood DC, Fortune B, Arthur SN, et al. Blood vessel contributions to retinal nerve fiber layer thickness profiles measured with optical coherence tomography. J Glaucoma. 2008 Oct-Nov;17(7):519-28. DOI:10.1097/IJG.0b013e3181629a02
15. Spaide RF, Fujimoto JG, Waheed NK. Image artifacts in optical coherence tomography

angiography. Retina. 2015 Nov;35(11):2163-80. DOI:10.1097/IAE.0000000000000765
16. Ferrara D. Image artifacts in optical coherence tomography angiography. Clin Exp Ophthalmol. 2016 Jul;44(5):367-8. DOI:10.1111/ceo.12781
17. Li Y, Tang J. Blood vessel tail artifacts suppression in optical coherence tomography angiography. Neurophotonics. 2022 Apr;9(2):021906. DOI:10.1117/1.NPh.9.2.021906
18. Mansberger SL, Menda SA, Fortune BA, Gardiner SK, Demirel S. Automated segmentation errors when using optical coherence tomography to measure retinal nerve fiber layer thickness in glaucoma. Am J Ophthalmol. 2017 Feb;174:1-8. DOI:10.1016/j.ajo.2016.10.020
19. US Department of Health and Human Services, Centers for Disease Control and Prevention. Writing smart objectives [Internet]. Atlanta (GA): Centers for Disease Control and Prevention; 2018 Nov 21 [cited 2024 Jan 22]. Available from: https://www.cdc.gov/healthyyouth/evaluation/pdf/brief3b.pdf
20. Chatterjee D, Corral J. How to write well-defined learning objectives. J Educ Perioper Med. 2017 Oct 1;19(4):E610.
21. Young JQ, Van Merrienboer J, Durning S, Ten Cate O. Cognitive load theory: implications for medical education: AMEE Guide No. 86. Med Teach. 2014 May;36(5):371-84. DOI:10.3109/0142159X.2014.889290
22. Gatewood E, De Gagne JC. The one-minute preceptor model: a systematic review. J Am Assoc Nurse Pract. 2019 Jan;31(1):46-57. DOI:10.1097/JXX.0000000000000099
23. Neher JO, Gordon KC, Meyer B, Stevens N. A five-step “microskills” model of clinical teaching. J Am Board Fam Pract. 1992 Jul-Aug;5(4):419-24.
24. Day J, Devers CJ, Wu E, Devers EE, Gomez E. Development of educational media for medical trainees studying MRI physics: effect of media format on learning and engagement. J Am Coll Radiol. 2022 Jun;19(6):711-21. DOI:10.1016/j.jacr.2022.03.009
25. Krishnan N, Brannan E, Hafler J, Brennan-Wydra E, Encandela J. Assessment of a hemodialysis e-curriculum in postgraduate nephrology education: a pilot mixed methods study. Clin Nephrol. 2022 Nov;98(5):247-55. DOI:10.5414/CN110778
26. Mayer RE, Moreno R. Nine ways to reduce cognitive load in multimedia learning. Educ Psychol. 2003;38(1):43-52. DOI:10.1207/S15326985EP3801_6
27. Gooding HC, Mann K, Armstrong E. Twelve tips for applying the science of learning to health professions education. Med Teach. 2017 Jan;39(1):26-31. DOI:10.1080/0142159X.2016.1231913
28. Young JQ, Van Merrienboer J, Durning S, Ten Cate O. Cognitive load theory: implications for medical education: AMEE Guide No. 86. Med Teach. 2014 May;36(5):371-84. DOI:10.3109/0142159X.2014.889290
29. Villani V, Bohnen JD, Torabi R, Sabbatino F, Chang DC, Ferrone CR. “Idealized” vs “true” learning curves: the case of laparoscopic liver resection. HPB (Oxford). 2016 Jun;18(6):504-9. DOI:10.1016/j.hpb.2016.03.610
30. Siddaiah-Subramanya M, Smith S, Lonie J. Mastery learning: how is it helpful? An analytical review. Adv Med Educ Pract. 2017 Apr 5;8:269-75. DOI:10.2147/AMEP.S131638

Jonathan Bradley, OD, FAAO, graduated from Indiana University School of Optometry and completed a pediatrics and binocular vision residency at Indiana University and a hospital-based primary care residency at VA Illiana Health Care System. He is the optometry student externship coordinator for the Bob Michel VA Outpatient Clinic in Peoria, IL.

Jessica Johnson, OD, FAAO, graduated from Indiana University School of Optometry and completed an ocular disease and low vision residency at Jesse Brown VAMC in Chicago. She is the Chief of Optometry at VA Illiana Health Care System in Peoria, IL.

Guadalupe Mejia, OD, FAAO, graduated from Indiana University School of Optometry and completed a residency in low vision and traumatic brain injury rehabilitation and primary care optometry at the

Northport VA in Northport, New York. She serves as the Assistant Director of the William S. Middleton Memorial Veterans Hospital and Clinics in Wisconsin and Illinois.

Lara Pedretti Staley, OD, graduated from the Illinois College of Optometry and completed 4 years Active Duty as an Army Optometrist. Currently she is an Optometrist at the VA Illiana Health Care System in Peoria, IL.

PEER REVIEWED

Bridging the Divide: Strategies to Improve Equitable Access to Quality Eyecare Services Globally Through Collaborative Optometric Education

Parres Wright, OD, FAAO, Diane van Staden, PhD, MPA, BOptom *| Optometric Education: Volume 51 Number 1 (Fall 2025)*

Abstract

There is an urgent public health mandate facing the profession of optometry. The 2030 In Sight call to action demands that vision be recognized as fundamental economic, social and developmental issue, and as part of this, proposes leveraging educational settings in the strategy to end avoidable sight loss. Despite advancements in optometric education and services globally, inequities in access to quality eye care persist both within and between countries. Variable training standards and scopes of practice across the world also contribute to disparities in access to quality care; further exacerbated by inequitable access to advanced technologies that promote early diagnosis and treatment and mostly affects institutions in low- and middle-income countries. Collaborative education models between countries presents a possible solution to addressing these variable resource and training standards, as well as promoting shared learning. This paper argues that exploring collaborative teaching and learning opportunities between institutions in contextually differently regions of the world could help support global goals in respect of achieving equitable access to high-quality eye care and reducing the unnecessary causes of vision impairment or loss.

Keywords

eye care access, optometric education, scope of practice, teleoptometry

Background

Globally, uncorrected refractive error, which is primarily the responsibility of the optometry profession, is a significant unmet health need and a major cause of avoidable vision impairment.[1] Despite an increase in optometric education and services in both the developed and the developing world over the past decade, avoidable vision impairment remains a public health challenge.[1] There has been long-standing inequitable distribution of the burden of unaddressed eyecare needs, with low- and middle-income countries (LMICs) typically having higher rates of blindness and vision impairment.[2] Among the main challenges limiting the coverage and quality of eyecare services, particularly in developing countries, are the availability of trained human resources and access to appropriate equipment and technologies.[3]

Optometrists are considered primary eyecare providers responsible for diagnosing, managing and treating diseases and disorders of the eye and visual system. However, scope of practice variations from country to country or state to state, result in disparities in the level of care optometrists can provide[4] both within and between countries. Even more concerning is that in some countries in the developing world, there are no established optometry schools, meaning that there isn’t a steady supply of qualified optometry personnel entering the health workforce to address these unmet eyecare needs, even where optometrists are available, essential ophthalmic equipment and consumables to manage ocular conditions are frequently unavailable or not in good working condition particularly in the public health sector of some low- and middle-income settings.[5]

While the last decade has seen the establishment of new optometry training programs in low- and middle-income countries,[6] training standards may not be immediately regulated due to delays or bureaucracies in establishing new regulatory authorities for the profession of optometry.[7] In this paper, the authors argue that there is a collective obligation facing the optometric community; specifically optometrists and optometry training institutions, to address the needs and challenges facing the profession in terms of addressing the unmet eye health needs of populations.

Opportunity exists for training institutions in better-resourced settings to collaboratively support this broader developmental agenda in partnership with institutions in developing countries as well as other supports. Collective accountability will promote shared learning as well as elevate the role of all optometric institutions beyond their primary training mandate, to that of an active participant in the global fight against avoidable vision impairment and social responsibility to reduce the disparities in access to quality optometric care.

Discussion

Disparities in Optometric Education and Scope of Practice

Optometric training varies in terms of curriculum content, duration and certification requirements both within and between countries around the world. In the United States (US), the optometric scope of practice varies between states as well and has advanced to the point where, in some states optometrists can now perform certain surgical and laser procedures. However, in most parts of the developing world where unmet eyecare needs are high, the scope of practice for optometrists is limited to diagnostic level or in some cases, just refraction. This, coupled with the additional challenge of a limited number of ophthalmologists to provide secondary and tertiary care, compounds the challenge of unmet needs; limiting opportunities for early diagnosis and treatment which reduces the risk of avoidable vision impairment. Similarly, eyecare centers and training institutions in developed countries are generally better equipped and often have access to state-of-the-art technologies, unlike the reality for most institutions in low- and middle-income countries. These contextual disparities may inadvertently be contributing to widening the gap in terms of access to quality optometric care for people everywhere – regardless of nationality and socio-economic status.

The World Council of Optometry (WCO) describes optometry as “a healthcare profession that is autonomous, educated and regulated (licensed/registered), and optometrists are the primary healthcare practitioners of the eye and visual system who provide comprehensive eye and vision care, which includes refraction and dispensing, detection/diagnosis and management of disease in the eye, and the rehabilitation of conditions of the visual system”.[8] In 2024 the WCO revised its previous Competency Framework for Optometry which categorized optometry into four levels of service starting at Category 1, Optical Technology, up to Category 4, Ocular Therapeutics, with Visual Function and Diagnostic services representing Categories 2 and 3 respectively.[9,10,11] The WCO now presents five competency domains reflecting the expected minimum competencies of optometric education programs globally, so optometrists can make a greater contribution towards meeting future demands of eye care. One of these domains includes public health.[16]

The former WCO categories were used to assess the global optometric workforce in the Global Mapping of Optometry Workforce study. The survey compiled responses from 123 of 152 countries with only 66 of 123 countries meeting the recommended 1:50,000 optometrists-population ratio.[11] According to the study, there was a positive relationship between the prevalence of significant vision impairment and optometrist-population ratios. Unsurprisingly, countries with low Gross Domestic Product (GDP) had higher optometrist-patient ratios and greater deficits of optometrists.

Though there are varying levels of practice and scope of practice between countries, globally, one optometrist serves an average of 20,479 people.[11] However, in Central Sub-Saharan Africa, a single optometrist serves 1,198,141, while in Western Europe the ratio is 1:3,877. This highlights the imbalance disadvantaged developing countries face in terms of addressing unmet eyecare needs, improving access and providing quality care. Of the 21 Global Burden of Disease (GBD) regions (**Figure 1**), three did not have any institution within its countries to train optometrists.[11] Regions most affected were Central Asia, Central Sub-Saharan Africa and Oceania.[11] Approximately half of the countries surveyed regulate optometry as a profession. Furthermore, optometry was a recognized profession in all high-income regions, with 34% of countries imposing mandatory continuing professional education to maintain clinical competency and enforce up-to-date practices.[10]

Since public health now has a stronger global focus in optometry,[16] this should be reflected in the curricula and training models of optometry programs everywhere, if 2030 global targets are to be met.

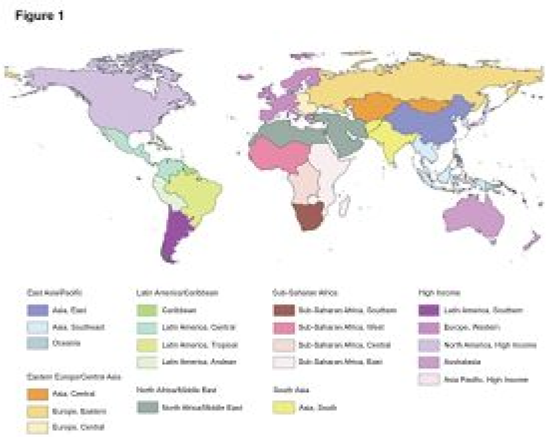


Figure 1:Figure 1 Map of the 21 GBD regions. Source: https://www.researchgate.net/figure/Map-of-the-21-GBD-regions-GBD-Global-Burden-of-Disease-Risk-Factors-and-Injuries_fig1_233955589. Click to enlarge

The rise in demand for eyecare services

Population aging, along with a greater awareness of rehabilitation options for people with severe vision impairment, is resulting in a rise in the demand for vision care services in general, and low vision services in particular. All members of the "Baby Boomer" generation, which includes those born in 1946-1964 will reach age 65 years and older by 2029, bringing the US population over 75 to 12%.[13] This growth in the aging population in the US mirrors the ever-growing, aging populations globally. By 2030, one in six people in the world will be aged 60 years or over and will total approximately 1.4 billion people.[14] Putting this in perspective, the over 60 population of the world will double by 2050 and those over age 80 is expected to triple between 2020 and 2050, reaching 426 million.[14] This trend started in high-income countries, like Japan, whose over 60 population has already reached 30%.[14] Currently, low- and middle-income countries are experiencing the greatest change regarding population aging.[14]

With the aging of populations, the numbers of those with vision loss are expected to increase. In 2019 it was reported that a minimum of 2.2 billion individuals worldwide have some form of visual impairment.[5,15]

It is projected that by 2050, 6.95 million people in the US will have vision impairment and 2.09 million people will have blindness.[13] In addition to aging leading to increased numbers of those with vision loss, studies have also shown that visual impairment is also expected to rise among working-aged adults worldwide. “In 2019, the highest number of visual impairment associated disability-adjusted life years (DALYs) among working-age individuals was documented in South Asia, whereas the lowest was documented in Oceania.”[15] Vision impairment negatively impacts employment opportunities and as such, the increasing trend of vision loss in working-aged adults is poised to be a global public health concern.[15] Optometrists worldwide must therefore be properly, trained, educated and equipped to address these growing needs preventing and treating vision loss and blindness.

Opportunities for shared learning through teleoptometric education

Given the disparities between how optometrists are training globally, and the potential impacts of this on widening the gap in terms of equitable access to quality care, finding innovative ways to bridge training and development gaps between the different regions of the world, may prove mutually beneficial for training institutions.

Studies have highlighted the lack of access to equipment and technologies as a barrier to delivering quality eye care in LMICs.[12] The reality is that, given the economic and structural problems facing developing nations, resource acquisition for eye care must compete with other more pressing health system demands and may therefore not be a priority. For many of these countries, there is no short-term fix to address resourcing gaps.

Within this digital age, our world is essentially borderless; meaning that the lack of skilled human resources, as well as access to routine equipment or diagnostic technologies affecting certain countries need not be a limitation in terms of providing quality primary eyecare services in any setting. Innovative strategies such as remote, real-time consultations and the use of diagnostic software applications which are increasingly being utilized to serve remote communities, can also be employed to support training in various parts of the world where resourcing is a challenge.

Remote optometry is emerging as a viable tool to address unmet resource and skills needs by using telemedicine, making access to more specialized services accessible for people in outlying areas, even in developing countries. Teleoptometry, and by extension teleoptometric education, allows for increased access to care in remote areas worldwide and increased timeliness of care. It also supports the training needs of optometry students in developing countries to help them be better prepared for the future of eye care and rapidly advancing technologies. However, this need not be a one-sided benefit as underresourced institutions may also have rich lessons to share on creative approaches to instruction when standard resources are not available, particularly when students are engaging in service learning outside of the academic center. These innovative models of teaching and learning as well as unique clinical cases can be a shared learning opportunity.

