Adopting a modified Delphi technique for revisiting the curriculum: a useful approach during the COVID-19 pandemic

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Abstract
Purpose – The purpose of this paper is to describe a participatory qualitative research project using the Delphi consensus technique aided by Internet technology for successful transition of academic endeavors during and the post COVID era. The study aimed to derive a holistic competency matrix for an optometry program for transformation of the program to competency-based education.

Design/methodology/approach – This study combined a scoping review of literature for developing a baseline competency framework, along with derivation of an E-Delphi consensus within a panel of diverse stakeholders to achieve the objective of plotting a detailed competency matrix.

Findings – The involvement of all stakeholders of educational system in Delphi study resulted in a valid and all-inclusive competency framework with 18 competency units and 97 competency elements. This framework provided a strong base for redesigning pedagogy and assessment methods during COVID-19 crisis.

Practical implications – The paper highlights the feasibility and utility of adopting a participatory approach during COVID-19 outbreak. The Delphi technique aided by Internet technology was employed to develop a competency-based curriculum.

Social implications – The paper narrates a suitable, feasible and scientific method for rapid transition in academia, following the restrictions and social distancing norms imposed during the COVID-19 outbreak.

Originality/value – Although there is good evidence for use of the Delphi technique in curriculum development, this paper adds value by focusing on a participatory approach in using it. The suggested method here shows ways to gain optimum scientific output with minimum resources in constrained situations such as COVID-19 crisis.

Keywords COVID-19 pandemic, Participatory approach, Delphi method, Educational technology, Competency-based education

Paper type Research paper

Introduction
Most countries in the world faced a lockdown during COVID-19 pandemic ("Coronavirus disease 2019", 2020). The slowdown of economies across the world has thrown a set of challenges for employment opportunities, especially in light of the agenda of sustainable development (United Nations, 2019). Every sector of life is facing major setbacks and academia is no exception (Nicola et al., 2020).
Educators across the globe are facing uncertainties and challenges due to closure of schools and colleges and forced rapid transition to online teaching during COVID-19 outbreak (Daniel, 2020). A lot of short-term and long-term planning along with experimentation in novel teaching-learning and assessment methods was adopted for the successful transition through COVID disruption (Crawford et al., 2020). This crisis has led to educational experts predicting an expedited use of technology in academia in the post-COVID era. Hereafter heavy dependence on technology is inevitable in every educational activity, including academic research, as norms of social distancing are settling in over the long run (Strielkowski, 2020).

These multiple challenges have compelled academicians to revisit their purpose and methodology in order to restart their academic, research and development activities (Theoret and Ming, 2020). While educational entities must strive to produce skilled human resource, they also need to be equipped with necessary competencies required for the modernized jobs in the post-COVID era. One of the ways to do this is through restructuring the curricula to competency-based programs. As Morcke et al. (2013) have pointed out, the trend of all-inclusive competency-based education is already catching up in most streams and professions across the globe.

A major transformation of curriculum and learning objectives is required when transiting to competency-based curriculum. While implementing such changes in an established system, it is important that each stakeholder of the system is involved as a change agent from the initial planning of the reforms. The educational system has both internal and external stakeholders, including students, teachers, administrators and employers, who have the potential to generate a revolution with a 360-degree view. As Taylor (2005) has suggested, the participatory approach is one of the promising approaches in educational research to bring in constructive change in the system.

The participatory approach used in educational research for the development of academic activities including curricula employs mainly qualitative research methods (Padilla-Díaz, 2015). However, many of the qualitative research techniques, including observations, interviews, focus group discussions and community studies demand direct face-to-face interaction with human beings, which have become unviable with the COVID-19 outbreak (Liang et al., 2020). This has led to additional challenges for the individual educator in coping with present crisis.

