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Editorial

Transformation of Education - 1

Donald G. Perrin

The November Editorial began to explore necessary changes for education to weather the economic downturn. The short-term goal was to maintain educational services for all who need them. The long term goal was transformation to a sustainable, more efficient, and higher quality system to compete globally and to meet the needs of the 21st century. The short term solution was a band-aid approach. Pre-school through 12th grade public schools would recruit volunteers from out-of-work parents to increase overall productivity. Colleges and universities would use distance learning to extend educational services beyond their on-campus capacity. A band aid is not a solution – it protects something while healing or reconstruction is taking place.

Business, industry, military, government, health care, and living at home have undergone significant transformations during the past century as a result of innovations, new technology, socio-economic changes, and natural disasters. Innovations and technology include automobiles for the masses, airplanes, bullet trains, freeways, telephone, radio, motion pictures, television, audio /video recorder-players, computers, computer networks, the internet, Google, cell phones, digital cameras, Geographic Positioning Systems (GPS), automation, and robotics. Political and economic changes result from paradigm shifts, wars and natural disasters. In some instances, change is so radical that the way we live and do business is changed forever. Flattening of world economies, interdependence of countries, and instant communications have positioned us as partners in seeking solutions for regional and global problems.

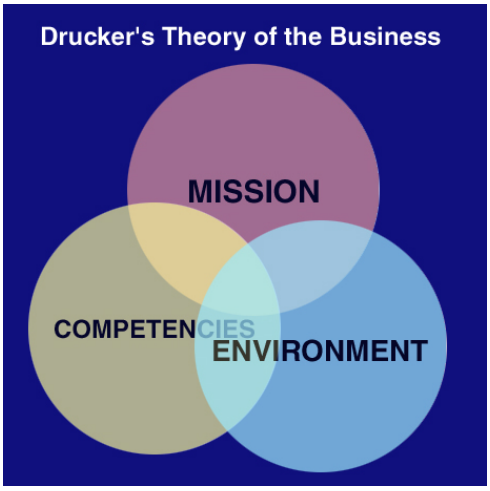
Business has excellent diagnostic tools that can guide educational change and development. One example is Peter F Drucker's *Theory of the Business* (Harvard Business Review, September-October 1994). It had two important messages. One was that strategies that worked in the past might not work in the future. He presented case histories that showed how corporations who did everything right (based on past experience) faced failure!

He demonstrated that success is related to the ability of an organization to respond to changes in the environment. Success requires a close match between the mission, environment, and competencies of an organization. Performance is degraded when these areas are out of balance.

The mission defines focus and boundaries for the organization. If the mission is too broad or unbounded, the organization is inefficient and less competitive. This caused near demise of IBM in the 1990s. IBM refocused its mission on what it did best – service and mainframes. The increase demand for services was sufficient for the company to reinvent itself.

Customer needs shapes demand. If its mission does not serve the needs of the environment, an organization becomes irrelevant and unprofitable. Since the environment is continually changing, the organization must continually adapt its products and services to be cost effective and maintain or grow market share.

An organization provides goods and/or services to the marketplace based on demand. Its effectiveness is dependent on quality, cost, and responsiveness to customer needs beyond the capabilities of its competition.



If we overlap these discs, we see a small common area where all three overlap and larger common areas where each pair overlaps. To the extent that all three areas overlap, the organization is relevant. Quality of service, profit, and communications will be greatest when the three discs overlap completely.

If the mission does not match the environment, it lacks relevance and demand is weak. If competencies (supply) do not match environmental needs (demand) the bottom line is diminished.

How does this relate to education? Is our mission relevant to the environment, and are our competencies equal to the mission? Is education "out of sync" with the world of the 21st century. The mission of transformation begins where we started in last month's editorial, by defining the problem and identifying alternative solutions that are relevant, affordable, sustainable, and replicable, with custom modifications, for all education and training. Perhaps there is not one solution but a cluster of options to serve different requirements of the education and training community. Then we train the trainers and teachers, produce the programs, install the technology; implement, evaluate, revise and replicate successful programs. We need to forever monitor the environment to upgrade our competencies and fulfill our mission. And since our products and services are designed for people who will move into future jobs and industries, our curriculum must be forward looking and supported by market surveys, forecasting, and management science tools.

Editor's Note: This excellent research is exciting information for teachers and learners of foreign languages.

Language Learning Strategy Use for EFL E-Learners and Traditional Learners: A Comparative Study

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Iran

Abstract

The present study is comparative research aimed at investigating language learning strategies used by EFL e-learners and traditional learners. To this end, it sought to compare and contrast the mentioned groups with respect to their preferences for language learning strategies, the frequency with which e-learners and t-learners use each language learning strategy type, the relationship between learners' English language proficiency level in each group with their language learning strategy use in general and in regard to subcategories of learning strategies, and the manifestation of differences in learners' use of strategies in each level of proficiency. Furthermore, the study attempted to investigate whether language learning strategy use can predict the proficiency level of the learners and the other way round. Two hundred (200) Iranian undergraduate EFL learners arranged in two groups participated in this study. The first group of 100 learners was selected from Shiraz Virtual University who were exposed to an e-learning program, and the second one was a 100-learner group going through a traditional course studying at Shiraz University. The study was conducted with a placement test (OPT), adopted from Allen (1985), and a questionnaire (SILL), developed by Oxford (1990b). The test was used to assess the learners' English language proficiency level, and the questionnaire was applied to estimate the frequency with which language learners use learning strategies. The data obtained through the application of the test and the questionnaire were subjected to descriptive and inferential statistics and the following analyses were run on the data: Independent Samples T-test, Pearson Correlation Coefficient, One-way ANOVA, and Standard Multiple Regression. The findings indicated that the type of education system has no contribution to language learning strategy use. No significant differences were observed with respect to the frequency with which the learners use each strategy type. It was also revealed that the effective use of strategies and the way learners usually go about learning is highly influenced by their level of proficiency in both groups. Finally, it was found that the use of learning strategies is predictable by learners' level of proficiency and the other way round.

Keywords: Language Learning Strategy, Language Proficiency, E-learners, T-learners

1. Introduction

Over the last twenty years, there has been a prominent shift within the field of teaching and learning with greater emphasis being put on learners and learning rather than on teachers and teaching. Due to recent changes in the education system and new challenges and demands, there has been the need for awareness of the necessity to improve the preparation of students for productive functioning in the continually changing and highly demanding environment (Bar-Yam, 2003). The formal education consists of systematic instruction, teaching, and training by professional teachers. This consists of the application of pedagogy and the development of curricula. In such known traditional form of education, teachers draw on many different disciplines for their lessons. Informal education also includes knowledge and skills learned and defined during the course of life, including education that comes from experience in practicing a

profession. Non-traditional education may be used to refer to all forms of education for all age groups and levels outside of traditional settings. It is rooted in various philosophies that are, commonly, fundamentally different from those of traditional compulsory education. A non-traditional type of education is a home-based learning and often emphasizes the value of small class size, close relationships between students and teachers, and a sense of community. The ways learners learn, remember, and process information has been the primary concern of researchers in recent years. In more recent studies, it is claimed that technology is an increasingly influential factor which changes the face of the education. Educational technology offers tools that practitioners can apply to their own concerns and incorporates a variety of contexts including face-to-face, self-directed, blended and distance learning modes, as well as a range of theories of learning and roles of technology. The practitioners of e-learning continue to seek guidance on pedagogically sound, learner-focused and accessible learning activities, and learning contexts are increasingly rich in electronic and mobile technologies (Beethman, 2003).

In the case of language learning strategies, Littlewood (1996) holds the opinion that, as the amount of information to be processed in a course of study is rather high, and learners have to perform the tasks and process the new input, they usually apply some language learning strategies intentionally or even unconsciously. The application of language learning strategies is considered very important to a language learner's development. "The term strategies in second language learning sense, has come to be applied to the conscious moves by second language speakers intended to be useful either in learning or using second language" (Cohen, 1998, p.1). Oxford & Nyikos (1989) believe that selection of appropriate language learning strategies enables learners to take responsibility for their own learning by enhancing learner autonomy, independence, self-direction, and necessary attributes for life-long learning. According to Littlewood (1996), learners need to keep on learning even if the formal classroom is not available. Being successful at learning nurtures learners' need to be autonomous and seeks individualized approaches to learning objectives.

Furthermore, learners' goals, language proficiency, level of motivation, personality traits, and general learning styles are among basic factors which influence the choice and use of language learning strategies (Wenden & Rubin, 1987; O'Malley & Chamot, 1990; Chamot & O'Malley, 1994; Oxford, 1996; Cohen, 1998).

With respect to all the existing factors which affect language learning strategy use, it seems that the system of education under which the learners develop L2 communicative abilities influences the selection and use of learning strategies.

1.1 Objectives of the Study

The main objective of this study was to reveal the importance of language learning strategies used in the language learning process, and to investigate the way they are applied in two different contexts (electronic vs. traditional). Moreover, it aimed at studying the relationship between e-learners' and traditional learners' (hereafter, t-learners) language learning strategy use and their language proficiency level, and examine the probable differences.

1.2 Research Questions

Based on the objectives, this study sought answers to the following questions:

1. Are there any significant differences between e-learners and t-learners in terms of their preferences for language learning strategies?
2. What is the frequency of occurrence of e-learners' and t-learners' use of language learning strategies?

3. What is the relationship between learners' English language proficiency level and their language learning strategy use, and how is this manifested in each group (e-group vs. t-group)?
4. What is the relationship between learners' English language proficiency level in each group and their preferences for subcategories of language learning strategies?
1. 5 Are there any significant differences in e-group's and t-groups' use of strategies in each level of proficiency (low, intermediate, high)?
5. Can language learning strategy use predict proficiency level of the learners and the other way round?

