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ORIGINAL ARTICLE

Impact of COVID-19 on academic activities and way forward in Indian Optometry

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Abstract
Purpose: Academia is experiencing massive reforms globally amid lockdown in COVID-19 outbreak. This study is aimed to apprehend the enabling and impeding factors of these reforms, with a focus on optometry education. It brings together how the Indian optometry educational system has responded to COVID-19 disruptions with findings of the 2020 survey, in light of similar survey done in 2018.
Methodology: A cross-sectional survey was designed to find changes in optometry training and adaptations of Indian optometry educators amid COVID 19 lockdown. In the last week of April 2020, on the observation that the majority of optometry institutions have switched their teaching-learning activities on e-learning mode, an online survey was conducted using a validated questionnaire containing a mix of open and close-ended questions.
Results: Seventy-three out of 78 optometry educators (93.58%) have switched to e-learning mode in a very short time span with good confidence. Most teaching-learning and assessment activities are carried out using multi-device supporting video conferencing tools, dedicated educational portals and social media apps.
Conclusion: The COVID-19 pandemic is proving to be a constructive disruptor, giving an opportunity for restructuring the present conventional, classroom based educational system. The quick transitions to online mode assisted in keeping continuity of optometry education programs, effectively fitting in the purpose of completion of the current academic year. The rapid transition to online education has not only benefited optometry students but also has created a momentum of continued education for practicing optometrist in the country.
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Impacto del COVID-19 en las actividades académicas y el camino a seguir en la Optometría en India

Resumen   Propósito: La Academia está experimentando reformas masivas a nivel mundial en medio del bloqueo del brote del COVID-19. Este estudio tiene como objetivo aprehender los factores favorables y desfavorables de estas reformas, con un enfoque en la educación de la optometría. Reúne cómo el sistema educativo de optometría de la India ha respondido a los trastornos del COVID-19 con los resultados de la encuesta de 2020, a la luz de una encuesta similar realizada en 2018.

Metodología: Una encuesta transversal fue diseñada para encontrar cambios en la formación de optometría y adaptaciones de los educadores de optometría de la India en medio del cierre del COVID 19. En la última semana de abril de 2020, a partir de la observación de que la mayoría de las instituciones de optometría han cambiado sus actividades de enseñanza-aprendizaje en el modo de aprendizaje electrónico, se realizó una encuesta en línea utilizando un cuestionario validado que contenía una mezcla de preguntas abiertas y cerradas.

Resultados: Setenta y tres de 78 educadores de optometría (93,58%) han cambiado a la modalidad de aprendizaje electrónico en un período de tiempo muy corto con buena confianza. La mayoría de las actividades de enseñanza-aprendizaje y evaluación se llevan a cabo utilizando herramientas de videoconferencia de apoyo multidispositivo, portales educativos dedicados y aplicaciones de redes sociales.

Conclusión: La pandemia del COVID-19 está demostrando ser un disruptor constructivo, que ofrece la oportunidad de reestructurar el actual sistema educativo convencional basado en el aula. Las rápidas transiciones al modo online ayudaron a mantener la continuidad de los programas educativos de optometría, encajando eficazmente en el propósito de completar el año académico actual. La rápida transición a la educación en línea no sólo ha beneficiado a los estudiantes de optometría, sino que también ha creado un impulso de educación continua para los optometristas en ejercicio en el país.

Introduction

As of 10th May 2020, COVID-19 pandemic has gripped 215 countries across the globe and many of these faced lockdown.[1] Academia was among the first few sectors that faced rapid shut down of all its activities.[2] Thousands of schools and higher education institutions and millions of students are affected by lockdown due to the COVID-19 pandemic as the first response from the educational sector was to completely halt its operations.[3] Coronavirus pandemic has triggered the significant change, imposing many challenges in the higher education community globally.[4] After about four months in the global crisis, we have started realizing that the COVID-19 is here to stay and we need to find solutions to move on. This crisis can be looked upon as an opportunity to reconstruct our longstanding educational systems and establish better and updated practices in academia, suitable for the present generation of learners.[5] We must prepare ourselves for the changing world when COVID-19 pandemic is blown off.