Relevance and purpose of this paper
This paper shares lessons learned from a study conducted for developing a competency-based curriculum for applied optics in an optometry program. A participatory approach aided by the Delphi technique was used in the study. Although the study was completed in 2019, the approach adopted is particularly applicable in responding to the COVID disruption to the educational field. While social distancing has become the norm, as we have pointed out in the previous paragraphs, the involvement of stakeholders remains key in restructuring educational curricula. This study provides a way of ensuring involvement of stakeholders in the process. The purpose of this study was to develop a detailed competency matrix with knowledge, skills and attitude (KSA) components for the two core competencies of the optometry profession.

Methods
Ethics statement
The study was conducted in accordance with the Declaration of Helsinki (WHO, 2001) and is approved by the recommended Institutional Ethics Committee of the university. (No: IEC 327/2017).

Study design
This study combined a scoping review of literature for developing a baseline competency framework, along with use of a Delphi consensus technique (Mcmillan et al., 2016) to achieve
the objective of plotting a detailed competency matrix. Outcomes of this study are reported using Standard for Conducting and Reporting Delphi Studies (CREDES) guidelines (Jünger et al., 2017).

**Experts panel for Delphi consensus study**

In view of the affirmed participatory nature of this study, we invited 19 optometry professionals of national repute, who were involved in different job roles to participate in this study. Representatives of external stakeholders of national repute, key opinion leaders of the profession, stalwart practitioners, representatives of professional and educational associations and representatives of multinational industry (MNC) in dispensing optics were invited to develop and validate a competency matrix. Internal stakeholders such as students, subject teachers, academicians and researchers were approached for their involvement in developing competency matrix and subsequently translating it in a competency-based curriculum. We also invited international representation with an objective of benchmarking our curriculum with global educational trends and practice standards.

Based on our ethics approved protocol, we commenced the recruitment of experts in March 2018. The first author contacted the potential participants via telephone to inform them about the study and its objectives. Each expert was sensitized to the objective and methodology of the study and was assured anonymity. It was emphasized that the inputs given by the experts were to be kept confidential, used only for research purposes and anonymously compiled. When the experts verbally consented to participate in the study, formal e-consent was obtained, which completed the recruitment process. Analysis of qualitative data was done at the end of each round to avoid the risk of bias in the form of individual inputs and opinion.

**Selection and formulation of competency clusters**

Based on the World Council of Optometry (WCO) and WHO recommendations on the scope of optometry practice, we chose two subjects in applied optics curriculum, namely refraction and dispensing optics (WCO, 2005; WHO, 2019). Competency in these subjects is required to effectively manage the massive public health problem of uncorrected refractive errors, the second leading cause of preventable blindness (Bourne et al., 2017). These broader subjects were further divided into competency units and competency elements that account for the smallest task done by an optometrist in his/her professional practice. The baseline framework thus comprised of two broad competency clusters, subdivided into individual competency units and its component elements. This framework was used to develop the detailed KSA matrix required for each of the included competency elements.

**Definitions of consensus during Delphi rounds**

1. First-round consensus: For inclusion of competency element into baseline framework, a questionnaire survey employing the Likert scale of 1–4 described as: not required (1), desirable (2), essential (3) and most essential (4) was used. All the competency elements that had scored 3 or 4 by at least 75% of experts would be included in the baseline framework. A cutoff of 75% was determined in view of the diversity of expertise of optometry professionals in the Delphi panel.

2. Final-round consensus: An agreement level of at least 95% was determined for validation and approval of the competency document.

3. Stability of agreement: Less than 10% variation in the number of panelists reporting differently for the competency unit between Round 3 and Round 4. (Expressed as yes/no).
Use of Internet to facilitate the Delphi procedure

The entire Delphi procedure was conducted in online mode, thereby eliminating the need for anyone to personally meet or travel for the purpose of study. We created and shared Google forms to get the consent and consensus in first round. Google drive was used to store and share spreadsheet templates used in further rounds. All communication was done via email. Inputs from panelists were stored on online data storage drives.

The Delphi process

We modified the Delphi procedure in the first and second round to suit the design and purpose of our study. In the first round, we replaced the traditionally asked open-ended questions with a structured questionnaire having a Likert scale. This was based on the scoping review, with an objective to get consensus on inclusion of competency elements in the baseline competency framework. Based on the consensus of the first round, we grouped the individual competency units into two clusters at the beginning of the second round.

