A MODIFIED DELPHI STUDY TO IDENTIFY COURSE DELIVERY MODES IN CEBU TECHNOLOGICAL UNIVERSITY

Decem C. Suladay and Gamaliel G. Gonzales
Cebu Technological University-Danao Campus

ABSTRACT

The purpose of this study was to reach consensus on future course delivery modes and recommended teaching competencies that would be required for teacher education faculty in future course delivery environments. A two-round, modified Delphi study was used to answer the following research questions (RQs): RQ1 What course delivery modes will teacher education faculty of Cebu Technological University (CTU) be using in 2023? and RQ2: What competencies will teacher education faculty of CTU need to teach using these delivery modes? Course delivery modes and general teaching competencies were determined as a result of consensus reached by a panel of 28 educational experts drawn from five campuses of Cebu Technological University offering teacher education programs. In the first round, Delphi questionnaire were distributed to the panel experts pertaining the subject under study. This was done individually and anonymously. Ratings by individual panel members were shown relative to the group response (median, mode, and IQR), followed by a request for the panelist to re-rate or confirm their original rating from Round I. Based on an analysis of data collected in Rounds I, and II, the following conclusions were drawn for each research question. Data collected to answer RQ1 found that teacher education faculty of Cebu Technological University in 2023 will integrate more online technologies into their face-to-face classroom-based teaching environment. Blended course delivery modes integrating online components was strongly supported by the panel experts who participated in the study. Among the various future online approaches identified through this study, the asynchronous, or combination asynchronous and synchronous, mode will be preferred over the synchronous mode alone.

Data analyzed to address RQ2 found that all statements in the general teaching competencies needed by higher education faculty in the coming decade received consensus for positive agreement. These competencies were logically grouped into the following five categories: planning and designing learning environment, teaching and learning, technology, assessment and evaluation and cultural and ethical issues.

Keywords: Delphi study, consensus, forecasting, education, hybrid environment, ctu

INTRODUCTION

Electronic capabilities continue to be integrated into the learning environment, thus, creating opportunities for teaching in different modes. It is foreseeable that they would influence course content delivery methods. (Armitage and Rodrigues, 2002, Sherer and Shea, 2002). This influence on delivery modes will predict the future conditions of teaching and competencies

needed by teachers. The delivery environment, such as classroom-based, online-based, and hybrid environment, is a particularly relevant condition in which to identify teaching competencies (International Technology Education Association [ITEA], 2003). Armitage and Rodrigues (2002) argue that the advancement of networking technology has become the comprehensive foreseeable emergent course content delivery methods. More technological capabilities have been a built in feature into the classroom and the rest of the learning environment, thus, creating new opportunities for teaching in different modes (Sherer and Shea, 2002). It is important for curriculum planners of Cebu Technological University (CTU) to have timely strategic forecasting, planning and information about the future competencies needed by its teachers.

The importance of good calculated forecast for faculty development, support, and training is recognized by Commission on Higher Education (Harley, 2001). One of the well-known strategic planning methods is forecasting. Lang (1998) described this method as the best known qualitative, structured, and indirect interaction research method to forecast the trend of the future --consensus among future-minded professionals. This is the *"foreseeable future"* where teachers and learners will not be anchored to classrooms as they make appropriate use of various forms of computer enhanced learning (Conhaim, 2003). The traditional mode of teaching will become just one of several modes that learners and teachers will switch between depending upon their particular needs.

Online education has become more than an alternative form of delivery. The current developments in flexible modes of course delivery are increasing (Sherer and Shea, 2002). As Williams (2000) indicates, teaching competencies will vary depending on the instruction delivery mode. It is therefore a prime motivation here in Cebu Technological University to audit current framework of teaching competencies whether or not to consider changing pedagogy because of the emerging technologies. It is in this existing framework of innovative course delivery modes and pedagogical competencies required in the future this study is conceived.