The post-COVID world removed geographical barriers to shared learning and resistance to virtual and remote clinical care and training models. Where institutions in the developed world may lack specific expertise available at institutions in the developing world, various lectures or clinical training can also be facilitated virtually. Much like learning online has become more commonplace even within the health professions, institutional collaboration and shared learning using digital technologies at higher education level is a very real possibility and should rightly be explored particularly in the context of growing needs and limited resources. Opportunity exists to bridge the access divide in the areas of training and diagnostic services in underresourced countries, while also creating diversified teaching opportunities and rich experiential learning opportunities, including international exchanges, for students in high income countries.

Where health partnerships exist, support from established partners for improved regulations and quality standards can help strengthen institutions still in a developmental stage, though both partners stand to benefit from shared knowledge, clinical cases, etc.

Graduates who make a difference

To build a workforce of optometrists trained to keep up with the burgeoning demand for eye care requires focusing on recruitment of diverse candidates and constructing robust, innovative training programs and curricula. To address some of the global challenges in providing high-quality eye care, insufficient numbers of optometrists, and discrepancies in levels of training the WHO developed the Eye Care Competency Framework (ECCF).[9] This framework utilized a wide range of eyecare professionals from both high- and low-income countries. The aim was "to facilitate eyecare workforce planning and development by providing a comprehensive set of competencies and activities that encompass the diverse roles represented by eyecare workers."[9] This competency framework is a tool to "strengthen the alignment of the workforce with the population's needs."[9] The value of such a framework would be greatest when designed to be applied to any context, particularly to low- and middle-income countries, where tools for workforce development are limited.[9] Learnings from both contexts would be invaluable in shaping the future of training and scope of practices in various regions of the world; with such guidance critical in educating and constructing the next generation of eyecare professionals.

Rise in new optometry schools

The world is favorably responding to global calls for increased access to eyecare services, with many new optometry schools in the US and Africa being opened to address the availability of skilled personnel to meet the growing eye health needs. Just 15 years ago, only one in four countries in Sub-Saharan Africa had optometry training programs. Since then, new optometry schools have opened across the African continent. With the development of new optometry programs across the US, the opportunity to do teaching and learning differently should be explored, and to include not only a global public health and developmental mandate within the ethos of training programs, but to further explore partnerships and collaboration opportunities which strengthen training via hybrid in-person and remote learning within a global optometry perspective, regardless of country of training.

Conclusion

The disparities in terms of optometric care standards across the world have been well documented. The authors believe that there is an opportunity for the optometry community globally, specifically optometry training institutions, to collaborate on improving access to better quality care through innovative training models and the use of technology. Technology has expanded the realm of what is possible via teleoptometry. Where resource gaps exist, the proposed use of a teleoptometry model to strengthen a collaborative public health approach to training could potentially lead to a more highly trained, better-equipped optometric workforce for all students through shared virtual learning.

By rethinking what we teach, and how we teach in terms of addressing the needs and challenges facing the profession, we can potentially create rich opportunities for mutual learning, share contextual lessons in advancing the access and quality of care, and ultimately move closer to the ideal of a single global standard for optometry education and scope of practice. Finally, the development, use and sharing of creative options to collectively address the profession's public health mandate improves equity in access to care globally, as well as egalitarianism to high-quality eye care.

References

1. Blindness and vision impairment [Internet]. Geneva, Switzerland: World Health Organization; c2023 [cited 2024 Jan 22]. Available from: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment
2. Forrest SL, Mercado CL, Engmann CM, et al. Does the current global health agenda lack vision? Glob Health Sci Pract. 2023 Feb 28;11(1):e2200091. DOI: 1-.9745/GHSP-D-22-00091
3. Graham R. Facing the crisis in human resources for eye health in sub-Saharan Africa. Community Eye Health. 2017;30(100):85–7.
4. Ezinne NE, Kwarteng MA, Tagoh S, Ekemiri KK, Ogbonna G. Scope of optometry practice in Trinidad and Tobago: a cross-sectional study. Health Sci Rep. 2023 Oct 31;6(11):e1667. DOI: 10.1002/hsr2.1667
5. World report on vision [Internet]. Geneva, Switzerland: World Health Organization; c2019 [cited 2024 Jan 22]. Available from: https://www.who.int/publications/i/item/9789241516570.
6. Abu SL. History and current status of optometric education in Africa. Hindsight: J Optom Hist. 2020 Sep 28;51(4):84–92. DOI: 10.14434/hindsight.v51i4.31557
7. Moodley VR. Towards a culture of quality assurance in optometric education in sub-Saharan Africa. Afr Vision Eye Health. 2019 Mar 6;78(1). DOI: 10.4102/aveh.v78i1.462
8. WCO's concept of optometry [Internet]. St. Louis, MO: World Council of Optometry; [cited 2023 Oct 7]. Available from: https://worldcouncilofoptometry.info/concept-of-optometry/.
9. Yu M, Keel S, Mariotti S, Mills JA, Müller A. Development of the WHO eye care competency framework. Hum Resour Health. 2023 Jun 19;21(1):46. DOI: 10.1186/s12960-023-00834-4
10. Kiely PM. A global competency-based model of scope of practice in optometry [Internet]. South Melbourne, Australia: Optometry Australia; [cited 2024 Jan 22]. Available from: https://worldcouncilofoptometry.info/wp-content/uploads/2017/03/wco_global_competency_model_2015.pdf
11. Naidoo KS, Govender-Poonsamy P, Morjaria P, Block S, Chan VF, Yong AC, Bilotto L. Global mapping of optometry workforce. Afr Vision Eye Health. 2023;82(1):a850. DOI:10.4102/AVEH.V82I1.850.
12. Sengo DB, Salamo ZMA, dos Santos II d'Alva B, et al. Assessment of the distribution of human and material resources for eye health in the public sector in Nampula, Mozambique. Hum Resour Health. 2023 Mar 31;21(1):27. DOI: 10.1186/s12960-023-00812-w
13. Varma R, Vajaranant TS, Burkemper B, et al. Visual impairment and blindness in adults in the United States: demographic and geographic variations from 2015-2050. JAMA Ophthalmol. 2016 Jul 1;134(7):802–9. DOI: 10.1001/jamaopthalmol.2016.1284
14. Steverson M. Ageing and health [Internet]. Geneva, Switzerland: World Health Organization 2022; [cited 2023 Oct 6]. Available from: https://www.who.int/news-room/fact-sheets/detail/ageing-and-health
15. Chen J, Yang C, Zheng W, et al. Global, regional, and national epidemiology of visual impairment in working-age individuals, 1990–2019. JAMA Ophthalmol. 2024 Jan 1;142(1):25–32. DOI:10.1001/jamaophthalmol.2023.5617
16. 16. WCO Competency Framework for Optometry [Internet]. Saint Louis, MO: World Council of Optometry; c2024 [cited 2024 Nov 30]. Available from: https://worldcouncilofoptometry.info/wp-content/uploads/2024/02/WCO_Competency-Framework-for-Optometry.pdf

Parres Wright, OD, FAAO, is an Associate Professor at Midwestern University-Chicago College of Optometry (CCO). She completed residency training in Geriatric Optometry and Low Vision Rehabilitation. She currently teaches clinically and didactically at CCO. She is passionate about increasing access to eye care and eye health education in under-served populations.

Diane van Staden, PhD, MPA, BOptom, is an Honorary Associate Professor at the University of KwaZulu-Natal in South Africa where she taught optometry for 12 years. She has a scholarly interest in health equity and transformative teaching and learning and is also an Adjunct Professor at the University of British Columbia Okanagan in Canada.

PEER REVIEWED

Perceptions and Attitudes of Optometry Students Towards the Use of Artificial Intelligence in Education and Practice

Guilherme F. C. Albieri, PhD | Optometric Education: Volume 51 Number 1 (Fall 2025)

Abstract

This study examined the usage, purpose and attitudes of optometry students toward generative Artificial Intelligence (GAI) and explored their perceptions of AI in general (including both generative and predictive AI) in optometric practice, patient care and education. Over half of the respondents reported not using GAI, and most used it rarely or occasionally. Common uses included answering questions, clarifying complex topics, writing papers and emails, and providing mental health support. While satisfaction with GAI was above average, perceptions of its impact, efficiency, and accuracy were neutral. Students acknowledge AI's potential in the industry and are open to using it in their future practices; however, reluctance persisted, particularly among those who had not yet adopted GAI tools.

Keywords

AI in education, AI in optometric practice, artificial Intelligence, student attitudes toward AI

Introduction

The public release of Artificial Intelligence (AI)-powered tools in 2022, particularly ChatGPT and other Large Language Models (LLMs), captured global attention. For many, the accessibility to these powerful AI systems—which mimic key human cognitive processes such as learning, reasoning, pattern recognition, problem-solving, perception and generating human-like text from prompts—evoked mixed feelings.[1,2,3,4] There was excitement about the accessibility, vast potential and low cost to consumers (e.g., LLM-based tools such as ChatGPT), and apprehension regarding their potential to transform various sectors.[2,5]

Since these initial public releases, numerous AI tools based on machine learning—particularly deep learning models that enable both generative and predictive AI—have entered the marketplace. Adoption of AI tools in health care and healthcare education has been equally significant, marked by an increasing number of students and clinicians integrating AI into their practices, and a surge in companies offering targeted AI-driven solutions.[6,7,8]

Generative Artificial Intelligence (GAI)—a type of AI that creates new content such as text and images based on large datasets—holds immense promise for transforming learning experiences, enhancing healthcare communications and documentation, and supporting patient care and practice efficiency.[9,10] GAI's applications span various domains. In education, it supports teaching by, for example, generating practice tests and learning by enhancing study strategies, such as summarizing complex materials, and enabling virtual clinical training simulations. In clinical settings, it can assist with analyzing patient symptoms and guiding further testing, chart summaries, educating patients, translations and streamlining healthcare processes (e.g, billing codes, customer service).[7,8,11,12]

Predictive AI—a type of AI that uses deep learning to identify patterns, anticipate behaviors and forecast future events—has shown promise in diagnosing refractive error, predicting the risks of myopia progression and extracting clinical insights and risk markers from medical images that were previously considered undetectable, to name a few.[13,14]

AI has the potential to augment, rather than replace, the capabilities of students and healthcare providers by leveraging collective knowledge to improve patient care.[4,15] However, while there is excitement, there are also concerns, including ethical and legal challenges, the risk of generating incorrect information, over-reliance on AI leading to decline in cognitive processes and the lack of preparedness of students and professionals to effectively use AI systems.[1,8,16,17]

To fully realize the benefits of AI, future healthcare providers should become conversant with the technologies that will shape future practice.[11,18,19] With the increasing integration of technology in education, particularly the emergence of AI tools, it becomes important to explore their role and impact in academic and professional settings.[19] Given the ubiquity and high adoption rate of these tools, understanding students' perception, attitudes and usage patterns of these tools is crucial for administrators and educators.[11]

To date, these attitudes have not been systematically examined in optometric education. This study aims to address this gap by examining optometry students' usage pattern, purpose of usage and attitudes of optometry students towards GAI, including their satisfaction, perceived impact and confidence in GAI-generated answers. Additionally, this study explores how students perceive the applicability of AI in general (predictive and generative) in their education.

Throughout this paper, GAI refers specifically to AI systems used by students in their studies, while "AI" is used as a general umbrella term that encompasses both generative and predictive AI applications.

Methods

All matriculated students at the State University of New York (SUNY) College of Optometry, including students in the professional optometry program (OD) and graduate students enrolled in the vision science program were invited to participate in this IRB approved study. Participation was voluntary and anonymous.

Students were sent an online survey administered through the platform SurveyMonkey. All participants were provided with an informed consent form outlining the study's purpose, procedures, anonymity, risks and benefits.

Participants responded to a series of five-point Likert-scale questions, ranging from Strongly Disagree (1) to Strongly Agree (5), assessing their perceptions, familiarity and attitudes toward AI in their professional and academic environments. Participants responded to a confidence rating question assessing their trust in AI-generated information for learning and clarifying concepts. The question utilized a five-point Likert scale, ranging from "Extremely Confident" to "Not at all Confident." Participants answered two yes/no questions, indicating whether they currently use AI in their studies and whether they conduct research at the college. Participants responded multiple-response ("Select all that apply") questions to assess for what specific tasks or purposes they used generative AI related to their optometric studies and how they have used generative AI in optometry school (i.e., Proofreading professional emails and letters, Composing professional emails and letters, etc.).

Participants also responded to open-ended questions designed to explore perceived benefits of GAI for optometry students, how creatively they used GAI in their studies, disadvantages or challenges of using

GAI and an opportunity to express additional thoughts about their excitement or fright over this emerging technology. Responses to the open-ended questions were using a content analysis approach. Thematic categories were developed after an initial scan of the data. Themes were also generated by ChatGPT and compared to those identified by the author. Minor changes to the original themes were made based on the results of the ChatGPT analysis. Two independent coders, who had no role in survey design, reviewed all responses and assigned them to the final thematic categories. To ensure consistency, the coders first practiced on a set of five responses. Once calibrated, they independently coded the full dataset. Agreement on the primary category was 78%. Any differences were discussed and resolved through consensus.

Students who reported not using GAI were removed from the analysis of attitudes toward satisfaction, impact of AI on studies and learning, purpose for using AI and confidence in answers.

Data analysis was conducted using SPSS. Descriptive statistics were used to provide a clear summary of findings. Differences in mean responses between student groups (e.g., class year, gender) were evaluated using t-tests or Analysis of Variance (ANOVA) techniques. Categorical variables were analyzed using the chi-square test to assess associations between groups.

Results

Demographics

The study included respondents from all class years of the professional program, one PhD student, and one resident, totaling 143 participants or 35% of the student body. The distribution of students in the professional OD program was as follows: 17.48% (n = 25) were members of the Class of 2024, 17.48% (n = 25) from the Class of 2025, 16.08% (n = 23) from the Class of 2026, 26.57% (n = 38) from the Class of 2027, and 20.98% (n = 30) from the Class of 2028.

Regarding ethnicity, the majority of respondents were Asian (52.45%, n = 75), followed by White (27.97%, n = 40), Black or African American (6.29%, n = 9), Hispanic or Latino (4.20%, n = 6), Middle Eastern or North African (3.50%, n = 5), Multiracial (1.4%, n=2) , and another race or not listed" (4.2%, n = 6). There were no respondents identifying as Native American or Alaska Native, or Native Hawaiian or other Pacific Islander.

Respondents were 72.73% (n = 104) female, 26.57% (n = 38) male, and 0.70% (n = 1) identified as non-binary. Non-binary respondents were excluded from gender-based analyses due to low sample size.

In terms of involvement with research projects or programs at the college, 88.81% (n = 127) of respondents were not involved in any research activities, whereas 11.19% (n = 16) were engaged in research projects or programs.

Overall GAI Usage

When asked if they were currently using GAI in their studies, 57.34% (n = 82) of respondents indicated they were not using it, and 42.66% (n = 61) reported using GAI in their studies.

Gender and GAI Usage. There was no statistical difference between gender and the use of GAI tools, $\chi^2(1, N = 142) = 0.015$, $p = 0.901$.

Class year and GAI Usage. No statistically significant difference was found between class year and the use of GAI tools, $\chi^2(4, N = 141) = 1.874$, $p = 0.759$.

Research Involvement and GAI Usage. There was no significant association between being involved in research at the College and the use of GAI tools, $\chi^2(1, N = 143) = .196$, $p = 0.658$.

GAI Tool

The most used GAI tool was ChatGPT, mentioned 32 times, followed by Google Gemini with five mentions, and Quizlet AI with four mentions.

