Preference of Communication Modality in Blended Learning Environment

Karma Öğrenme Ortamlarında İletişim Yöntemi Tercihi

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Abstract

In conventional education, online communication technologies can enrich learning environments by extending activities beyond the limitations of time and space and by providing peer-to-peer interactions. As connection bandwidth and capabilities of computer-like devices increase, much more information-rich communication facilities are replacing old text-based messaging dialogs. In addition to textual modality, today auditory and visual communication channels are supplementing communication with their special advantages. However, using only audio and visuals all the time in online communication is not the best way. This study investigated the use of three online synchronous communication modalities (textual, auditory and visual) in a blended learning environment to obtain strengths of each for learners. As a qualitative inquiry methodology, a case study with action research paradigm was conducted in a blended learning environment. An online communication tool was developed and used for a semester in a programming language course with fifty-one 2nd year undergraduate students. At the end of the semester, all students were given a Likert-type perception questionnaire. According to scores, three students from each part (top, middle and bottom in ranking) were interviewed. In depth analysis of results with the light of related literature provided with evidences to infer for special strengths of each modality.

Keywords: Blended learning, online communication, communication modality, learner preference.

Öz

Çevrimiçi iletişim teknolojileri öğrenme etkinliklerini zaman ve mekân sınırlarının ötesine taşıyarak ve bire bir etkileşim sağlayarak geleneksel eğitimi zenginleştirebilirler. Bilgisayar benzeri cihazların ve bilgisayar ağlarının her geçen gün artan kapasiteleri çevrimiçi iletişimde eski metin tabanlı mesajlaşmanın ötesinde daha yoğun bilgi ve veri transferini olanaklı sağlamaktadır. Metin tabanlı iletişim yöntemine ilave olarak kullanılmaya başlanan sesli ve görüntülü iletişim kanalları kendilerine has avantajlar içermektedir. Ancak iletişimde sesi ve görüntüyü her zaman kullanmak en iyi yol olmayabilir. Bu araştırma, harmanlanmış öğrenme ortamında üç çevrimiçi iletişim yönteminin (yazılı, sesli ve görüntülü) öğrenciye yönelik güçlü yanlarını görebilmek amacıyla yapılmıştır. Bir harmanlanmış öğrenme ortamında, nitel araştırma metodolojilerinden biri olan eylem araştırması deseninde durum çalışması yapılmıştır. Bu amaçla bir çevrimiçi iletişim aracı geliştirilmiş ve lisans öğrenimlerinin ikinci yılında öğrenim gören toplam 51 öğrenci ile bir dönem boyunca kullanım izlenmiştir. Dönem sonunda tüm öğrencilere algı anketi ve bu anket sonucunda farklı puanlara sahip 9 öğrenciyle de bire bir görüşme yapılmıştır. Elde edilen buldular analiz edildiğinde yazılı, sesli ve görüntülü yöntemlerin öğrenciye göre güçlü yanları sıralanmıştır. Araştırmanın sonucunda tercihleri etkileyen faktörler olarak iletişimin içeriği, amacı, iletişim kurulan kişiye yönelik tutum ve iletişim için gerekli teknik altyapı belirlenmiştir.

Anahtar Kelimeler: Harmanlanmış öğrenme, çevrimiçi iletişim, iletişim yöntemi, öğrenen tercihi.

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1. Introduction

Computer networks provide various types of synchronous communication opportunities in addition to simply sending messages like e-mail. Over the high-bandwidth connections; scripts, images, sound and vision are transmitted to someone else around the world in a second. Similarly, via numerous software and tools, instructors and students can access to each other and to resources over distances. E-mail, discussion lists, chat software and other instances of online communication are becoming regular components of an instruction in extent that many conventional instructional environments are re-designed and called as blended learning environments where face to face instruction is combined with any type of computer mediated communication (Graham, 2006; Graham, 2013). In that blend, instructors and students communicate with each other online by computers over Internet in addition to the face to face courses.

The simple and common communication pattern, or modality, is textual (e-mail and instant messaging), but today's high-speed bandwidth allows participants talk and see each other alive. Instructional environments are, on the other hand, very divers and miscellaneous so that such technologies need to be elaborated empirically within their own specific boundaries. Availability of online communication tools and modalities - textual, auditory and visual- do not guarantee the successful interactions in instructional environments routinely. This study investigates synchronous computer mediated communication modalities at blended learning environment with respect to students' point of view. The main question is how and why students prefer or neglect to use certain modalities in the blended learning environment.

