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Effectiveness of online learning in improving optometry student's reflective abilities

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Abstract

Purpose: Optometry education strives to develop competencies required for reflective practice in its pupils. The forced changes in academia during COVID-19 pandemic, rapid switching to online methods imposed serious challenges on the training of reflective skills. We hypothesize that the synchronous online sessions of case-based reflections are effective in imparting training for reflective practice in optometry students.

Methods: A prospective study was done with planned, synchronous, online, small group workshops for case-based reflections through the second year of optometry program during 'introduction to patient care' course. The reflective competencies were measured with a modified Groningen Reflection Ability Scale (GRAS) at the beginning and towards conclusion. Data was analysed with Mann-Whitney one tail test and qualitative thematic methods.

Results: Total of 104 students participated in the study. The aggregate score showed significant improvement ($p<0.05$) in students' reflective ability. A rising trend was seen in each component namely self-reflection, empathetic and communication reflections.

Discussions: The results demonstrate that the reflective skills can be developed using virtual patient experiences, case-based reflective practices conducted in synchronous small group workshops in online mode. Students perceived it as useful activity in developing themselves as healthcare professionals.

Introduction

Reflection is an ability of optometry professionals to appraise their judgements, feelings and emotional responses, following a certain situation or an experience. Reflective practice is an important tool for enhancing lifelong learning skills. "Reflection is a metacognitive process which allows the individual to learn from past experiences".[1] Candid reflections support educational endeavours by scaffolding the new knowledge on prior comprehensions and minimize learning errors. It also serves the purpose of training the health profession students in empathetic communication, critical thinking, and clinical decision-making skills.[2] It not only creates awareness but also helps in interpretation of vivid learning experiences in the present context. Reflective

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practices help to determine the focus of learning activities and to professionally respond to a crisis such as COVID-19 pandemic.[3]

Developments during COVID-19 pandemic have massively destructed conventionally practiced, face to face teaching methods in medical and health profession education and Optometry is no exception. Optometry educators across the globe quickly adapted the 'new normal', adding technology to their teaching practices, ranging from online lectures using video conferencing applications to virtual and simulated patient experiences and provision of digital libraries of learning material.[4-7] Optometry schools continued to follow the academic timetable, despite facing serious challenges such as availability of dedicated teaching time, difficult accessibility of clinical resources for teaching, cultivating professional attitude and behavioural skills in students and latest addition to the list is hybrid patterns of academic delivery.[8] The quick adoption of newer teaching methods such as synchronous lectures, online storytelling, asynchronous readings, video demonstrations of optometry techniques and many more has kept the momentum of teaching going. However, the effectiveness of these rapid adjustments is not yet fully understood.[9] Further, there is scarcity of published evidence about effectiveness of online training on improvements in health professional's attributes such as reflective practice. Additionally, unlike other health professionals, there is minimal evidence for the methods followed for development of soft skills in optometry students. Inculcating the habit of reflection in optometry students has always been challenging[10] and the difficulty has increased with restrictions imposed by the pandemic spread. This study was undertaken to find effectiveness of synchronous e-learning methods such as virtual patient experience and small group video meetings, in enhancing reflective ability of optometry students, during their pre-clinical learning endeavours. We hypothesize that the course "introduction to patient care" delivered using synchronous online learning methods was effective in improving students' reflective abilities.

Methods

Study settings

This study was approved by college ethics committee and followed the tenants of the declaration of Helsinki. Students who had taken "introduction to patient care" course during their second year of undergraduate optometry program were invited to participate in this study. The course was conducted fully in online mode due to restrictions imposed by COVID-19 pandemic on clinical skills training. Four supervisors in 2020 and five supervisors in 2021 conducted the course in synchronous mode, using techniques such as role play, small group workshops, peer review and feedback, delivered on a video conferencing platform. The sessions were designed on principles of collaborative learning.[11]