Frequency of GAI Usage

Among those who reported using GAI in their studies, 34.43% (n = 21) indicated they use it rarely, 34.43% (n = 21) indicated they use it occasionally (monthly), 22.95% (n = 14) use it frequently (weekly), and 8.2% (n = 5) use it always (daily).

Satisfaction with GAI Tools

Regarding their satisfaction with AI tools aiding their studies, 3.28% (n = 2) were very satisfied, 68.85% (n = 42) were satisfied, 24.59% (n = 15) were neither satisfied nor dissatisfied, 1.64% (n = 1) were dissatisfied, and 1.64% (n=1) were very dissatisfied.

Perceived Effectiveness of GAI

When asked about the perceived impact of generative GAI on their studies, 3.28% (n = 2) found AI extremely effective, 34.04% (n = 16) found it very effective, 62.3% (n = 38) of respondents found it somewhat effective, while 6.56% (n = 4) found it not so effective. No respondents reported that it was not at all effective.

Impact of GAI on Learning Experience

Regarding the impact of GAI tools on their learning experience, 13.11% (n = 8) indicated that GAI has significantly improved their learning and understanding, 55.74% (n = 34) reported that it has been somewhat helpful in their studies, 31.15% (n = 19) stated that it has had no noticeable impact on their learning. None of the respondents reported that GAI has hindered their learning and understanding.

Confidence in GAI Tools

When asked about their confidence in the accuracy of answers provided by GAI models, 4.92% (n = 3) felt extremely confident, 27.87% (n = 17) felt very confident, 49.18% (n = 30) felt somewhat confident, 18.03% (n = 11) felt not so confident, while no respondents reported being not at all confident.

Use of GAI

Educational Use of GAI

TABLE 1
Frequency of GAI Use in Studies by Task and Purpose

Usage	%	N
Enhancing understanding of complex concepts	74.14%	43
Searching for concepts, terms, or specific words	37.93%	22
Answering study questions	36.21%	21
Assisting in data analysis or interpretation	17.24%	10
Extracting key information from research papers	15.52%	9
Writing papers/essays or reports	12.07%	7
Writing academic papers or reports	8.62%	5
Comparing and contrasting research findings	8.62%	5
Writing patient case summaries	6.90%	4

Table 1: Frequency of GAI Use in Studies by Task and Purpose. Click to enlarge

Respondents reported using GAI for a variety of tasks and purposes related to their studies. **Table 1** presents these tasks and purposes, ranked from highest to lowest frequency of use.

Other uses mentioned by students included “create exam questions”, “generating practice questions”, “study mnemonics”, and “I ask for connections to real life scenarios and ask for ways to understand things easier.”

Non-Educational Use

Respondents indicated various other tasks for which they have used GAI in optometry school. **Table 2** presents these tasks and purposes, ranked from highest to lowest frequency of use.

TABLE 2
Frequency of GAI Use by Task and Purpose

Usage	%	N
Proofreading professional emails and letters	71.43%	25
Composing professional emails and letters	57.14%	20
Writing resumes and cover letters	37.14%	13
Serving as a mental health counselor	14.29%	5
Creating presentations	11.43%	4

Table 2: Frequency of GAI Use by Task and Purpose. Click to enlarge

Other usage included “Creating a proper study schedule and workout schedule depending on my goals.”

Creative GAI usage

When asked about creative ways in which they have used AI to aid their students, students responded:

- “I would ask to explain it how they would to a 5 year old [sic]”
- “Downloaded lectures and asked to generate summaries”
- “Use it to make flash cards from notes”
- “When there is a concept that is hard to understand I ask ChatGPT to break it down in a more digestable [sic] way”
- “Ask questions, making summaries. Solve problem. Help understand complex concepts.”
- “I use ChatGPT to provide clarification for certain topics whether it is to dumb it down for me or provide an analogy to explain it to me in a different way.”
- “Summarizing textbook, reading materisls [sic]”

Benefits of GAI Use in Education

Students were asked about the main benefits of GAI in their studies. The answers were categorized and summarized below:

TABLE 3
Benefits of GAI Use in Education

Themes and topics	Frequency of responses
Academic Support	• **Simplifies and Clarifies Complex Concepts:** Breaks down complicated topics, such as ocular diseases, into easily understandable language; Offers explanations from multiple perspectives. • **Summarizes and Condenses Content:** Helps summarize and condense research papers, lecture notes, and heavy course material. • **Creates Study Guides and Plans:** Assists in organizing information, making study guides, and mapping out study plans. • **Generates Practice Questions:** Can create practice questions and mock cases for exam preparation. • **Extra Source of Help:** Extra source to quickly clarify concepts without needing to browse the internet for long period of time.
Time Efficiency	• **Saves Time on Research:** Provides quick answers without the need to browse multiple sources. • **Quickly Locates Information and Convenience:** Offers instant access to information and concepts, reducing search time.
Clinical Skills Development	• **Enhances Clinical Understanding:** Helps students understand clinical skills like interpreting diagnostic test results. It could also potentially be used to create mock patients to help students practice their diagnostic skills • **Supports Technology Integration:** Potential to improve clinical tools, such as lensometers and phoropters: Analyzing OCT results.
Additional Support	• **24/7 Access to Information:** Provides round-the-clock access to a reliable resource for immediate answers. • **Mental Health and Study Guidance:** Can assist with general counseling, stress management, and study-related advice.

Table 3: Benefits of GAI Use in Education. Click to enlarge

Challenges with GAI Use in Education

Students were asked about the disadvantages or challenges of using GAI in their studies. The main challenges identified by students were categorized into the following themes:

TABLE 4
Challenges of GAI Use in Education

Themes and topics	Frequency of responses
Inaccurate or False Information	AI often provides false or inaccurate information. This can lead to misinformation if the responses are not cross-checked with reliable sources, making AI less trustworthy, especially for complex or advanced topics.
Limited Understanding of Complex Topics	AI struggles to comprehend and accurately address the depth of knowledge required in optometry studies. Students found that due to the specificity and niche nature of their field, AI's responses sometimes lack the depth and precision needed.
Specificity and Usability Issues	AI often requires a very specific input to generate useful responses. This can result in a frustrating experience, as users must refine their questions multiple times to obtain accurate or relevant information.
Need for Verification and Extra Effort	The need to verify AI-generated content adds an additional layer of effort for students. Responses often require proofreading, further validation, or editing, reducing the efficiency gains expected from using AI.
Barriers to Access and Use	Not all students have access to AI tools due to cost or skepticism about its accuracy. These barriers prevent some from fully exploring or benefiting from AI in their studies.
Environmental Concerns	Running large AI models consumes a significant amount of energy, raising concerns about the environmental impact.
Learning Implications	Concerns that relying too heavily on AI may reduce the depth of learning and understanding of complex topics. There is a concern that extensive use could result in a superficial understanding of material rather than mastery.

Table 4: Challenges of GAI Use in Education. Click to enlarge

AI in Professional Practice

Overall Attitudes over AI

As shown in **Table 5**, respondents generally recognize the impact that AI will have in the future of optometry and vision science. Two-thirds agreed AI will significantly impact the future of optometry or vision science practice (65.67%). Half of the respondents (50%) view AI as a valuable tool for improving diagnostic accuracy and treatment outcomes. Despite the recognition that AI will impact the profession, slightly over half of respondents (52%) believe AI will improve optometry and vision care, with a considerable proportion (40%) remaining neutral.

Feelings Surrounding AI

Student were divided on whether AI developments excite or concern them. Approximately 42% were neutral and 40% agreed that they were excited about developments in AI. However, student remain positive about it, with the majority (63%) expressing optimism about the potential benefits of AI in advancing vision care.

TABLE 5
Perceptions of GAI in Professional Practice

Statement	Total N	Mean (SD)	Disagree Combined (%)	Neither Agree nor Disagree (%)	Agree Combined (%)
Integrating AI into my professional practice is essential for maintaining competitiveness	133	3.11 (.97)	21.81% (n = 29)	44.36% (n = 59)	33.84% (n = 45)
AI is a valuable tool for improving diagnostic accuracy and treatment outcomes in optometry	134	3.38 (.93)	14.93% (n = 20)	35.07% (n = 47)	50.0% (n = 67)
Familiarity with AI technology is increasingly important for optometrists/vision scientists	134	3.63 (.86)	8.96% (n = 12)	26.12% (n = 35)	64.92% (n = 87)
AI will significantly impact the future of optometry or vision science practice	134	3.71 (.85)	5.98% (n = 8)	28.36% (n = 38)	65.67% (n = 88)
I am optimistic about the potential benefits of AI in advancing vision care	134	3.59 (.90)	10.45% (n = 14)	26.87% (n = 36)	62.69% (n = 84)
I am open to incorporating AI into my future practice	134	3.54 (.90)	9.7% (n = 13)	31.34% (n = 42)	58.96% (n = 79)
With the knowledge I currently possess, I believe I am adequately equipped to utilize AI in my future career	134	2.92 (.99)	34.33% (n = 46)	38.06% (n = 51)	27.61% (n = 37)
AI will revolutionize optometry and eye care	134	3.38 (.88)	10.44% (n = 14)	47.01% (n = 63)	42.54% (n = 57)
These developments frighten me	133	2.9 (1.1)	39.1% (n = 52)	30.83% (n = 41)	30.07% (n = 40)
These developments make optometry more exciting to me	134	3.27 (.92)	15.67% (n = 21)	42.54% (n = 57)	41.79% (n = 56)
AI will improve optometry and vision care	134	3.49 (.80)	6.71% (n = 9)	40.3% (n = 54)	52.98% (n = 71)
AI should be part of my optometric education	133	3.29 (.88)	12.03% (n = 16)	49.62% (n = 66)	38.34% (n = 51)

Table 5: Perceptions of GAI in Professional Practice. Click to enlarge

Readiness and Educational Needs

Familiarity with GAI technology was considered important by a substantial percentage of respondents (65%). However, despite the recognition of AI's importance and that familiarity is necessary, more than a third (34%) of respondents believed that they were not adequately equipped to utilize AI in their future careers, given their current knowledge of the technology, while 38% were neutral. When asked if GAI should be part of their education, about half (49%) were unsure, while 38% agreed it should be incorporated in their training.

Differences by Gender, AI Usage and Research Status

Table 6 shows how perceptions varied by AI usage, gender and research involvement. Respondents who already used AI were consistently more favorable in their views. For instance, they rated "AI as a valuable tool for improving diagnostic accuracy and treatment outcomes" higher than non-users ($M_{\text{AI Users}} = 3.55$ vs. $M_{\text{Non-Users}} = 3.23$, $p < .05$), and expressed greater optimism about AI's potential ($M_{\text{AI Users}} = 3.83$ vs. $M_{\text{Non-Users}} = 3.39$, $p < .001$). They were also more open to incorporating AI into future practice ($M_{\text{AI Users}} = 3.75$ vs. $M_{\text{Non-Users}} = 3.36$, $p = .01$) and less likely to be frightened by AI developments ($M_{\text{AI Users}} = 2.64$ vs. $M_{\text{Non-Users}} = 3.11$, $p = .01$).

Gender differences emerged primarily around the importance of familiarity with AI: female respondents rated this higher than males ($M_{Female} = 3.73$ vs. $M_{Male} = 3.36$, $p < .05$). Research involvement was linked to heightened excitement and perceived benefits of AI; those conducting research found AI more exciting (M = 3.63) and beneficial (M = 3.81), compared to their peers not involved in research (p = .05).

TABLE 6
Perceptions of GAI in Professional Practice by Gender, AI Usage, and Research Status

Statement	Total N	Mean (SD)	Gender M (SD)	AI Usage M (SD)			Research		
			[illegible]	Using AI [illegible]	Not using AI [illegible]	p-value	Conducting research [illegible]	Not conducting research [illegible]	p-value
Integrating AI into my professional practice is essential for maintaining competitiveness	133	3.11 (.97)	NS			NS			NS
AI is a valuable tool for improving diagnostic accuracy and treatment outcomes in optometry	134	[illegible]	NS	[illegible]	[illegible]	[illegible]			NS
Familiarity with AI technology is increasingly important for optometrists/vision scientists	134	[illegible]	F = 3.73 (.78), M = 3.36 (.95), p < .05	[illegible]	[illegible]	[illegible]			NS
AI will significantly impact the future of optometry or vision science practice	134	3.71 ([illegible])	NS			NS			NS
I am optimistic about the potential benefits of AI in advancing vision care	134	[illegible]	NS	[illegible]	[illegible]	[illegible]			NS
I am open to incorporating AI into my future practice	134	[illegible]	NS	[illegible]	[illegible]	[illegible]			NS
With the knowledge I currently possess, I believe I am adequately equipped to utilize AI in my future career	134	[illegible]	NS			NS			NS
AI will revolutionize optometry and eye care	134	[illegible]	NS	[illegible]	[illegible]	[illegible]			NS
These developments frighten me	133	[illegible]	NS	[illegible]	[illegible]	[illegible]			NS
These developments make optometry more exciting to me	134	[illegible]	NS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AI will improve optometry and vision care	134	[illegible]	NS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AI should be part of my optometric education	133	[illegible]	NS	[illegible]	[illegible]	[illegible]			NS

Table 6: Perceptions of GAI in Professional Practice by Gender, AI Usage, and Research Status. Click to enlarge

Discussion

The present study aimed to understand the overall usage, purpose of usage, attitudes of optometry students towards GAI, including overall satisfaction, confidence and perceived impact of GAI generated answers. Additionally, it explored students' perceptions of the applicability of AI in optometric practice and patient care.

GAI Use Rate and Student Perceptions

Contrary to expectations, most respondents (57.34%) reported not using GAI in their studies. This finding contrasts with other research showing that half of college students use AI in their studies.[20] A plausible explanation could be the timing when students were exposed to GAI, with professional students being exposed later in their educational careers, whereas college students may have been introduced to it earlier, possibly during high school. Research also suggests that students' field of study explain differences in usage and acceptance of GAI tools. For example, engineering and technology students show higher usage rates and trust in GAI tools, while medical and health care students showed less positive attitudes.[21] Also, specific demands of optometric education, which does not emphasize writing and editing, may limit the utility of GAI for this cohort. However, a survey of college students showed that "understanding difficult concepts" was one of the main reasons for using GAI,[20] a trend that aligns with the findings in this study. As students find creative ways to apply GAI beyond editing and writing, such as creating practice problems and patient cases, the percentage of users may increase considerably.[15]

Surprisingly, there was consistent usage of GAI across class years and research status at the College. It was expected that students in earlier years, who might have been introduced to AI during their undergraduate studies, would have higher usage rates. Additionally, students involved in research were expected to use GAI more frequently due to its utility in summarizing and editing. Gender was not a factor influencing AI usage, which contradicts previous research showing that males were more likely to use ChatGPT compared to females.[21,22]

The frequency of GAI usage was moderate, with only 8% using AI tools daily and more than one-third (34%) stating they used AI tools rarely. Although existing studies suggest higher use rate of AI in education, these results need to be interpreted cautiously. The documented increase in AI use appears to be a recurring trend when compared to early reports,[21] suggesting that adoption levels will likely continue to rise as AI capabilities evolve and students become more familiar and comfortable with those tools.