2. Literature Review

2.1 Review of Studies Related to Electronic vs. Traditional Teaching/Learning Process

	Study	Findings
1	Bar-Yam (2003)	By the recent changes in the education system and the new challenges and demands, there has been the need for awareness of the necessity to improve the preparation of students for productive functioning.
2	Russell (2001)	Learners have increasing opportunities to take their learning from place to place in the form of e-portfolios and learning records, and to make choices about how, when, and where they participate in education.
3	Jonassen, Peck & Wilson, (1999)	Classroom teaching with minimal equipment allows the teachers to tailor their approach to the immediate needs of learners. With the use of digital technologies, all of the pedagogical activities such as presenting explanations, guiding discussions, asking questions, etc. require forethought and an explicit representation of what learners and teachers will do.
4	Mann (1998)	New technological options are challenging and changing the very nature of teaching as faculty migrate from being deliverers of information to facilitators and students are also undergoing a transformation from passive recipients to participants in an active learning environment.
5	Kearsley (1995)	The primary type of communication between a faculty member and students in a traditional classroom is lecture and discussion. Students' role in a traditional classroom include note-taking, summarizing, and questioning. In an online environment, the role of both the faculty member and students change. In online courses, students have the opportunity to interact with electronic media presentations and stimulations.
6	Harasim (1995)	The results of a study that surveyed 240 teachers and learners that used the internet for educational purposes revealed that of the 176 responses to a question about differences between learning in a computer-mediated environment and a traditional classroom, 90 percent indicated that there were differences. Many of the stated differences involved changes in the roles of both teachers and students.

2.2 Summary of Studies on E-learners' & T-learners' Language Learning Strategy

	Study	Findings
1	Azemi (2004)	There is no doubt e-learners also come in different styles and strategies in ways they take in and process information. Based on different personalities, proficiencies and styles, they use different strategies to take benefit from the course.
2	Lessard-Clouston (1997)	In an electronic course as learners work rather independently, the strategies to be applied are mostly self-developed and the responsibility of the selection of the appropriate strategies relevant to the given context is upon learners' shoulder. Learning preferences affect the way students approach any task and the way they function under different conditions and different learning environments.
3	Fedderholdt (1997)	There is no doubt a language learner who is aware of a wide range of learning strategies, and their use in the appropriate context will be able to improve his/her language skills in a better way.
4	Oxford & Lever (1996)	As the learners increase their competence in the target language, they will be able to apply learning strategies to help them use known language in new contexts, identify key words and phrases in speech and in simple written texts, and use word lists and dictionaries, as well as in more general learning in other areas of the curriculum.
5	Winston & Mayer (1986, p.315)	Language learning strategies are "behaviors and thoughts that a learner engages in during learning and that are intended to influence the learner's encoding processes. Thus the goal of any particular learning strategy maybe to affect the learner's motivational or affective state, or the way in which the learner selects, acquires, organizes, or integrates new knowledge".
6	Oxford & Crookall (1989)	Strategies should be chosen so that they mesh and support each other and so that they fit the requirements of the language task, the learners' goals, and learners' styles of learning. Self-developed strategies like instructional ones should enable students to take charge of their own learning and lead to autonomy, independency, and self-direction.

3. Methodology

3.1 Participants

This study was conducted with 200 undergraduate computer software learners. The sample population was taken from two universities. The first group of 100 learners was computer software students studying at Shiraz Virtual University who were exposed to an e-learning program, and the second one was a 100-learner group of the same major studying at Shiraz University going through a traditional course. All learners were native speakers of Persian selected from different intakes, from freshmen to seniors.

3.2 Instruments

Two instruments were used in this study. The first one was the Oxford Placement Test (OPT), adopted from Allen (1985) consisting of 100 items on vocabulary, structure, and reading comprehension. The test was used to assess the general English language proficiency of the learners. The second one was Strategy Inventory for Language Learning (SILL), developed by Oxford (1990b) consisting of 50 likert-type items including 6 subscales. This questionnaire was used to assess the frequency with which language learners use each learning strategy. For the sake of simplicity and avoidance of misunderstanding, the translation of the items adopted from Hasanpour (1999) was used.

3.2.1 The Proficiency Test

Oxford Placement Test (OPT) consists of 100 items which provides a practical way of grading students and assessing their level of general English proficiency in areas of vocabulary, structure, and reading comprehension, and was adopted from Allen (1985). The participants were supposed to choose the correct answer from among the three choices. Every correct answer received one point and the maximum possible score was equal to100.

3.2.1.1 Validity and Reliability of the Proficiency Test

Due to the fact that the OPT is a standard test of proficiency, its validity and reliability were assumed to be satisfactory. To ensure the content validity of the test, the comments of three experts were sought. Each strongly confirmed the appropriateness of the test in regard to subject matter content and the general objective of measuring learners' English proficiency in areas of vocabulary, structure, and reading comprehension.

In order to estimate how reliable the use of Oxford Placement Test is, the internal consistency of the test was computed based on KR-21 formula. As recommended by Raatz and Klein-Braley (1995), the formula measures internal consistency in an acceptable way. The reliability index for the OPT in this study was found to be .94 with 40 learners through a pilot study, which is considered a high positive reliability. The obtained results are shown in Table 3.1.

Table 3.1

Reliability of the OPT

Test Type	Number of Items	Mean	V□	Std□	KR-21
OPT	100	41.8	395	19.87	0.94

3.2.2 The Questionnaire

Strategy Inventory for Language Learning (SILL) is a 50-item likert-type questionnaire, developed by Oxford (1990b) which consists of 6 subscales; that is, memory, cognitive, compensation, metacognitive, affective, and social strategies. Students were asked to indicate their response (1,2,3,4, or 5) ranging from 'always or almost always true of me' to 'never or almost never true of me' to strategy description related to six major strategy groups according to the extent to which they use each strategy.

1-9 are related to memory strategy
10-23 are related to cognitive strategy
24-29 are related to compensation strategy
30-38 are related to metacognitive strategy
39-44 are related to affective strategy
45-50 are related to social strategy

The items were in the form of statements and the subjects self-rated themselves according to the following scheme:

1 means: never or almost never true of me

2 means: usually not true of me

3 means: somewhat true of me

4 means: usually true of me

5 means: always or almost always true of me

3.2.1.2 Validity and Reliability of the Questionnaire

The validity of the SILL has been widely and extensively confirmed, based on construct validity. SILL construct validity is partially shown in relationships between the SILL on the one hand and language performance on the other. This evidence is probably the strongest support possible for the assertion of the construct validity of the SILL. A number of ESL/EFL studies have demonstrated this relationship. The content validity is reported to be reasonable based on independent raters (Oxford, 1986; Oxford and Burry-Stock, 1995).The viewpoints of three experts were taken into consideration in regard to the validity of the questionnaire.

In terms of reliability of the questionnaire, it is worth pointing out that acceptable reliabilities were found for the SILL by many researchers who had used the instrument. Oxford and Nyikos (1989) reported Cronbach Alpha of .96 for SILL which is extremely high considering 1 as its maximum. Phillips's (1991-2) data had a reliability of .87 with 141 students.

Although internal consistency of the SILL was tested worldwide, the questionnaire was tested and revised following a pilot study with 60 learners comparable to the participants of the study. In order to check the internal consistency of the SILL for the current study, the Cronbach Alpha Coefficient was calculated. The resulting data for each strategy type is presented in Table 3.4.

Table 3.4

Cronbach Alpha for Each Strategy Type

Strategy Type	Cronbach Alpha
Memory	.88
Cognitive	.88
Compensation	.86
Metacognitive	.86
Affective	.87
Social	.86

Since these reliabilities are respectable, it could be concluded that the SILL can be administrated with confidence and the measurement error is minimal.

3.3 Data Collection

The procedures of data collection including the administration of the instruments and scoring procedures are presented as follows:

3.3.1 Administration Procedures

The required data were collected in two sessions in each university. First, the 100-item OPT was given to 100 e-learners. The necessary instruction as how to complete the test was given. The learners were supposed to complete each part of the test normally in about 35 minutes. However,

there was no time pressure for subjects, most of them completed each part in about 30-40 minutes as expected. The results obtained from the test indicated the level of proficiency of learners in general English. The same test was given to t-learners and the same procedure was run. Then, they were given the SILL in another session. The learners were asked to indicate their choices which determined how often they tend to use language learning strategies, and which strategies they tend to use most often. There was no time restriction, but it took about 10-15 minutes to complete the questionnaire for each subject. The results were analyzed to examine how language learning strategies were used by e-learners and t-learners in their language learning process.

3.3.2 Scoring Procedures

The correct answer for each item in the OPT was supposed to be chosen from among the three choices. Every correct choice received one point. The maximum possible score for each part was equal to 50 and the total score obtained from the whole test containing two parts was equal to 100.

Each of the items in the SILL was answered on five point likert-scales, ranging from 'always or almost always true of me' to 'never or almost never true of me'. A subject's endorsement in 'always or almost always true of me' was equated with 5; 'usually true of me' with 4; 'somewhat true of me' with 3; 'usually not true of me' with 2; and 'never or almost never true of me' with 1.

3.4 Data Analysis

In order to investigate the answers to the proposed questions, the results obtained from the OPT and the SILL were analyzed and the following statistical analyses were run on the data:

1. Independent Samples T-test: Independent Samples T-test was used to compare the mean scores for two different groups (e-learners vs. t-learners); that is, to investigate whether there is a significant difference in the mean scores for the two groups of t-learners and e-learners.
2. Pearson Correlation Coefficient: Correlation analysis was used to describe the strength and direction of the linear relationship between the variables.
3. One-way ANOVA: One-way ANOVA was used to indicate the mean differences for the three proficiency levels (low, intermediate, high) on applying language learning strategies within each group.
4. Standard Multiple Regression: Standard Multiple Regression was used to indicate whether the continuous variable can predict a particular outcome; that is, to explore whether language learning strategy use predicts proficiency level of the learners and the other way round.

4. Results

In order to find the answers to the proposed research questions, the results obtained from the test and the questionnaire were subjected to the relevant descriptive and inferential statistics.

Findings of the Descriptive Statistics for E-learners' and T-learners' Scores on the OPT and the SILL:

Table 4.1 shows descriptive statistics for the scores of the subjects on the OPT. The table provides a summary of minimum, maximum and mean scores, as well as standard deviations.

Table 4.1

Descriptive Statistics for the Scores of the Subjects on the OPT

Statistic / Learners	N	Min	Max	Mean	Std
E-learners	100	14.00	81.00	46.91	14.97
T-learners	100	18.00	82.00	48.10	16.34

Table 4.2 shows descriptive statistics for the scores of the subjects on the SILL. As clear, the table provides some information on minimum score, maximum score, mean, and standard deviation for the same number of population in each group based on their preferences for language learning strategies.

