Question-Answer Activities in Synchronous Virtual Classrooms in Terms of Interest and Usefulness

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Abstract

Instructors generally convey their face to face habits to synchronous virtual classrooms, but these face to face strategies do not work in these environments. In this sense, the purpose of this study was to investigate the effects of question type and answer format used in synchronous class implementations on perceived interest and usefulness. To do this, questions were asked in different ways and answers were requested in different formats in synchronous virtual sessions. The participants consisted of 28 postgraduate students registered in an online criminal justice program at a university located in the North-East part of Turkey. Data was collected in the context of a Research Methods in Security Sciences course during 2012–2013 fall semester. Results showed effects of question type on learner interest, while answer format has an effect on usefulness of online activities. In conclusion, to increase interest in synchronous virtual classrooms by asking questions, instead of closed-ended questions, open-ended questions which everybody can answer should be preferred.

Keywords: Synchronous communication, virtual classrooms, question-answer activity, synchronous web-based course, videoconferencing

Introduction

Distance education technologies enable people in different places to interact simultaneously (Kidd & Stamatakis, 2006). The greatest advantage of distance education is the assembly of learners and instructors from different places in a single environment and timeframe without the limitation of place or setting (McBrien, Jones & Cheng, 2009; West & Jones, 2007). Synchronous practices often involve synchronous virtual classrooms, during which instructors conduct lectures via video conferencing. In this way, learners can actively interact with the lecturer, classmates, and the interface (De Freitas & Neumann, 2009). Synchronous class platforms generally include tools that allow for sending messages, sharing files, and posting images and audio, and prompting simultaneous participation (Engle & Parent-Stevens, 1999; McBrien et al., 2009).

   Interaction is a very important component of the distance learning environments and its forms are instructor-learner, learner-learner, learner-content, learner-interface forms (Guichon, 2010; Tipton, Pulliam, Allen & Sherwood, 2011). The instructor-learner interaction takes place especially in the synchronous virtual classrooms (Schullo, Hilbelink, Venable & Barron, 2007). In order to increase interaction in synchronous virtual classroom, it is important to employ a variety of techniques (Murphy, Rodriguez-Manzanares & Barbour, 2011). Teaching methods should encourage the interactions between learners and instructors in the synchronous virtual classrooms (Karaman, Aydemir, Kucuk, & Yildirim, 2013). Since teaching methods have an impact on achievement, learner motivation, and attitudes towards a course, these methods should be designed carefully (Karaman, et al., 2013; Marjanovic, 1999; McAlister, Ravenscroft, & Scanlon, 2004; Ng, 2007). Examples of activities that facilitate instructor-learner interaction include role playing, researching, asking and answering questions, discussions, analysis, and small scale projects, either individually or in groups

(Brade, 2007; Larkin, 2007). The most frequently used method is question and answer activities in synchronous virtual classrooms (Guth & Petrucco, 2008; Tabak & Rampal, 2014; Watkins, 2005).

Questions are a basic component of effective teaching (Bell, 2002; Conderman & Morin, 2002). When properly used, they have the potential to increase learner success (Wilen & Clegg, 1986). Questions may be used to enrich teaching by evaluating knowledge acquisition, creating motivation, attracting attention, solidifying concepts, and assessing understanding (Levin & Nolan, 2004; Bond, 2007). Questioning prompts interaction between instructor and learner and immediately reveals progress and efficiency of learning (Bernstein, 2013; Goossen, 2002). Previous studies have further shown that questioning strategies affect the emotional change of the learner as well as relationships between instructors and learners (Canfield & Wells, 1994; Sun, 2012; Zou, 2004).