A scenario in India

India is a demographically diverse large country with high population density. The nationwide lockdown was the only strategy in the fight against COVID-19 pandemic, which started on 25th March 2020 and is continued in its fifth phase until 30th June 2020 with some relaxations in no infection areas.[6] Citizens across the country chose to sit in their homes abiding the guidelines issued by the government of India. Academic activities in India were rapidly halted in the middle of the year, by individual institutions and states even before the countrywide lockdown began.[7] As per the recent guidelines issued by University Grant Commission (UGC), the apex body for higher education in India, the educational institutes must strive to provide quality education, ensuring uniformity, equity and universal accessibility to all the learners.[8] There is constant encouragement from Hon. Prime Minister Shri Narendra Modi, for innovative use and promotion of technology in ushering educational reforms to create a vibrant knowledge society.[9]

Medical and healthcare education is also severely affected by this global crisis. Moreover, it will continue to remain affected as healthcare systems as most teaching hospitals are completely occupied by COVID-19 load.[10] The challenge of clinical exposure to the medical and health profession students will aggravate even further.[11] Owing to the rapid transmission of COVID-19, face-to-face and small group tutorials are prohibited. This imposes greater challenge especially in the context of ophthalmic and optometric skills, which requires close contact between the eye

care practitioner and the patient.[12,13] Social distancing and telemedicine are set to be 'a new normal' hereafter, imposing a persistent challenge for global optometry educators, to teach various clinical skills to the students.[14] The scenario is prompting an urgent need for transformation of optometry education, from traditional brick mortar system to e-learning environment, imparting updated competencies in our graduating optometry professionals.

Optometry educators in India have responded very quickly to this crisis, in the light of guidelines issued by the Government of India and UGC. There is a sudden surge seen in the number of webinars and online learning sessions on social media platforms, on various topics of optometry, attended not only by students but also by a massive number of practitioners. This has generated never before momentum in optometry education and also in continuing education programs. The purpose of this study is to apprehend the enabling and impeding factors behind this momentum.

This paper reports the findings of the observational study describing the rapid transition of optometry education in India amid COVID 19 disruptions. Findings of nationwide online survey ascertaining the present practices of teaching-learning in optometry are discussed in light of similar survey done in 2018 by the same authors (VR and UM). It not only informs the readers about what changed in reference to the past but also appraises how and why the quick adaptation was possible, along with the challenges that are faced during the transition from educator's perspectives.

Methodology

Study design: A cross-sectional survey was designed to find changes in optometry training and adaptations of Indian optometry educators amid COVID 19 lockdown.

Study setting: India went into lockdown on 25th March 2020. Since then the educational institutes had started to figure out the solution to continue with their academic endeavors as the academic year 2019–2020 was inching close toward concluding. After about a month of lockdown, on the observation that most of the optometry institutions have strategized to adapt to 'new normal' and have restarted their activities with e-learning technologies, a questionnaire-based online survey was administered during lockdown conditions in India in last week of April 2020.

Questionnaire development: A cross-sectional survey was conducted in 2018 using a questionnaire comprised of 27 items (hereafter referred to as '2018 survey'). It was designed to know various teaching-learning methods used for subjects related to applied optics curriculum in optometry programs in India. This questionnaire collected factual data about teaching learning methods used in visual optics, optometric optics and dispensing optics curriculum. The survey also gave insights on teacher's perception about academic practices followed at that time. A follow-up survey was now necessary as significant modifications are witnessed in educational activities amidst this lockdown period. Due to the drastic changeover of the situation, and to address the questions of the present study, we extensively revised the questionnaire of an earlier survey. Three optometry educators discussed and finalized 30 items of the new questionnaire (hereafter referred to as

'2020 survey') (Appendix A). This questionnaire contains 24 multiple choice or objective questions and 6 open ended questions; distributed in five sections. The questionnaire collects not only the factual information about the adoption of e-learning methods for undergraduate and postgraduate optometry curriculum, during COVID period but also educator's perception about the transition from classroom based system to the e-learning system.

The reliability of both questionnaires was calculated using Cronbach Alpha, prior to the administration of surveys on the Goggle survey platform. The results of these surveys are reported using CHERRIES guidelines for reporting internet-based surveys.[15] Although we focus on the findings of the 2020 survey, discussing some of the relevant findings of the 2018 survey[16] here would give us consistent answers to the questions under consideration. Therefore, the methodology of both the surveys is reported herein summary table (Table 1).