Table 4.2

Descriptive Statistics for the Scores of the Subjects on the SILL

Strategy	Memory		Cognitive		Compensation		Metacognitive		Affective		Social	
Statistic	E	T	E	T	E	T	E	T	E	T	E	T
N	100	100	100	100	100	100	100	100	100	100	100	100
MIN	1.78	1.66	1.82	2.00	1.35	1.66	2.00	2.16	1.66	1.66	2.00	1.50
MAX	4.66	4.83	4.50	4.66	4.50	4.50	4.55	4.78	4.83	4.66	4.71	4.66
MEAN	3.13	3.26	3.17	3.06	3.27	3.26	3.28	3.54	3.09	3.17	3.17	3.12
STD	0.61	0.70	0.55	0.66	0.64	0.70	0.66	0.62	0.68	0.61	0.72	0.72

Findings of the Inferential Statistics for E-learners' and T-learners' Scores on the OPT and the SILL

The first research question:

4.2.1 Are there any significant differences between e-learners and t-learners in terms of their preferences for language learning strategies?

The probable existing difference between the two groups of learners (e-learners vs. t-learners) in terms of their preferences for language learning strategies was examined through the application of an Independent Samples T-test. The results are summarized in Table 4.3.

Table 4.3

Independent Samples T-test for E & T-learners' Preferences for LLSs

		Levene's Test for Equality of Variances		T-test for Equality of Means		
		F.	Sig.	t	df	Sig. (2-tailed)
LLSs Average	Equal Variances Assumed	.229	.633	-1.176	198	.241
	Equal Variances Not Assumed			-1.176	197.95	.241

As shown in Table 4.3 the average scores of the two groups were compared. As the table indicates, the existing significance value (.241) is larger than the significance level (.05). In other words, there are no significant differences between the two groups of learners (e-learners vs. t-learners) in terms of their preferences for language learning strategies.

The second research question:

4.2.2 What is the frequency of occurrence of e-learners' and t-learners' use of language learning strategies

Figure 4.1 shows the frequency distribution of language learning strategy use comparing the two groups of learners.

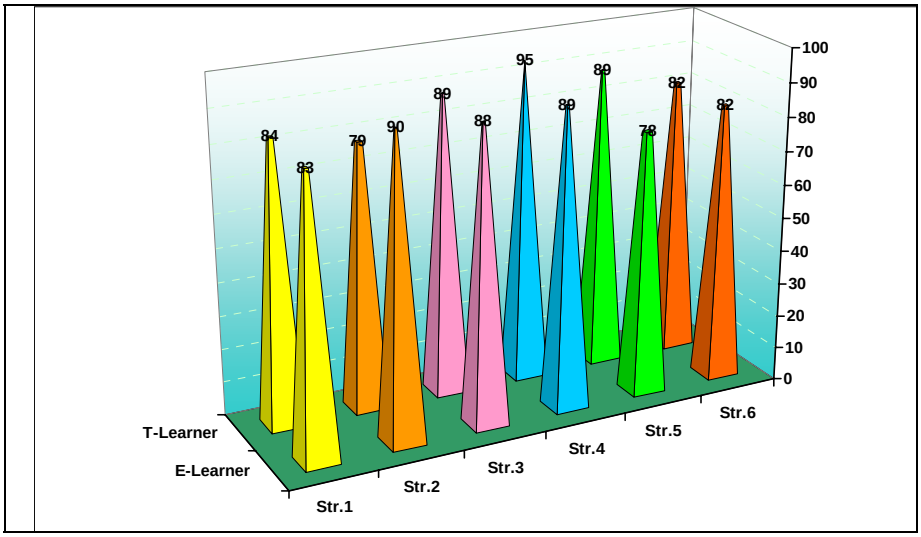

Figure 4.1 Frequency Distribution of E & T-learners' Preferences for LLSs.

In the frequency of occurrence in strategy 1, memory strategy, a slight difference between the two groups' preferences could be seen than can be ignored. It shows that e-learners' and t-learners' preferences for memory strategy have been more or less the same.

As opposed to strategy 1, a considerable difference between the two groups in applying strategy 2, cognitive strategy, could be observed. As shown, e-learners have used cognitive strategy more frequently than the learners in t-group. Taking a glance on the strategy frequency of occurrence in the existing groups, one can amazingly find out that cognitive strategy in the e-group is the most frequent strategy whereas in the t-group it is the least frequent one.

Comparing the two groups regarding the third strategy, compensation strategy, one can infer that the frequency of occurrence is more or less the same. It means that both e-learners and t-learners have had the same trends applying this type of strategy in their process of language learning.

There is a substantial difference between the two groups' preferences for the fourth strategy, metacognitive strategy. As could be observed, t-learners' application of metacognitive strategy seems to be greater than e-learners'.

The difference in regard to application of the fifth strategy, affective strategy, is considerable with respect to the two groups of learners. As clear, e-learners tended to use affective strategy less frequently than the learners in the t-group.

As the Figure 4.1 implies, the frequency of occurrence of the sixth strategy, social strategy, in both groups is exactly the same. It means that surprisingly both e-learners and t-learners tended to use social strategy exactly in the same manner.

The third research question:

4.2.3 What is the relationship between learners' English language proficiency level and their language learning strategy use, and how is this manifested in each group (e-group vs. t-group)?

The above raised question comprises two parts. In order to provide answer for each part, first the relationship between all learners' English language proficiency level (including e-learners' & t-learners'), and their language learning strategy use was investigated; Then, such relationship was examined separately within each group. Table 4.4 provides the actual value of the Pearson Correlation Coefficient between the variables along with the p-value.

Table 4.4

Pearson Correlation between E & T-learners' LP and their LLSs Use

		LLSs Preferences	Language Proficiency
LLSs Preferences	Pearson Correlation Sig. (2-tailed) N	1 200	.621** .000 200
Language Proficiency	Pearson Correlation Sig. (2-tailed) N	.621** .000 200	1 200

** Correlation is significant at the .01 level (2-tailed)

As the Table 4.4 shows, the correlation is '.621' and p-value is '.000'. Thus, it can be concluded that the correlation is significant. On the other hand, there is a high correlation between language proficiency and language learning strategy use. The following tables demonstrate how the relationship between the variables is manifested in each group.

As Table 4.5 implies, the correlation is '.616' and the p-value is '.000'. The existing result indicates that the correlation is significant at the '1.01' level (2-teiled). It means that there is a linear correlation between the proficiency level of the learners and their language learning strategy use in e-group. Table 4.6 represents Pearson Correlation Coefficient between the variables in t-group.

Table 4.5

Pearson Correlation between E-groups' LP and their LLSs Use

		LLSs Preferences	Language Proficiency
LLSs Preferences	Pearson Correlation Sig. (2-tailed) N	1 100	.616** .000 100
Language Proficiency	Pearson Correlation Sig. (2-tailed) N	.616** .000 100	1 100

** Correlation is significant at the .01 level (2-tailed)

Table 4.6 also shows a significant correlation at the '1.01' level (2-tailed). The index representing the correlation is recorded as '.625' which demonstrates a high correlation between the proficiency level of the learners and their language learning strategy use in t-group.

Table 4.6

Pearson Correlation between T-groups' LP and their LLSs Use

		LLSs Preferences	Language Proficiency
LLSs Preferences	Pearson Correlation Sig. (2-tailed) N	1 100	.625** .000 100
Language Proficiency	Pearson Correlation Sig. (2-tailed) N	.625** .000 100	1 100

** Correlation is significant at the .01 level (2-tailed)

The fourth research question:

4.2.4 What is the relationship between learners' English language proficiency level in each group and their preferences for subcategories of language learning strategies?

Table 4.7 gives the actual value of the Pearson Correlation Coefficient along with the p-value demonstrating the existing relationship between e-learners' English language proficiency and their preferences for subcategories of language learning strategies.

Table 4.7

Pearson Correlation between E-groups' LP and Subcategories of LLSs

		Lg. Prof.	Str.1	Str.2	Str.3	Str.4	Str.5	Str.6
Lg.Prof	Pearson Sig. N	1 . 100	.330** .001 100	.475** .000 100	.342** .000 100	.503** .000 100	.373** .000 100	543** .000 100
Str.1	Pearson Sig. N	.330** .001 100	1 . 100	.447** .000 100	.457** .000 100	.393** .000 100	.323** .000 100	.413** .000 100
Str.2	Pearson Sig. N	.475** .000 100	.447** .000 100	1 . 100	.424** .000 100	.456** .000 100	.327** .000 100	.597** .000 100
Str.3	Pearson Sig. N	.342** .000 100	.457** .000 100	.424** .000 100	1 . 100	.491** .000 100	.290** .000 100	.511** .000 100
Str.4	Pearson Sig. N	.503** .000 100	.393** .000 100	.456** .000 100	.491** .000 100	1 . 100	.362** .000 100	.629** .000 100
Str.5	Pearson Sig. N	.373** .000 100	.323** .000 100	.327** .000 100	.293** .000 100	.362** .000 100	1 . 100	.508** .000 100
Str.6	Pearson Sig. N	543** .000 100	.413** .000 100	.597** .000 100	.511** .000 100	.629** .000 100	.508** .000 100	1 . 100

** Correlation is significant at the .01 level (2-tailed)

As could be inferred from the table, the direction of the relationship between language proficiency and each subcategory of language learning strategy is positive. The positive correlation represents that high scores on one variable are associated with high scores on the other. Then, there is a direct relationship between the variables.

The size of value of correlation usually can range from '-1.00' to '1.00'. This value will indicate the strength of the relationship between language proficiency and the use of each subcategory. A correlation of 0 indicates no relationship, a correlation of '1.0' indicates a perfect positive correlation and a value of '-1.0' indicates a perfect negative correlation (Pallant, 2005).

Table 4.8 gives the actual value of the Pearson Correlation Coefficient between t-learners' English language proficiency and their preferences for subcategories of language learning strategy.