Satisfaction rates were relatively high, with the majority expressing satisfaction (68.85%) and a similar percentage (62.3%) finding AI tools somewhat effective. In terms of the impact on their studies, the majority (55.74%) reported finding AI somewhat helpful, while 31.15% remained neutral. Very high or very low satisfaction, effectiveness, impact and confidence were rarely reported, and extreme dissatisfaction or perceptions of ineffectiveness were almost non-existent. Students' perceptions of satisfaction, effectiveness and impact may increase as their confidence in GAI responses improves. Research shows that students' competence in using AI technologies significantly influences their learning effectiveness and outcomes.[23] Students felt somewhat confident (49.18%) in the accuracy of responses, while nearly one in five felt "not so confident." This lack of confidence may be due to the current limitations and error-proneness of GAI models. By closing this confidence gap, students may be more willing to adopt GAI as a study tool.[1,24]

The tasks for which students use GAI are diverse. Breaking down complex concepts to aid understanding was the primary purpose, followed by searching for concepts, terms or specific words, and answering questions. In non-study-related tasks, most students used GAI for proofreading (71%), composing (57%) professional emails and letters, and for writing resumes and cover letters (37%). Interestingly, some students even reported using AI as a mental health counselor (14%), an emerging trend that addresses the surge in the prevalence of mental health disorders, but raises important ethical, privacy and efficacy considerations.[25]

Benefits and Challenges of GAI Use in Education

The perceived benefits of GAI for optometry students are manifold, ranging from academic support to time efficiency and clinical development.

Despite the perceived benefits, the study identified several challenges with GAI use, most notably the output of false or inaccurate information. Additionally, although AI was recognized by students as improving time and efficiency, there were concerns about potentially wasting time due to the need to cross-reference AI-generated content with credible sources. Students also expressed doubts about GAI's ability to understand and respond to complex topics. With the continuous and rapid development of LLMs, this may become a moot issue soon. For instance, a study showed that although ChatGPT demonstrated a significant decrease in performance as the complexity of questions increased, the model was still able to reach a passing threshold for the USMLE Step 1 for a third-year medical student.[26]

Another concern raised by students was the over-dependency on GAI, which could result in a superficial understanding of material rather than mastery. Intuitively, students grasp the perils of cognitive offloading, the usage of external aids or tools, including AI, to reduce cognitive workload.[1,27] Overreliance on these tools can diminish deep engagement, memory formation, independent problem-solving and critical-thinking, raising concerns about long-term impacts on cognitive abilities.[1] The rate of cognitive offloading is likely to increase as trust in AI tools increase.[24] Due to the likely increase and negative consequences of cognitive offloading, its impact on student performance in optometry school, board examination and clinical care needs to be closely monitored and proactively addressed. Educators should consider teaching students when and how to integrate AI in ways that deepen rather than dilute understanding, and, more than ever, emphasize the importance of deep learning as the foundation to long-term clinical reasoning and professional growth.

AI in Professional Practice

The data indicate that most respondents recognize AI's relevance to optometry and vision science, though the urgency and readiness to embrace it differ significantly. Over half (65.67%) believe that AI will significantly impact the future of optometry, and half (50%) see it as a tool for improving diagnostic accuracy and treatment outcomes. Nevertheless, fewer respondents believe AI will fully revolutionize eye care (42.54%) or feel particularly excited about these developments (41.79%). This pattern suggests a cautious optimism: many acknowledge AI's potential but remain skeptical if it will truly be transformative. Usage of GAI tools was associated with greater excitement and more positive views of AI's impact on the profession in various measures (**Table 6**), underscoring the role that personal usage and exposure to new technologies play in shaping perceptions. Although perceptions may continue to evolve as AI technology advances and familiarity increases, this finding may also reflect the tendency of health profession students to adopt AI technologies more cautiously compared to those in engineering or technology-focused fields.[21]

The notion that healthcare professionals—particularly in a humanistic field such as optometry—may be less inclined to embrace AI was underscored by responses to the open-ended questions. Some participants explicitly stated that "humans, not robots, should be engaged in eye care," or that they "don't care about AI." In a few more extreme comments, respondents labeled individuals trained with AI tools as "hopeless" and that the legitimacy of their degrees should be questioned.

Although 58.96% of respondents expressed openness to incorporating AI tools into their future practices, just over one-third (33.84%) felt that integrating AI was necessary to maintain competitiveness. This relatively low figure may reflect uncertainty about how AI tools will evolve to enhance efficiency in optometric settings. By streamlining administrative tasks, AI has the potential to free up optometrists' time and energy, allowing them to devote more attention to patient care.[28] It is important to remember this study focuses on students. The findings may look different if the same questions were posed to optometrists active in the field who must deal with mundane administrate tasks. Also, exposure to real-world AI tools could yield confident responses.

Preparedness is a known barrier to AI usage.[22,29] In this study, only 27.61% of students felt equipped to utilize AI in their future careers, and only 38.34% agreed that AI should be part of their optometric education. This finding seems at odds with the 64.92% who view familiarity with AI technologies as increasingly important. AI literacy will increasingly become essential as AI powered applications infiltrate the market, shaping the skills and expertise expected of healthcare providers.[30,31]

Future Research

This study was limited to students at one college of optometry. Future research should expand to include perceptions of students from other optometry programs to provide a broader understanding of GAI usage. Additional studies should investigate potential disparities between GAI usage by optometry students compared to other health profession students, as well as differences between undergraduate and graduate student populations. Longitudinal studies should be conducted to monitor acceptance and usage rates over time, especially as AI models become more accurate and sophisticated. Comparative performance between GAI users and non-users should be examined in future studies.

Conclusion

AI is a powerful and transformative technology that is reshaping entire industries—optometry and optometric education included. Findings from this study suggest that, while optometry students expressed optimism toward AI, they remained somewhat reluctant to fully incorporate generative AI tools into their academic activities and expressed caution about the broader role of AI in future clinical practice. As AI models evolve, become more accurate and see increasing everyday use, broader acceptance is likely to follow. This study therefore offers a valuable baseline for observing shifts in AI acceptance and usage over time. In the meantime, optometry programs face the challenge of determining how to harness AI's capabilities for both learning and patient care, all while navigating curricular constraints and ensuring these emerging tools ultimately serve to enhance, rather than dilute, students' educational experience. Educators must prepare students not only to use these powerful tools, but to evaluate them critically, question their outputs and have the wisdom to know when to rely on them. As AI become more integrated in learning environment, educators should emphasize more than ever the importance of deep and lifelong learning, clinical excellence and ethical patient care.

References

1. Gerlich M. AI Tools in Society: Impacts on Cognitive Offloading and the Future of Critical Thinking. Societies. 2025;15(1). DOI:10.3390/soc15010006
2. Dwivedi YK, Kshetri N, Hughes L, et al. "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. Int J Inf Manage. 2023;71. DOI:10.1016/j.ijinfomgt.2023.102642
3. Wong WKO. The sudden disruptive rise of generative artificial intelligence? An evaluation of their impact on higher education and the global workplace. Journal of Open Innovation: Technology, Market, and Complexity. 2024;10(2). DOI:10.1016/j.joitmc.2024.100278
4. Bellanda VCF, Dos Santos ML, Ferraz DA, Jorge R, Melo GB. Applications of ChatGPT in the diagnosis, management, education, and research of retinal diseases: a scoping review. Int J Retina Vitreous. 2024 Oct 17;10(1). DOI:10.1186/s40942-024-00595-9
5. Wong WKO. The sudden disruptive rise of generative artificial intelligence? An evaluation of their impact on higher education and the global workplace. Journal of Open Innovation: Technology, Market, and Complexity. 2024 Apr;10(2). DOI:10.1016/j.joitmc.2024.100278
6. Dave M, Patel N. Artificial intelligence in healthcare and education. Br Dent J. 2023 May;234(10):761-764. DOI:10.1038/s41415-023-5845-2
7. Henry TA. 2 in 3 physicians are using health AI—up 78% from 2023 [Internet]. Chicago, IL: American Medical Association; 2025 Feb 26 [cited 2025 July 5]. Available from: https://www.ama-assn.org/practice-management/digital-health/2-3-physicians-are-using-health-ai-78-2023
8. Xu X, Chen Y, Miao J. Opportunities, challenges, and future directions of large language models, including ChatGPT in medical education: a systematic scoping review. J Educ Eval Health Prof. 2024;21. DOI:10.3352/jeehp.2024.21.6
9. Civaner MM, Uncu Y, Bulut F, Chalil EG, Tatli A. Artificial intelligence in medical education: a cross-sectional needs assessment. BMC Med Educ. 2022 Nov 9;22(1). DOI:10.1186/s12909-022-03852-3
10. Dave M, Patel N. Artificial intelligence in healthcare and education. Br Dent J. 2023 May;234(10):761-764. DOI:10.1038/s41415-023-5845-2
11. Mir MM, Mir GM, Raina NT, et al. Application of Artificial Intelligence in Medical Education: Current Scenario and Future Perspectives. J Adv Med Educ Prof. 2023 Jul;11(3):133-140. DOI:10.30476/jamp.2023.98655.1803
12. Waisberg E, Ong J, Kamran SA, et al. Generative artificial intelligence in ophthalmology. Surv Ophthalmol. 20255 Jan-Feb;70(1):1-11. DOI:10.1016/j.survophthal.2024.04.009
13. Poplin R, Varadarajan AV, Blumer K, et al. Predicting Cardiovascular Risk Factors from Retinal Fundus Photographs using Deep Learning. Nat Biomed Eng. 2018 Mar;2(3):158-164. DOI:10.1038/s41551-018-0195-0

14. Nguyen T, Ong J, Jonnakuti V, et al. Artificial intelligence in the diagnosis and management of refractive errors. Eur J Ophthalmol. 2025 Jul;35(4):1456-1480. doi:10.1177/11206721251318384
15. Canadian boards Study-Guide-2025 [Internet]. Stouffville, Ontario: Optometry Examining Board of Canada; c2024 [cited 2025 February 9]. Available from: https://oebc.ca/wp-content/uploads/2024/12/Study-Guide-2025.pdf
16. Busch F, Hoffmann L, Truhn, D, et al. Global cross-sectional student survey on AI in medical, dental, and veterinary education and practice at 192 faculties. BMC Med Educ. 2024 Sep 28;24(1):1066. DOI: 10.1186/s12909-024-0635-4
17. Bellanda VCF, Dos Santos ML, Ferraz DA, Jorge R, Melo GB. Applications of ChatGPT in the diagnosis, management, education, and research of retinal diseases: a scoping review. Int J Retina Vitreous. 2024 Oct 17;10(1). DOI:10.1186/s40942-024-00595-9
18. McCoy LG, Nagaraj S, Morgado F, Harish V, Das S, Celi LA. What do medical students actually need to know about artificial intelligence? NPJ Digit Med. 2020 Jun 19;3(1). DOI:10.1038/s41746-020-0294-7
19. Lomis K, Jeffriers P, Palatta A, et al. Artificial intelligence for health professions educators. NAM Perspect. 2021 Sep 8:1-14. DOI:10.31478/202109a
20. Generative AI in Higher Education: Fall 2023 Update of Time For Class Study | Enhanced Reader [Internet]. Boston, MA: Tyton Partners; c2025 [cited 2025 April 9]. Available from: https://tytonpartners.com/app/uploads/2023/10/GenAI-IN-HIGHER-EDUCATION-FALL-2023-UPDATE-TIME-FOR-CLASS-STUDY.pdf
21. Stöhr C, Ou AW, Malmström H. Perceptions and usage of AI chatbots among students in higher education across genders, academic levels and fields of study. Computers and Education: Artificial Intelligence. 2024 Dec;7. DOI:10.1016/j.caeai.2024.100259
22. Maaß L, Grab-Kroll C, Koerner J, et al. Artificial Intelligence and ChatGPT in Medical Education: A Cross-Sectional Questionnaire on students' Competence. J CME. 2024 Dec 24;14(1):2437293. DOI:10.1080/28338073.2024.2437293
23. Fakhri MM, Ahmar AS, Isma A, Rosidah R, Fadhilatunisa D. Exploring Generative AI Tools Frequency: Impacts on Attitude, Satisfaction, and Competency in Achieving Higher Education Learning Goals. EduLine: Journal of Education and Learning Innovation. 2024;4(1):196-208. DOI:10.35877/454ri.eduline2592
24. Gerlich M. Exploring Motivators for Trust in the Dichotomy of Human—AI Trust Dynamics. Soc Sci. 2024 May;13(5). DOI:10.3390/socsci13050251
25. Olawade DB, Wada OZ, Odetayo A, David-Olawade AC, Asaolu F, Eberhardt J. Enhancing mental health with Artificial Intelligence: Current trends and future prospects. Journal of Medicine, Surgery, and Public Health. 2024 Apr;3:100099. DOI:10.1016/j.glmedi.2024.100099
26. Gilson A, Safranek CW, Huang T, et al. How Does ChatGPT Perform on the United States Medical Licensing Examination? The Implications of Large Language Models for Medical Education and Knowledge Assessment. JMIR Med Educ. 2023 Feb 8:9:e45312. DOI:10.2196/45312
27. Dave M, Patel N. Artificial intelligence in healthcare and education. Br Dent J. 2023 May;234(10):761-764. DOI:10.1038/s41415-023-5845-2
28. Nidamanuri, NDS. A study on the adoption challenges and solutions for transforming healthcare with generative AI. World Journal of Advanced Research and Reviews. 2022 Mar;13(3):533-542. DOI:10.30574/wjarr.2022.13.3.0169
29. Gupta R, Rathore B. Exploring the generative AI adoption in service industry: A mixed-method analysis. Journal of Retailing and Consumer Services. 2024 Nov;81:103997. DOI:10.1016/J.JRETCONSER.2024.103997
30. Hazarika I. Artificial intelligence: Opportunities and implications for the health workforce. Int Health. 2020 Jul 1;12(4):241-245. DOI:10.1093/INTHEALTH/IHAA007
31. McCoy LG, Nagaraj S, Morgado F, Harish V, Das S, Celi LA. What do medical students actually need to know about artificial intelligence? NPJ Digit Med. 2020 Jun 19;3:86. DOI:10.1038/s41746-020-0294-7

Guilherme F.C. Albieri, PhD, serves as the Vice President of Student Affairs and Engagement and International Programs Director at SUNY College of Optometry.

PEER REVIEWED

A Voluntary Guna Eye Clinic: Opportunities for developing clinical skills, cultural competence and research capacity

Héctor C. Santiago, OD, PhD, FAAO, Dipl AAO, Damaris Pagán, OD, MPH, FAAO | Optometric Education: Volume 51 Number 1 (Fall 2025)

Abstract

VOSH/International chapters have sponsored international humanitarian clinics at many schools and colleges of optometry in the United States. A clinic was developed by a US-based school and a school in Panama to provide eye care to the country's Indigenous Guna population. Besides providing clinical services, the event was an opportunity to enhance the students' clinical skills and participants' cultural competence. The clinic also developed the clinical research and scholarly skills of faculty members. Finally, it created an alliance between academic institutions and NGOs to sustain eye care services in Panama.

Keywords

clinical skills, cultural competence, indigenous population, international education, research, VOSH

Volunteers Optometric Services to Humanity (VOSH/International) has been promoting international humanitarian clinics staffed by optometrists and optometry students since 1972.[1] Many of these clinics are international and attended by VOSH and SVOSH (Student VOSH) chapters from the United States (US) and Canada.[2] These clinics are generally short-term experiences lasting several days. A key factor in recognizing, understanding and addressing health disparities among minority populations is the cultural competence of clinicians; that is, having the knowledge, skills and attitudes to effectively serve people from different cultural backgrounds.[3] Cultural competence increases patient satisfaction and improves the quality of care, while cultural incompetence presents a critical obstacle to achieving equitable healthcare.[4,5,6,7]

The related concepts of cultural humility and cultural safety are also essential for successful engagement.[8.9.10] Cultural humility emphasizes a clinician's self-evaluation and self-critique of their own cultural biases, while cultural safety focuses on the patient's experience, creating environments where they feel safe to express their identity without fear of discrimination. This is particularly relevant when working with Indigenous communities that have been subjected to continued oppression. For this reason, successful and ethical engagement with these populations necessitates a "nothing about us without us" approach, ensuring that Indigenous voices and perspectives are central to the planning, implementation and evaluation of any care or research.