The literature has defined several classifications of questions. Jones (1995) analyzed questioning strategies in interactive tele-courses and divided questions into two types, private and discussion. A private question was defined as a question with a single answer according to knowledge level, while a discussion question was open-ended with more than one appropriate answer. Guilford (1956) divided questions into convergent and divergent. Convergent questions generally had one correct answer, as with multiple-choice questions, but divergent questions had many reasonable answers. Meanwhile, Hargreaves (1984) and de Rivera, Girolametto, Greenberg, and Weitzman (2005) classified questions as open- and closed-ended. Hargreaves (1984) defined open-ended questions as requiring high cognitive skills such as inquiry and evaluation; closed-ended questions required lower level skills such as remembering. De Rivera et al. (2005) extended the definition of open-ended questions to include requiring detailed answers, while closed-ended questions required simple, short answers. As all classifications were based on the scope and clarity of the expected answer, Jones's (1995) private question, Guilford's (1956) convergent question, and Hargreaves's (1984) and Riviera et al.'s (2005) open-ended questions all represent the same type of question. Similarly, Jones's (1995) discussion, Guilford's (1956) divergent, and Hargreaves's (1984) and de Rivera et al.'s (2005) closed-ended questions are the same.

One of the major problems in online education environments is the lack of learner-learner and instructor-learner interaction (Kim, 2012; Lee & Choi, 2011). This drawback of online education environments can be partly overcome by synchronous e-learning systems such as BigBlueButton, Adobe Connect or Elluminate (Leidner & Jaryenpaa, 1995; Hrastinski, Keller & Carlsson, 2010). However, this technical solution is not effective alone. Effective learning and interaction can be ensured provided that these solutions are harnessed with appropriate pedagogical activities. One of the traditional mechanisms which trigger interaction is question-answer activities. However, it is shown in the literature that habits in face to face environments do not adequately work in online synchronous environments (Ng, 2007). Therefore, it is necessary to re-design these activities compatible with online synchronous environments and investigate their effects (Karaman et. al, 2013). So in general we need online pedagogies to increase instructor and learner interaction in online education environments (Repman, Zinskie & Carlson, 2005) and specifically it is necessary to investigate how to use question and answer at synchronous learning environments (Kato, White, Teevan & Dumais, 2013).

Since distance education is becoming more and more synchronous class oriented to increase interaction (Martin & Parker, 2014), widespread effects of the results of this study are likely to be useful. The findings of this study will be directive in planning, practicing, and evaluating question-answer activities for synchronous class practices. In this sense, the main purpose of this study was to investigate the effects of question type (open- or closed-ended) and answer format (the quickest or all) used in synchronous class implementations on learners' perceptions of interest and usefulness. Two research questions guided the study:

1. Do question type (closed- and open-ended) and answer format (the quickest and all answers) affect learners' perceptions in terms of interest?
2. Do question type (closed- and open-ended) and answer format (the quickest and all answers) affect learners' perceptions in terms of usefulness?

Methods

Research Design

Repeated measures factorial design was used in this research. Repeated measures factorial design is used to determine interactions between independent variables that have multiple measurements and unique effects due to each independent variable (Ellis, 1999; Cohen & Cohen, 1983; Minke, 1997). Therefore, a 2x2 (closed-ended and open-ended X the quickest answer and all learner answer) repeated measures factorial design was used to analyze each subject for each score of the combinations of the factors by measuring at different times (Huck & Cormier, 1996).

Samples

Samples consisted of 28 postgraduate students studying at a distance education center serving the East Anatolia Region of Turkey. The students participated in a synchronous virtual classroom of Research Methods in Security Sciences course for five weeks. In this study, purposeful sampling method was used. Their ages ranged from 35 to 40, and all of them were employed in addition to taking classes. Before the study, the learners had all taken distance education classes for at least one year and had previously attended synchronous virtual classrooms. Question and answer activities were carried out within synchronous class sessions of the Research Methods in Security Sciences course. This course was designed to equip master's students with basic principles of research methods in security sciences and demonstrate how scientific studies should be conducted.

Data collection instrument

An experiment was conducted for five weeks to see the ongoing effects of question-answer activities in terms of perceived interest and usefulness levels according to question type and answer format. At the end of each session students were surveyed about their reactions to the questions and whether the questions promoted their engagement with the subject matter. They scored each question and answer activity on a scale of 1 to 5 in terms of interest and usefulness.