Table 4.8

Pearson Correlation between T-groups' LP and Subcategories of LLSs

		Lg. Prof.	Str.1	Str.2	Str.3	Str.4	Str.5	Str.6
Lg.Prof	Pearson Sig. N	1 . 100	.434** .001 100	.531** .000 100	.369** .000 100	.312** .000 100	.482** .000 100	529** .000 100
Str.1	Pearson Sig. N	.434** .001 100	1 . 100	.546** .000 100	.357** .000 100	.371** .000 100	.469** .000 100	.486** .000 100
Str.2	Pearson Sig. N	.531** .000 100	.546** .000 100	1 . 100	.618** .000 100	.272** .006 100	.541** .000 100	.583** .000 100
Str.3	Pearson Sig. N	.369** .000 100	.357** .000 100	.618** .000 100	1 . 100	.179** .076 100	.430** .000 100	.386** .000 100
Str.4	Pearson Sig. N	.312** .002 100	.371** .000 100	.272** .006 100	.179** .076 100	1 . 100	.329** .001 100	.411** .000 100
Str.5	Pearson Sig. N	.482** .000 100	.469** .000 100	.541** .000 100	.430** .000 100	.329** .001 100	1 . 100	.570** .000 100
Str.6	Pearson Sig. N	529** .000 100	.486** .000 100	.583** .000 100	.386** .000 100	.411** .000 100	.570** .000 100	1 . 100

** Correlation is significant at the .01 level (2-tailed)

As presented in Table 4.8, a strong positive correlation in all cases could be observed between language proficiency of the learners and their application of each strategy type. Then, it could be claimed that a direct relationship exists between language proficiency and application of subcategories of language learning strategies.

The fifth research question:

4.2.5 Are there any significant differences in e-groups' and t-groups' use of strategies in each level of proficiency (low/intermediate/high)?

In order to investigate the probable differences among the means of three language proficiency levels on applying language learning strategies in each group, a one -way Analysis Of Variance (ANOVA) was applied for each group of learners (e-learners & t-learners) separately. Table 4.9 displays the results of the one-way ANOVA performed on the means of the three proficiency levels in the e-group.

Table 4.9

`One-way ANOVA on the Means of Proficiency levels in E-group

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.450	2	3.225	19.01	.000
Within Groups	16.452	97	.170		
Total	22.902	99			

As the table represents, there are significant differences among the means of the compared groups as a whole. In order to determine the exact mean differences, multiple comparisons needed to be performed. Post-hoc Tests are useful means to find out where the differences lie. Table 4.10 shows post-hoc results on the e-group.

Table 4.10

Post-hoc Tests on the Means of Proficiency Levels in E-group

Level		Mean df	Std. Error	Sig	95% Confidence Interval	
					Lower Bound	Upper Bound
Low	Mid	-.437**	.120	.001	-.725	-.150
	High	-.910	.148	.000	-1.26	-.557
Mid	Low	**.437**	.120	.001	.150	.725
	High	-.473***	.111	.000	-.738	-.207
High	Low	.910**	.148	.000	.557	1.264
	Mid	-.473**	.111	.000	.207	.738

Correlation is significant at the .05 level (2-tailed)

As Table 4.10 manifests, the significance values (.01 & .00) are less than the significance level (.05). Thus, it can be concluded that there are significant differences among the means of the three proficiency levels regarding their preferences for language learning strategies.

`Table 4.11

One-way ANOVA on the Means of Proficiency Levels in T-group

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.242	2	4.121	26.038	.000
Within Groups	15.352	97	.158		
Total	23.594``	99			

To examine the probable differences among the means of three language proficiency levels on applying language learning strategies in t-group a one-way ANOVA was run. The obtained results are shown in Table 4.11.

As could be realized from the table, there are significant differences among three proficiency levels on applying language learning strategies. Post-hoc Tests applied to manifest where exactly the differences lie. The results on Post-hoc Tests are shown in Table 4.12

Table 4.12

Post-hoc Tests on the Means of Proficiency Levels in T-group

Level		Mean df	Std. Error	Sig	95% Confidence Interval	
					Lower Bound	Upper Bound
Low	Mid	-.419**	.104	.000	-.667	-.170
	High	-.916	.127	.000	-1.21	-.612
Mid	Low	**.419**	.104	.001	.170	.667
	High	-.497***	.102	.000	-.741	-.253
High	Low	.916**	.127	.000	.612	1.21
	Mid	.497**	.102	.000	.253	.741

** Correlation is significant at the .05 level (2-tailed)

As shown in the table, the existing values in each category are less than the significance level. It means that the differences are significant. Thus, one can conclude that language learning strategies are applied differently by learners with different language proficiencies.

The sixth research question:

4.2.6 Can language learning strategy use predict proficiency level of the learners and the other way round?

To answer the raised question, two Standard Multiple Regressions were performed. Once, language learning strategy use was regarded as independent variable and language proficiency as the dependent one. Then, language learning strategy use was considered as dependent variable and language proficiency as the independent one. The following tables provide the results obtained from Standard Multiple Regression.

Table 4.13

Model Summary in Multiple Regression (b)

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	.621a	.385	.382	12.294

a. Predictors (Constant): Language Learning Strategy
b. Dependent Variable: Language Proficiency

The value of '.385' as R square (coefficient of multiple determinations) indicates that the model explains '38.5' percent of variance in language proficiency level. In order to make sure that the independent variable has been able to significantly predict the variance in the dependent variable, it is necessary to take a look on the ANOVA table.

Table 4.14

ANOVA in Regression Analysis (b)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	187	1	187	124.17	.000
Residual	299	198	151		
Total	486	199			

a. Predictors (Constant): Language Learning Strategy
b. Dependent Variable: Language Proficiency

As it is evident, the resulting significance level is smaller than the p-value. Then, it can be claimed that the coefficient of Multiple Regression is significant. In order to investigate if the independent variable contributed to the prediction of the dependent variable, the coefficients in regression analysis should be observed. Table 4.15 presents the related analysis.

Table 4.15

Coefficients in Regression Analysis (a)

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. E.	Beta			Tolerance	VIF
1 (constant	-16.623	5.820		-2.856	.005		
LLSs	20,022	1.797	.621	11.143	.000	1.000	1.000

The Beta value of '.621' means that language learning strategy use makes a strong contribution to explain the dependent variable, language proficiency.

Regarding the significance value, it could be observed that the resulting significance is less than '.05', then it can be concluded that language learning strategy use is making a significant contribution to the prediction of the language proficiency level of the learners.

A converse procedure was followed to find out whether language proficiency level can predict language learning strategy use. In this case, language learning strategy use was considered as dependent variable and language proficiency as the independent one. The following tables demonstrate the results.

Table 4.16

Model Summary in Multiple Regression (b)

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	.621a	.385	.382	.381

a. Predictors (Constant): Language proficiency
b. Dependent Variable: Language Learning Strategy

As shown in the table, R square index is '.385', indicating that '38.5' percent of variance in the learners' language learning strategy scores is explained by the independent variable, language proficiency, which is considered a respectable result. In order to assess the statistical significance of the result, it is necessary to consider the ANOVA table.

Table 4.17

ANOVA in Regression Analysis (b)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	18.04	1	18.04	124.17	.000a
Residual	28.77	198	.145		
Total	46.82	199			

a. Predictors (Constant): Language Learning Strategy
b. Dependent Variable: Language Proficiency

The ANOVA table provides evidence to prove if the coefficient of Multiple Regression demonstrated by R square is significant or not. As could be understood from the Table 4.17, the reported significance (.000) is less than the p-value (.0005). In order to find out to what extent the independent variable has been able to predict the variance in the dependent variable, the coefficient analysis needed to be performed. Table 4.18 presents coefficients in regression analysis.

Table 4.18

Coefficients in Regression Analysis (a)

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. E.	Beta			Tolerance	VIF
1 (constant	-2.288	.086		26.492	.000		
LP	.019	.002	.621	11.143	.000	1.000	1.000

The Beta value under standardized coefficients indicates the power of contribution to explain the dependent variable. By the resulting Beta value of '621', it can be claimed that learners' language proficiency scores can reasonably predict their scores on language learning strategy use. As displayed, the language proficiency has a significance level below '.05'. This means that this variable can predict the variance in language learning strategy scores.

4.3 Discussion

The results obtained from the data collected through the test (OPT) and the questionnaire (SILL) can be discussed as the following. The foregoing discussion includes a review of the findings and the related studies in the domain.

Language learning strategies which are considered as effective means for productive learning are used more or less the same way by learners under different educational systems; that is, learners exposed to an e-learning program whose education is more self-directed and lacks essential instruction as how to fit the assumed framework to the current teaching/learning issues, engage in the learning process as those who were instructed how to develop awareness for a comprehensive learning. As a result, the choice and use of language learning strategies is not significantly influenced by the type of education system.

This finding contradicts Bar-Yam's (2003) beliefs stating that the system of education under which the learners develop L2 communicative abilities influences the selection and use of learning strategies.

The findings of the study also stand in contrast with Harasim's (1995) findings who reported the results of a study that surveyed 240 teachers and learners that used the internet for educational purposes. Of the 176 responses to a question about differences between learning in a computer-mediated environment and a traditional classroom, 90 percent reported that there were differences.

The result accords with Oxford and Lever's (1996) assertion that an important aim of language learning in any system is making students familiar with strategies which they can apply to the learning of any language. As the learners increase their competence in the target language, they will be able to apply learning strategies to help them go toward progress.

Fedderholdt (1997) believes that acquisition of strategies is considered very important to a language learner's development. No doubt a language learner who is aware of a wide range of learning strategies, and their use in the appropriate context will be able to improve his/her language skill in a better way. On the other hand, Azemi (2004) asserts that e-learners also come in different styles and strategies in ways they take in and process information. Based on different personalities, proficiencies, and styles, learners use different strategies to benefit from the course.

The results of the study indicate that there are no considerable differences with respect to the frequency with which the learners use each strategy type. According to Oxford (1990a) the frequency of occurrence and the type of language learning strategy applied by the learners are mostly influenced by factors such as motivation, gender, cultural background, attitudes and beliefs, type of task, age, L2 stage, and learning style but not by the type of educational system. Moreover, many scholars stressed that successful learners who cater their foreign language learning strategy use to their proficiency level demands (under any type of education system) use language learning strategies more appropriately (Oxford & Nyikos, 1989; O'Malley & Chamot, 1990; Ellis, 1994).