In this paper, we describe the unique experience of SVOSH chapters from two universities, one from Puerto Rico and one from Panamá, working together in a humanitarian clinic that applied these principles. Between May 25 and May 27, 2022, the two academic institutions provided primary eyecare services to an Indigenous population of Panamá. One institution is the Inter American University of

Puerto Rico School of Optometry (IAUPRSO), located in Puerto Rico. This university was founded in 1912, and its school of optometry opened in 1981. The school, accredited by the Accreditation Council on Optometric Education, offers a typical US-based optometric curriculum.[11] More than 50% of the student body comes from the US mainland, many of which are minority and non-Spanish speaking. The second institution is the Specialized University of Las Americas of Panamá (UDELAS).[12] UDELAS established a 5 year bachelor's in optometry program in 1997. Nearly all students are Hispanic, of Panamanian origin and almost exclusively Spanish speaking.

We describe how voluntary eye clinics in underserved Indigenous communities offer significant opportunities for clinical education and research. When a collaborative approach is taken, these international clinical activities can foster student confidence in their clinical skills and cultural competence. Furthermore, they can increase faculty research opportunities, improve access to eye and vision care for underserved populations and open doors for intersectoral alliances and collaboration.

Background

The Indigenous population of Latin America comprises approximately 50 million individuals, representing approximately 8% of the region's population and 12% of the population of Panamá. The Indigenous communities are usually impoverished and suffer significant socioeconomic inequities.[13] The life expectancy of the Guna Indigenous group, one of the Indigenous groups of Panamá, is about 8 years below the average for the general Panamánian population.[14]

The Gunas are the second-largest Indigenous group in Panamá. The original Gunas environment is the archipelago of San Blas, formed by 365 islands. Their economy consists of fishing, farming, clothing manufacturing and tourism. Due to flooding and poverty, many Gunas migrated to other regions of Panamá. In 1985, they formed a community called Guna Nega (home to Gunas) in Panamá City, the capital of Panamá. Guna Nega is a few kilometers away from the new Panamá City garbage dump at Cerro Patacón. This facility was established in 1983 due to the saturation of the old Panamá City garbage dump. Cerro Patacón ceased to function as a proper sanitary landfill and became an open-air dump, characterized by poor management that generated air, water and soil pollution, as well as recurring fires and an unsanitary environment for the Guna Nega community. Nowadays, some Gunas depend on recycling garbage from the landfill for their livelihood. Nearly 1,500 people live in approximately 125 houses in Guna Nega.[15]

The Gunas represent an Indigenous community with a significantly different ancestry and cultural background from mainstream Panamanian society.

In November 2018, the IAUPRSO group visited Panamá to provide eye examinations, eyeglasses and referrals to patients from underserved communities in Panamá City who face financial barriers to accessing eye care. During this visit, we learned about the dire need for eyecare services in the Guna Nega community. As a result, conversations were held with counselors of the UDELAS and IAUPRSO SVOSH chapters to plan a visit to Guna Nega in May 2022.

Methods

The authors of this paper, from IAUPRSO, conducted a literature search. We determined that there was a paucity of research on the refractive conditions and visual impairment of Indigenous populations in Latin America. The limited literature showed significant healthcare inequities among the Indigenous populations in the region.[16] We decided that examining a sample of the Guna population would contribute important information on the visual conditions of an Indigenous population in the Latin American region.[17]

The faculty from UDELAS visited the Guna Nega community to learn more about the community and obtain the advice of the chief of the Guna Nega community, Mrs. Cornelia López, a nurse. Afterward, the faculty from both academic institutions held three Zoom meetings with the Guna chief. The discussion with the Guna chief included the perceived needs of the Guna community for eye care, dates and times of the clinic, the examination site, the consent process, and the overall clinical and research protocol. Mrs. López consulted with her community in an open assembly and eventually approved the clinic and study. The study was approved by both academic institutions' institutional review boards (ethics boards).

For the clinic, IUAPRSO provided seven faculty members (five optometrists, one ophthalmologist and one optician) and 15 students. UDELAS provided three faculty members (optometrists) and 18 students. The Panamá Lions Club secured the services of an additional local ophthalmologist. Participation in the project was voluntary, and students received no academic or clinical credits for their involvement. The clinic volunteers examined 520 patients between May 25 and May 27, 2022. Moreover, the UDELAS team examined an additional 352 patients from August to December 2022 for 872 patients.

The IAUPRSO and UDELAS students worked side by side at the examination stations. These stations are listed in **Table 1.** The group included second-, third- and fourth-year students, and the stations were assigned based on each student's expected level of knowledge and skill. In general, most students stayed with a station for a half day, allowing them to practice the different skills on 10 to 260 patients during the duration of the clinic, as shown in **Table 1**. Faculty supervised students to ensure the quality of their procedures, ask questions or discuss findings. Unusual conditions and observations of particular clinical interest or educational value were shared with all team members. Clinical data were recorded in paper form. The paper data was digitalized into an EpiInfo© template by a faculty member from IAUPRSO and another faculty member from UDELAS.[18] To ensure patient confidentiality, the patient's name and date of birth were removed from the raw data before it was transferred to an Excel spreadsheet for initial organization. The de-identified data were then analyzed using SPSS© version 28.[19]

TABLE 1
Examination Stations and Average Patient Encounters per Student for each School

Station	Procedure / Equipment	Average Encounters per Student IAUPRSO	Average Encounters per Student UDELAS
Registration and Case History (1-2 students)	Individual private interviews	260	436
Visual acuity and cover test at distance (2 students)	Distance LogMAR charts	260	436
Visual acuity and cover test at near (2 students)	Near LogMAR chart	260	436
Cycloplegia (ages 2 to 18) and Autorefraction (4 students)	Proparacaine 0.5% (1 drop OU), Cyclopentolate 1% (2 drops OU), Retinomax 3	141	317
Subjective refraction (10 students)	Standard Phoropter refraction	30	60
External and internal exam (10 students)	Slit lamp, Ophthalmoscopy, Tonometry	10	26
Patient counseling (2 students)	Individual private interview by OD	260	436
Selection of frames and dispensing (2 students)	Frames, Readers, Ready-to-clip glasses	260	436

IAUPRSO = Inter American University of Puerto Rico School of Optometry
UDELAS = Specialized University of Las Americas (Panama)

Table 1: Examination Stations and Average Patient Encounters per Student for each School. Click to enlarge

The IAUPR provided full international travel scholarships for optometry students with a defined grade point average. Twelve students (out of 15) from IAUPRSO were eligible and received full international travel scholarships. The university requires students who received scholarships to write a short essay on their experience. Since the university promotes internationalization, the essays provide evidence to accrediting agencies of the added value of international service activities. The other three students were not eligible for the travel scholarship and were not asked to write the essay. We read all the student essays. The responses were aggregated into topics and themes by consensus using the Dedoose© qualitative analysis software.[20]

Results

Students' opportunities to develop clinical knowledge and skills, cultural competence and positive attitudes toward service

The essays from all 12 students indicated that the experience with the Guna Nega community enhanced their overall clinical skills and improved their diagnosis of ocular pathologies (**Table 2**).

The qualitative analysis of the students' responses related to cultural competence revealed several key themes (**Table 2**). Students reported acquiring cultural competence and were particularly impacted by their first-hand experience with *Poverty* and the *Lack of eye care* within the Guna Nega community. They also acknowledged gains in cultural competence through *Interaction with students from UDELAS* and by *gaining Knowledge about the Guna culture*. Additionally, students valued the opportunity to *Practice Spanish.*

TABLE 2
Frequency of students' responses by Themes and Topics

Themes and topics	Frequency of responses
Theme 1: Development of clinical skills	
Diagnosing ocular pathologies	18
Refractive error correction	10
Ophthalmoscopy skills	5
Use of the portable Slit lamp	4
Practice clinical skills	2
Opportunity to identify my strengths	5
Theme 2: Cultural competence	
Acquire cultural competence	12
Experience with poverty	10
Experience with a lack of eye care	7
Interaction with students from another school	6
Knowledge of the Guna culture	9
Opportunity to practice Spanish	7
Theme 3: Emotions and attitudes	
Feel grateful	12
Feeling of satisfaction	8
Value my profession	9
I will do another humanitarian clinic in the future	13

Table 2: Frequency of students' responses by Themes and Topics. Click to enlarge

The students' responses also highlighted a significant emotional and attitudinal impact (**Table 2**). They expressed feeling *Grateful* and a sense of *Satisfaction*, along with a renewed *Value of my profession*. Furthermore, they expressed a willingness to *Do another humanitarian clinic in the future*. Overall, the students' responses demonstrated their perception of improved clinical skills, cultural competence and satisfaction with their humanitarian work.

Developing alliances

Humanitarian eyecare clinics provide immediate local services to a limited number of patients. Providing eyecare services to a larger population continuously requires the work of many concerned individuals and organizations. These organizations develop agreements and alliances that can sustain the services. **Table 3** summarizes the collaborators, organizations and their roles in the project.

TABLE 3

Table 3: Collaborators and their roles in the Guna Project

Individual/Organization	Type of collaboration
Mrs. Cornelia López, Chief of the Guna Nega Indigenous community	Guna Indigenous community liaison, project permissions, development of the research protocol, examination sites, and distribution of eyeglasses
Yazmin Colón de Cortizo (First Lady of Panama)	Support for the Guna community by the Panamanian Health Ministry
Mario Him, Past President of the Lions D-1 District	Liaison to the Guna community, logistical support for local transportation, clerical support, ordering, and distribution of eyeglasses
Mr. José Luis Fábrega, Mayor of Panama City	Continued funding of eyeglasses to the Guna Nega community
Judith Williams, Head of Advocacy and Partnerships, OneSight EssilorLuxottica Foundation	Funding of eyeglasses, posters, brochures, and posters
Dr. Carlos González, former director of the UDELAS optometry program	Faculty time release, Ethics Board submission and approval, and student permissions to participate
Dr. Santiago Peña, Former President of the Panamanian Optometric Association	Development of a public health committee within the association to provide continued eye care to the Indigenous communities
Dr. Neisha Rodriguez, Faculty IAUPRSO	Protocol and Ethics Advisor, Clinical supervisor
Dr. Naduska Platero, Faculty UDELAS	Main researcher UDELAS
Dr. Juan Oliveros, Faculty UDELAS	Associate researcher UDELAS
Dr. Maybeth Bernal, Faculty UDELAS	Clinical Supervisor
Dr. Julian Chang, Lions Club	Ophthalmologist and Clinical supervisor
Dr. Héctor Santiago, IAUPRSO	Researcher and Clinical Supervisor
Dr. Damaris Pagán, IAUPRSO	Researcher and Clinical Supervisor
Dr. Ángel Romero, Dr. Luis Ruiz, Mr. Dick Robles, Dr. Karen Gil, Faculty IAUPRSO	Examination of patients, Clinical supervisors
Student clinicians, IAUPRSO and UDELAS	Examination of patients under the supervision of clinical faculty

IAUPRSO = Inter American University of Puerto Rico School of Optometry
UDELAS = Specialized University of Las Américas (Panama)

Table 3: Collaborators and their roles in the Guna Project. Click to enlarge

As reported in the literature, the success of collaborative work between academics and non-academics depends on frequent communication of the project's objectives.[21] For example, while the Guna community leader and the Lions Club's partners wanted a large number of patients to be examined daily, we made it clear that the project's goal was not only to provide eyecare services to the Gunas, but also to serve as a teaching and research clinic. For that reason, we limited the number of patients per day to be able to provide comprehensive examinations and reliable data collection using a strict protocol. The collaborative nature of the project was significantly enhanced because several optometrists were already members of VOSH/International and Lions Clubs International. These two leading non-governmental organizations (NGOs) share a common mission of providing eye care to disadvantaged populations, and this mutual understanding fostered clear and accessible communication between the optometrists and the organizations' members.[21]

Enhancing the research capacity of faculty and students

This project significantly enhanced the research capacity of both faculty and students by providing hands-on experience in a novel epidemiological study on refractive error and visual impairment among the Guna people. This research was particularly noteworthy as it explored the prevalence of myopia, astigmatism, visual impairment and blindness in a Latin American Indigenous group.

Faculty members from both academic institutions played pivotal roles, spearheading the literature search, protocol development, consent form creation, statistical analysis and the preparation of posters and papers. Students were actively involved in data collection and transcription into EpiInfo, gaining valuable practical experience in research methodologies.

The findings from the Guna Project have been widely disseminated across multiple platforms, showcasing the project's impact and contributing to the broader scientific community. Early results were presented in a poster at the American Academy of Optometry Congress, followed by a Zoom joint webinar of VOSH/International and the International Educators Special Interest Group of the Association of Schools and Colleges of Optometry in October 2023.[22,23] More recently, the research was highlighted in a lecture at the Fifth World Congress of Optometry in June 2025 and has been published in a peer-reviewed public health journal.[17,24]

Beyond academic dissemination, the project actively advocated for the optometry profession. The initiative was publicized in *Franja Visual*, the largest regional vision care Latin American publication, and received a two-page spread in *El Nuevo Día*, Puerto Rico's largest newspaper.[25,26]

The project's funding also facilitated substantial donations to the UDELAS team, including a portable phoropter, autorefractor, visual acuity charts, prism bars and cycloplegic medications. These resources will enable the continuation of this vital research program, further solidifying the research infrastructure and opportunities for future faculty and student involvement.

Providing eye care and clinical education to an Indigenous community

The Guna community leaders distributed 700 examination tickets in advance. Patients were scheduled for one of the five half-day appointment periods to reduce waiting time. Out of the 700 people invited, 520 attended the clinic (74.3%). Because we originally planned to examine 700 persons, an additional 400 people from the Guna Nega community were invited between August and December 2022, resulting in 352 additional examinations. Of the total 872 patients seen by the clinic, 638, or 73.2%, were Indigenous Gunas.

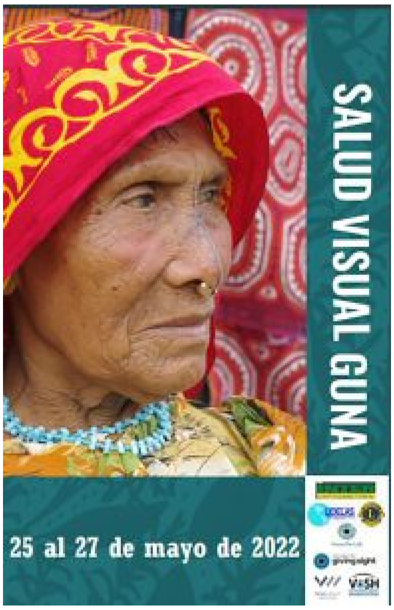


Figure 1: Commemorative poster distributed to the patients at the Guna Nega eye clinic in Panamá City. Click to enlarge

Among the Gunas, the mean age was 40.7 years (± 22.3 SD). The youngest Guna patient was 1 year old and the oldest was 92 years. Only 98 Gunas (15.4%) reported previous eye examinations. The prevalences of myopia (40.4%), astigmatism (36.6%), visual impairment (41.1%), and blindness (2.5%) are the highest of all indigenous groups.[17] Despite the high prevalence of visual impairment and blindness, only 15.4% of had some form of ophthalmic correction. All Gunas needing an ophthalmic correction received custom-made eyeglasses, ready-to-clip single vision eyeglasses or readers. All patients who required custom-made eyeglasses received them within 2 months after their examination. After our refractive correction, visual impairment decreased to 10.0% and blindness to 1.5%.