1.1. Computer Mediated Communication

Computer mediated communication (CMC) is a type of interaction among people in various forms implemented via computers or computer networks as the medium of communication (Romiszowski, 1997). Electronic mails, forums, discussion lists, chat and video conferencing are the sample tools and techniques of CMC applications. The main advantage of CMC is that it allows people to communicate at any time and at anywhere. If participants want to see, say or send something to each other, they have many options via computer-like device over Internet.

The answer of *how that communication opportunities can and should take place in instructional fields* has investigated by the paradigm of constructivism because it advises collaborative learning and social interactions through which individuals construct their own knowledge (Miller & Miller, 1997; Leflore, 1997). Constructivist theory claims that learning is a knowledge construction process through active learning and collaboration. Interactions with the content and with others (instructors and students) in the learning environment are two promises of CMC valued by constructivists (Romiszowski & Mason, 2004).

On the other hand, how learner interacts with these tools and with the content of communication is explained by cognitive studies in human learning, especially by human information processing model. This model explains how human memory acquires, transforms, encapsulates, synthesizes, stresses and uses information obtained from our sensory registers. (Moore, Burton & Myers, 2004). Multiple-channel communication (Broadbent, cited in Moore et al, 2004), cue-summation (Severin, cited in Moore et al, 2004) and dual coding (Paivio, cited in Moore et al, 2004) theories, based on information-processing approach, expose how individuals perceive the messages and depict limits of human mind in these perception processes.

1.2. Synchronicity and Characteristics of Computer Mediated Communication

The literature on online communication tools and/or techniques has come up with certain characteristics to describe a particular tool: Social presence (Gunawardena & McIsaac, 2004), transactional distance (Moore, 1997), interaction (Moore, 1989). With those characteristics, stakeholders are able to elaborate and estimate outcomes from use of particular communication systems. For example social presence is high (Ko, 2012; Han, 2013) and transactional distance is low in video conference system because participants both see and hear others with their body movement during dialogs. On the other hand communicating via e-mail may cause participants feel alone more than via video conferencing which means a high transactional distance. Similarly, interaction is described as high when a certain communication medium allows immediate feedback to be sent; or as low if the medium is one of asynchronous communication tools.

Synchronicity is another characteristic of CMC that describes the timing in sending and receiving messages in any medium. If both participants should involve in communication at the same time, like

telephone conversations, then the medium is called synchronous. On the contrary, if participants may send and receive messages any time they want, like in e-mail, then it is called asynchronous communication (Romiszowski & Mason, 1996). While video conferencing, instant messaging, telephone conversations are the examples of the synchronous communication tools; e-mail, discussion lists and forums are asynchronous instances.

1.3. Blended Learning

Computer mediated communication (CMC) can create an environment for collaborative learning, which is an instructional method where students work together as groups to accomplish shared goals (Johnson & Johnson, 2004). For successful collaboration, CMC tools and strategies may provide time and location independent communication facilities both for learners and instructors. Especially in distance education environments, CMC may be an only way of communicating. On the other hand, face to face instructional environments can also get benefit from CMC tools by extending learning environment and acitivites beyond the classroom walls and school time. Combination of CMC tools and online learning strategies with regular face to face learning environments is defined as a blended learning (Graham, 2006; Graham, 2013). While the term "blended" describes a combination of online and face to face instruction, it does not impose certain portions for this combination (Bernard, Borokhovski, Schmid, Tamim, and Abrami, 2014). Rather than using as many as possible tools because of their availability or fashion, the successful blends are based on educational and sociological science (Chew, Jones, and Turne, 2008; Gedik, Kiraz and Ozden, 2013). Therefore empirical studies about blended learning in diverse cases are needed.

1.4. Communication Modalities and Video Conferencing

As parallel with the enhancements in communication technology, participants have gained a chance of sending and receiving "information-rich" messages. While e-mail messages are composed of mainly text (and sometimes pictures), today video conferencing applications provide alive vision and sound of the participants. If you have an Internet enabled device, it has become a regular and trivial process to use chat software with visual and audio channels. Textual, auditory and/or visual channels are called communication modes or modalities. In textual modality, participants write and read texts like in emails or in chat applications. Auditory modality let participants speak and listen to each other similar to telephone conversations. Visual modality provides visual content like in video conferencing environments.

Today, people are capable of combining those modalities in a CMC dialog, which can be called as video conferencing. Once it was difficult and expensive type of communication, today there are plenty of commercial or freeware software or Internet services like Skype®, Google Hangout®, Adobe Connect®, Openmeetings®, and Anymeeting®. With an Internet enabled device, users can easily send instant textual messages, talk simultaneously and/or see each other alive.