Independent variables

Question type and answer format served as independent variables in this study. Question type variables were closed-ended and open-ended. Similarly, answer format variables were the quickest answer and all learner answers. Question type was determined by information covered in the question and the expected answer. Generally, closed-ended questions have a single correct answer. Closed-ended questions cover skills at the level of knowledge and comprehension, such as simple remembering, whereas open-ended questions may have multiple answers. Open-ended question requires analysis and synthesis, such as associating multiple pieces of information, expressing information in various ways, and applying knowledge to different situations. "What are non-scientific research methods?" is an example of a closed-ended question; "What are the basic differences between the perspectives of qualitative and quantitative research methods on research?" is an open-ended question.

Answer format served as another independent variable, as either the quickest answer or all learner answers. Answer format can be regarded as the strategy followed by learners after a question is asked. When learners were asked for the quickest answer, the answer taking process ended after receiving four or five answers. After asking questions, the instructor said: "Who will give the quickest answer?" For all learner answers, each participant was expected to give an answer, and the process ended when approximately 70% of participants answered the question. After asking questions, the instructor said: "Everyone must answer this question".

Dependent variables

Levels of interest and usefulness towards question type and answer format were dependent variables in this study. Learners were asked to rate the answer format of each question for interest and usefulness during activities in synchronous classes. Levels ranged from 1 to 5. The survey was completed weekly after synchronous classes, and responses were recorded.

Procedure

This study was conducted in an online criminal justice postgraduate program in a university's distance education application and research center located north-east part of the Turkey. The study was conducted during the 2012–2013 fall semester. The instructor asked a question during the synchronous class session of research methods in the criminal and justice course, and participants wrote responses in chat. Questions were prepared according to course material and directed learners in line with answer formats. A total of 20 question-answer activities were carried out over five weeks, and 290 written responses were collected. Questions were separately prepared and approved by the instructor each week before being asked. As seen in Figure 1, four questions were asked each week for five weeks. Each week, both types of question were used. A single group of learners were asked to rate each activity on a scale of 1 to 5 in terms of interest and usefulness.

Group	1st Week				2nd Week				3rd Week				4th Week				5th Week			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
	Survey				Survey				Survey				Survey				Survey			

Figure 1: Implementation process

Note: A: closed-ended question, the quickest answer; B: closed-ended question, all learner answers; C: open-ended question, the quickest answer; D: open-ended question, all learner answers

Question types were closed- and open-ended, while answer formats were the quickest and all learner answers. During five weeks of the course, each question type and answer format was matched, leading to four questions being asked. Table 1 summarizes each question-answer activity.

Table 1: Structure of question-answer activities

Question type	Answer format	
	The quickest answer	**All learner answers**
Closed-ended	Question-answer activity 1	Question-answer activity 2
Open-ended	Question-answer activity 3	Question-answer activity 4

Context

Different web conferencing applications such as Adobe Connect, Blackboard Collaborate, WebEx, and GoToMeeting were used for synchronous virtual classrooms (Moore & Quintanilla, 2013). In this study, *Adobe Connect* platform -which is enterprise web conferencing software- was used. These kinds of platforms enable learner-instructor, learner-learner and learner-content interaction without place limitation. It enables real-time meetings that students can access via a web-browser. It includes features such as file, presentation and screen sharing, chat, audio and video conversation, and whiteboard. Meeting workspaces are organized in parts. These parts include screen share, chat, webcam etc. By using these features and parts, synchronous virtual classroom was held by the instructor. A screenshot of a synchronous class session can be seen in Figure 2. The layout includes chat, attendee list, webcam and sharing parts (Figure 2).
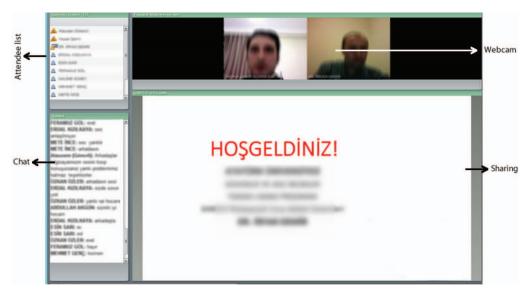