Patients in need of further treatment like glaucoma, cataract or pterygia surgery were referred to the local hospital. One of the patients who underwent surgery was a 9 year-old with congenital cataracts.

About 60% of our sample could read basic Spanish, and 80% could speak Spanish. Informational banners were present in the examination areas, and the patients were provided with a commemorative poster (**Figure 1**) and color brochures with information on refractive errors and common eye conditions such as cataracts and diabetic and hypertensive retinopathy.

Discussion

The international humanitarian clinic in the Guna community provided a valuable opportunity for optometry students to enhance their clinical skills and cultural competence. Our findings, based on student perceptions, indicate that this experience was successful in both areas.

This hands-on experience in a real-world setting allowed them to apply the knowledge and skills they had acquired in their academic curriculum. These findings align with previous research showing that students participating in international health electives experience significant gains in clinical knowledge and skills and consider international health work in their careers.[27]

All students in the project at IAUPRSO took a required, first-year, two-semester course in cultural competence taught by the first author (**Table 4**).[31] The 2.5-day Guna clinic provided a real-world opportunity for students from IAUPRSO to apply the knowledge and skills they learned and developed in the cultural competence course. On the other hand, faculty and students from UDELAS can provide long-term, sustainable optometric care to Indigenous communities in Panamá.[28] The local clinicians can eventually become cultural safety advocates.

TABLE 4
Topics covered in the Cultural Competence Course at the Inter American University of Puerto Rico School of Optometry

Themes and topics
What is cultural competence?
Health disparities and inequities
The Hispanic Patient
The African American Patient
The Asian Patient
The Native American Patient
Patients of European ancestry
The role of religion and spirituality
The culture of the elderly
The culture of young adults
The culture of children
Motivational Interviewing
Delivering Bad News
Ethical dilemmas
The power of stories
The power of visuals
Volunteer service organizations
The role of the WHO, WCO, AOA, NOA, LEO, and ALDOO

WHO = World Health Organization
WCO = World Council of Optometry
AOA = American Optometric Association
NOA = National Optometric Association
LEO = Latinos En Optometry
ALDOO = Latin American Association of Optometry and Optics

Table 4: Topics covered in the Cultural Competence course at IAUPRSO. Click to enlarge

Students' responses revealed a heightened awareness and understanding of cultural factors influencing healthcare. This immersion in a different cultural context, including interaction with Panamanian students and Guna community members, fostered a greater appreciation for diverse perspectives. This is consistent with a survey of occupational therapy students, who also found that international clinical activities enhanced their cultural competence by providing authentic experiences that reflected the host culture.[4]

A key factor in the clinic's success was the collaborative approach taken by all stakeholders. The project was a joint effort between two academic institutions, multiple organizations like VOSH/International and Lions Clubs, funding organizations such as the Optometry Giving Sight and the OneSight Essilor Luxottica Foundation, and critically, the Guna community itself. Decisions regarding eyecare activities and the study protocol were made by consensus with the Guna community, demonstrating a commitment to cultural competence and respect for local preferences. The involvement of Guna community members as interpreters and cultural liaisons was essential for effective communication and for providing context to patients' responses.[29]

This collaboration also had significant benefits for faculty and the Panamanian optometry program. The project represents the first epidemiological research study conducted by the Panamanian institution, leading to capacity-building benefits. Faculty from both institutions developed robust research protocols and manuscript preparation skills. Additionally, Panamanian students gained invaluable hands-on field research experience. This strengthens the program's research capabilities and helps to foster a new generation of clinicians and researchers dedicated to addressing health disparities in indigenous communities. The value of such international collaboration in epidemiological research has been advocated by other professions as a means to inform national health policies and understand the influence of culture on health.[30,31]

Conclusions

The Guna project was a collaborative effort between two optometry schools: IAUPRSO and UDELAS. The project provided comprehensive examinations and refractive corrections to those who needed them. The students perceived the project as an opportunity to refine their clinical skills. It also allowed the members of both school teams to interact clinically and socially, learn about the Guna culture and promote their cultural competence. The project allowed the two academic teams to collaborate and develop their clinical research knowledge and skills. The results were presented in a peer-reviewed poster, lecture and journal. Finally, it promoted a local Panamanian network of optometrists, the university, SVOSH members and members of the Lions Club to work together to provide sustainable eye care to other Indigenous and non-Indigenous communities in Panamá. International clinics like the Guna clinic can enhance the cultural and clinical skill-building experiences of students in the schools and colleges of optometry.

Acknowledgments

We acknowledge the support from the Optometry Giving Sight Foundation, OneSight EssilorLuxottica Foundation, VOSH/International, VSP, Panamá Lions Club, the former Mayor of the City of Panamá (Mr. José Luis Fábrega) and the former First Lady of Panamá (Mrs. Yazmín Colón de Cortizo).

We also acknowledge the support of the participating faculty and students from the Inter American University of Puerto Rico School of Optometry (IAUPRSO) and the Faculty of Medical and Clinical Sciences at the Specialized University of Las Américas (UDELAS) of Panamá.

Conflict of interest

The authors have no conflicts of interest associated with any company or product mentioned in the manuscript.

References

1. Listenberger M. Bringing the World into Focus: The Story of VOSH (Volunteer Optometric Services to Humanity). Bloomington, IN: Author House; 2017.
2. Clinics – VOSH/International [Internet]. Omaha, NE: Volunteer Optometric Services to Humanity; c2025 [cited 2025 August 7]. Available from: https://vosh.org/get-involved/clinics/
3. de Guzman MR, Durden TR, Taylor SA, Guzman JM, Pothoff KL. Cultural Competence: An Important Skill Set for the 21st Century [Internet]. Lincoln, NE: University of Nebraska Lincoln [cited 2023 January 4]. Available from: https://extensionpublications.unl.edu/assets/html/g1375/build/g1375.htm
4. Sequist TD, Fitzmaurice GM, Marshall R, et al. Cultural competency training and performance reports to improve diabetes care in black patients: a cluster randomized, controlled trial. Ann Intern Med 2010 Jan 5;152(1):40–6. DOI: 10.7326/0003-4819-152-1-201001050-00009
5. Chabot M, Mitchell M, Stevens-Nafai E, Nafai S. Impact of Clinical and Cultural Activities on Personal Growth During International Service-Learning. Internet Journal of Allied Health Sciences and Practice. 2022 Jan 3;20(1):1-8. DOI: 10.46743/1540-580X/2022.2121
6. Paez KA, Allen JK, Beach MC, Carson KA, Cooper LA. Physician cultural competence and patient ratings of the patient-physician relationship. J Gen Intern Med. 2009 Apr;24(4):495–8. DOI: 10.1007/s11606-009-0919-7
7. Burton MJ, Ramke J, Marques AP, et al. The Lancet Global Health Commission on Global Eye Health: vision beyond 2020. Lancet Glob Health 2021 Apr;9(4):e489-e551. DOI: 10.1016/S2214-109X(20)30488-5
8. Tervalon M, Murray-García J. Cultural humility versus cultural competence: a critical distinction in defining physician training outcomes in multicultural education. J Health Care Poor Underserved 1998 May;9(2):117–25. DOI: 10.1353/hpu.2010.0233
9. Ramsden IM. Cultural Safety and Nursing Education in Aotearoa and Te Waipounamu: A Thesis Submitted to the Victoria University of Wellington in Fullfillment of the Requirements for the Degree of Doctor of Philosophy in Nursing. Wellington, New Zealand; 2002.
10. Brascoupé S. Cultural Safety Applicability to Aboriginal Health and Wellness. J Aborig Health 2009 Jan;5:6–41. DOI: 10.3138/IJIH.V5I2.28981
11. Home – Inter American University of Puerto Rico School of Optometry [Internet]. Bayamón, PR: Inter American University of Puerto Rico; [cited 2025 September 1]. Available at: https://www.optonet.inter.edu/
12. Udelas. Licenciatura en Doctor en Optometría [Internet]. Ciudad de Panamá, Panamá: Universidad Especializada de las Américas; [cited 2025 September 1]. Available from: http://oracle.udelas.ac.pa/en/facultades/facultad-de-ciencias-medicas-y-clinicas/ofertas-academicas/licenciatura-en-doctorado-profesional-en-optometria/
13. Los pueblos indígenas de América Latina – Abya Yala y la Agenda 2030 para el Desarrollo Sostenible. Tensiones y desafíos desde una perspectiva territorial [Internet]. Santiago, Chile: United Nations Economic Commission for Latin America and the Caribbean; Available from: http://repositorio.cepal.org/bitstream/handle/11362/45664/17/S2000125es.pdf
14. Urriola Candanedo G. Dinámica demográfica de las Comarcas Indígenas de Panamá [Internet] Revista Karakol 2023;3:44–57; c2023 [cited 2023 December 19] Available from: https://revistas.udelas.ac.pa/index.php/karakol/article/view/229/295
15. Atencio C. La mujer que fundó Guna Nega [Internet]. Panamá, Panamá: La Estrella de Panamá. 2015 March [cited 2025 September 1]. Available from: https://www.laestrella.com.pa/panama/nacional/guna-nega-mujer-fundo-OKLE128251
16. Furtado JM, Fernandes AG, Silva JC, Del Pino S, Hommes C. Indigenous Eye Health in the Americas: The Burden of Vision Impairment and Ocular Diseases. Int J Environ Res Public Health. 2023 Feb 21;20 (5):3820. DOI: 10.3390/ijerph20053820.
17. Santiago H, Pagan D, Platero N, Oliveros J. Prevalence of Refractive Error and Visual Impairment

in the Guna Indians of Panama. J Community Med Public Health. 2024 Sept 12;8:1–11. DOI: 10.29011/2577-2228.100467
18. Center for Disease Control. Epi Info. Atlanta, GA.: Center for Disease Control; 2018.
19. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corporation; 2021.
20. Dedoose. Manhattan Beach, CA: SocioCultural Research Consultants; 2023.
21. Giffords ED, Calderon O. Academic and Community Collaborations: An Exploration of Benefits, Barriers and Successes. Human Service Organizations: Management, Leadership & Governance 2015;39(4):1-9. DOI:10.1080/23303131.2015.1034907
22. Santiago H, Pagan D, Platero N, et al. Refractive error, visual impairment, and ocular pathologies in the Guna indigenous population of Panama. Poster session presented at: American Academy of Optometry meeting; 2023 Oct 12; New Orleans, LA.
23. Santiago H. Improving Sight and Cultural Understanding: The Guna Indian Project. Paper presented at: VOSH/ASCO meeting; 2023 Oct 5; Virtual.
24. Santiago H. Improving Sight, Research, and Cultural Competence: The Indigenous Guna Project. Lecture presented at: Fifth World Congress of Optometry; 2025 Jun 26; Minneapolis, MN.
25. Alvarado-León G. Alumnos y profesores de la Interamericana llevan salud visual al pueblo guna en Panamá [Internet]. Panamá, Panamá: El Nuevo Día. 2022 June 18 [cited 2024 December 31]. Available from: https://www.elnuevodia.com/noticias/locales/notas/alumnos-y-profesores-de-la-interamericana-llevan-salud-visual-al-pueblo-guna-en-panama/
26. Kirsten-Coleman A. Vision Impact Institute se une a otros socios para llevar buena visión a poblaciones vulnerables en Panamá [Internet}. Bogota, Columbia: Grupo Franja 2022 May 24 [cited 2025 September 1]. Available from: https://grupofranja.net/vision-impact-institute-se-une-a-otros-socios-para-llevar-buena-vision-a-poblaciones-vulnerables-en-panama/
27. Jeffrey J, Dumont R, Kim GY, Kuo T. Effects of International Health Electives on Medical Student Learning and Career Choice: results of a systematic literature review. Fam Med. 2011 Jan;43(1):21–8.
28. Pearce MG. Volunteer-based vision nongovernmental organizations and VISION 2020. Optometry. 2008 Aug;79(8):464–71. DOI: 10.1016/j.optm.2007.10.016
29. Kasten MJ, Berman AC, Ebright AB, Mitchell JD, Quirindongo-Cedeno O. Interpreters in Health Care: A Concise Review for Clinicians. Am J Med 2020 Jan 11;133(4):424-428.e2. DOI: 10.1016/j.amjmed.2019.12.008
30. Gallani MC. International collaboration in the Nursing agenda in the coming decades. Rev Lat Am Enfermagem. 2016 Nov 21;24:e2739. DOI: 10.1590/1518-8345.0000.2739.
31. Walker SN, Badger TA, Johnson J, Lengacher C, Prevost S, Romyn D. International Collaborative Research Guidelines [Internet]. Indianapolis, IN: Sigma Nursing; c2003 [cited 2024 December 30]. Available from: https://www.sigmanursing.org/docs/default-source/research-documents/guidelines_icr.pdf?sfvrsn=0

Héctor Santiago, OD, PhD, FVI, Dipl AAO, is Professor, Director of Research, and Past-Dean of the Inter American University of Puerto Rico School of Optometry (IAUPRSO). He earned his OD from the New England College of Optometry, and his MS, and PhD from the University of Texas. Dr Santiago is also a Diplomate of the Public Health and Environmental Vision Section of the American Academy of Optometry, and President, VOSH/International.

Damaris Pagán, OD, MPH, FAAO, is an Associate Professor and Dean of Clinical Affairs of the Inter American University of Puerto Rico School of Optometry (IAUPRSO). She earned her OD from IAUPRSO, and her MPH from the University of Puerto Rico, Medical Sciences Campus.

PEER REVIEWED

Comparing self, peer, and faculty assessments within an interprofessional hybrid course

Jasmine Wong Yumori OD, FAAO, Dipl AAO, FNAP, Kierstyn Napier-Dovorany OD, FAAO, JaeJin An, PhD | Optometric Education: Volume 51 Number 1 (Fall 2025)

Abstract

Providing effective and timely feedback to students on interprofessional communication skills, particularly within courses with large enrollment, can be difficult. This study compared faculty to self- and peer assessments of consultations/referrals written by second year optometry students enrolled in an interprofessional hybrid course. Results demonstrated that the highest scores were generally seen from self-assessments, followed by peer, and lastly faculty assessments. Since correlations between faculty and both self- and peer assessments were weak, more investigation is needed to evaluate how and when to best use self and peer assessment.

Keywords

interprofessional education, peer assessment, self-assessment

Introduction

Effective interprofessional communication skills are critical in achieving efficient and safe care of patients.[1] Written consultation and referral requests are the most common methods by which healthcare providers communicate crucial patient information.[2] Poor communication can lead to increased healthcare costs and delays or even errors in diagnosis.[3] Thus, it is essential for health professional students, including optometry students, to practice and receive feedback on writing consultations/referrals prior to direct involvement in the clinical care of patients. As stated by the Association of Schools and Colleges of Optometry, schools and colleges of optometry shall ensure that before graduation each student will have demonstrated "effective communication skills, both oral and written, as appropriate for maximizing successful patient care outcomes".[4]

Providing effective and timely feedback from faculty regarding communication skills can be difficult, particularly in courses with large student enrollment. Self- and peer assessments have been shown to serve as learning tools to stimulate student participation, allow students to gain insight into their own performance, promote self-directed lifelong learning,[5-8] build reflection and self-awareness skills,[9] and provide constructive feedback.[10] The ability to understand ones' own strengths and weaknesses through the process of self-assessment is an important component in health professions training.[11,12]

While self- and peer assessments have been shown to be effective learning tools, there are mixed impressions regarding their use as an assessment tool.[6,7,13-17] The goal of this study is to assess for similarities and differences between optometry students' self-assessments of written interprofessional communication skills compared to assessments from peers and faculty to thus evaluate the effectiveness of self- and peer assessment as a reliable assessment tool in this context.