Ethics approval: The 2020 survey was aimed to gather updated information on teaching-learning methods in the present COVID era and was not intended to test knowledge, skills or effect of any interventions done on participants. This was conducted in accordance with the Declaration of Helsinki.[17] The 2018 survey is a part of an ongoing study titled 'development and testing of a competency-based learning model in applied optics curriculum in optometry'. This study is approved by the Institutional Ethics Committee of Kasturba Medical College, Manipal, India (IEC No 327/2017).

Results

The 2020 survey recorded a total of 79 respondents, with 78 valid responses. One respondent was not an educator hence was omitted before analysis. Of 78 valid responses, 37 were males (47.43%) and 40 were females (51.28%). One respondent preferred not to disclose the gender identity. The survey reported representation pan India which was found consistent with the findings of the 2018 survey (Table 2). The responses were received from educators in all categories of optometry institutions of India. These demographic results add value to the reliability of the present study.

Familiarity with e-learning environment

Seventy-three out of 78 educators (93.58%) have switched their educational activities to e-learning mode in a very short period, while 5 educators (6.41%) reported the temporary shutdown of all academic activities for lockdown period. Forty-five of 73 educators (61.64%) who switched to e-learning mode were familiar with it, 25 (34.24%) were neutral and 5 (4.10%) were not so familiar. Interestingly only 29 of 73 (39.72%) educators had used online teaching mode before COVID-19 lockdown period.

Usage of e-learning

Thirty-one educators reported teaching with e-learning platforms only for the undergraduate program, 2 for postgraduate and 40 for both undergraduate and postgraduate

Table 1 Summary of the methodology followed by the 2018 and 2020 surveys.

Sr no	Description	2018 survey	2020 survey
1	Survey development	Literature survey followed by a discussion between three optometry faculties to finalize items of the questionnaire	Reference of 2018 survey questionnaire and discussion between three optometry faculties to finalize items of the questionnaire
2	Number and nature of items in the questionnaire	27, Mix of open and close-ended questions	30, Mix of open and close-ended questions
3	Reliability (Cronbach Alpha)	0.9252 (High)	0.902 (High)
4	Mode of survey	Internet-based	Internet-based
5	Survey period	Jan-May 2018	April 2020
6	Sample frame	Purposive sampling, ensuring one representation from all Optometry colleges across India, conducting a four-year bachelor degree program	Open survey, Open for all educators in optometry colleges across India
7	Target population	Optometry educator, as representative of an optometry institute	Optometry educator, as a full time/part-time faculty in optometry institute
8	Recruitment process	Invitation by Email, with two reminders over the phone/messaging platform	Open invitation over the social messaging platform (WhatsApp) in a target group with one reminder message
9	Participation	Voluntary participation	Voluntary participation
10	Survey administration	Sequential questions administered using Google forms	Sequential questions administered using Google forms
11	Informed consent	E-consent	E-consent
12	Incentives	None	Sharing of survey results
13	Curriculum under consideration	Applied optics subjects such as visual optics, optometry optics, dispensing optics	Entire optometry UG/PG program, essentially taught by optometrist faculty
14	Use of adaptive questions	Yes	Yes
15	Number of screens	3	6
16	Review step	Review with back button; no alteration possible once a response is submitted	Review with back button; no alteration possible once the response is submitted
17	Preventing multiple entries from single respondent e.g. Cookies used	No such mechanism employed	No such mechanism employed
18	Data capturing	Automatic conversion into a spreadsheet	Automatic conversion into a spreadsheet
19	Data analysis	Descriptive statistics and qualitative thematic analysis of open-ended questions	Descriptive statistics and qualitative thematic analysis of open-ended questions
20	Software used for statistical analysis	EZR open source	EZR open source

Table 2 Demographic characteristics of respondents in both surveys.