2. Problem

At first, video conferencing gained attention mainly in distance education field where social presence (Akyol, Garrison and Ozden, 2009), transactional distance and interaction gaps could be compensated by those new ways of communication. On the other hand, as constructivist learning assumptions imply, traditional (face to face) learning environments *can* and *should* extend learning process beyond classromm walls and hours (Duffy & Cunningham, 1996). At that point, online communication tools, especially video conferencing, can provide communication platform both for learners and instructors to engage in learning process outside schools and time-independently. However, what kind of communication modality learners need during a certain learning process is not always the one that provides richest content. For instance McGrath and Hollingshead (1993) generated a task-oriented communication grid where they emphasized different kind of modalities for different type of tasks. In their grid, there are certain types of tasks like generating ideas where textual messaging is better than visual modality. Therefore, though its availability, communication modalities should be analyzed from different perspectives in different contexts. The perceptions of the learners toward those modalities in certain context may also affect the efficiency.

This study is aimed to investigate the perception of textual, auditory and visual modalities from the learners' point of view and to obtain affective factors based on learners' preferences in modalities in blended learning environment.

3. Method

As a qualitative inquiry methodology, a case study with action research paradigm was designed and implemented for this study. In order to obtain real perceptions of learners, a video conferencing tool (named as ITL Live Meeting) has been developed by the researchers and utilized for a semester in an undergraduate course for a semester. As action research paradigm implies (Mills, 2000), the instructor played an active role in design and implementation of the research study with the new tool. The case context, as described in detail below, had unique properties such that the students and researchers had an adequate computer literacy lack of which might affect the use of tool. Also the tool was developed for the study since their commercial alternatives required purchasing and extra special software behind the scenes.

3.1. Context

As case studies focus on a specific context, the thick and explicit description of the aspects of the context is essential part of the research study for trustworthiness and credibility. The aspects in this study are the course, the communication tool and the instructor.

3.2. The Course

The course is a programming language course having two-hour regular face to face instruction in a classroom and two-hour laboratory works each week. It is a second programming language course given at second year spring semester at four-year undergraduate program of Computer Education and Instructional Technologies department at Middle East Technical Univerisity. The language of the course was English as all other courses at the university.

The course content included syntax, algorithm, language specific development techniques and user interface design for 14-week semester. The course was supported by a learning management system (a web site) where the students could reach to course resources, announcements and assignments, submit their assignments and get feedback from the instructor, and lastly discuss in a forum. The instructor could see reports about site usage for any time period. Moreover, the instructor recorded himself in classrooms during lecturing and added those videos into the web site to provide compensating content for those who missed lessons. In this form, the course environment can be described as blended learning.

3.2.1. The Students

There were 51 undergraduate students in the study. Except one foreign student, all others were Turkish students who had learnt English as a foreign language either in preparation school for a year or during their previous college education. The foreign student had also Turkish language courses at each year but her English was much better, as she explained in interview. The department of computer education and instructional technologies includes both pedagogical and computer related technical courses. The students were more experienced in computer applications and spent more time in computer laboratories relative to other education faculty students.

3.2.2. The Tool

In a research laboratory in the department, (called Instructional Technology Laboratory, ITL) the video conferencing tool was developed and named as *ITL Live Meeting*. By the tool, any two or more people can send textual messages, use audio and video channels separately or together to communicate. It requires a login name and password provided by the researchers at the study. On the other hand the tool is instructor-controlled such that the instructor should open (enable) dialog session through which the students can join and send messages in any modality. Therefore students cannot communicate with each other without the instructor. This feature let the instructor control the conversations against irrelevant topics and interruptions during video conversations.
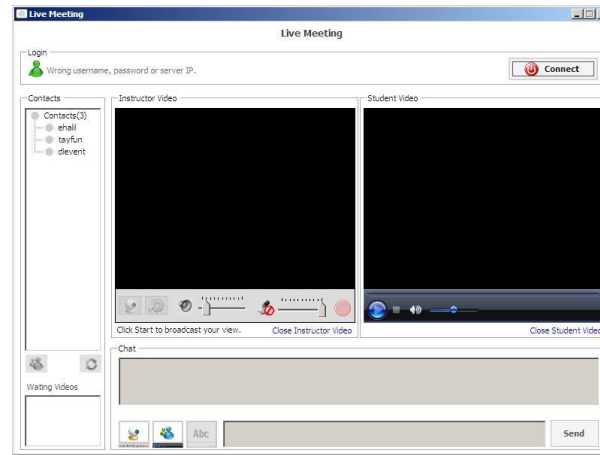
Figure 1 Screenshot of ITL Live Meeting Video Conferencing Tool

3.2.3. The Instructor

The instructor had been giving programming courses for 5 years at the time study was conducted. He had both programming and computer-hardware knowledge to give those courses at undergraduate level. His research area was about use of web-based technologies, especially computer mediated communication. At first glance, his background and active role in design, development and implementation of the tool and study seem to be threat for validity and reliability, but he tried to minimize and eliminate a researcher bias in implementation and analysis parts by providing thick description of the context (course, tool, himself, participants), expert consultancy in design and development of the tool, peer-reviewing in data analysis and utilizing both quantitative and qualitative data for triangulation.