Methods

Description of the Course

Team Training in Healthcare I (IPE 6000) is a course at Western University of Health Sciences. During the Fall 2015 delivery of IPE 6000, the course had over 850 students enrolled across eight health professions programs (dental medicine, graduate nursing, optometry, osteopathic medicine, pharmacy, physical therapy, podiatric medicine and veterinary medicine) on two campuses (Pomona, California, and Lebanon, Oregon) and was mainly delivered online. Students enrolled in IPE 6000 completed written consultations/referrals based on a case created by faculty from students' respective professions. The process and rubric were introduced to students through a video briefing session.

Self- and Peer Assessments

TABLE 1
SBAR tool

Category	Description
Situation	Speaker introduces themselves, providing patient identifiers and a brief description of the problem
Background	Speaker provides patient history related to the situation, signs and symptoms, and relevant test results
Assessment	Speaker shares a provisional diagnosis or clinical impression
Recommendation	Speaker suggests what is needed and when

Table 1: SBAR tool. Click to enlarge

After students uploaded their consultations/referrals onto a Learning Management System (Blackboard), they were asked to provide self-assessments and anonymous peer assessments from two health professions students enrolled in the course using a generalized rubric focused on interprofessional communication skills. Given the randomization process, peer assessments were completed by students from any of the enrolled eight health professions programs. Thus, the peer feedback could have been done by an optometry or a non-optometry student. The design of the rubric was based on the SBAR (Situation-Background-Assessment-Recommendation) tool from the Institute for Healthcare Improvement (**Table 1**)[18] and the core competencies from the Interprofessional Education Collaborative.[19] Consultations/referrals written by optometry students only were evaluated in this study.

TABLE 2
Rubric categories

Category	Ideal description
Situation	All relevant data, focused into a one- or two-sentence description of need, is provided
Background	All key (including safety) issues and details to make an assessment are provided
Assessment	The writer's position on the issue is clear
Recommendation	A clear indication of what the writer wants to be done and when is provided
Roles and Responsibilities	Communicates one's roles and responsibilities clearly
Organization	Discipline-specific terminology is avoided; appropriate grammar and spelling is used; judicious use of abbreviations
Relationship-building	Writer is clear, concise, confident, and respectful
Values and Ethics	Dignity/privacy of patient is maintained; patient/populations is/are at the center of health care delivery; demonstrates development of trusting relationships

Table 2: Rubric categories. Click to enlarge

The specific rubric categories were Situation, Background, Assessment, Recommendation, Roles and Responsibilities, Organization, Relationship-building and Values and Ethics (**Table 2**). Ideal descriptions for each category were provided. For each rubric category, students had to rate performance as Ineffective, Somewhat effective or Effective. Students were provided with the opportunity to provide qualitative feedback for each category, asked to provide an overall rating and encouraged to provide overall qualitative feedback.

Students subsequently received peer feedback on their own consultation/referral and a video debrief with overall feedback from the instructor of record (Yumori) was provided after the completion of each case. **Figure 1** summarizes the student perspective of the consultation/referral process.

Figure 1: Student perspective of the consultation/referral process. Click to enlarge

Faculty Assessment

Two college of optometry faculty members (Yumori and Napier-Dovorany) completed faculty assessments on consultations/referrals written by second-year optometry students enrolled in the Fall 2015 delivery of IPE 6000. To reduce inter-rater variability, the faculty members separately evaluated three consultations/referrals using the same rubric as used by students (**Figure 1**) and then discussed scores. After this step, each faculty member then independently evaluated 29 consultations/referrals using the same rubric. Consultations/referrals were de-identified prior to the faculty assessment process.

Statistical Analysis

With identifying information removed, a total of 58 consultations/referrals written by optometry students were included for this study. Ten consultations were excluded from analysis due to missing self- or peer assessments, and 48 consultations/referrals were used for analysis. For each consultation/referral, optometry students' self-assessment was given a numeric composite score, with one point for Ineffective, two points for Somewhat effective and three points for Effective across each of the eight rubric categories (Situation, Background, Assessment, Recommendation, Roles and Responsibilities, Organization, Relationship-building and Values and Ethics). This process was used to calculate the numeric composite score from each peer (two total) and from the faculty assessment. The Peer Average was calculated by averaging the numeric composite score from both peer assessments. Descriptive statistics and intra-class correlation coefficient were applied comparing scores between Self and Peer Averages, Peers (Peer 1 vs Peer 2), Self and Faculty, and Peer Average and Faculty. Scores were also categorized (23-24, 21-22, 19-20, and 18 or lower) and Cohen's kappa statistics and 95% confidence intervals were calculated to assess for agreement between Self and Peer Average, Peer 1 and Peer 2, Self and Faculty, and Peer Average and Faculty. This study was approved by to the Institutional Review Board at Western University of Health Sciences.

Results

Overall, mean (SD) composite scores were relatively high (23.5 (0.8) for Self, 23.2 (0.7) for Peer Average, and 20.7 (2.2) for Faculty), with Self and Peers assessments tending to show higher scores compared to Faculty (**Figure 2**).

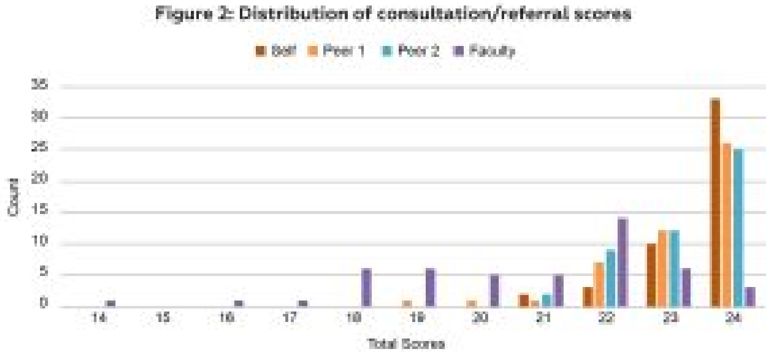


Figure 2: Distribution of consultation/referral scores. Click to enlarge

Intra-class correlation coefficients using composite scores were “highest” between Peers (Peer 1 and Peer 2) at 0.13, followed by Self and Peer Average at 0.12, Peer Average and Faculty at 0.06, and lowest for Self and Faculty scores at -0.01.

TABLE 3
Inter-observer agreement

Category	Kappa	95% CI	
Self and Peer Average	0.11	-0.25	0.46
Self and Faculty	-0.08	-0.17	0.01
Peer 1 and Peer 2	-0.01	-0.27	0.25
Peer Average and Faculty	0.001	-0.05	0.05

Table 3: Inter-observer agreement. Click to enlarge

When composite scores were categorized (23-24, 21-22, 19-20, and 18 or lower), Cohen’s kappa statistics and 95% confidence intervals were 0.11 (-0.25-0.46), -0.01 (-0.27-0.25), and 0.001 (-0.05-0.05) for Self and Peer Average, Peer 1 and Peer 2, and Peer Average and Faculty, respectively (**Table 3**).

Agreement differences between the Peer Average and Faculty scores varied based on rubric categories (**Figure 3**). Higher agreement was seen with the Values and Ethics (100%), Relationship-building (98%), and Organization (91%) categories. Lower levels of agreement were seen between the Peer Average and Faculty scores on the Assessment (30%), Background (35%), Situation (43%), Recommendation (48%), and Roles and Responsibilities (54%) categories.

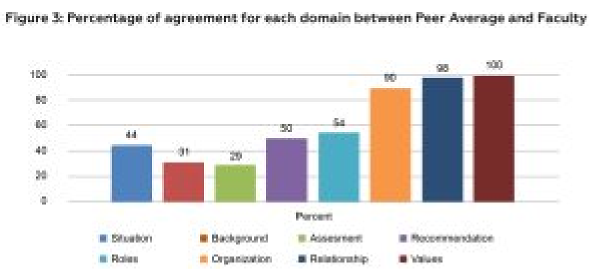


Figure 3: Percentage of agreement for each domain between Peer Average and Faculty. Click to enlarge

Discussion

In this study, which compared self-, peer and optometry faculty assessments of consultations/referrals written by second-year optometry students within an interprofessional education course, overall, scores were relatively high, with generally higher scores from self-assessments, followed by peer assessments and lastly assessments from faculty. The trend of students tending to self-rate their communication abilities high is common, as seen in by Chu and Woo, where 96% of optometry students self-rated “use of written and oral communication that is understandable to patients, families and other healthcare team members” as an area of strength.[20] Papinczak, Young, Groves and Haynes highlight that students with greater self-efficacy tend to score their performance higher and found moderate correlations between peer assessments and tutor.[9] This is similar to our statistical agreement, with the “highest” intra-class correlation coefficient between peers and lowest between self and faculty. However, given that stratification was done by category with good agreement in organization, Relationship-building and Values and Ethics and lower agreement in the SBAR dimensions, there is poor overall agreement. This difference in agreement is likely due to the shared perspectives peers encompass compared to the differences in level of development and experience between students and faculty. Over-estimation common in self-grading may also have been a contributing factor.[21]

Weak agreement between self-, peer and faculty assessments may also be partly based on differences across rubric categories, with more agreement seen between peers and faculty in more subjective categories (Values and Ethics, Relationship-building and Organization). Such categories may thus be appropriate to assign to peers from an assessment perspective, allowing faculty to dedicate more time in providing feedback to other sections that perhaps require more experience. While self- and peer assessments may not align closely with faculty evaluations and self-assessment accuracy can change over time,[22,23] these strategies offer benefits that should not be overlooked. Self-grading has been shown to promote self-regulation of learning,[24] improve metacognition,[21] and support lifelong learning,[25] all of which are crucial skills for healthcare professionals, including optometrists. Peer assessment helps students develop critical evaluation skills and exposes them to diverse perspectives, which is essential for effective interprofessional communication. Both self- and peer assessments allow students to be more active and motivated throughout the learning process,[26] especially in lower stakes learning opportunities. Furthermore, value may lie in the learning process itself rather than in producing scores that match faculty grading. These methods can serve as powerful complementary tools to faculty assessment, particularly in large courses where timely, individualized feedback from instructors may be challenging to provide.

When composite scores were categorized little to no agreement was seen, with the no agreement seen between self and faculty, between peers and between the peer average and faculty assessments; slight agreement was seen between the peer average and self-assessments.[27] We believe the weak to no agreement may be due in part to ceiling effects. Trudel and colleagues shared two definitions of ceiling effects:[28] the first is “an intervention having limited effect because the population is already at, or near, a pinnacle point,”[29] which may fit with our study that involved optometry students, who must be highly qualified academically in order to enter an optometry program.[30]

The second definition Trudel and colleagues reference regarding ceiling effects,[28] those caused by “the limitation of an assessment to capture the extent and variance of accomplishment because essentially the assessment is too simplistic,”[29] is also appropriate. It is possible that the profession-specific case the second-year optometry students based their consultation/referrals on was too simple and/or the rubric was not specific or sensitive enough to capture meaningful differences. Selecting a more complex case and using more specific assessment tools such as checklists, which provide more structured guidance to students, may correct this measurement problem that limits our ability to accurately assess.[31,32] Other course-specific characteristics, such as providing more extensive training session[23] and more detailed rubric criteria,[33] may additionally be influential in students’ accuracy in self- and peer scoring, with faculty scores as comparison.

Future directions involve enhancing the rubric design by incorporating detailed descriptors that clearly define the criteria for each performance level: Ineffective, Somewhat effective and Effective. Capturing student-specific characteristics such as overall academic performance, gender and self-efficacy and competency to see whether these affect self-, peer and faculty assessments of optometry students' interprofessional communication skills may also be helpful. Additional future directions include assessing optometry students' performance as they gain more clinical experience, comparing assessments from and of optometry students across different institutions, and to expand this work beyond the profession of optometry to allow comparisons between different professions.

It is important to note that based on the course and Learning Management System design, it was not possible for us to control for which health professional student evaluated which consultation/referral. It would be exciting to see whether there is a difference in assessments from optometry versus non-optometry students and furthermore between optometry faculty members (as seen in this study) compared to faculty from other health professions. Other areas to explore include featuring other types of clinical cases to see whether more complex cases demonstrate less influence from ceiling effects and any differences between written and verbal interprofessional communication.

Moving forward, educators should consider implementing a balanced approach that combines faculty, self- and peer assessments. This multi-faceted strategy can provide students with a more comprehensive learning experience, fostering critical skills such as self-reflection, peer evaluation and interprofessional communication. However, it is crucial to provide clear grading criteria and training for students to maximize the effectiveness of self- and peer assessments.

Conclusion

This study highlights the challenges of relying solely on self- and peer assessments in interprofessional communication skills training, especially in large courses. The weak correlations between faculty, self- and peer evaluations suggest students may lack the objectivity or experience to accurately assess their own and their peers' performance in these complex skills.

Instructors need to re-evaluate how we use self- and peer assessments, perhaps shifting towards incorporating more structured assessment rubrics, providing explicit training on evaluation criteria, and increasing direct faculty feedback, even in large enrollment courses. Thoughts about breaking down communication skills into smaller, more observable behaviors that are easier for students to evaluate may be appropriate.

This experience furthermore underscores the need to design activities that specifically encourage students to calibrate their self-perception against expert feedback. If self- and peer assessment are maintained as valuable components of an IPE course, students can be advised to reflect on expert observations and feedback so that they may be more calibrated in future iterations of assessment.

Ultimately, if there is a desire for students to develop effective interprofessional communication skills, assessment methods need to be valid, reliable and provide meaningful feedback that drives improvement. This will allow students to become active, self-directed lifelong learners, build reflection and self-awareness skills and provide constructive feedback, all of which are crucial skills to develop in optometry and all health professional students.