Based on the findings, it's worth pointing out that language learning strategy use is highly influenced by the proficiency level of the learners in both groups. The learners with high English proficiency seemed to use more learning strategies in their language learning process rather than those with low proficiency level.

Such finding is in accordance with Yang's (1994) results who discussed that perceived proficiency levels have a significant effect on students' use of learning strategies. The better students perceive their language proficiency, the more often they use various learning strategies to assist them in learning a second/foreign language. Chamot and Kupper (1989) also asserted that learners with high proficiency know how to use appropriate strategies to reach their learning goals, while learners with low proficiency are less expert in their strategy use and choice. Oxford and Nyikos (1989, p.291) concurred saying "better language learners generally use strategies appropriate to their own stage of learning …", that is to say that affective strategy use changes as the demands at language proficiency dictate.

It was investigated that the use of language learning strategies can predict the proficiency level of the learners and the other way round. . Ellis (1994, p.555) also concluded that "the strategies that learners elect to use reflect their general stage of L2 development".

To wrap up the discussion, it can be stated that both e-learners and t-learners, needless to say, apply learning strategies in their process of language learning and the type of education system has no influence on applying learning strategies. Furthermore, no significant differences were observed with respect to the frequency with which the learners use each strategy type. The effective use of strategies and the way the learners usually go about learning is also highly influenced by their level of proficiency. Finally, the use of learning strategies is predictable by the learners' level of language proficiency. In this case, the level of proficiency can be predicted by the use of language learning strategies as well.

5. Conclusion

The findings of the study are summarized as follows based on the proposed research questions.

Concerning the first research question dealing with investigating the differences between learners exposed to two different education systems with respect to their preferences for language learning strategies, the obtained findings through Independent Samples T-test revealed that the education system has little influence on the way learners usually go about applying language learning strategies. In other words, both groups of learners (e-learners & t-learners) showed more or less the same trends while applying language learning strategies in their language learning process.

The second research question aimed at exploring the frequency with which e-learners and t-learners use language learning strategies. No significant differences were observed in regard to the frequency of occurrence of learners' use of strategies in each group after data were analyzed.

With respect to the third research question studying the probable existing relationship between learners' English language proficiency level in each group and their language learning strategy use, it is worth mentioning that the efficient use of strategies is significantly influenced by learners' level of proficiency in both groups. As such, the result obtained from the application of Pearson Correlation Coefficient manifested that learners with high language proficiency level showed more effective use of strategies whereas the learners with low level of proficiency usually failed to choose the appropriate learning strategies in their process of language learning.

The fourth research question dealt with studying the investigated relationship in the third posed question with respect to the subcategories of language learning strategies; that is, memory, cognitive, compensation, metacognitive, affective, and social strategy. It was revealed that there is a positive correlation between language proficiency level and application of subcategories of language learning strategies.

The fifth research question was after investigating whether there are differences in learners' use of strategies in each level of proficiency. Analyzing the results from one-way Analysis Of Variance (ANOVA), one could claim that there were differences regarding language learning strategy use in each proficiency level, but contrasting each proficiency level two by two, no significant differences were observed.

The last attempt was to explore whether language learning strategy use is predictable by the level of proficiency and the other way round. Through the application of Standard Multiple Regression considering language learning strategy use as the independent variable, it was clarified that language proficiency level can be predicted by the way learners use of language learning strategies. The reverse procedure indicated the prediction of language learning strategy use by language proficiency level. Therefore, both language learning strategy use and language proficiency level can be predicted by each other.

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Editor's Note: The editors appreciated the depth of this study and look forward to research data that will clearly delineate specific functions and levels of learning for students in computer mediated communication for foreign language learning.

Computer Mediated Communication and Foreign Language Education: Pedagogical Features

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Abstract

This meta-analysis article starts with a critical review of Computer Mediated Communication (CMC) from various theoretical perspectives, namely structural, cognitive, and sociocultural. This is followed by the discussion characteristics, modes, and scopes of CMC. The presentation then moves from an overview of didactic features of CMC in general education to pedagogical benefits of CMC in foreign language learning and teaching. The conclusion drawn from the discussion is that CMC, both synchronous and asynchronous, possesses potential advantages capable of improving learners' foreign language development; and that future research in many aspects of CMC in language education is still needed.

Keywords: Computer Mediated Communication, CMC, CMC Learning, CMCL, Computer Assisted Language Learning, CALL, Asynchronous CMC, ACMC, Synchronous CMC, SCMC, English as a Foreign Language, EFL, face-to-face, FTF, Pedagogy, Socio cultural theory, SCT.

1 Introduction

The development of the computer along with the widespread use of the Internet has rapidly promoted Computer Mediated Communication (CMC) as a very important communication media, which has been used widely and effectively, and has a profound effect on many aspects of education (Beatty & Nunan, 2004; Pfaffman, 2008). Alongside face-to-face (FTF) communication, writing and printed material, CMC - as the fourth revolution in the means of knowledge production (Warschauer, 1997) and as a new medium with unique characteristics - is becoming an increasingly significant element in teaching and learning environments. In fact, CMC has proved to be a feasible and preferable alternative to FTF communication as in many ways it provides an ideal environment for English to be used in communicative situations. CMC-based Computer Assisted Language Learning (CMC-CALL) has considerably revolutionized the world of education by offering countless new ways to teach and to learn (Boone, 2001). Researchers are constantly exploring how CMC may contribute to the education process in particular sociocultural settings while also identifying some of its limitations. It has introduced us to the idea of new literacies and language genres; and at the same time, has blurred the line between written and oral communication (Kern, 2006; Warschauer, 2004). A thorough understanding of CMC-supported learning processes is unequivocally essential for not only educators but language teachers as well. Hence, language professionals need to capitalise on the advantages and potential strengths that this technology has to offer.

2 What is CMC?

CMC has been extensively researched from various disciplinary and methodological perspectives. This form of communication, with a broad scope of processes and tool-use, facilitates information design and delivery, and human-human and human-machine interactions with structural, cognitive and sociocognitive implications. It has been more than ten years since the online CMC

Magazine started a debatable question of "what is CMC?" in 1997. Various definitions have been offered from a diversity of perspectives. CMC, as first coined by Hiltz and Turoff (1978), was originally defined as "the process by which people create, exchange, and perceive information using networked telecommunications systems that facilitate encoding, transmitting, and decoding messages" (December, 1996). This rather technical-oriented definition has been endorsed by a number of researchers. Luppicini (2007), for example, defines CMC as "communications, mediated by interconnected computers, between individuals or groups separated in space and/or time" (p. 142). Similarly, according to Herring (2001) and Warschauer (1999), CMC is openly delineated as communication taking place between human beings via the instrumentality of computers. Technically, CMC is widely known as a transmission and reception of messages using computers as input, storage, output, and routing devices.

However, just like the fast-changing CMC technologies themselves, the definition of CMC is not fixed. But rather, there has been an evolution from focus on tool or medium to emphasis on process or interaction between human. A human-oriented description of CMC can be perceived as any form of organised computer-supported interaction between people; or as an environment in which users interact with other users over the network (D. E. Murray, 2000; Paramskas, 1999). In other words, CMC is a generic term that embodies all forms of communication between individuals and among groups via networked computers. Another more abstract definition claims that CMC "means different things to different people, which is both its strength and the source of some of the problems arising in the research literature" (P. J. Murray, 1997, p. 1). In reference to language learning, "CMC allows language learners with network access to communicate with other learners or speakers of the target language" (Kern & Warschauer, 2000, pp. 11-12).

Many a researcher has recently suggested the application of Sociocultural theory (SCT) as a theoretical framework into the study of CMC (Chapelle, 2001; Kern & Warschauer, 2000). Looking from the sociocultural perspective,

CMC is not just a tool. It is at once technology, medium, and engine of social interactions. It not only structures social relations, it is the space within which the relations occur and the tool that individuals use to enter that space" (Jones, 1995, p. 16).

In quite a few circumstances the uniqueness of CMC mirrors and contributes to recent changes in society and developments in educational theories (Romiszowski & Mason, 2004). Regarding the contextual setting, CMC is "more than the context within which social relations occur… It is commented on and imaginatively constructed by symbolic processes initiated and maintained by individuals and groups" (Jones, 1995, p. 16).

Accordingly, as a pedagogical shift has moved language educators from cognitive assumptions about knowledge and learning as brain-local phenomenon to contextual, collaborative, and sociocultural approaches to language development and activity (Kern & Warschauer, 2000; Lund, 2006), CMC - like all other human creations - should be considered as cultural tools possessing particular interactional and relational associations, expectations, and preferred uses (Thorne, 2008a). In other words, CMC with its own social and cultural features has various implications, meanings and uses in different communities.

In general, CMC can be viewed both as mediational tools and as a communication process. When viewed as tools, CMC is examined from technological aspects that provide the medium for communication. Other aspects are revealed when CMC is perceived as a communication process, which includes the message, the sender and the receiver. It is therefore human factors with their sociocultural and historical background that play significant roles during the interaction process. A more comprehensive understanding of CMC will be attained through the examination of its characteristics, modes, and scopes.

2.1 Characteristics of CMC

Though there has been an exponential increase in the number of CMC publications available (Abrams, 2006; Shi, Mishra, Bonk, Tan, & Zhao, 2006), research interests are often centred upon those characteristics of CMC that are supposed to differentiate CMC from the traditional form of FTF communication (Abrams, 2006; Sierpe, 2005). It is noted that "CMC differs substantially from FTF communication, in form if not in function" (Walther, 2007, p. 2539). The various features of CMC presented below are, therefore, those that make it different from traditional FTF communication mainly in terms of forms; and where possible, functions of CMC are marginally mentioned. These discussions include the technological, social/cultural, and linguistic characteristics of CMC.

Technologically, hyperpersonal and interpersonal communication (Walther, 2007) is facilitated by the use of computer network technology, which theoretically makes online participants communicate with each other independent of time and space. In other words, CMC provides freedom from temporal and spatial constraints (Luppicini, 2007) and communication via CMC is either synchronous or asynchronous. Besides, CMC affords a variety of media, combining text, audio, and video with hyperlink and hypermedia features. Multimedia CMC is now becoming popular and used every day by a large number of people the world over. Another technological affordance of CMC is that it enables multi-dimensional communication including one-alone, one-to-one, one-to-many, and many-to-many. Regarding language learning, the electronic nature of CMC "makes language manipulable" (O'Rourke, 2008, p. 232). In sum, it can be seen that all of the technical and technological developments of CMC are combining various media tools and potentially fostering a renovative style of collaborative learning.