| Sr no	Characteristics of respondents		Number of respondents	
			2018 survey	2020 survey
1	National representation of respondents	East region	18.18%	15.19%
		North region	15.91%	15.19%
		West region	38.64%	39.24%
		South region	27.27%	30.38%
2	Category of institution	Private optometry college/department under university	30	42
		Private optometry college under hospital/clinic	10	28
		Public/government medical college	4	5
		Other (with industry, Not for profit trusts & NGOs)	0	4
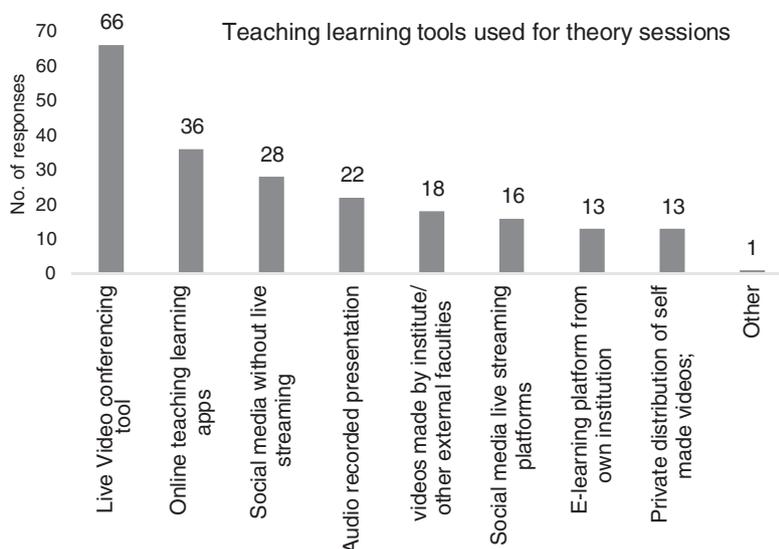
Figure 1 Graph showing the popularity of various online teaching tools for THEORY classes.
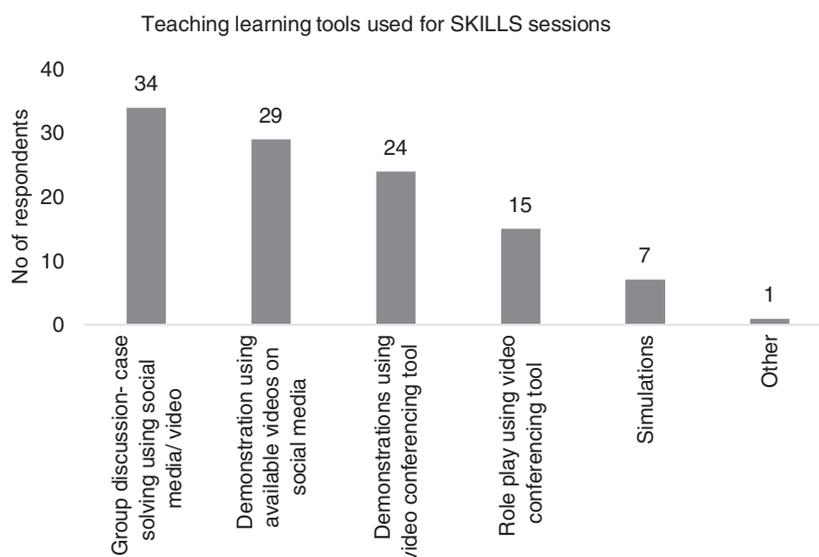

Figure 2 Graph showing the popularity of various online teaching tools for SKILLS sessions.

programs. While switching to e-learning mode, 57 educators (78.08%) modified their intended learning objectives to make it suitable for an online session. The preparation time of 30–60 min per session was reported by 33 educators (45.20%) while 40 educators (54.79%) required more than an hour for the same. Maximum i.e. 47 educators (64.38%) reported the average duration of their online session between 30 to 60 min. Session of more than an hour length was reported by 20 educators (27.39%) and less than half an hour length reported by 6 (8.21%) educators. Most educators (97.26%) reported sharing of notes or reading material or recording of the online session with the students during or after the session. Sixty-one educators (83.56%) reported that they make themselves readily available over a phone call or messages for clearing doubts or solving any problem students might face during the entire lockdown period.

Tools for online teaching: All educators indicated that they have used at least one teaching method listed in the questionnaire for covering the theoretical component of the syllabus. For clinical skills training, 58 of 73 (79.45%) educators reported the use of online teaching tools as shown in Figs. 1 and 2.