References

1. Keller KB, Eggenberger TL, Belkowitz J, Sarsekeyeva M, Zito AR. Implementing successful

interprofessional communication opportunities in health care education: a qualitative analysis. Int J Med Educ. 2013 Dec 22;4:253-9. DOI: 10.5116/ijme.5290.bca6

2. François J. Tool to assess the quality of consultation and referral request letters in family medicine. Can Fam Physician. 2011 May(5);57:574-5.
3. Epstein RM. Communication between primary care physicians and consultants. Arch Fam Med. 1995 May;4(5):403-9. DOI: 10.1001/archfami.4.5.403
4. Smythe JL, Daum KM. Attributes of Students Graduating from Schools and Colleges of Optometry: A 2011 Report from the Association of Schools and Colleges of Optometry [Internet]. Rockville, MD: Association of Schools and Colleges of Optometry; c2011 [cited 2019 October 2]. Available from: https://optometriceducation.org/files/2011_AttributesReport.pdf
5. Speyer R, Pilz W, Van Der Kruis J, Brunings JW. Reliability and validity of student peer assessment in medical education: a systematic review. Med Teach. 2011;33(11):e572-85. DOI: 10.3109/0142159X.2011.610835
6. Wagner ML, Suh DC, Cruz S. Peer- and self-grading compared to faculty grading. Am J Pharm Educ. 2011 Sep 10;75(7):130. DOI: 10.5688/ajpe757130
7. Tornwall J. Peer assessment practices in nurse education: An integrative review. Nurse Educ Today. 2018 Sep 21;71:266-75. DOI: 10.1016/j.nedt.2018.09.017
8. Dolmans D, Schmidt H. The advantages of problem-based curricula. Postgrad Med J. 1996 Sep;72(851):535-8. DOI: 10.1136/pgmj.72.851.535
9. Papinczak T, Young L, Groves M, Haynes M. An analysis of peer, self, and tutor assessment in problem-based learning tutorials. Med Teach. 2007 Jun;29(5):e122-32. DOI: 10.1080/01421590701294323
10. Anderson PA. Giving Feedback on Clinical Skills: Are We Starving Our Young? J Grad Med Educ. 2012 Jun;4(2):154-8. DOI: 10.4300/JGME-D-11-000295.1
11. Epstein RM. Assessment in medical education. N Engl J Med. 2007 Jan 25;356(4):387-96. DOI: 10.1056/NEJMra054784
12. Batalden P, Leach D, Swing S, Dreyfus H, Dreyfus S. General competencies and accreditation in graduate medical education. Health Aff (Millwood). 2002 Sep-Oct;21(5):103-11. DOI: 10.1377/hlthaff.21.5.103
13. Hanrahan S, Isaacs G. Assessing Self- and Peer-Assessment: The Students' Views. Higher Education Research & Development. 2001 May;20(1):53-70.
14. Magin D. A Novel Technique for Comparing the Reliability of Multiple Peer Assessments with that of Single Teacher Assessments of Group Process Work. Assessment & Evaluation in Higher Learning. 2001 Jun;26:139-52. DOI:1080/02602930020018971
15. Rudy DW, Fejfar MC, Griffith CH 3rd, Wilson JF. Self- and Peer Assessment in a First-Year Communication and Interviewing Course. Eval Health Prof. 2001 Dec;24(4):436-45. DOI: 10.1177/016327870102400405
16. Fitzgerald K, Vaughan B. Learning through multiple lenses: analysis of self, peer, near-peer and faculty assessment of a clinical history taking task in Australia. J Educ Eval Health Prof. 2018 Sep 18;15:22. DOI: 10.3352/jeehp.2018.15.22
17. Tai JH, Canny BJ, Haines TP, Molloy EK. The role of peer-assisted learning in building evaluative judgement: opportunities in clinical medical education. Adv Health Sci Educ Theory Pract. 2015 Dec 12;21(3):659-76. DOI: 10.1007/s10459-015-9659-0
18. Institute for Healthcare Improvement T. SBAR Tool: Situation-Background-Assessment-Recommendation [Internet]. Cambridge, MA: Institute for Healthcare Improvement; [cited 2019 July 12]. Available from: http://www.ihi.org/resources/Pages/Tools/SBARToolkit.aspx.
19. Interprofessional Education Collaborative Expert Panel. Core competencies for interprofessional collaborative practice: Report of an expert panel. Washington, DC: Interprofessional Education Collaborative; 2011.
20. Chu, RH, Woo S. Student Perceptions of Attaining the Association of Schools and Colleges of Optometry Graduate Attributes. Optometric Education. 2021 Fall;47(1).

21. Jackson MA, Tran A, Wenderoth MP, Doherty JH. Peer vs. Self-Grading of Practice Exams: Which Is Better? CBE Life Sci Educ. 2018 Sep 1;17(3):es44. DOI: 10.1187/cbe.18-04-0052.
22. Fitzgerald JT, White CB, Gruppen LD. A longitudinal study of self-assessment accuracy. Med Educ. 2003 Jul;37(7):645-9. DOI: 10.1046/j.1365-2923.2003.01567.x
23. Blanch-Hartigan D. Medical students' self-assessment of performance: results from three meta-analyses. Patient Educ Couns. 2011 Aug 14;84(1):3-9. DOI: 10.1016/j.pec.2010.06.037
24. Eccles JS, Wigfield A. Motivational beliefs, values, and goals. Annu Rev Psychol. 2002;53:109-32. DOI: 10.1146/annurev.psych.53.100901.135153
25. Sambell K, McDowell L, Brown S. But is it far?: An exploratory study of student perceptions of the consequential validity of assessment. Studies in Educational Evaluation. 1997;4:349-71.
26. Edwards N. Students self-grading in social statistics. College Teaching. 2007;55(2):72-6. DOI:3200/CTCH.55.2.72-76
27. McHugh ML. Interrater reliability: the kappa statistic. Biochem Med (Zagreb). 2012;22(3):276-82.
28. Trudel MC, Marsan J, Paré G, et al. Ceiling effect in EMR system assimilation: a multiple case study in primary care family practices. BMC Med Inform Decis Mak. 2017 Apr 20;17(1):46. DOI: 10.1186/s12911-017-0445-1
29. Judson E. Learning about bones at a science museum: examining the alternate hypotheses of ceiling effect and prior knowledge. Instr Sci. 2011 Nov;40(6):957-73. DOI: 10.1007/s11251-011-9201-6
30. Associations of Schools and Colleges of Optometry. Annual Student Data Report [Internet]. Rockville, MD: c2018 [cited 2019 September 9]. Available from: https://optometriceducation.org/wp-content/uploads/2018/05/ASCO-Student-Data-Report-2017-18.pdf
31. Hetstroni A. Ceiling effect in cultivation: general tv viewing, genre-specific viewing, and estimates of health concerns. Journal of Media Psychology: Theories, Methods, and Applications. 2014 Mar;26(1):10-8. DOI: 10.1027/1864-1105/a000099
32. Vita S, Coplin H, Feiereisel KB, Garten S, Mechaber AJ, Estrada C. Decreasing the ceiling effect in assessing meeting quality at an academic professional meeting. Teach Learn Med. 2013;25(1):47-54. DOI: 10.1080/10401334.2012.741543
33. Ward M, Gruppen L, Regehr G. Measuring self-assessment: current state of the art. Adv Health Sci Educ Theory Pract. 2002;7(1):63-80. DOI: 10.1023/a:1014585522084

During this work, Drs. Jasmine Yumori and Kierstyn Napier-Dovorany were Associate Professors at Western University of Health Sciences College of Optometry and Dr. JaeJin An was an Assistant Professor at Western University of Health Sciences College of Pharmacy.

Features

Editorial

Fifty Years of Optometric Education: A Legacy of Learning

Keshia S. Elder, OD, MS, MS, FAAO, FNAP | *Optometric Education: Volume 51 Number 1 (Fall 2025)*

This Fall issue celebrates the 50th anniversary of *The Journal of Optometric Education/Optometric Education*. For five decades this journal has advanced optometric education and served as a platform to foster collaboration, document innovation and advance pedagogy.

The first issue of *The Journal of Optometric Education* was published in Winter 1975. ASCO President Dr. William Baldwin indicated that the journal symbolized ASCO's commitment to "provide active national leadership in the quest to strengthen and improve optometric education." Topics published in the journal included the cost of optometric education, optometric educator training, clinical training and curriculum. These topics are still researched and discussed in today's *Optometric Education*. The inaugural editorial, "Why A Journal?", written by Dr. Norman E. Wallis, Editorial Council Chairman, addressed the impending changes in the profession of optometry, strides within schools and colleges of optometry to meet these changes, ASCO's responsibilities to the profession, individual responsibilities of students and faculty to advocate for the profession, unity within optometric education and the need for a mechanism to showcase the quality education that trains future optometrists. Although progress has been made in these areas, they still warrant discussion. The original purpose behind creating *Optometric Education* remains relevant today. Many milestones have been met over the years: we have expanded from 10 to 26 schools and colleges of optometry, technology has been integrated into optometric education and patient care, year-long optometry residencies were launched, accreditation standards were majorly revised, curriculum innovations have been introduced, and clinical training advancements have been made. As these milestones were met, *Optometric Education* documented the profession's commitment to advancing evidence-based practice and lifelong learning.

Optometric Education has served as a venue to showcase faculty contributions to optometric education, support faculty development, disseminate research and highlight faculty innovation. As optometry transformed over the years into a primary healthcare profession, the journal supported and recorded its growth and development. Optometry and optometric education continues to evolve. *Optometric Education* will continue to serve as a platform for dialogue, collaboration and sharing. Public awareness of the profession of optometry, (ASCO's Optometry Gives Me Life campaign), quality and quantity of the optometry applicant pool, scope of practice, diversity within the profession, healthcare reimbursement, workforce shortages and access to care gaps remain challenges. Engaging in the scholarship of teaching and learning will ultimately help us better serve our students and patients.

As optometric educators, we work together to embrace the opportunities that shape the future of the profession. There will be new and evolving trends in the upcoming years. Artificial intelligence (AI) applications including education, diagnostics and data analytics will likely influence the approach to patient care. Changing healthcare models incorporating telemedicine and remote care, scope expansion and global care warrant discussion. Discussions surrounding artificial intelligence ethics, curriculum innovation, clinical simulations and virtual reality will be ongoing. *Optometric Education* remains a resource to provide educators with innovative teaching models, evidence-based strategies and insights into emerging trends.

This 50th Anniversary issue celebrates the journal and the people who sustain it. Thank you to the authors, readers, reviewers and sponsors for your dedication and trust. Thank you to the past editors whose vision and leadership formed the foundation of the journal and guided us through the decades of change. As we look to the next 50 years, I invite your continued support of the journal and optometric education. Share your research, innovations, and your thoughts so that we can continue to collaborate and develop new ideas to advance the profession.

Optometric Education maintains its status as the only peer-reviewed journal dedicated solely to serving optometric education. Optometric educators hold a distinctive role because although we are subject matter experts, many of us lack formal pedagogical training. Nonetheless, we educate future optometrists with evolving needs in a changing professional landscape. When looking to what's in the future for *Optometric Education*, former editor Dr. Aurora Denial stated, "I hope it continues to expand the body of educational scholarship and remains the leading resource for evidence-based teaching in optometry. Its continued growth will ensure that future generations benefit from both rigorous research and innovative practices." *Optometric Education* will continue to support us in this journey.

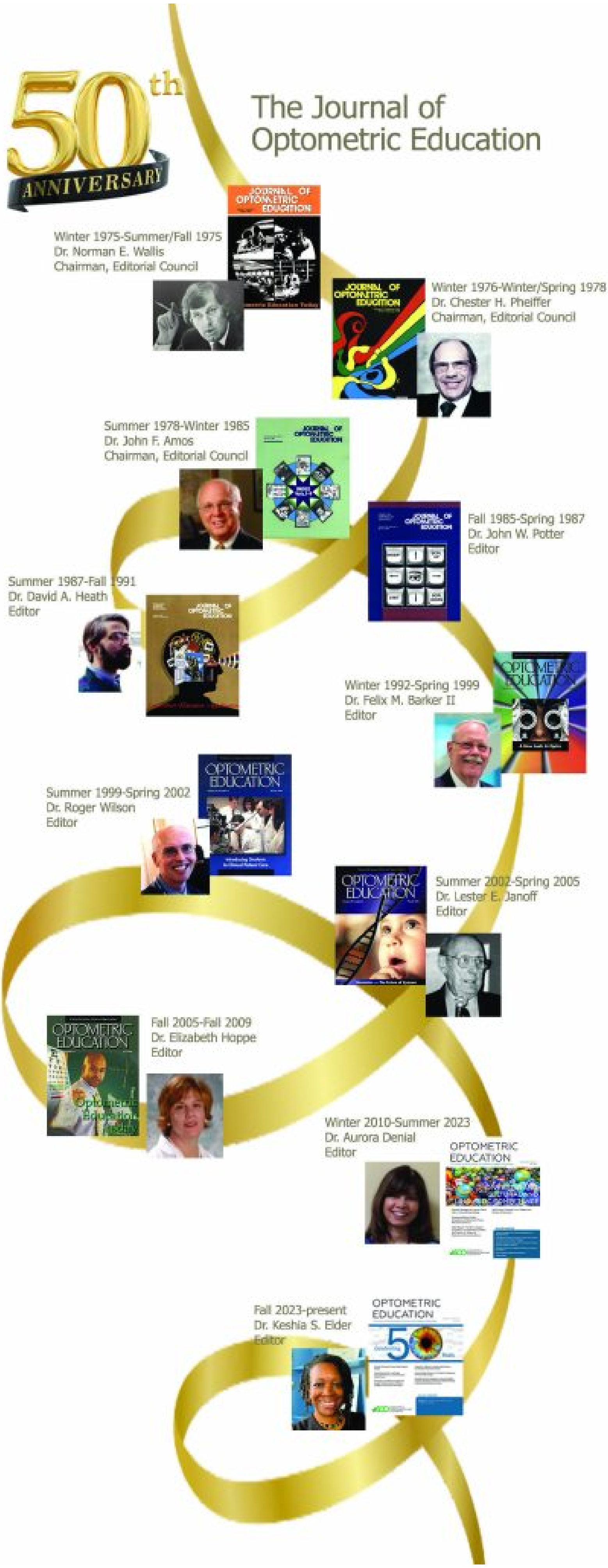
Cheers to the next 50 years!

Dr. Keshia Elder [elderk@umsl.edu], Editor of *Optometric Education*, is a Clinical Professor and Dean of the University of Missouri-St. Louis College of Optometry.

A Legacy of Stewardship

Rebecca Dobrinski, Managing Editor | Optometric Education: Volume 51 Number 1 (Fall 2025)

As we celebrate *Optometric Education*'s anniversary, we also celebrate the editors whose vision, leadership and dedication shaped the journal across five decades. Each editorial tenure marks a chapter in the evolving story of optometric education. Together, they advanced scholarship, expanded perspectives and upheld standards of excellence. Together, these men and women form a legacy of stewardship that has kept *Optometric Education* relevant and vital as our profession continues to evolve.


50th ANNIVERSARY
The Journal of Optometric Education
Winter 1975-Summer/Fall 1975
Dr. Norman E. Wallis
Chairman, Editorial Council
Winter 1976-Winter/Spring 1978
Dr. Chester H. Pheiffer
Chairman, Editorial Council
Summer 1978-Winter 1985
Dr. John F. Amos
Chairman, Editorial Council
Fall 1985-Spring 1987
Dr. John W. Potter
Editor
Summer 1987-Fall 1991
Dr. David A. Heath
Editor
Winter 1992-Spring 1999
Dr. Felix M. Barker II
Editor
Summer 1999-Spring 2002
Dr. Roger Wilson
Editor
Summer 2002-Spring 2005
Dr. Lester E. Janoff
Editor
Fall 2005-Fall 2009
Dr. Elizabeth Hoppe
Editor
Winter 2010-Summer 2023
Dr. Aurora Denial
Editor
Fall 2023-present
Dr. Keshia S. Elder
Editor

50 Years of Editorial Leadership.
Graphic designed by Janice White
University of Missouri-Saint Louis
College of Optometry.

Sponsors

ALCON Precision7

OptometricEducation | Optometric Education: Volume 51 Number 1 (Fall 2025)

CooperVision

OptometricEducation | Optometric Education: Volume 51 Number 1 (Fall 2025)

Blog

A one-stop resource featuring regularly updated, original content including peer written articles, legislative updates, and news and information from CooperVision.®

Online Success Center

The Online Success Center delivers online, on-demand information to benefit your patients and your practice when and where you want it.

Podcast

The Podcast is an ideal way to learn while you listen to experts talk about topics that are relevant and engaging.

It's easy to join—and to enjoy

To subscribe to the Blog:

1. Scan the QR Code
2. Click *Subscribe to ECP Viewpoints℠*
3. Enter your information

To register for Online Success Center:

1. Scan the QR Code
2. Click *Register Here*
3. Enter your information

To subscribe to the Podcast:

1. Search for ECP Viewpoints℠ on your favorite podcast app

ECP VIEWPOINTS CooperVision®

Walmart OD

OptometricEducation | Optometric Education: Volume 51 Number 1 (Fall 2025)