Delivery of the course in online mode

Students were randomly divided into groups of twelve that met weekly on a video conferencing platform. Random division of students helped us to mitigate potential biases and manage expectations among the students. Prior to each session, a pair of students was given a simulated case with a detailed patient history and corresponding clinical records. Every week, on rotation, a pair of students mimic the role of optometrist and patient. The student representing the optometrist begins a patient workup to determine the patient's history and reasons for visit. The pair then completes the simulated clinical workup to arrive at a diagnosis with a decision on first line of treatment. At the conclusion of the workup, the remaining students in the group were encouraged to give feedback on the roleplay. The feedback was given on optometry skills, decisions based on principles of evidence-based practice and soft skills such as communicative and empathic skills. The group then enters into a discussion that requires self-reflection on the part of the presenter. The presenting pair then summarizes the patient's history in professional terms and reviews the case analysis with the supervisor while the rest of the group reviews the pre-written case in pairs. Each pair must upload the summary and conclusions to the Padlet, an online tool for writing collective notes. After a consensus is reached, the same pair repeats the roleplay, with swapping of their roles. The student who was the patient becomes the optometrist, explaining the results of the eye examination and treatment recommendations. The remaining group now observes the students' soft skills that are required to communicate the outcomes of eye examination in an appropriate tone and urgency. At conclusion of second role play, the students were asked questions, guiding them to reflect upon their learning experiences. The students are encouraged to reflect and discuss on the soft skills demonstrated by the presenting pair. These real time reflections were discussed by their peers and supervisors. The contemporaneous feedback was given by the supervisor, with two objectives in focus; first to improve their clinical learning and second to improve their reflective skills. The students underwent multiple sessions that gave them simulated patient experience and practice to reflect upon the experience. Table 1 shows

Table 1 Case-based reflective activities.

Task for clinical learning	Type of reflection in focus	Review and feedback	Frequency
Role play − case history and summary	Empathic and Communication reflection	Peer and Supervisor	4-6
Presentation of patient circumstances	Empathic and Communication reflection	Supervisor	2-3
Diagnosis of patient supported by EBP	Self and Empathic reflection	Peer and Supervisor	2-3
Treatment of patient supported by EBP	Self and Empathic reflection	Peer and Supervisor	2-3
Peer feedback	Self and Communication reflection	Supervisor	12
Writing of referral letter to patient / other professionals	Self and Communication reflection	Supervisor	2-3

the summary of various case-based reflective activities done throughout each academic year, to complete the course of 'introduction to patient care'.

Study design

This study was undertaken with an aim to find effectiveness of online teaching and virtual patient experience in improving student's competency to reflect on their patient experiences. We evaluated the reflective skills using modified Groningen Reflection Ability Scale (GRAS),[12] a popular instrument to measure reflective abilities of medical and healthcare practitioners. The GRAS questionnaire is a one-dimensional scoring instrument, with three sections focusing on different types of reflections. There were ten questions exploring ability of self-reflection, six questions investigating empathic reflection and seven questions inspecting reflective communication. We modified this questionnaire with inclusion of an open question in each section that required the students to present their position in specific type of reflection in writing. A pilot was conducted in 2019 to find the cross-cultural suitability of the questionnaire. Key findings of the pilot were related to relevance of few questions with this study. We also found more neutral responses indicating students' easy escape from taking a definite stand in various aspects of reflective skills. Subsequently, we reduced the questionnaire to 18 questions. We modified two questions (no.10 and 17) into positive statements. Additionally, we modified the responses to 4-point Likert scale (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree), ensuring that students take definite position while answering the questions. The questionnaire was adapted to make it suitable for the optometry students engaged in online learning activities. The questionnaire was translated from English to Hebrew and visa-versa to ensure its accuracy in the Hebrew version.

During the first lesson of the course "introduction to patient care" the students received an explanation of the study and were told that there would be no academic consequence for not participating in the study. After their consent, the students completed the questionnaire twice on an online google form, once on the first day of the course and later at its conclusion. The students were encouraged to take the time to read each question carefully and give a thought before answering. The responses were anonymous.

Data analysis

The total score and section scores were calculated by adding up the scores from all the questions in the questionnaire and its sections respectively. The quantitative data was not normally distributed (tested by Shapiro-Wilk test) so the Mann-Whitney test one tail was used for continuous variable. The level of significance was set at 0.05. Effect size was also computed to find magnitude of the differences. All quantitative data analysis was conducted using SPSS version 24.0 (IBM corporation). The open-ended questions were thematically analysed with an objective to find student's perception about their reflective ability and overall experience of reflective practice. Deductive analysis of data resulted in broad themes describing students' perception about their reflective ability.