3.3. Implementation and Data Collection

After the development of the tool in several months, the study was implemented throughout a semester. At the beginning of the semester, the students were introduced to the tool by the instructor (the researcher) and were invited to use it during laboratory sections when they were assigned with coding exercises in front of computers. They told that during the laboratory hours, each of them could use the video conferencing tool to communicate with the instructor, who was not there physically but ready in his office. In laboratory sections, a research assistant, who did not have content-knowledge but could support them about laboratory equipment and was responsible for attendance, had stayed with students. Once they got online, they waited the instructor to open a dialog session. Then the instructor let them to work their programming tasks and to ask questions to him in any modality. The students were either active participants by asking own questions or passive observers of other talking students via the tool. In passive span, they could see all textual messages; hear auditory conversations or watch talking participants.

When a student initiated a dialog over the tool, in most cases, the instructor responded in a modality that was used in request. However, in some instances he used video modality to express a topic requiring in depth understanding within a short period of time or present a content that interested all students at that time.

All conversations, on the other hand, open to all participants who whether requested support intentionally or not. The tool shared the messages, sound and/or visual content with all participants, but limited only two participants to send audio and video content at a time. Otherwise, like in face to face environment, it would be difficult or impossible to listen and understand more than one person. However, text messages were all shared and allowed since they stayed in interface as long as application run so that it was easy for participants to trace and re-read.

Participants were let use their native language, Turkish, and also English if they wanted. Most of the conversations were in Turkish, but a foreign student used English both in written and oral dialogs.

3.4. Questionnaire

At the end of the semester two data collection instruments were used: Perception questionnaire about synchronous communication and interview on perception about Live Meeting and communication over it. The first questionnaire is composed of two parts, first one includes 12 Likert type items and second part has 8 semantic differential items with one open ended item. The first part with 12 items were developed by Kies, Williges and Rosson (1997) and then revised by Grant and Cheon (2007) with adequate reliability coefficient where Cronbach's Alpha was 0.782 and 0.715 in this study. The second part with differential items was created by Spencer and Hiltz (2003). After a revision and expert opinion, some adjectives were replaced with their synonyms. The Cronbach's Alpha was calculated as 0.802. All 51 students were invited and 31 of them completed the survey. The items and responses are given at Table 1 below.

Table 1
Perception Questionnaire Items about Synchronous Communication

Part I: Likert-type Items
1. The video quality was acceptable
2. The video size was adequate
3. The video was good as being live in the same classroom
4. The audio quality was acceptable
5. The audio was good as being live in the same classroom
6. Communication via Live Meeting-Student encouraged me to think critically about the subject matter
7. Live Meeting did not obstruct my communication with the instructor
8. I thought communicating via Live Meeting was just as effective as face-to-face communication
9. I was able to interrupt and ask question easily
10. Adding video into communication would improve the communication
11. Adding audio into communication would improve the communication
12. I would be willing to take a course which utilizes a communication tool such as Live Meeting

Part II: Semantic Differential Items	
I found communication with Live Meeting was...	
13. Useless	Helpful
14. Informative	Confusing
15. Complex	Primitive
16. Supportive	Unhelpful
I found Live Meeting was…	
17. Useless	Helpful
18. Unappealing	Attractive
19. Secure	Insecure
20. Comforting	Disturbing
Open-ended Item	
Additional Comments about Live Meeting?	

For the first part, subjects were expected to select an integer number (from 1 to 5 where 1 stands for "strongly disagree" and 5 for strongly agree). Mean scores for each item and for each participant calculated. Higher mean score for a participant accounted for higher positive perception about the tool. The answers of last open-ended item were analyzed by content-analysis method.

In second part they were given 5 dots between the two counter adjectives and expected to select a dot reflecting their decision (dots was numbered as 1 to 5). Mean score for each counter-adjective pair was calculated.