Student's participation

The decision of switching to the online mode of teaching was taken after consultation with students by 62 educators (84.93%) while 11 educators (15.06%) did not get a chance to consult students as the transition was very rapid. Student's training for using online platforms for learning was facilitated by 38 educators (52.05%) while 35 (47.94%) did not give any training to students, although 15 of them believed
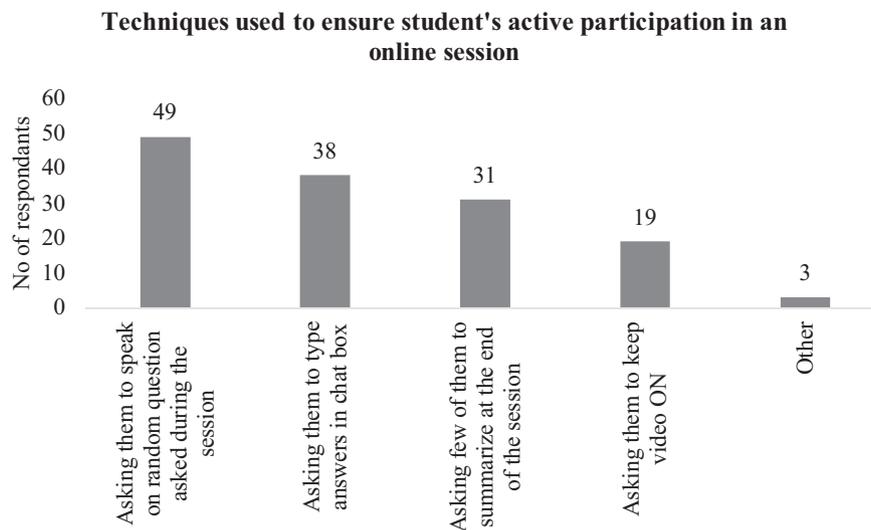
Techniques used to ensure student's active participation in an online session

Figure 3   Graph showing techniques used to ensure active involvement of students in online sessions.

Table 3   Collaborative efforts made to quickly adapt to the e-learning environment.

Response to collaborative efforts	No of responses	% of total responses
I would like to collaborate with the purpose of sharing resources.	22	28.21
Individual to individual faculty collaboration	32	41.03
Institute to institute collaboration	12	15.38
Institute to individual faculty collaboration	21	26.92
No, I have no interest/belief in collaboration	9	11.54
Other	8	10.26

that training was necessary. Not every online session records the student's feedback. An average of 3.42 sessions per 5 online sessions record student's feedback. The number of attendees in online sessions varies from a minimum of 5 to a maximum of 800 learners. Discounting the outlier, the mean (SD) of the number of attendees is reported as 31.41 (21.00) in an online session. Student's active participation in an online session is ensured by the number of methods as shown in Fig. 3.

Assessments in the e-learning environment

Of the 73 responses, 39 (53.42%) had conducted the online examination, while 34 (46.57%) did not. Thirty educators (41.09%) were planning to conduct the online examination in the near future. Nine educators had conducted both theory as well as skills examination in online mode. Out of 73 educators, 43 (58.90%) favored, 23 (31.51%) were neutral on an online assessment. Seven respondents (9.59%) were not in favor of online assessment and are less likely to conduct it even in the future.

Overall perception about e-learning environment

Overall satisfaction of educators on switching to online mode was 3.44 on the Likert scale of 1 (least satisfied) to 5 (most

satisfied), indicating that most of the educators are satisfied with it. Positive perception is seen on being collaborative in adapting with this new normal, summarized in Table 3.

The 2020 survey questionnaire also asked six open ended questions to the educators, based on their experiences, to narrate the facilitating and limiting factors in transiting to online education, which is analyzed using qualitative thematic analysis methods. These findings are deliberated in the discussion section.

The table 4 relates the parallel findings from both the surveys, which will help us know the exact nature of the transition of the optometry education system in India. As the two surveys were done with different intentions and instruments, we do not intent to calculate statistical significance but the mere comparison will help us derive appropriate explanation for the research question under consideration (Table 4).

Discussion

This study brings together how the Indian optometry educational system has responded to COVID-19 disruptions using findings of the 2020 survey, in light of findings of the 2018 survey,[16] combined with authors' experiences and observations in academia.

Table 4 Summary of key results in both surveys.