Results: quantitative results

Forty-six and fifty-eight students were recruited in the study at the start of the academic years 2020 and 2021 respectively. We considered a total of 97 (59 (60%) female, 5 (5%) male and 33 (35%) who prefer to not disclose) complete responses in pre-survey and 101 (65 (64%) female, 9 (9%) male and 27 (27%) who preferred to not disclose) responses in post-survey for the statistical analysis. The mean age of students participating in the study was 21.4±2.1 (range 19-31 years).

The aggregate score showed significant improvement (U=5491.5, Z=1.480, P=0.04) in students' reflective ability. Individual components of reflection scores improved marginally, however no statistically significant improvement was seen (self-reflection (U=4636.5, Z=-0.66, P=0.35) empathetic reflection (U=5019, Z=0.318, P=0.55) and communication reflection (U=4607.5, Z=-0.743, P=0.49)). Table 2 shows the aggregate as well as component-wise mean ($\pm$ SD) and median (MAD) survey scores of students' reflective ability.

Some of the interesting findings of these results were related to improvement in students' awareness about their professional standards. A significant improvement was seen for the question which asked about importance of knowing guidelines and laws related to professional practice. Similar

Table 2 Summary of survey scores.

	Min and Max scores	Pre survey (n=97)		Post survey (n=101)		
		Mean (SD)	Median (MAD)	Mean (SD)	Median (MAD)	P(Median)
		Range	IQR	Range	IQR	r
Aggregate Score	18-72	58.06 (7.25)	58.5 (3.5)	59.73 (6.74)	61 (4.5)	0.04*
		28-72	8	18-72	9	0.10
Self-reflection	8-32	26.74 (4.21)	28 (3)	27.72 (3.73)	28 (2)	0.35
		8-32	5	8-32	4	0.04
Empathetic reflection	4-16	13.73 (2.24)	14 (1)	14.11 (1.97)	14 (2)	0.55
		4-16	3	4-16	3	0.02
Communication reflection	6-24	17.59 (2.66)	18 (2)	17.90 (2.45)	18 (1)	0.49
		6-24	3	6-24	3	0.05

* Significance p< 0.05 using Mann Whitney U test (one tail), and r denotes the effect size.

significant improvement was seen where students were asked if they are thinking deep enough, if they are examining their thinking before they speak and self-awareness which is important component of reflective learning.

Qualitative findings

Qualitative data was collected using open ended question, inserted at the end of each section of the questionnaire. The results of thematic analysis are summarised in Table 3.

In summary, reflective practice after virtual patient encounter triggered student's thinking about the importance of soft skills such as self-awareness, an empathetic approach and good communication skills. Improvement in understanding of essential components of patient care was clearly visible in their reflections.

Discussion

This study evaluated reflective abilities of second year undergraduate Optometry students. Reflective abilities were shown to increase after the completion of the "introduction to patient care" course. Self-reflection, empathic and communicative reflective skills showed a rising trend, although not statistically significant. Even with small effect size, these findings are encouraging as reflective practice has become an essential component of healthcare professions in 21st century. Reflection encourages the healthcare practitioner to reframe problems, re-question assumptions and contextualize problems from different perspectives, facilitating deliberate thought processes that gives meaning to clinical experience.[13] For students, it stimulates the deep learning process. Reflections help to actualize the real, direct learning experiences, facilitating clearer understanding and application of the theoretical concepts.[10] Therefore, reflective skills are increasingly used in health profession education, both as a learning technique and as a learning objective to be achieved.[2] However, teaching reflective practice is a multifaceted complex activity to plan, implement and measure its effectiveness, especially in early years of health professionals' training.[14] In face-to-face mode of delivery of education, the supervisors were individually guiding the students to reflect during their clinical training, analysing their reflective write ups and provide direct one to one feedback.[15] Many authors in medical and

Table 3 Thematic qualitative analysis of open-ended questions.