Figure 2: A screenshot of a synchronous class session

The instructor shared the lecture notes, the presentations and the other materials in sharing part. Attendee list includes instructor's and students' names. Questions were directed to students by using the chat area. There is an instructor and students' camera recording in webcam part. Students were able to reply to the questions in the chat and whoever wanted could answer first. During the sessions, instructors and students were supported in terms of the usage of the software by the technical staff. All sessions were recorded with the help of the software as a video for later use. Synchronous virtual classrooms were also recorded and uploaded to the learning management system for the students who could not attend this session or who wanted to watch the lecture again.

Data Analysis

As indicated previously, this study had two independent variables, question type and answer format, and two dependent variables, perceived interest and usefulness scores. Within the scope of the research questions, the data was analyzed first by descriptive statistical methods and then by two-way ANOVA because there are two independent variables (question type and answer format) and each variable has two levels (question type: open-ended and closed-ended; answer format: the quickest and all learner answer). This approach allowed for consideration of the interaction between the independent and dependent variables.

Results

The Effect of Question Type and Answer Format on Perceived Interest

In order to determine the effects of question type and answer format, different combinations were directed to learners. Average and standard deviation values of learner interest scores regarding the questions type and answer format are shown in Table 2.

Table 2: Interest scores for question type and answer format

Question type and answer format	N	$\overline{X}$ *	SD
Open-ended question – All learner answers	96	4.50	.858
Open-ended question – The quickest answer	96	4.47	.973
Closed-ended question – The quickest answer	96	4.31	.910
Closed-ended question – All learner answers	96	4.31	.955

As shown in Table 2, all learner answers in reply to open-ended questions drew the most attention ($\overline{X}$ = 4.50), followed by open-ended questions with the quickest answers ($\overline{X}$ = 4.47), closed-ended questions with all learner answers ($\overline{X}$ = 4.31), and closed-ended questions with the quickest answers ($\overline{X}$ = 4.31). Open-ended questions were, therefore, relatively more interesting than closed-ended questions. As for answer format, the all learner answer format was more attractive than the quickest answer format.

Two-way ANOVA was administered to understand the difference in interest scores (see Table 3). As a result of the analysis, it was detected that the effect of question type on interest scores was significant ($F_{(94)}$ = 47.105, p < .05, η_p^2 = .026). However, this effect was rather low. On the other hand, the difference in answer format for interest score was insignificant ($F_{(94)}$ = 0.671, p > .05). In addition, question type and answer format did not have an interaction effect on interest score ($F_{(94)}$ = 0.000, p > .05).

Table 3: The effect of question type and answer format on interest

Measurements	df	MS	F	p
Question Type	1	6218.338	47.105	.000
Answer Format	1	88.624	0.671	.413
Question Type and Answer Format	1	0.015	0.000	.991

The Effect of Question Type and Answer Format on Perceived Usefulness

The average and standard deviation values for each factor of question type and answer format regarding usefulness were calculated and are presented in Table 4. Closed-ended/all answers ($\overline{X}$ = 4.56) and open-ended/all answers ($\overline{X}$ = 4.56) were determined as most useful; they were followed by open-ended/the quickest answer ($\overline{X}$ = 4.54) and closed-ended/the quickest answer ($\overline{X}$ = 4.47) pairs.

Table 4: Usefulness scores of question type and answer format

Question type and answer format	N	$\bar{X}$	SS
Closed-ended – All learner answers	96	4.56	.723
Open-ended - All learner answers	96	4.56	.805
Open-ended- The quickest answer	96	4.54	.882
Closed-ended – The quickest answer	96	4.47	.882

Two-way ANOVA analysis results indicated that answer format had an effect on usefulness ($F_{(94)} = 6.155$, $p < .05$, $\eta_p^2 = .004$); however, this effect was rather low. Results (table 5) showed that question type had no effect on usefulness ($F_{(94)} = 3.798$, $p > .05$, $\eta_p^2 = .002$). Question type and answer format also did not have an effect on usefulness scores when taken together ($F_{(94)} = 2.271$, $p > .05$, $\eta_p^2 = .002$).