Sr no	Results	2018 survey	2020 survey
1	System of education	Conventional classroom based system	E-learning system
2	Educator's attitude	Teacher centric: 30 out of 44 (82.5%) believed that most academic activities must be decided by teachers.	Student-centric: 62 out of 73 (84.93%) considered consulting students before switching to e-learning mode.
3	Educational model- attaining learning objectives	Tea steeping model- Pre-determined clock-hours to be completed for face to face teaching in each subject. E.g. Visual optics is taught for 40 h theory and 20 h skills. Learning is confirmed at end semester examinations.	Competency-based model- Learning objectives to be achieved regardless of actual online contact time spent in teaching- learning. Learning is confirmed by performance in immediate, small, online unit tests/assignments and not merely by attending/viewing online sessions.
4	Pre-determined learning outcomes for each session.	77.27% of respondents paid attention to carefully draft and convey the ILOs.	78.08% of respondents altered ILOs to suit new pedagogy techniques.
5	Top three methods used in teaching theory (knowledge component)	Didactic lectures, reading/writing assignments, and class presentations	Lectures using video conferencing apps, assignments using learning apps, use of pre-recorded presentations on social media platforms
6	Top three methods used in teaching clinical skills	Demonstrations, practice on peers, observation postings at clinics	Demonstration using video clips, case discussions, and role-play using video conferencing apps.
7	Provision of study material	95.45% responded that teacher-designed notes, textbooks and reference books are most circulated study material during or after class.	97.26% responded that presentations, other online resources, and recorded sessions are circulated during or after the session.
8	Nature of assessment	Prominently summative	Prominently formative
9	Conduct of examination	Theory written examination; practical skills demonstration	Online examination for theory in the form of assignments/presentations. Skills examination in the form of role-plays and oral examination.

The journey so far

COVID-19 pandemic is proving to be a creative disruption with tough challenges for all educational systems.[18] At the same time, there is a strong opportunity for us to adopt newer techniques that are more suitable for the present generation of learners.[19] Lockdown is continued in several states in India. While some other states are starting up with the gradual and prioritized restoration of their activities. With norms of social distancing in place and the guidelines issued by UGC, the academia is likely to continue with e-learning platform at least for few more months.[20] Finding from this survey suggest that long-awaited restructuring of the educational system as suggested in the model curriculum of optometry by the Ministry of Health and Family Welfares (MOHFW), India has commenced.[21,22] Our 2018 survey showed that the optometry education system was a conventional classroom based system with most teaching and assessment conducted in face to face mode. The Indian teachers and students are habitual to everyday meetings and carrying out teaching-learning activities in a class. Findings

of the 2020 survey suggest that more than 90% optometry institutions and educators in India have quickly adapted to E-learning mode. The trend in pedagogy for theoretical content has shifted from monotonous didactic lectures to interactive online lectures using video conferencing tools (e.g. Google meet, Microsoft teams, Zoom, etc.); reading and writing assignments are getting done using various teaching learning apps such as Goggle classroom; class-presentations are switched to uploading of pre-recorded presentations on social media platforms. Teachers are using features such as random questioning, use of chatbox, opinion polls student lead summarization of the session and more techniques to keep the learner active and engaged during live streamed online sessions. The clinical skills teaching is now not focused only on the psychomotor skills but evidence based practice, critical thinking and clinical decision making skills are also covered using case discussions. The educators are using a wide variety of online tools and apps to keep going with their teaching. Students have also become active learners by contributing to the inputs in the e-learning environment. The rapid transition looks successful in the prima

fascia. Work from home culture appears to have settled in optometry educational system prompting 'teach from home' and 'learn from home' strategies. We asked educators about the facilitating and challenging factors of online education. Qualitative thematic analysis of these open ended questions in 2020 survey identified the following facilitating factors, contributing toward the seamless transition of optometry education.

Teacher related factors:

1. *Millennial teachers for the iGeneration of learners*- with tech-savvy generations in academia, it is comparatively easy to adapt to the e-learning environment.[23] The finding that 70% of teachers are below 35 years of age, confirms the contribution of the major ground force for online content development in the success of the quick transformation. However, further subgroup analysis showed that senior faculties were also at par with millennial teachers in adoption with e-learning systems. All the faculties reported high confidence in the use of technology for educational purposes. However, they also reported limited awareness of all technology solutions and their salient features which can be used for various educational activities. And therefore, they must be formally trained for efficient usage of various tools and online pedagogy via faculty development programs.[24]

2. *Technology at hand*: There are challenges in having appropriate high-tech gadgets, computers, or laptops with every student, and even faculty.[3] More often these electronic gadgets with students are shared between the siblings. With the ongoing digital revolution in India, smartphones equipped with a 4G internet connection have reached even in the remotest part of the country.[25] At the same time, the development and availability of a wide variety of tools at our figure tips are assuring the feasibility of getting into online mode.[26] Educators enlisted usage of platforms such as Google classroom, Google meet, MS teams, YouTube, Zoom meetings and many more, which are multi-gadget compatible. A wise choice of multi-screen supported teaching platforms and strategic use of synchronous and asynchronous teaching techniques done by educators accommodated spectrum of devices, operating systems and internet infrastructure benefiting the students, leading to a successful transition of teaching activities to e-learning mode.