3.5. Interview

After the survey analysis, the subjects were sorted by their overall score from first part, then 3 students from each top, middle and bottom part of the list were invited into interviews to achieve maximum variation. Among nine, one rejected to participate then another one with the closest score was invited and participated. The interview was in semi-structured form and conducted by each participant separately after a week semester ended. Their consent was requested and obtained before interviews about sound-recording during the interview sections. The interview protocol was created with nine directional and one open-ended question given in Table 2.

Table 2
Interview protocol

| 1. Frequency of use of any online communication tools in daily life |
| 2. Experiences with those communication tools in any course before |
| 3. Experiences with those communication tools in the course under investigation |
| 4. How LM* be introduced |
| 5. How and when to use LM at the course |
| 6. Liked features of the LM |
| 7. Disliked features of the LM |
| 8. Recommendations on LM |
| 9. Differences between face to face communication and online communication over LM |
| 10. Any comments about communication with LM |

(LM stands for Live Meeting)

In data analysis, the recordings first transcribed into text and then analyzed by segmenting, coding and developing categories (Johnson & Christensen, 2004). For the first 5 questions in interview protocol, frequency tables about various descriptive results were created. Rest of the questions was more related with features of the tool and the communication such that the techniques mentioned above were used and categories were created.

4. Results

4.1. Questionnaire Results

For the Likert-type questionnaire, which was about perceptions about synchronous communication via the tool, 33 out of 51 students responded the items. After analyzing the descriptive results (distribution and frequencies) of responses, distribution diagram was created as in Figure 2.

Figure 2 Distribution of Responses for Likert-type Questions (n=33)

According to the distribution data above, it can be said that the subjects agree with the items in favor of the tool and online communication in the study. The students were seemed to perceive video and audio quality good and satisfactory. The video width and height were 320 and 240 pixel that was a common ratio used over Internet. Video image quality was also set to 248 Kbps by the researchers so that the subjects with slow connections could watch the video stream smoothly.

While students seemed to believe that video and audio channels (video and audio) could improve the communication (the 10th and 11th items with 78.8% and 81.8% agreement respectively), adding video into communication seemed to be more valuable than audio (60.6% and 48.5% agreement relatively).

In the 6th item, majority of the students (63.6%) reflected that communicating via LM was encouraging in terms of critical thinking. Even though more than half of them (54.5%, 69.7% and 63.7% at 7th, 9th and 12th items) indicated that they feel comfortable with the communication in the study, they did *not* totally agree that online communication in the study was as effective as face to face communication (only 42.7% agreement at the 8th item).

The results of the second part of questionnaire are given in Figure 3. Items from 13 to 16 queried students' perceptions about "online communication with LM". The scores close to 1 and 2 were attributed for aggreement with the first adjective, 4 and 5 were accounted for aggreement with the second adjective in the results. Scores close to 3 were interpreted as undecided.

Figure 3 Mean Scores for Semantic Differential Items

The distribution results indicate that students perceived the communication as helpful (mean is 4.09), informative (2.15), moderately primitive (3.42), and lastly supportive (1.97). The LM tool was perceived as helpful (mean is 3.97), attractive (3.88), sort of secure (2.52) and comforting (2.24).

The last item was in open-ended question asking any additional comments on communicating with LM. Out of 33 students, only one wrote that:

> Even though it has been used at laboratory hours, it is an effective communication tool.
> Even we have used the right of asking questions with the laboratory assistant. I think the
> purpose of it could not been realized well although its name is very effective one.

To summarize the 20-item perception questionnaire results it can be said that the students seemed to perceive the tool effective in functionality and felt comfortable during usage, but they would not replace online communication with face to face one at all.

4.2. Interview Results

The first five questions in the interview was descriptive items investigating participants' past experiences with online communication tools like forum, chat, email and video conference. The results for those questions are frequencies of specific tool usage and given at tables below.

Table 3
Responses for Question #1

Question #1: How frequently do you use online communication tools? (n=9)				
Tools	Frequently	Rarely	Never	No Answer
Email	9	-	-	-
Forum	2	5	1	1
Chat	7	2	-	-
Chat with web camera	3	1	-	5
Video Conference	-	2	7	-

Table 4
Responses for Question #2

Question #2: Have you ever used any of these tools in your courses for instructional purposes and how?	
Tool	Frequency
E-mail	4
Forum	5
Chat	5
Video Conference	0
None	2

The experiences, mentioned at question 2 above, come from either instructional activities existing in a course design or students' individual needs like using chat applications during group projects.