THEORETICAL BACKGROUND

This study deduces that emerging delivery modes and teaching competencies in the next ten years can be predicted through subjective-intuitive foresights of panel experts using the modify Delphi technique (Nelson, 2002; Skulmoski, 2007). Foresights of the Delphi panel experts can predict policy implementations, curriculum development, facility and equipment procurements, and technology adaptations (Dalkey, N. C., and Helmer, O.1963). Further, it postulates that strategic planning towards the improvement of the quality of education is through the diversification course delivery methods and aligned pedagogical competencies promoting experimentation, innovation, the diffusion and sharing of information (UNESCO, 2002).

This study further views these emerging methods and competencies have unparalleled impact to teacher education. The effects can be identified as to what pedagogical competencies are desirable in order to achieve efficient teachers to produce competent graduates. This claim is supported by some of the most prominent theories including socio-cultural theory (Vygotsky, 1978),

constructivism theory (Jean Piaget Society, 2001), self-regulated learning (Resta, 2002) situated cognition (Brown, Collins and Dugout, 1989; Winn, 1993), cognitive apprenticeship, problem-based learning (Cognition and Technology Group at Vanderbilt), cognitive flexibility theory (Spiro *et al.,* 1988), and distributed cognition (Salomon *et al.,* 1993). Each of these theories is based on the same underlying assumptions that learners are active agents, purposefully seeking and constructing knowledge within a meaningful context.
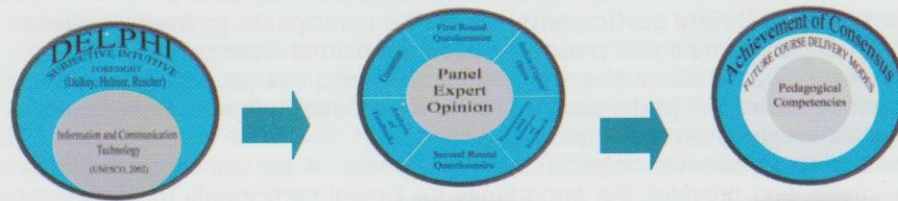

Figure 1. The Conceptual Framework.

To redesign the context of learning for the future learning landscape, it is vital to recognize that today's world requires that students be able to work collaboratively with others, think critically and creatively, and reflect on their own learning processes. The emerging course delivery modes are necessary to redesign current pedagogical delivery models. It means it is necessary to identify framework to validate a framework for teaching competencies through involvement of educational experts. Educational experts, who have knowledge of important aspects of teaching from their theoretical and practical experience, are a useful source of information to develop and validate the framework. The Delphi technique as a foresight tool seems to possess certain degrees of invariance to survive in the changing challenges. The method could serve different understandings of forecasting or foresight and probably understood by the users as being relevant for covering technical perspectives, organizational perspectives, but also personal perspectives. The individual could express a distinctly different opinion as compared to the group perspective and this to a differing degree between the technical details under scrutiny.

METHODOLOGY

This section describes the procedures that the investigator had undertaken to conduct the modified Delphi study.

The purpose of the study was to reach consensus on recommended pedagogical competencies needed by education instructors and professors for teaching environments. The study was directed by two main research questions: (a) what course delivery modes will teacher education faculty of Cebu Technological University be using in 2023? And (b) what competencies would teacher education faculty of Cebu Technological University need to teach using these delivery modes?

Study Design
          This study used a two rounds modified Delphi technique, a subjective-intuitive foresights to achieve consensus among a group of experienced education faculty Cebu Technological University. The   instrument   is   an adaptation from the pattern of previous competency study (Na, 2006). Using a panel of 28 Delphi panel experts to determine the future course delivery modes and pedagogical competencies, this study followed the rules for conducting a Delphi study by Rowe and Wright (qtd. from Skulmoski *et al,*. 2007):
1. **Anonymity of Delphi participants**: allows the participants to freely express opinions without undue social pressures to conform from others in the group. Decisions are evaluated on their merit, rather than who has proposed the idea.
2. **Iteration:** allows the participants to refine their views in light of the progress of the group's work from round to round.
3. **Controlled feedback:** informs the participants of the other participant's perspectives, and provides the opportunity for Delphi participants to or change their views.
4. **Statistical aggregation of group response:** allows for a quantitative   and interpretation of data.