3. *Habitual to web resources*: The 2018 survey exposed a dependency on lectures and seminars for delivering knowledge component of the curriculum. Power-Point presentations, videos and web resources were extensively used by educators even before COVID-19 disruption. Switching to e-learning during this lockdown was readily facilitated by these resources.

4. *Attitude to collaborate*: The crisis situation is equally difficult for each of us. We must be able to collaborate for a wide variety of real and virtual resources with us to promote learning in the best possible way.[18] Professional attitude, transparency and clarity in communication is the key to effective collaboration. Majority educators believed in collaborative efforts and started the journey for collaboration on an individual basis, without waiting for institutional support or directives. External stakeholders like industry partners, individual practitioners, researchers were also pulled in to contribute directly to academia, which brought in new knowledge and a fresh perspective of looking at optometry education.

5. *Positive enthusiasm about e-learning*: Number of educators reported numerous advantages of e-learning environment like the ease of conduct, convenient technique even with limited resources at hand, cost-effective, ability to adapt to the wide learning styles and choices of iGeneration learners, the possibility of innovation and ease of monitoring and documentation of teaching activities. Some of the facilitating factors mentioned by respondents include the time flexibility, the comfort of work from home, and the ability to discharge their duties even in crisis situations adding to their satisfaction level. These factors kept the motivation of teachers high in adapting to e-education mode.

6. *Student related factors:*

7. *Tech-savvy iGeneration students*: The present generation of learners has grown up with technology. Greater use of online learning activities facilitate greater engagement of the learner. Ability to learn and revise at one's own pace, being independent of place and time leads to better educational prospects.[27] The forced transition to online mode is in-fact a sure GO for iGeneration learners. The students are more concerned about their education and completion of training on time.[18] In this situation of uncertainty, the students are welcoming every single act which will ensure continuity of their academic activities. They are actively involved in, not merely attending the online sessions but are also actively searching and bringing the relevant online content to the session.

8. *Safe learning environment*: Students are allowed to ask their doubts using social or personal messaging apps that get addressed without disclosing their identity during the online class. This type of multi-channel communication between the students and teachers is helping to achieve better outcomes.[27]

9. *Ease and comfort of attending online sessions* from home without physically traveling anywhere save a lot of time and energy. Further, students can choose and attend many online sessions other than regular online classes, either live or in deferred time, organized by various national and regional associations in optometry. They get to hear and interact with many faculties, the practitioners of national and international repute, which excites them to learn more.

10. *Institutional and external environment-related factors:*

11. *Institutional infrastructure:* The use of technology, blended learning and E-learning is on the rise since about a decade.[28] These are promising techniques to foster self-learning attitude in health professional students. An increasing number of institutions are encouraging the use of technology in day to day teaching as students find it enjoyable. Purposeful and effective use of blended learning is absolutely necessary for managing student-centric learning system.[28] Majority of the respondents (89.74%) reported service in

optometry institution running either under a hospital setup or as a department in a university. The infrastructure and administration of hospital and university are essentially different, and therefore the priorities, procedures and techniques of academic activities are different. For instance, university educators reported use of E-learning platforms developed by their own university along with other applications, while educators belonging to hospital infrastructure relied mainly upon applications from public domain. The IT support from the institution is also identified as a major factor contributing to the quick and smooth transition to online learning. However, all educators reported high confidence and satisfaction in using online teaching tools, irrespective of type of institution they belong.

12. *Contribution from external stakeholders:* Social media in India saw a sudden surge of inputs from nationwide optometry/optical associations and industries in the form of webinars, live streaming of panel discussions, which stimulated not only practitioners and faculties but also students to attend more and more webinars and other online educational activities. Strong numbers of live attendees and even more number of subsequent followers ranging from 200 to 4100 unknowingly resulted in positive competitive spirit among academicians, practitioners and subject experts, to conduct good quality sessions.[29] This created a positive momentum of transition from a traditional educational system to a competency-based e-learning system. Many institutions equipped with better infrastructure are contributing to the development of educational modules covering various specialties of optometry practice. Students and practitioners across India are enthusiastically participating in these online sessions, developing a culture of continued education.