In terms of social and cultural communicative aspects, impersonality in CMC has been mentioned in literature (Kreijns, Kirschner, Jochems, & Van Buuren, 2004). Previous research has noted the negative aspect of non-humanlike communicative nature of CMC (Jonassen, 2004; Lund, 2006) and that CMC lacks the particularly relational features, "which enable the interlocutors to identify correctly the kind of interpersonal situations they find themselves in" (Riva, 2002, p. 581). Hiltz and Turoff (1978), for example, asserted that computer conferencing seemed much less intimate and self-exposing than oral communication due to its impersonal nature. Also, misunderstandings and thereof misinterpretations may occur due to the lack of gestures, facial expressions and other general social, non-verbal or para-verbal cues (such as head nods, smiles, eye contact, distance, and tone of voice).

However, regardless of the limitations mentioned, the impersonality itself brings certain benefits to learning. Mental and physical effort can be focused on the topic discussed rather than on unnecessary visual and auditory cues. Research (Q. Wang & Woo, 2007, for example) also revealed that CMC users take more time than those in FTF communication in order to reach a common view, which helps them make better decisions with appropriate attitudes and language. In other words, despite the lack of human qualities including paralinguistic and non-linguistic behaviours (O'Rourke, 2008), CMC, while gaining more and more popularity, allows relational development through extended communication (Knight, 2005). There seems to be a trade-off between social skills and technical expertise in this regard.

Last but not least are the linguistic features of CMC, being described as having its own unique language. For Murray (2000), CMC in general has four linguistic characteristics. First, it is related to both spoken and written language. According to Crystal (2006), CMC is fundamentally different from speaking and writing media; it shares in their properties, but possesses those features that neither could possibly have. CMC combines oral and written language forms and provides for real-time communication, similar to oral language. There is a complex interaction of contextual aspects in specific contexts. In many cases, CMC exchange may be viewed as a typed conversation (Sierpe, 2005), in which participants can freely use the ability to stress words and

phrases in italics or by bolding, the same functions seen in speaking in a first person's point of view (Smith, 2003). Smith (2003) also described some characteristics of written language in CMC, such as the lack of intonation, the permanent record of the discourse, the lexical density, and the use of punctuation and textual formatting in messages. In other words, some textual features of CMC are comparable to those found in writing and others found in oral language. Second, CMC language has a simplified register due to the fact that the speaker either perceives the addressee as a language user with limited competence or performs under constraints of time and space. It is reported in Murray's study (2000) that learners in CMC environment delete subject pronouns, determiners, and auxiliaries, use abbreviations, do not correct typos, and do not use mixed case in order to reduce typing time. It is popular to see "shorter sentences, abbreviations, simplified syntax, the acceptance of surface errors, and the use of symbols and emoticons to express emotion" (Smith, 2003, p. 39). In general, it must be asserted that the language of CMC is developing as less expressive and less sophisticated than previous forms of writing.

The third linguistic attribute of CMC deals with the structure of conversations. Regarding conversational structures, there are at least two aspects that make CMC conversations different from the traditional telephone or FTF exchanges (Smith, 2004). Due to the automatically technological-supported identification, some norms, such as openings, closings, greetings, and different turn-taking strategies (Gains, 1999) are optional in CMC. Also, because of its reduced sensory nature, CMC conversations require more explicit signifying of understanding and non-understanding. Lastly, the mechanism of maintaining topic threads like in email, blog, and wiki exchanges make conversations more cohesive and coherent. This feature of threaded discussion is considered to promote collaborative learning (Suthers, Vatrapu, Medina, Joseph, & Dwyer, 2008). The critical issues, however, are different technologies amplify certain features of communication and reduce others. To sum up, regarding the language used in CMC, Warschauer (2005) concluded that it is not merely an amalgamation of a traditional form of written language plus computers, but rather there is now a completely new system of language that needs to be discovered, analysed, and studied. The use of the new technology for human communication is said to promote language change and to demand the acquisition of new literacy skills (Braga & Busnardo, 2004).

2.2 Modes of CMC

It is conventional to divide CMC into two basic modes including synchronous (SCMC) and asynchronous (ACMC) communication capacity with high and multiway interactivity (Levy & Stockwell, 2006; Luppicini, 2007; Pfaffman, 2008). SCMC discussion involves users exchanging opinions in real time format via chat rooms, instant messengers, or video conferencing. Participants in SCMC environment post typed messages which appear on the computer screen; and they can scroll back and forth to review previously sent stretches of the discourse text. SCMC discussion not only allows learners to communicate similar to FTF discourse (Lee, 2001), but, at the same time, also increases learner monitoring of language usage (Sykes, 2005). Learners must however sign onto a computer system simultaneously to launch the network, which is considered the downside of this mode of communication with regard to different class times and time zones (Levy & Stockwell, 2006).

On the other hand, in ACMC, such as World Wide Web (WWW), e-mail, web blog, newsgroups, and postings in bulletin board system, interaction does not need to be simultaneous. ACMC mode allows students more time to read, understand, reflect and respond to the posted written messages. Learners also have a chance to monitor and edit their own or other learners' writing. ACMC has been widely used in collaborative writing and brainstorming, fostering critical thinking habits of the participants (Lee, 2004).

Still, this binary division is not absolute. As far as the simultaneity is concerned, even real-time chat, for example, is hardly completely synchronous due to delays depending on such variables as Internet speed, typing speed (D. E. Murray, 2000), and preferences of use, in which an offline chat message, for example, may be received and responded to days after being received.

Another widely-accepted classification of CMC is whether it is text-based or audio/video-based (Figure 1). Text-based computer-mediated communication (CMC) still remains most common in education environments, although bandwidth and hardware for two-way audio and video is now widely available and gaining jn popularity (Paulus, 2007). The textual nature of CMC, which makes language more "persistent, visual, and archivable" (O'Rourke, 2008, p. 232), still has a significant impact on language study (D. E. Murray, 2000; Warschauer, 1997). It has introduced us to the idea of new literacies and language genres, and has blurred the historical division between written and oral communication (Kasper, 2000), both of which have been merged into a single medium of text-based CMC, as previously discussed. Because of this, text-based CMC has been the subject of research in many disciplines from general education to language studies.

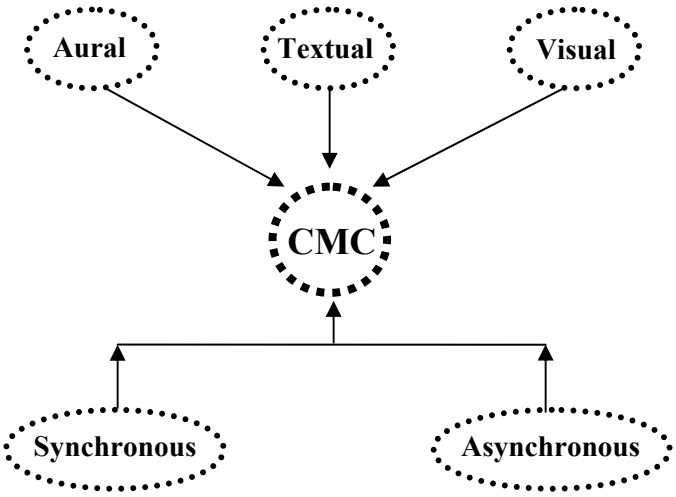

Figure 1 Modes of CMC

Nevertheless, information technologies in general and CMC technology in particular have been developing so fast and growing to be so hybrid that the bimodal partition of CMC has almost become obsolete. Historically, CMC has developed from the first generation of email and chat to the second generation of Wikis and Blogs, which has recently combined and a new name has been coined as Bliki, and then to Podcasting and Gaming, which are considered the third generation (Thorne, 2008b). Regarding both technical and communicative issues, some CMC forms, such as blogs and wikis, are hardly listed as either asynchronous or synchronous. These mediation tools can be used either asynchronously or at the same time depending, mainly, on participants' preferences and objectives, which makes the synchronicity classification of CMC unnecessary. Similarly, online chat services in many of the providers, such as MSN Messenger, Yahoo Messenger, Skype, and Google Talk now include both text and audio/video functions, which makes textual/aural/visual grouping of CMC redundant.

The categorisation can also be made according to the various affordances of different modes of CMC, namely temporal, social and psychological, linguistic, material, and individual (Levy & Stockwell, 2006), which have various potentials to influence the communication mediated through CMC. In other words, CMC "*technology* plays a major role not only in the choice of *language* used, but also the types of *messages* that can be conveyed, the *social* relationships that can be formed, the *psychological* pressure that participants may feel, as well as the choice of *tool* in conducting the communication" (Levy & Stockwell, 2006, p. 97, italics added).

Socioculturally, the concept of multimodal CMC is therefore suggested (Thorne, 2008a) and now commonly used (Blake, 2005; Kern, 2006; Lamy & Hampel, 2007). Kern (2006) identified that CMC is not a single uniform genre of language use, but rather a collection of genres related in part to the particular medium (Figure 2) and in part to the particular sociocultural contexts of a given act of communication.

Kern explained that while at the product-oriented end of the continuum, messages are composed as wholes before being released to their readership, on the process-oriented end utterances may be more fragmentary, multiple participants communicate spontaneously and simultaneously, and several turns may be required to accomplish a single message. Communicative motivation or purpose tends to vary along the continuum in terms of forms and functions. The end product is biased toward information exchange, whereas the process end is inclined toward phatic communion, reinforcing social contact in and of itself (Crystal, 2006; Herring, 2001; D. E. Murray, 2000).