Table 5
Responses for Question #3

Question #3: At the course, which online communication tools have you used?		
Tool	Frequency	Description (Frequency)
Email	5	o Writing extra messages in addition to reading announcements via e-mails (5)
Forum	9	o Both read and write (1) o Only read (5) o Aware but not read (3)
Chat (Video conference)	9	o I have used (5) o I could not use (4)

In question #3, four participants who said they could not use video conferencing facility (i.e. Live Meeting) explained the reasons as follows:

- "There was a connection problem."
- "It was available but I did not use it."
- "Support from research assistants at laboratory activities was more dominant."
- "We used Microsoft MSN® free commercial software) during the projects."

Table 6
Responses for Question #4

Question 4: How has Live Meeting been introduced to you? Was that introduction useful for you in terms of how to install and why to use it? Why?		
	Adequate	Not Adequate
Adequacy of the introduction about how to install	9	-
Adequacy of the introduction about why to use	8	1

As seen in results of the question #4 above, only one participant argued that "it was difficult to understand without a demonstration".

Table 7
Responses for Question #5 with five sub questions

Question #5: When and how did you use Live Meeting during the semester?	
Sub Question 5.1: When and where did you use Live Meeting?	Frequency
During application hours at computer laboratory	9
At home at night	1
Sub Question 5.2: Why did you use Live Meeting?	
To ask questions and get answers about current topic at that moment	8
To see others questions	1
Sub Question 5.3: Have you ever watched the instructor alive?	
Yes	8
No	1
Sub Question 5.4: Have you ever broadcasted/shared your video?	
Yes	1
No, but I would	3
No and I would not	2
No, no comment	3
Sub Question 5.5: Difficulties during the use of LM	
Losing connection during communicating (need to connect again)	4
Unable to connect at all times	1
Audio and video delay during video conference between participants	1
Audio delay during watching instructor video	2
Poor quality of speakers at the computer	1

In sub question #5.4, only 1 participant said that he or she could both watch and publish his or her view through camera. Other three said that they had not had necessary equipment (camera and headphone).

Another two admitted that they would *not* have preferred to broadcast their own view even they had necessary equipment. In last sub question (#5.5), participants expressed the difficulties in using LM as given table 9.

In 6th question, students were expected to present features of the LM that they had liked. As given in table 10 below, several features were expressed under two groups: Benefits from synchronous communication and benefits from various communication channels. In the same question, participants also expressed their concerns about the communication and tool. They said that their participation would depend on the identity of communication partner. Their decision about using video channel would change according to whom they were communicating. In fact one said that he or she felt uncomfortable in front of the camera so he or she would never engage in video channel.

Table 8
Responses for Question #6

Question #6: Liked Features of Live Meeting	
Categories	Specific Features
Benefits from Synchronous Communication	o Immediate feedback
	o Engaging other tasks simultaneously
	o Increased retention
Benefits from Communication Channels	o Reduced perceived distance in video conference
	o Increased retention and motivation in video conference
	o Permanent appearance of text messages
	o Accent in speech in audio
	o Easy to express ideas by talking
	o Easy to convey ideas by mimics in video conference
Other Concerns	o Effect of Communication Partners
	o Being uncomfortable in front of camera

In 7th question, as opposite with the previous one, most disliked features were asked. The participants indicated several disliked features as given in table 11 below under two groups: Technical problems and design problems.

Table 9
Responses for Question #7

Question 7: Disliked Features of LM	
Categories	Specific Features
Technical Problems	o Time delay at audio/video transmission
	o Connection problems in joining the dialog session
Design Problems	o Difficult to trace questions and answers at the same time
	o Difficult to understand the sender of messages at textual messaging
	o Being distracted by watching another student
	o Formal and academic mood of conversations

In question #8, the students were asked for their recommendations to improve the Live Meeting tool. Under three groups, they expressed suggestions as given in table 10 below.

Table 10
Responses for Question #8

Question 8: Recommendation for Improving Live Meeting tool	
Category	Recommendations
Changes in Communication Pattern	o Allow students to start a dialog session without the instructor authorization o Allow private dialogues with the instructor to make message tracing easier and to get answers quickly
Changes in Interface Design	o More attractive alert for new messages o Emotional icons and images at textual messaging o Different text colors and fonts at textual messaging to differentiate instructor's messages o Being similar to other chat software
Extra Features	o Desktop or application sharing o File sharing o Saving textual messages and audio/video dialogues

As a last question, the participants were inquired to compare the online communication via Live Meeting with face to face at the classroom. It is expected that after expressing pros and cons of online communication in previous questions, students can make a preference of communication way one over another. After the first interview session with the first subject, the question was modified as: "If there would be three different courses, one over Live Meeting, one at classroom, and one blending both Live Meeting and classroom; which one would you like, and why?" The preferences and factors for each were are given below in Table 11.