In addition, based on our Delphi panel experts’ interest and experience, we created two groups, to ensure that a diversity of opinions was included in the creation of the competency definitions. We also maintained a holistic approach to defining competencies, wherein each competency element is described with complete details of KSA required to attain that competency. The two groups developed detailed KSA matrix for each competency cluster in a parallel process. The inputs from both groups were aggregated at the end of the second round. In the third round, all panelists reviewed aggregated definitions of each competency element and suggested modifications wherever they felt the necessity. Modified definitions were reviewed and validated by all panelists in the fourth and final round. Figure 1 shows the flowchart of the procedure followed during Delphi study.

Results

The scoping review of ten documents related to competencies of practicing optometrists in various countries across the globe led to the formulation of a questionnaire. In total, 18 out of 19 invited experts consented to be part of Delphi panel. Table 1 summarizes the present job role and variety of experiences brought in by the Delphi panelist.

Delphi procedure for definition and validation of competency matrix was completed in four rounds. The consensus of first round resulted in the inclusion of 18 competency units, described in 97 competency elements. The subsequent two rounds yielded detailed KSA definitions. The fourth round finalized and validated the competency matrix with 99.77% agreement between the panelists.

Table 2 shows a summary of the results of the Delphi study. Column 3 shows the agreement level for the inclusion of competency elements in baseline competency matrix. The summary of the agreement for each competency element in third and fourth round is given in columns 4 and 5, respectively, while the last column gives the stability of agreement for each competency element.

Discussion

The rationale for the choice of the Delphi technique

The Delphi technique is a popular method for the development of competency frameworks and curriculum in education (Green, 2014; Humphrey-Murto et al., 2017). Besides cost-effectiveness, the Delphi technique provides advantages in terms of plotting generalized futuristic educational goals and objectives (Green, 2014). Also, given our avowed participatory approach to developing this curriculum, the Delphi method was found to be most suitable for multiple reasons. For instance, while a participatory method implies that all
people will participate equally, given the diverse nature of the experts in this study, we anticipated multiple challenges (Catherine, 2003). These include but are not limited to the experts’ varied geographical locations, differences of opinions due to variation in experiences, practice settings and patterns of clinical and optical setup and conflicts and biases due to perceived seniority in the profession. The use of the Delphi method helped to overcome these challenges.

At the end of the process, we found that our objectives were successfully achieved, with minimal glitches. Using the E-Delphi technique, the need for travel and meeting together in person was eliminated as the panelists could give their inputs from their own locations using the Internet. Further, they were not required to take time off work or give up their professional...
practice for the duration of the study, as the nonsynchronized pattern of responses using the Internet gave them access to shared templates and enabled them to give their inputs via emails, at a time which they found convenient. Thus, we achieved appropriate scientific output with minimal usage of scarce resources at hand.

**Participatory approach**

We chose the participatory approach for this study as the transformation of the educational system can be successfully done only with the contribution of each stakeholder. We intentionally invited panelists with diverse experiences to ensure appropriate representation of the profession (Hasson *et al.*, 2000). Reputed clinicians, dispensing retail owners, academicians, researchers, multinational industry representative and association representatives participated in this Delphi study. Heterogeneity of panelists adds value to the final outcome of the study (Green, 2014). We approached professionals who had experience in multiple domains of practice. For example, most of the panelists had experience as full-time or part-time academicians during or before their years of professional practice. Many of them come in close contact with the multinational industry for their everyday business. Two panelists had, in addition, chaired the national association of optometry.

These wide-ranging experiences of individuals helped in better coordination and understanding and showed respect for each other’s views. The hallmark feature of the Delphi technique is anonymity, which resulted in independent contributions and reviews in each round. Each panelist could give their own opinions and, at the same time, work together as team member in the development of the competency matrix. The process facilitated amalgamation of potentially diverse voices from wide spectrum of practice patterns in optometry profession.