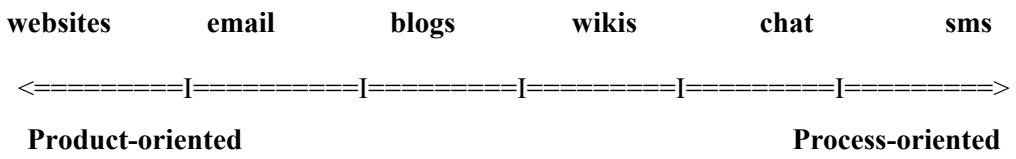

Figure 2 CMC continuum

In summary, together with ACMC, having already gained its place in both everyday communication and language education with a steady increase in formality, "using SCMC for learning and practising a target language now seems like the most natural thing in the world" (O'Rourke, 2008, p. 227). SCMC and ACMC each has their own characteristics, complementing each other (Honeycutt, 2001). While synchronous discussions may be best suited for brainstorming and quickly sharing ideas during interaction, asynchronous exchanges allow more time for considered opinions and are more effective for deeper discussion of ideas (Ingram & Hathorn, 2004). A combination of synchronous and asynchronous experiences seems to be necessary to promote the kind of engagement and depth required in collaborative learning. In line with the current communicative, sociocognitive trends in education, both synchronous/process-oriented and asynchronous/product-oriented CMC as everyday authentic communication tools offer numerous possibilities for SLA in terms of collaborative learning and are now a significant avenue of enquiry in applied linguistics.

It is emphasised that the selection of synchronicity-based interaction modes via CMC depends largely on the temporal, cultural, socio-psychological, institutional, linguistic, material and individual dimensions, purposes, aims, objectives and preferences (Levy & Stockwell, 2006), while technology with its various affordances just moderately affects the choice. This is confirmed by Stockwell (2007), who claimed that the reasons for choosing a particular technology are probably as varied as the range of technologies themselves, but some of the main reasons may include pedagogical objectives, institutional decisions, personal curiosity, and trends and fashions. Similarly, Salaberry (2001) argued that pedagogical goals should be the driving force behind decisions of what medium is most efficient in implementing a particular task.

2.3 Scopes of CMC: Intercultural versus intracultural

CMC, due to the characteristic of space and time independence, is widely known for affording both intercultural and intracultural exchanges (alternatively termed as inter-cultural and intra-class/group respectively by Chun, 2008). Intercultural CMC is also known as telecollaboration, in which participants are from at least two different countries or communities. Conversely, intracultural CMC involves participants who share a native language (Abrams, 2006), and can be conducted within-class and out-of-class, i.e. on campus, at canteens or at home.

Intercultural CMC is exemplified in Ware and O'Dowd's (2008) study. Spanish students learning English and American students learning Spanish exchanged online across the two countries over a year-long period in a telecollaborative research project. These students were required to write at least an essay in their foreign languages weekly. They were placed into pairs (one English native and one Spanish native) and then exchanged their writings through the function of asynchronous CMC in Blackboard for peer responses. Another similar telecollaborative language learning is found in Greenfield's study (2003), which examined high school students' attitudes toward and perceptions of a telecollaborative email exchange between a 10th grade English class in Hong Kong and an 11th grade English class in Iowa.

On the other hand, Liu and Sadler (2003) divided their EFL students in a large university into traditional group and technology-enhanced group. The two groups followed the same syllabus; but different from the traditional group who used pen and paper for their writing and editing, the technology-enhanced group exploited Microsoft Word for writing assignments and MOO for group discussion. The study, thereof, investigated whether differences in modes of interactions resulted in differences in students' quality of peer revisions. Similarly, Beatty and Nunan (2004) also investigated intracultural CMCL. However, they examined group work at the computer, rather than via various CMC tools. Students in their study were divided into pairs, sitting and collaborating orally in front of the computer to solve various language tasks. The study strived to test the hypothesis that a constructivist interface generated greater collaboration than the behaviourist model of instruction.

3. CMC in language education

3.1 Pedagogical benefits of CMC

Since being applied to the educational environment, CMC is believed to offer a number of pedagogical applications. Numerous primary and secondary studies on didactic characteristics of both SCMC and ACMC have been published, through which educators are gradually realising their educational potential to the learning context. CMC is reported not only to support a range of learning activities such as discussions, role-play, and simultaneous games but also to serve different functions and learning goals. The applications of CMC, either intra-class or inter-class and with or without teachers, are hardly limited to any particular topic or discipline. CMC is seen a dynamic and adaptable application for educators and teachers who need to be familiar with its strengths, limitations, and weaknesses in order to improve pedagogical sound activities.

Within a socio cultural theory (SCT) framework, it is argued that "socialization and language acquisition cannot be separated from the interactive linguistic contexts in which they occur" (Kitade, 2000, p. 145). Looking from a SCT perspective, educational CMC offers a variety of potential benefits to human's social and cultural development alongside language proficiency. CMC can be considered as one of the potential technical and linguistic mediators (Darhower, 2002) of the transformation process from lower mental functions to the higher, cultural functions (Vygotsky, 1978). In Vygotskian terms, CMC could be argued to give learners access to two types of mediators which develop their cognitive processes: psychological tools and other human beings. CMC allows learners to mediate their psychological processes by facilitating the exchange of text between human beings. In addition, CMC can assist learners to develop a greater sense of mastery if the conditions are right, i.e. if learners are working collaboratively on tasks or if learners are interacting with domain experts. In the case of language learning, these experts are native or proficient speakers of the target language. Darhower (2002) comparatively claimed that if mediational means are viewed as a series of items making up a "tool kit" (p. 253), CMC then should be considered as one of the items in the language learning tool kit. The social, cognitive, and affective functions found in CMC interactions in Darhower's study are reported to be consonant with the SCT view of constructed second language learning.

A review of the literature on SCT in education also exposes that CMC not only provides opportunities for socialization, but also facilitates collaborative and comprehensible interaction (Kitade, 2000) together with reflective learning and learner autonomy (Benson, 2007). CMC facilitates the collaborative construction of knowledge through the social negotiation of ideas in an authentic context (Jonassen, 2004). In addition, it provides access to a variety of perspectives due to the fact that participants could be based in any number of different contexts. CMC also provides learners with opportunities to engage in activities which require them to perform relevant tasks with an emphasis on reflection and production. This kind of social interaction, according to Vygotsky (1978), promotes cognitive development.

Table 1

Pedagogical features of CMC

Pedagogical features of CMC	Sample research publications	Mode of CMC	
		SCMC	ACMC
Increase motivation	Lee, 2004; Schwienhorst, 2004; Smith, 2003	√	
	Sotillo, 2000	√	√
	Weasenforth, Biesenbach-Lucas, & Meloni, 2002		√
Support active learning	Warschauer, 1996	√	
	Lee, 2005	√	√
	Bikowski & Kessler, 2002		√
Promote reflective learning	Swaffar, Romano, Markley, & Arens, 1998	√	√
	Jonassen, 2004; Weasenforth, Biesenbach-Lucas, & Meloni, 2002		√
Enhance learner autonomy	Arnold, 2002; Payne & Whitney, 2002; Warschauer, 1996	√	
	Beauvois, 1995; Schwienhorst, 2004	√	√
	Chiu, 2008		√
Foster collaborative learning	Darhower, 2002; Leahy, 2008; Warschauer, 1997	√	√
	Abrams, 2005; Savignon & Roithmeier, 2004; Weasenforth et al., 2002		√

Presented in Table 1 is a summary of the pedagogical features of CMC reviewed from key studies. The principle pedagogical features to be discussed are believed to support the SCT view on CMC in education. It is also argued that there is a cause-effect relationship among these didactic features of CMC.

3.1.1 Motivation

Research has shown that learners' motivation can be more positive in the CMC context than in FTF interaction (Beauvois, 1998). Interaction with a real, often international, audience in the target language via CMC may linguistically and socially affect the quality of online negotiation and students' motivation toward CMC (Lee, 2004). This authentic and meaningful type of interaction also supports learners to become more responsible and willing to engage in their own learning (Chen, 2005). Besides, many studies have reported that the level of motivation and attitudes towards learning during a CMC task is enhanced due to the interactive nature of the activity (D. M. Chun, 1994; Lee, 2004; Sotillo, 2000), which contributes to the reduction of shyness and anxiety about computer use. Another motivating factor of CMC is novelty; learners are exposed to a different type of language learning activity (Meunier, 1998). These aspects of the activity could be said to be unique, such as interacting with different people, meeting people from other countries, chatting in real time and using the computer to communicate. Students are fascinated by how the system works and are reported to write more due to the novelty factor (Felix, 2005), which then augment learners' active learning.

3.1.2 Active learning

CMC is reported to support active learning, in which learners take the initiative to explore and manipulate information in the learning process. The literature on conditions for language learning and acquisition indicates that learning takes place when learners are active (Egbert, 2001; Lee, 2005; Warschauer, 1996); and active learning is one of the crucial elements creating a successful online learner-centred language learning environment (White, 2007). The electronic medium allows for more lateral exploration access as structured by learners who are given more freedom to discover alternative pathways to develop their one learning styles. Egbert (2001) also claimed that CMC can often make it easier to develop meaningful tasks during which language learners of any language level are active and have opportunities to interact. This idea is endorsed by Lee's study (2005) on learners' perspectives on online active learning. Lee confirmed the use of web-based instructional tool, like Blackboard or WebCT, not only facilitated the development of students' language skills and reinforced their cognitive skills but also supported an active learning environment. It is reminded in Lee's conclusion that "for online active learning to occur, both effective pedagogical principles including specific instructional goals and procedures, as well as technological tools must be thoughtfully taken into account at the stage of implementation" (p. 152).

3.1.3 Reflective learning

Reflective learning engages learners in evaluating their experiences, and is a trend in language learning. This style of learning, as one of the metalinguistic functions (Yamada & Akahori, 2007), is supported in CMC environments where learners have more time to reflect on others' work than in FTF conversations. The idea is endorsed by Jonassen (2004), stating that CMC, especially ACMC, allows more time for reflection and referring to other electronic sources of information. Moreover, the asynchronous nature of the CMC medium not only allows learners to prepare their messages more carefully in a word processor but also is believed to invite quiet students to play more active roles since their more reflective learning styles are easily accommodated (Weasenforth et al., 2002). Finally, it is proved that with the social-oriented development of CMC technology, such as wikis and blogs, learners are able to more easily access people and knowledge in ways that encourage creative and reflective learning practices that extend beyond the boundaries of the school and the limits of formal education.