13. *Positive attitude in the community at large about COVID 19 pandemic-* a timely decision of lockdown and sincere efforts by all individuals in all sections of the community are leading to control on the spread of the virus. The situation in India is seen as much better as compared to many developed countries in terms of the spread of COVID-19, a lesser number of cases per thousand population, lesser percentage of patients requiring critical care, higher recovery rate and lesser morbidity rate.[30] This has brought a general sense of confidence which is helping in overcoming the challenges.[31] A positive and hopeful environment definitely has contributed directly or indirectly toward the success of this transformation. This is evident by the fact that our 2020 survey recorded more inputs to advantages and facilitating factors and listed out very few challenges faced during the transition to e-learning.

Challenges encountered in transition to e-learning mode

According to WHO, COVID-19 is here to stay for a long period. The health care practices are experiencing significant changes, establishing 'new normal' by using the technology of the next generation. The restrictions of physical contact with patients, reduction in face to face

consultation, social distancing norms are some of the challenges identified in clinical skills training.[12] These challenges will persist for a longer period of time as telemedicine, artificial intelligence and innovative technologies are ready to set in permanently into eye care systems.[32,33] Experiential learning with direct patient exposure in already strained resources is now significantly challenged in optometry skill training. Therefore, we must find an effective long-lasting solution by incorporating blended learning in the educational system. A good mix of online and face to face learning is suggested while addressing the challenges surfaced during this initial experience. The respondents of 2020 survey enlisted the challenges of execution of online teaching such as uninterrupted internet connectivity, technical disturbances in apps, student orientation, adjusting the pace to suit most learners, restriction on a number of online sessions per day, extension of working hours and working on weekends. Few challenges related to communication, for example, no eye contact, face reading or body language reading to understand if students are following were also reported. The time and efforts required in the preparation of high quality customized, attractive and user-friendly educational material, suitable for digital delivery of optometry content was enormous. Institutional support in terms of faculty development, student's training for efficient use the technology was also lacking.

Students of the present generation are used to group learning and value peer opinion.[23] Optometry students in India are young, having just completed schooling, without much experience. Most of them do not get in a job while pursuing their education and are financially and emotionally dependent on family, assuming very little self-responsibility. Therefore, educators do not believe that learners will engage themselves in self-directed learning. Further, the lockdown has imposed the challenges of solo learning on them. Hence, the total and long term transition to e-learning is challenged.

Way forward

The development of dedicated online modules specific to defined areas of competency along with detailed planning of blended learning activities is required. Accessing telehealth interactions in compliment with e-learning modules can address the perceived gap in clinical skill teaching. We must move ahead from just taking online lectures to the development of more engaging and novel teaching-learning methods based on principles of adult learning.[34] We must utilize this once in a lifetime opportunity where massive sudden transitions are taking place in all sectors of life. This accelerated change if continued in the direction of upcoming trends of optometry practice will fetch positive rewards in years to come.

Limitations of the study

The 2018 study was focused more on optics related subjects while the 2020 survey addresses the entire curriculum taught by optometry faculties. In India, the optometry faculties are mostly engaged in teaching applied optics, contact lenses, binocular vision and low vision subjects.[35] Since the

two surveys were addressing similar but not exactly the same research question, in different learning environments, with two different instruments, no direct statistical comparison was possible. But we felt that it was reasonable to see the results of the latest survey in the light of earlier one, in order to gain clarity about the journey so far from the traditional classroom system to the technology-aided competency-based educational system.

Conclusion

The COVID-19 pandemic and its disruptions have created an opportunity for the restructuring of the optometry educational system. The quick transitions to online mode assisted in keeping continuity of optometry education programs, effectively fitting in the purpose of completion of the current academic year. The journey from the tea steeping model of education to a competency-based learning program has commenced. Online teaching, use of internet technology in optometry education are set to become a new normal. The transition can be quick and smooth if educators and technical staff show an adaptive and collaborative attitude. It is, however, very early to conclude the successful narrative of transition as the judgment of students' performance and quality of passing out professionals is yet to be realized. Further studies may be directed to test student's performance and satisfaction on switching to the e-learning educational system.

Conflicts of interest

The authors have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at https://doi.org/10.1016/j.optom.2020.06.002.

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