Environment
          The study was conducted in 5 of the 9 campuses of Cebu Technological University (CTU): CTU-Main Campus, CTU-Danao Campus, CTU-Argao Campus, CTU-Carmen Campus, and CTU San Francisco Campus. The identified campuses under CTU System which offer teacher education curriculum were due to their track records, accomplishments, and influence in the community engaged in a number of efforts to effect changes in the teaching/ learning process to prepare students for an information and technology based society.

Respondents (Delphi Panel Selection)
          To create the necessary panel of experts for this study, four sources for experts in or related to, the field of teacher education were determined. The sources were (a) teacher education organizations (FEA); (b) major/technology subject-specific teachers; (c) educational technology experts; (d) professional/ academic disciplines and technology-vocational disciplines directors. These panel members were expected to communicate technological and pedagogical jargons to fully execute participation of forecasting the competencies of teacher education faculty in 2023.

Instrument Design and Data Gathering Implementation
          This two round modified Delphi study conducted was a structured process that used a panel of experts to investigate a complex or imprecise issue using a series of structured statements.
The process occurs in three stages:
          Stage 1. A pre formulated (adapted from Na, 2006) Delphi questionaire are distributed to the panel experts pertaining the subject under study. This is done individually and anonymously.
          Stage 2. They indicate their level of agreement with each statement using a 7-point Likert scale.

Stage 3. Each statement is fed back to the panel with their own and the rest of the panel's previous opinions. All feedback is anonymous. Numerous iterations may be necessary.

Data Analysis

Data Analysis for this Delphi study had two purposes: (a) to provide feedback between rounds for respondents and (b) to identify when consensus or stability is reached.

Specifically, the first criterion used in the process was an IQR ≤ 1.5 to indicate consensus among panel responses to each statement. The second criterion used to establish consensus was a frequency of 70%. Because the IQR criterion lacked sensitivity in distinguishing degree of agreement for items with IQR ≤ 2.5, this additional criterion for determining consensus for such items was developed.

Table 1. Definition of Consensus.

Consensus Definition	
Agree (A)	If the median ≥ 5, and IQR ≤1.5 If the median ≥ 5, IQR ≤2.5, and frequency of 5-7 ≥ 70%
Disagree (D)	If the median ≤ 3, and IQR ≤1.5 If the median ≤ 3, and IQR ≤2.5, and frequency of 1-3 ≥ 70%
Neutral (N)	If the median = 4, IQR ≤2.5

Table 1 shows the summary of dual criteria used in determining consensus and the level of agreement and disagreement. For example, items with IQR ≤ 1.5 and a median rating of 5, 6, or 7 were considered to be in consensus for agreement. Items with IQR ≤ 1.5 and a median rating of 1, 2, or 3 were considered to be in consensus for disagreement. Items with IQR ≤ 2.5 and with more than 70% of respondents rating 5, 6 or 7 were considered to be in consensus for agreement. Items with IQR ≤ 2.5 and with more than 70% of respondents rating 1, 2, or 3 were considered to be in consensus for disagreement. Items with the median of 4 and IQR ≤ 2.5 was considered to be in consensus for neutral. This analysis strategy is similar to that developed by Alexandrov et al,. (1996), who used a cutoff of 67% in one of two categories (e.g., yes-no) to designate consensus.

RESULTS AND DISCUSSION

Delphi Respondents Profile

The total percentage of questionnaires returned during the first round was 100 percent, during the second 89 percent. Out of the 28 individuals who expressed their willingness to participate in the study, 28 responded to the first round by responding the questionnaire, and completing Round I Questionnaire.

Round I Part 1. Delivery Modes

Using the data collected in Part I of the first round questionnaire the mean, median, and IQR for each of the delivery modes were computed. Consensus was determined based on the median, IQR, and a 70 percent frequency rate for a specific range within the 7-point scale (either 1-3 or 5-7).

Table 2. Delivery Modes Reached Consensus in Round I.