<table>
<thead>
<tr>
<th>Type of stakeholder</th>
<th>Present job role</th>
<th>Additional / past experience</th>
<th>Number of panelist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Academics</td>
<td>Clinical practice, Retail dispensing practice</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Internal Academics</td>
<td>Association representative Clinical practice, Retail dispensing practice</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Internal Academics</td>
<td>Association representative Clinical practice, Research</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Internal Academics</td>
<td>Research, Retail dispensing practice</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>External Clinical practice</td>
<td>Academics, Industry (MNC)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>External Clinical practice</td>
<td>Academics, Retail dispensing practice</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>External Industry (MNC)</td>
<td>Retail dispensing practice, Clinical practice</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Internal Student/Research scholar</td>
<td>Clinical practice, Retail dispensing practice</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>External Retail dispensing practice</td>
<td>Academics, Clinical practice, Industry (MNC)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>External Retail dispensing practice</td>
<td>Academics, Industry (MNC)</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Note(s):** Internal stakeholders: Individuals who work or are employed within academic institutional framework, including teaching staff, clinical staff, clinical supervisors, mentors, research scholars and students. External stakeholders: Individuals who do not work or employed with academic institutions, including clinical practitioners, retail optical business owners and staff, employees of multinational companies (MNC) in dispensing optics manufacturing industry and consultants.
The scoping review saved significant time and effort in building the baseline architecture of competency matrix. In contrast to the traditional Delphi method (Green, 2014; Hasson et al., 2000), we replaced open-ended questions, which are used to generate ideas, by a structured questionnaire using a Likert scale, which brought in uniformity in the terminology used in labeling various competency elements. First consensus round in the Delphi process ensured applicability of these elements in the context of local requirements of the healthcare system while following a global trend. As a result, the final outcome achieved better precision, as evidenced by the achievement of a consensus level of 99.77% in just three iterations.

One of the reported limitations of the Delphi technique is the panelist’s competency to respond outside their field of specialization, causing instability of the panel membership.

Table 2. Summary of results in various rounds of the Delphi technique

<table>
<thead>
<tr>
<th>Sr no</th>
<th>Short title of competency unit</th>
<th>No. of experts rating as essential (%) in round 1</th>
<th>Agreement on KSA description (%) in round 3</th>
<th>Agreement on KSA description (%) in round 4</th>
<th>Overall stability of agreement (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Case history</td>
<td>93</td>
<td>95</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Vision assessment</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Objective refraction</td>
<td>97</td>
<td>99</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Subjective refraction</td>
<td>91</td>
<td>99</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Near vision assessment</td>
<td>100</td>
<td>99</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Refraction in special cases</td>
<td>94</td>
<td>98</td>
<td>99</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Prescribing prisms</td>
<td>100</td>
<td>99</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Primary eye examination</td>
<td>99</td>
<td>99</td>
<td>99</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Management of refractive error</td>
<td>100</td>
<td>98</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Choice of optical aids</td>
<td>90</td>
<td>88</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>96.46</td>
<td>97.42</td>
<td>99.75</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>The interpretation of prescriptions</td>
<td>96</td>
<td>96</td>
<td>99</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Parameters of old spectacles and prescription</td>
<td>93</td>
<td>99</td>
<td>99</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Choice of frames</td>
<td>91</td>
<td>99</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Choice of lenses</td>
<td>96</td>
<td>100</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Fitting and glazing process</td>
<td>92</td>
<td>95</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Dispensing the spectacle</td>
<td>93</td>
<td>98</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Troubleshooting of nonadapting cases</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Business aspects in dispensing optics</td>
<td>83</td>
<td>99</td>
<td>100</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>92.90</td>
<td>98.02</td>
<td>99.84</td>
<td>Y</td>
</tr>
</tbody>
</table>

Note(s): CC: competency cluster
KSA description: description of Knowledge, Skills and Attitude (behavior) required to attain a particular competency

*Modified* Delphi process

The scoping review saved significant time and effort in building the baseline architecture of competency matrix. In contrast to the traditional Delphi method (Green, 2014; Hasson et al., 2000), we replaced open-ended questions, which are used to generate ideas, by a structured questionnaire using a Likert scale, which brought in uniformity in the terminology used in labeling various competency elements. First consensus round in the Delphi process ensured applicability of these elements in the context of local requirements of the healthcare system while following a global trend. As a result, the final outcome achieved better precision, as evidenced by the achievement of a consensus level of 99.77% in just three iterations.