Table 11
Responses for Question #9

Question 9: Reasons and effective factors in preferences of communication via Live Meeting and face to face communication at classroom	
Preference	Reasons
Face to face only	o Need for social interaction o Easy to recognize emotional states and feelings o Easy to manage dialogues o Sharing ideas from ongoing dialogues o Direct support from the instructor
Live Meeting only	o Effect of new technology o Motivation from instructor existance alive o Feeling uncomfortable in classroom o Easy to manage dialogues o Accessing archived dialogues o Appropriate course content o Communicating in foreign language
Blending both	o Task related communication needs o Need to feel the existence of an instructor
Effective Factors in preferences	o Attitudes toward instructor o Abilities of instructor o Attitudes toward course

In the last group above, the participants said that their preference would change according to their attitude toward the instructor, to online abilities of the instructor and to attitudes toward the course. They said they would be willing to take online courses if they liked the instructor and the course. Moreover they stressed that the abilities of the instructor in online environment could affect their preference.

5. Discussion and Conclusion

To answer the research question, (*how and why students prefer or neglect to use certain modalities in the blended learning environment),* the results of both instruments (questionnaire and interviews) were analyzed and elaborated. As results of the questionnaire, it can be said that the tool (Live Meeting) fulfilled the synchronous communication needs of the students comfortably**.** In terms of video and audio quality, the students found the existing capacities acceptable. The size (320x240 pixels in width and height) and image quality (248 Kb per second and 29.9 frame per second) of the Live Meeting seemed to be satisfactory for such communication. At this point, it is important to mention that the instructor and students saw only the face and head of the speaker during the video conferences. In this case, the size and quality of the video were quite acceptable. In terms of video quality, the findings were in line with the research study of Kies, Williges and Rosson (1997). They had found that the size of 320x240 pixels and frame rate of 6 fps (30 fps is recommended) was the minimum acceptable quality measure.

5.1. Textual Modality

In terms of communication channels, diverse affective factors emerged from findings for each modality. Strengths of textual modality, as results of students' interview data, are grouped under four.

5.1.1. Permanency of the Text Messages on Screen

Words and other symbols stay at screen in textual messaging in opposed to sound or vision so that there is much more time span for sensation and comprehension. This extra time span before responding may have participants feel more comfortable (Falloon, 2011). Similarly a participant can delay reading and responding the message for a second to maintain concentration on current activity.

5.1.2. Textual Content of the Programming Language Course

The content of the communication in the case was programming language topics which required sending codes in dialogs. As even one letter or punctuation in coding is important, transmitting these messages in texual modality is the least risky way. Audio and visual modalities are vulnerable to losing or missing some characters. Moreover, permanency of text messages about programming codes lets participants reach and read them more than once.

5.1.3. Availability of Time Span in Reading and Writing for Non-Native Speakers

For non-native speakers, reading and writing is more comfortable than listening and talking alive. Not only the content-specific terminology but also regular part of the dialog in foreign language may create a pressure and cause to avoid communication at all. As one subject stated, non-native speakers prefer textual modality, where the risk of misunderstanding is lower than in audio and video modality. Berge and Collins (1993) pointed out similarly that time independency in online communication allows participants allocate extra time for reflection before posting messages. This extra time may help non-native speakers understand dialogs and participate them.

5.1.4. Easiness in Archiving Text Messages

Even the primary purpose in online communication is immediate support in this study; the content of dialog seemed to be valuable in later times. Archiving textual messages is very easy either by communication software or by participants themselves. Coping and pasting scripts into any other application let you keep them forever. Managing is also easy since saving very long scripts in textual modality needs very small amount of digital storage space. For example, you can send one hundred page of text scripts to yourself as a

email but a 10-minute sound or video file require much more storage capacity that you may not send it by email. Moreover, while textual content can be opened by plenty of ways even in an-old fashioned computer, sound and video files necessitate special software and relatively better hardware.

5.2. Auditory Modality

Auditory modality refers communication only over audio channel like telephone conversations. Both students and the instructor in the study had a chance to close camera vision but continue with sound. After the data analysis phase, following advantages emerged:

5.2.1. Immediate Response

Since the recognition capacity and retention of auditory information are superior to visual information (Gelder & Vroomen (1997; Penney, 1989), participants spend less time in talking than typing and reading. Especially if main purpose of the initiated dialog is to get help or to ask a question about ongoing task, immediacy is important property of a communication channel. Students said that communication with talking was easy and took less time by accent in speeches.