Delivery Modes	M	Mdn	Mode	IQR	% f, 5-7
Mode 1: Face-to-Face (F2F)	5	5	5	1.5	79
Mode 2: F2F + Satellite Combo	5	5	5	2.0	71
3d. F2F + Web-Async Text/Audio/Video Comb	5	5	5	1.0	79
3e. F2F + Web-Synchronous Text Combo	5	5	5	1.0	86
3f. F2F + Web-Synchronous Audio Combo	5	5	5	1.5	86
3g. F2F + Web-Synchronous Video Combo	5	5	5	1.5	86
3h. F2F + Web-Sync Text/Audio/Video Combo	5	6	6	1.0	82
3i. F2F + Web-Async/Sync Text Combo	5	5	5	1.0	86
3j. F2F + Web-Async/Sync Audio Combo	5	5	5	1.0	86
3k. F2F + Web-Async/Sync Video Combo	5	5	5	1.5	86
3l. F2F + Web- Async/Sync Text/Audio/ Video	6	5	5	2.0	93
4b. Web-Asynchronous Audio	5	5	5	1.0	71
4c. Web-Asynchronous Video	5	5	5	1.0	82
4d. Web-Asynchronous Text/Audio/Video	5	5	5	1.5	86
5a. Web-Synchronous Text	5	5	5	1.5	71
5b. Web-Synchronous Audio	4	5	5	1.0	68
5c. Web-Synchronous Video	5	5	5	1.0	68
5d. Web-Synchronous Text/Audio/Video	5	6	6	1.0	82
6a. Web-Async/Sync Text	5	5	5	0.5	79
6b. Web- Async/Sync Audio	5	5	5	1.5	75
6c. Web- Async/Sync Video	5	5	5	1.0	79
6d. Web- Async/Sync Text/Audio/Video	6	.5	5	1.5	82
7b. Instructor- Led Virtual Reality	5	5	5	1.5	79
7c. Community-Led Virtual Reality	5	5	5	2.0	71
Agree but not Consensus using the frequency criteria (% Frequency, 5-7 ≥ 70%)					
3a. F2F + Web-Asynchronous Text	5	5	5	2.5	68
3b. F2F + Web- Asynchronous Audio	5	5	5	2.0	68
3c. F2F + Web-Asynchronous Video	5	5	5	2.5	64
4a. Web-Asynchronous Text	5	5	5	2.0	68

Note. N = 28. The median cutoff used was 5 with the redefinition of Disagree = 1-3; Neutral = 4; Agree = 5-7 (Strongly Disagree = 1, Disagree = 2, Somewhat Disagree = 3, Neutral = 4, Somewhat Agree = 5, Agree = 6, Strongly Agree = 7). % f, 5-7 indicates the percentage of frequency for scores, 5-7.

Out of the 29 delivery modes included in the first round, 24 demonstrated positive agreement consensuses. Five delivery modes demonstrated agreements but not consensus using the dual criteria method previously outlined. The 24 statements of positive agreement consensus were not included in the second round. Approximately 79 percent of the panel members agreed that traditional F2F would still be one of the course delivery methods in 10 years.

However, Mode 3 received varied frequency distribution: 3.a *F2F + Web-Asynchronous Text* 68 percent; 3.b *F2F + Web- Asynchronous Audio* 68 percent; 3.c *F2F + Web-Asynchronous Video* 64 percent; 4.a *Web-Asynchronous Text* 68 percent & 7.a *Self-Guided Virtual Reality* 64 percent did not reach the consensus using the frequency criteria (% Frequency, 5-7 ≥ 70%) and to be included in the Round II questionnaire (for further attempt to get consensus) because there was considerable variability in the frequency distribution of responses among these items. Mode 3.h *F2F + Web-Sync Text/ Audio/Video Combo* & Mode 5.d *Web-Synchronous Text/Audio/Video* received the highest positive agreement out of all the delivery modes (median of 6; IQR of 1.0). As explained earlier, higher IQR scores indicate a large variation. These items also showed the greatest variance in frequency distribution. As a result, these five delivery modes were retained for the second round.

Round I Part 2. Teaching Competencies

The expert panel rated the teaching competencies on a scale of 1 (*not necessary*) to 7 (*essential*) based on how strongly they perceived the need for each competency in the future delivery environment. Out of 87 competency items included in the first round, all demonstrated consensus or 100 percent agree. All 87 competencies that reached consensus for positive agreement were not included in the second round.