Table 5: The effect of question type and answer format on usefulness

Measurements	df	MS	F	p
Question type	1	555.814	3.798	.051
Answer format	1	900.895	6.155	.013
Question type and answer format	1	398.235	2.271	.099

Discussion

Results revealed that asking both open- and closed-ended questions to learners during synchronous class sessions changed their interest; with open-ended questions increasing interest the most. However, the answer format—"Who will give the quickest answer?" versus "Everyone must answer this"—did not create a difference in terms of raising interest. There was also no interaction effect of question type and answer format on interest.

Some reasons learners may pay more attention to open-ended questions include the concepts that this type of question (a) does not have a single correct answer (Goossen, 2002), so this encourages the person (Sobell & Sobell, 2008), and (b) may be answerable in part, if not known in full (Rogers, 1972; Lee, Kinzie & Whittaker, 2012). Also, since closed-ended questions have a single answer (Rogers, 1972; Lee et al., 2012), while open-ended questions seek multiple perspectives (Wragg & Brown, 2001; Jelly, 2001; Lee et al., 2012), open-ended questions might encourage learners to contribute more. Having only one right answer might increase anxiety about making mistakes. On the other hand, responses given to open-ended questions are unique and represent individual ideas (Lee *et al*., 2012), potentially increasing interest. An open-ended question can be related to personal thoughts and experiences, and open-ended questions allow respondents to select what pieces of information to provide after evaluating the opinions elicited by the response.

Since closed-ended questions require a structured answer (Tekin, 1991), the learner might not wish to answer, even when the answer is easy. On the other hand, with open-ended questions, both those who know a little and those who know a lot can give responses. Proper difficulty level is one of the most important factors for motivation in learning (Leng, 2006; Lieb 1991; Thoms 2001).

A question may often be either too easy or too difficult, especially a closed-ended question with its single correct answer. Yet, open-ended questions are appropriate for every person's reasoning level, since the quality, extent, and length of an answer is left to the respondent's preference (Çepni, et al., 2012).

According to findings, the questions were generally regarded as useful. This finding can be explained by the value of learner interaction, reviewing and confirming one's own knowledge, and correcting mistakes (Almeida, 2012; Goossen, 2002; Maloney, 2012). Though there was no significant difference between question types according to usefulness scores, answer format did change the perception of usefulness. Rather than the quickest answer, all learner answers were perceived as more useful. While only a few learners respond for the quickest answer, all learner answers require participation from nearly everyone, leading to a feeling of obligation to interact and prompting all students to experience the process and envision it in their minds (Goossen, 2012; Maloney, 2012). With the quickest answer format, an individual may feel relieved from the responsibility of answering, and the reasoning process may not occur. If the responsibility of carrying out a task is clearly assigned to a person, the task may be found more useful since the learner is likely to engage in it more.

In conclusion, this study dealt with question type and answer format in terms of interest and usefulness in online synchronous learning environments. Results showed effects of question type on learner interest, while answer format has an effect on usefulness of online activities. To increase interest in synchronous virtual classrooms by asking questions, open-ended questions, which everybody can answer, should be preferred, instead of closed-ended questions. On the other side, it is observed that asking questions which every student in synchronous virtual classrooms can answer is more useful, but when students were requested to give the quickest answer, open ended questions were more appropriate.

The results can be a guiding source for investigating and evaluating usefulness and interest levels of question type and answer format involved in question-answer activities in educational environments. However, the demographics and number of the subjects should be considered while interpreting results. In this sense, diversifying question type and answer format as well as investigating in terms of achievement, motivation, performance, and satisfaction are suggested for future studies.

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