Section theme	Subtheme	No of students	Representative quotes
Self-reflection Importance of self-awareness in development as health professional (72 out of 101)	Identifying one's strength and weaknesses that help build confidence and trust with professional colleagues and patients.	30	*"You have to know what you are good at and what you need to improve in your work. You must be able to self-critic to strengthen yourself in your field."*
	Development of confidence as healthcare practitioner	22	*"It is important to believe and trust in ourselves that we know how to handle our patients."*
	Self-awareness as a way of becoming more attentive to patients and their needs	20	*" In a certain way if we develop awareness of ourselves, we will be more aware and open to listen to our patients"*
Empathetic reflection: Importance of developing a healthy therapeutic relationship with the patient (60 out of 101)	Demonstration of empathetic approach: By gaining the trust of the patient to give better care	29	*"The patient will then be able to trust us because he sees we understand him."*
	Identifying themselves with patients to facilitate delivery of better patient care.	31	*"We have to identify with the patient in order to truly understand him and then we will be able to help him in the best way possible".*
Reflective communication abilities: Communication skills are essential in development of any professional (72 out of 101)	Understanding importance of good communication that helps in nurturing a comfortable atmosphere for treatment of the patient	31	*"If there is open communication, the (eye) examination will flow easier for both, the patient and the optometrist... So, the patient will feel comfortable and not afraid"*
	Identifying primary goal of communication: to understand and cater for the healthcare needs of the patient.	27	*"It is important to hear and understand his (patient's) needs so that we can help him"*
	Identifying need of brisk communication, limited to relevant eyecare contents only.	14	*"You always need to be nice, but there is no need to have long and unrelated conversations with your patients."*

health profession education have communicated the importance of real patient encounters, combined with portfolio writing for improving students' reflective ability.[16−22] Our findings align with these results, highlighting the importance of exposure to clinical cases in improving the reflective ability. The significant improvement in overall scores is comparable with other disciplines of medical and health professional education.[17,19,21] The students demonstrated enhanced ability to comprehend the professional practice standards by making meaning of their virtual patient experiences. Reflective exercise following every online session of the 'introduction to patient care' course stimulated deep thinking contributing to developing their confidence and thoughtful communication skills.

The online mode of delivery of education is believed to be unproductive for the courses that demand more demonstrations and practice.[9] 'introduction to patient care' is one such course in optometry program that comprise of large number of demonstrations and skills to be practiced. Initially we were sceptical about delivery of this course in online mode but pandemic restrictions had left us with no choice. With the forced alterations in teaching methods during the pandemic crisis, most educational activities were switched to online mode, to maintain continuum of teaching.[7] However, abrupt adaptation to online methods heavily fragmented the educational space and therefore did not guarantee effective learning.[23] Moreover, there is scarcity of published evidence proving effectiveness of these altered teaching methods especially used in development of soft skills such as reflective practice. With new mode of delivery during COVID-19 pandemic, we switched clinical training to online role plays and case discussions within a small group of students, which proved as feasible alternative to facilitate acquisition of clinical decision-making skills. We redesigned the course from highly structured time-based course to a semi structured outcome-based course where attainment of specified soft skills was considered as concluding point of the course. However, resembling with most competencies referred as hidden curriculum,[24] inculcating reflective competencies continued to be a major challenge in an online class, as there is no in-person support from peers and supervisors. This study demonstrates the method for cooperative engagement of students which could potentially be used to facilitate reflective practice even with online learning. The descriptive responses in post-survey showed students' acceptance towards reflective practice. Students were found noticing, making sense and making meaning of their virtual patient experiences. Similar findings are reported by a study done in undergraduate program of elementary school teachers.[3] Advancing further, students were also working with meaning attached to their thoughts and actions, which facilitated deep learning of their clinical skills. The observations made by supervisors participating in this study support the effectiveness of collaborative learning in online mode in improvement of reflective abilities.

"The students were engaged with the case and each other throughout the course. A safe place was created where constructive criticism along with laughter and sharing of minds was a weekly occurrence."