Table 3. Summary of Final Delphi Findings on Teaching Competencies.

Competencies	Total Sub-C	Agreed Sub-C/Round		Final List	Total % Consensus
		Round I	Round II		
Planning and Designing	12	12	-	12	100
Teaching and Learning	36	36	-	36	100
Technology	27	27	-	27	100
Assessment and Evaluation	6	6	-	6	100
Cultural Ethical Issues	6	6	-	6	100
Total Number of Competencies	87	87	-	87	100

Note: "Sub-C" indicates the number of sub-competencies.

Since the entire competency statements reached consensus for positive agreement from Round I, there is no longer movements towards consensus for teaching competencies. The number of sub-competencies listed under each category in Round I and Round II is shown in Table 3. All competency categories had reached consensus on being essential teaching competencies of teacher education faculty in 2023. There is no competency statement that did not reach consensus, that simply means there is no

competency statement under the Teaching and Learning category were included in the second round.

Round II. Data Analysis

Out of twenty eight respondents, twenty five panel members had completed the second round questionnaire resulting in an 89 percent response rate. The literature reveals that a total response rate of 89 percent is within acceptable limits of second round response rates in Delphi studies. The Round II questionnaire consisted of 5 delivery modes. The panel members were given the Round I mean, median, mode, and the frequency of response for each item. Under the "Results of Delphi I" column, the original rating of each item was marked.

Round II Part 1. Delivery Modes

With the re-rating of some panel members in Round II, all 5 delivery modes reached consensus for positive agreement (will be a mode in the future).

Table 3. Additional Delivery Modes Reaching Consensus after Round II.

Mode	Delivery Modes	Mdn	IQR	% f, 5-7
Mode 3.a	F2F + Web Asynchronous Text	5	1	80
Mode 3.b	F2F + Web Asynchronous Audio	5	1	92
Mode 3.c	F2F + Web Asynchronous Video	6	2	92
Mode 4.a	Web-Asynchronous Text	5	1	80
Mode 7.a	Self-Guided Virtual Reality	5	1	80

Note. N = 25. The higher IQR score, the wider range of panel ratings. % f, 5-7 indicates the percentage of frequency for scores, 5-7. Note. N = 25. The higher IQR score, the wider range of panel ratings. % f, 5-7 indicates the percentage of frequency for scores, 5-7.

It was noted that the consensus reached for these additional modes was achieved at the strongly agreeable level (average median rating of 7). The panel judged the five delivery modes as being essential for future teacher education faculty in 2023.

CONCLUSIONS

The purpose of the study was to reach consensus on future course delivery modes and recommended teaching competencies that would be needed by teacher education faculty for teaching environments in the year 2023. A two-round, modified Delphi study was used to answer the following research questions: 1. What course delivery modes will teacher education faculty of Cebu Technological University (CTU) be using in 2023?, and 2. What competencies will teacher education faculty need to teach using these delivery modes?

Course delivery modes and teaching competencies were determined as a result of consensus from a panel of 28 educational experts drawn from the faculty of 5 selected campuses offering teacher education program.

Upon completion of the Delphi data analysis, conclusions were drawn to answer the two research questions. The participants of this Delphi study clearly favored that a hybrid mode of traditional Face-to-Face and online course delivery methods will be utilized by the teacher education faculty of CTU. Teacher education faculty of CTU in 2023 will integrate more online technologies into their Face-to-Face classroom-based teaching environment. Blended course delivery modes integrating online components was strongly supported by the panel experts who participated in the study.

The panel experts predicted a total of 87 or 100 percent of teaching competencies that would be considered necessary by education instructors and professors in the teaching milieu of 2023. F2F will not entirely go away. Online teaching and learning in teacher education will become more essential. More online technologies will be integrated into teaching environments of Cebu Technological University by 2023. Consequently, teacher education faculty in the future will find it necessary to acquire specific online teaching competencies in addition to the traditional teaching competencies currently developed.

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