5.2.2. Bidirectional Conversations

Beside high speed in perceiving sound, existence of only two participants in audio modality rather than many people in textual modality let a person save time in deciding the targets of the messages. All incoming messages are obviously targeted to listener and vice versa so that no extra effort and time to associate messages with their senders are needed. In interviews, students complained about difficulty in tracing text messages and their senders.

5.2.3. Engaging in a Visual Task and Audio Dialog at the Same Time

Dual coding theory (Paivio, 1991) advocates that, people process verbal and nonverbal information separately, thus presenting verbal and nonverbal information simultaneously supports remembering. On the contrary, providing more than one verbal or more than one nonverbal presentation at the same time causes confliction. Since audio modality let visual information to be processed independently, participants can continue working on tasks in front of computers while talking and listening.

5.2.4. Accent in Speech

Accent in speech provides extra information for listener about the message. Certain words in a sentence may be stressed explicitly in order to take listener's attention on them. Similarly the same word can be a question or an answer with proper accent which means less mental load for listener.

5.2.5. Easy To Express Feelings By Audio

Beside accent in speech mentioned above, people can feel comfortable in talking since participants' emotions can also be anticipated. Tone in talking, silence and some voices like laughing, crying, etc., provide extra information to listener. Even though there are some symbols used to convey feelings in textual communication like :) , :P , :D, etc., they are incapable of conveying whole mood.

5.2.6. Accessing Dialog Archives

The tool in the study was not archiving the audio and video dialog. Some subjects recommended such option both for audio and video conversations. Technically, sound can be recorded easily and then accessed by anyone through Internet.

5.3. Visual Modality

In visual modality, both vision and audio channels were used simultaneously in the study. For that reason some of strengthens of visual modality came out similar to those of auditory modality. In following section, advantages of vision in those live conversations are listed:

5.3.1. Extra Information by Visual Clues

Like face to face communication, talking to someone while looking him or her gives extra information in addition to the message. The emotional state or attitudes of the participants become visible by looking at their mimics, accent, body language and an environment they are talking in (Huang and E.-Ling, 2012).

5.3.2. High Social Presence

Similarity of visual modality with face to face communication makes students feel high social presence in online communication. As students stated in interviews, visual modality decreases feeling of being far away and loneliness which is implicitly increases the motivation.

5.3.3. Ability to Archive and Access Later

The online meetings over auditory or visual modalities were not being archived in this study and students recommended such facilities for themselves in interviews. Information in visual channel can be archived either by a participant or by the tool automatically. After archiving, participants can watch those movies again and again, which let a student to focus on only certain part of the communication and to revise again and again.

5.4. Conclusion

After the particular advantages of each modality, the study let to conclude with following concerns for future implications:

- Content of the communication may make certain modality more effective.

For example, the conversations in the study were mainly included textual information (programming codes) so that some students explicitly stated that they could have ignored the visual and auditory channels since it is easier to understand when reading a code than listening. Further online communication implications should take the instructional content into account and provide appropriate modalities.

- Purpose of the communication may affect the preference of modality.

In study, the purpose of some students in communication was to get support about ongoing coding task. Auditory modality allowed them to communicate without interrupting their work. In those cases, only audio channel was acceptable since it was possible to listen and to type at the same time. Similarly, if the purpose was sending codes to someone without any lose, textual modality was used. Moreover, seeing the instructor was told to be motivating. As a result, purpose of the communication should be considered in online communication.

- Attitude toward the instructor or other participant can affect the students in preferring communication channel.

In interviews, a couple of students said that they would not want to see and to share their visual appearance with an instructor or with a student if they did not like him or her in general. Audio and visual modalities can share extra information about the sender unconsciously (vision of face, clothes, hair style, vision of room or office, etc.). Participants' attitudes toward each other may affect the idea of sharing that kind of personal information and may cause avoiding audio or visual modality. Practitioners should think about that attitudes and should not enforce and expect using certain modality.

- Technical requirements should be met for quality audio and visual communication.

Communication quality in visual and audio channels is more vulnerable than textual channel since further channels require extra hardware (camera, speaker and microphone), proper environment in terms of light and sound isolation, and lastly higher and robust connection speed. Stakeholders should define technical requirements for online communication and/or design online communication matching existing infrastructure and equipment.

As last words, this study shows that increase in the capabilities of online communication does not guarantee that learners will prefer and use new technologies (Epp, Green, Rahman, and Weaver, 2010). Like this study, more context-sensitive studies with diverse parameters should be conducted.

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