One of the reported limitations of the Delphi technique is the panelist’s competency to respond outside their field of specialization, causing instability of the panel membership.
(Green, 2014). This may result in low response rate (Hsu and Sandford, 2007). In our study, the panel comprised of experts having a variety of job roles, from different specialties of the profession. The optometry profession offers a unique combination of clinical services and retail business. Although all of the panelists had good knowledge of competencies required for these practices, not all were comfortable in drafting detailed KSA definitions in each competency element. For example, clinicians were not comfortable in drafting KSA definitions for the retail area of “CC2: dispensing optics.” Similarly, optometrists from retail in dispensing optics and industry background were not comfortable in drafting KSA definitions for the clinical area of “CC1: refraction.”

This challenge was overcome by dividing the panelists into two groups for the second round according to (1) their field of expertise, (2) relevance of their experience in optometry practice and (3) their choice/interest. This division enabled panelists to focus on their core practice area. This gave the additional advantage of time efficiency as the exhaustive task of defining KSA components of about hundred competency elements was shared between the two groups. Synthesized data at the end of the second round was shared in the third round. Every panelist thoroughly analyzed KSA definition of all the competency elements during the third round, which ensured the all-inclusiveness of the final outcome.

Challenges of COVID-19 outbreak
In the situation of COVID-19 pandemic, individual educators are striving hard to modify their curricula to suit the e-learning environment. Redesigning learning objectives, aligning competencies and assessments, scaling up teachers training to adapt to the online educational system are the needs of this hour (Eachempati and Ramnarayan, 2020; Toquero, 2020). With ongoing restrictions imposed by the outbreak of COVID-19, it is a mammoth task for individual educators with very little time at hand to implement these reforms.

The approach taken in this study provides a means to overcome such challenges. This study, with its participatory approach, aided by Internet and communication technology, provided a description of all competency elements required for the job role of optometrist as primary eye care practitioner as well as separate baskets of KSA required for specialty practitioner. Expression of curriculum contents in terms of KSA gives clarity in redesigning learning objectives and in aligning newer pedagogy practices with it. Participation of external stakeholders in curriculum development has proved beneficial in fetching inputs on new trends and competencies involved in the professional practice. The scientifically developed curriculum thus benchmarks with global standards, at the same time, also satisfies needs of local professional norms.

From our experience, the panelists, representing many dimensions of professional practice, can lead the transformation, acting as change agents. The time has come where teachers need to realize that they are not the sage on the stage but must be the guide by the side of the student. At the same time, they should abandon their assumption that they have a monopoly in teaching and design of educational activities. Involvement of internal as well as external stakeholders of the healthcare professional education during the contextualization process has the potential to provide a holistic view to each component of the curriculum, making it more comprehensive. It also facilitates acceptance by the students, professionals and community at large. The all-inclusive curriculum helps to provide equal opportunities for learning, stimulates motivation for learning not only through academic institutions but also through experiences in private spaces and professional field.

Conclusion
The COVID-19 crisis has given us an opportunity to catch up with the long-overdue revolution in the educational system by revisiting its baseline architecture. The E-Delphi
method as described here is one of the best alternatives available for transforming our curriculum in scientific manner during a lockdown situation. Appropriate use of technology and participation of a variety of experienced professionals can make this transformation feasible in a short time. The swiftness and collaborative efforts of educational institutions with their professional counterparts will help us to be better prepared for educational practices when the COVID disruptions are tempered.

References


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