The simulated patient workup in absence of real patients exposed students to variety of cases that are commonly seen in optometry clinic, developing their clinical reasoning and decision-making abilities, in early years of their optometry program. While solving the simulated case scenario, students collaborated with each other to demonstrate application of the knowledge acquired through online didactic lectures. The provision of peer and supervisor feedback on these reflections helped overcome the challenges of monotonous online learning such as sense of isolation, fear of missing out (FOMO) and lack of motivation.[25]

Presently, while we are planning a hybrid model of learning for post-pandemic era, it is important to engage with the techniques which are proven to provide most concrete learning experiences. With limited availability of clinical exposure and face to face sessions, it is important that we support clinical training activities by reflective practices, which can be designed with virtual patient experiences and online group discussions as demonstrated by this study.

The improvement in total scores indicate the effectiveness of these virtual techniques in improving reflective ability of the students. The uptrend seen in each component of reflection, although with minimal effect size, illustrates use of constructive feedback in improving students' self-awareness. However, communication with real patients may prove more effective to enhance empathetic and communication reflective abilities. Students' perception about reflective practice also aligned with this finding. Students have emphasized the importance of analysing self-performance, generating awareness about strengths and weaknesses which helps in development of confidence. Students have highlighted development of healthy therapeutic relationship with patient in order to provide better clinical care. These findings are encouraging as students' have shown awareness and concern over these soft skills even without having real patient exposure, in early years of their academic program. Therefore, we strongly recommend use of reflective practice as a learning tool for improving professional skills especially in present hybrid learning system.

We recognise the limitations of the study. There were five supervisors in total who helped to guide the students in their learning. Students were exposed to only one supervisor throughout the course. This may have influenced their reflective process and the outcomes. The revalidation of survey instrument was not done after modifying the questionnaire in light of results of a pilot study. In addition, the cohort is limited although it provides enough statistical power to extract valid conclusions about increased reflective abilities. A larger sample size would perhaps yield a significance in all sections of reflection, including empathic and communicative abilities. The reported results are omni-directional as the GRAS questionnaire used to measure reflective abilities is a self-rated single direction scale.

Conclusion

The study confirms the effectiveness of virtual patient experiences and online small group workshops in developing reflective abilities of optometry students. Reflective practice is not only a learning tool to achieve program objectives

but also a learning objective itself, specifically useful to enhance outcomes of learning endeavours in online or hybrid learning model. Further research can be done to find the effectiveness of reflective practices in achieving the clinical competencies of the optometry students.

Declaration of Competing Interest

No potential conflict of interest relevant to this article was reported.

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Declaration

All authors have made substantial contributions to all of the following:

(1) the conception and design of the study, or acquisition of data, or analysis and interpretation of data,

(2) drafting the article or revising it critically for important intellectual content,

(3) final approval of the version to be submitted.

We all the named authors (RD, RE, VR) declare that this manuscript is original, represents honest work, has not been published before, and is not currently being considered for publication elsewhere. We declare no conflicts of interest associated with this publication. We confirm that the manuscript has been read and approved for submission by all the named authors.

Annexure: Questionnaire used to measure reflective abilities of optometry students

Questionnaire to measure reflective abilities of optometry students
Responses: 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree

Section 1: Self-Reflection
1. I take a closer look at my own habits of thinking
2. I want to know why I do what I do
3. I find it important to know what certain rules and guidelines are based on
4. I am aware of the emotions that influence my thinking
5. I can see an experience from different standpoints
6. I am aware of the cultural influences on my opinions
7. I am aware of my own limitations
8. I think that in order to be a successful optometrist, one must have self-reflection

Section 2: Empathic reflection
9. I am aware of the possible emotional impacts of information on others
10. I accept different ways of thinking
11. I am able to understand people with a different cultural/religious background
12. I think that in order to be a successful optometrist, one must be empathic to your patients

Section 3: Communication reflection
13. I sometimes find myself having difficulty in illustrating an ethical standpoint
14. I think about what I want to say before I say it
15. I take responsibility for what I say
16. I sometimes find myself having difficulty in thinking of alternative solutions
17. I welcome remarks about my personal functioning
18. I think that in order to be a successful optometrist, one must have open communication with your patient

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