3.1.4 Learner autonomy

Learner autonomy, a central but complicated concept in online learning (White, 2003), is defined by Sinclair (2000) as the notion of taking responsibility for one's own learning and also associated with a number of other terms, such as learner independence, independent learning, lifelong learning, learning to learn, thinking skills. Advances in CMC technologies are encouraging the development and promotion of autonomy in language learning (Arnold, 2002; Benson, 2007; Chiu, 2008). Chiu's study (2008), for example, asserted that there is a positive connection between CMC and learner autonomy in language education and that the use of networked computers not only shifts the authority from the teachers to learners but also provides opportunities for interactions, especially among learners. Online language learners automatically become partly interdependent of the teacher because of the easy availability of supporting tools such as online dictionaries, word processing tools, and the Internet which give students control over their own learning (Chapelle, 2001). In other words, it can be seen that the roles of the teacher as provider of information and the student as receptacle thereof have shifted radically in CMC environments (Nguyen, 2008). In addition, according to Toyoda and Harrison (Toyoda & Harrison, 2002), CMC technologies are getting more and more user-friendly, which results in the fact that the more learners get to know the tools, the more autonomy they develop. With CMC technologies, individuals are given the opportunity to move out of their individual comfort zones in order to participate productively and effectively in the learning process (Hoven, 2006).

Furthermore, by looking at three different approaches to learner autonomy, including an individual cognitive, a social-interactive, and an experimental-participatory perspective, Schwienhorst (2004) claimed that combinations of CMC technology and pedagogy can lead to more successful implementations of learner autonomy principles. In general, CMC provides an environment that promotes learners' autonomy with the teacher as the facilitator (Warschauer, 1999), through which learners will be able to "experience autonomy in order to become more autonomous" (Murphy, 2008, p. 83) in a process of the so-called autonomisation as the results of their getting opportunities for more control, more participation, and more interaction via online exchanges, all of which are believed to be premises for collaboration.

3.1.5 Collaborative learning

Motivation, participation, reflection, and autonomy all play significant roles in collaborative learning (Figure 3); and all have been evidently researched in literature. In fact, online collaborative learning research in education in general and in language learning in particular has been widely published. The text-based nature of CMC has meant that collaboration has become a prime source of data for researchers from both interactionist and sociocultural approaches who are investigating second language acquisition. Online interaction environments, which involve active construction of knowledge, can be potentially used as a powerful tool for collaborative learning and group communication. CMC, according to Kaye (1989), can provide a valuable dimension to collaborative learning as it both fosters more equally distributed turn-taking and supports more thoughtfully composed inputs. Similarly, Harasim (2007) claimed that this technology provides a new way for interaction between teachers and learners and among learners themselves and this new form of online environment creates a new domain which facilitates collaborative learning.

Reviews on online collaborative learning started with Warschauer's (1997) influential study, which discussed five distinguished features of CMC that were believed to enhance collaboration: (a) text-based and computer-mediated interaction, (b) many-to-many communication, (c) time/place-independence, (d) long distance exchanges, and (e) hypermedia links. Warschauer presented CMCL by using a conceptual framework starting with famous theories of input and output and leading to sociocultural learning theory. Later studies (Beatty & Nunan, 2004;

Greenfield, 2003; Harasim, 2007; Marmini & Zanardi, 2007; Sotillo, 2006) have also shown the promising capacities of CMC in collaborative learning.

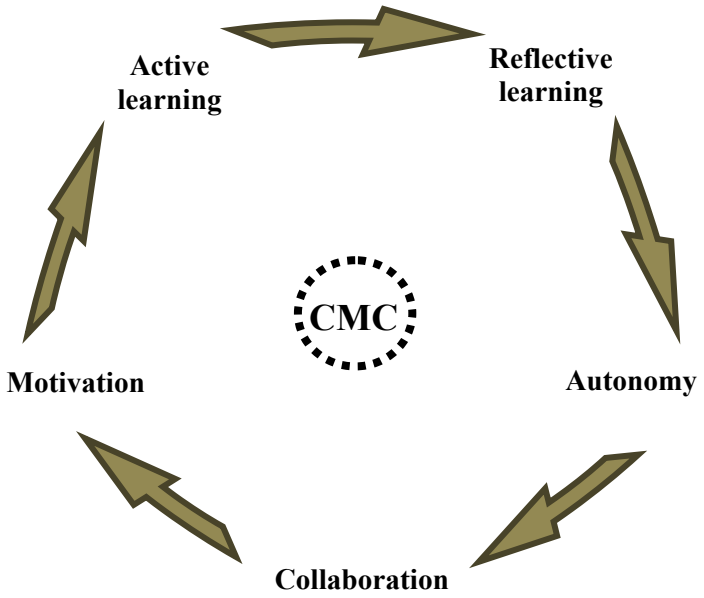

Figure 3 CMC pedagogical circle

3.2 Benefits of CMC in language development

Numerous studies have been devoted to CMC in language education so far (Kern, 2006; Kern & Warschauer, 2000; Luppicini, 2007; D. E. Murray, 2000; Romiszowski & Mason, 2004; Stockwell, 2007; Thorne, 2008a, 2008b). CMC is reported as a student-centred tool in language learning to facilitate interaction, discussion, and collaboration among learners from a variety of backgrounds. This enhances the social component of any course and gives learners access to multiple perspectives (Jonassen, 2004). All of the pedagogical benefits of CMC discussed above clearly support, augment, and enhance language development via electronic exchanges.

Presented in Tables 2, 3, and 4 below are both metalinguistic aspects that are believed to be effective for SLA and language areas and skills that language learners are able to develop through CMC environments (D. M. Chun, 2008; Lamy & Hampel, 2007; Levy & Stockwell, 2006; Thorne & Payne, 2005).

3.2.1 Metalinguistic aspects

A substantial number of CMC research has examined various metalinguistic aspects of language development, including negotiation of meaning, sociolinguistic environment, and intercultural competence (Table 2). A variety of studies, from either an interactionist approach or a sociocultural viewpoint to SLA have been conducted on negotiation of meaning and CMC (D. M. Chun, 2008). Covering the topic from different focuses and angles, previous studies have been proving that CMC, both ACMC (Kitade, 2006) and especially SCMC (Blake, 2000; O'Rourke, 2005; Pellettieri, 2000; Sotillo, 2005; Tudini, 2003) facilitates interaction and negotiation of meaning. Interestingly, as far as task types concerned, research ahs shown that while SCMC and ACMC may complement each other in completing different tasks leading to successful linguistic objectives (Ingram, Hathorn, & Evans, 2000).

CMC is also known for providing a profitable environment for sociolinguistic development (Kitade, 2000; Smith, 2003). Learners reflect less anxiety and increase self-esteem, thereby liberating the minorities (Honeycutt, 2001) during electronic communication than in face to face interactions, which has led students, often reluctant to participate in oral discussions, to contribute more actively in electronic discussions (Al-Sa'di & Hamdan, 2005). Similarly, data analysis in the study by Kitade (2000) revealed three salient distinctive interactional features of CMC which facilitated encouraging conditions for developing positive attitudes towards language learning: no turn-taking competition, text-based interaction, and a lack of nonverbal cues. Finally, intercultural competence (Abrams, 2006; Kramsch & Thorne, 2002; Ware & O'Dowd, 2008) is evident through CMC research as these tools provide "convenient, authentic, direct, and speed access to native speakers and their cultures" (Kramsch & Thorne, 2002, p. 100). According to D. M. Chun (2008), though many studies have focused on intercultural competence via both ACMC and SCMC, attention has also been paid to intracultural CMC in the EFL/ESL classroom (Abrams, 2006).

Table 2

Benefits of CMC in metalinguistic aspects

Metalinguistic aspects	Sample research publications	Mode of CMC	
		SCMC	ACMC
Negotiation of meaning	Blake, 2000; O'Rourke, 2005; Pellettieri, 2000; Shekary & Tahririan, 2006; Sotillo, 2005; Tudini, 2003; L. Wang, 2006	√	
	Sotillo, 2000; Toyoda & Harrison, 2002	√	√
	Kitade, 2006		√
Sociolinguistic environment	Kern, 1995; Kitade, 2000; Warschauer, 1996	√	
	Schwienhorst, 2004	√	√
Intercultural & intracultural competence	Kramsch, A'Ness, & Lam, 2000; Sotillo, 2005; Thorne, 2003	√	
	Abrams, 2006; D. M. Chun & Wade, 2004; Kramsch & Thorne, 2002; Thorne, 2003	√	√
	Itakura, 2004; O'Dowd, 2003; Ware & Kramsch, 2005; Ware & O'Dowd, 2008		√

3.2.2 Language areas and components

A number of studies, taking a more cognitive approach to SLA, have suggested an increase in linguistic competence, both quality and quantity, among learners (Table 3). The influential study by Kern (1995) revealed that CMC-supported learners created more language production that the FTF group. Kern found out that SCMC discussions produced between two and four times more turns, more sentences, and more words than in the oral discussions. This conclusion is later confirmed by Abrams (2003), who claimed that students produced more language in CMC

environments, especially the SCMC, than the control group. Another beneficial effect is that CMC also fosters the improvement in linguistic and grammatical development, which is proved in Kern's (1995) study, showing learners' language production was at a greater level of sophistication regarding grammatical accuracy and complexity. Similarly, Shang (2007) demonstrated that the nature of CMC application promoted written accuracy and sentence complexity. In addition, previous studies also indicate that the delayed nature of ACMC exchanges appears to give learner more chances than SCMC to produce complex language (Sotillo, 2000).

Expectedly, not all studies release positive results. It is reported in Fitze's (2006) study, for example, that there is no statistically significant difference in the number of words produced by students in CMC versus FTF discussions. However, the greater range of vocabulary is found in electronic exchanges than in FTF discussions (Fitze, 2006; Fuente, 2003; Li, 2000). Moving beyond the text-based CMC out to voice chat rooms, Jepson (2005) focused on the pronunciation when comparing the patterns of repair moves of non-native speakers in text chat rooms versus voice chat rooms. It is concluded that there are a higher number of total repair moves made in voice chats than in text chats, and that these repairs in voice chats are often pronunciation-related. To sum up, based on previous studies, CMC environments enhance the improvement and development of various language areas and components.

Table 3

Benefits of CMC in language areas or components

Language areas or components	Sample research publications	Mode of CMC	
		SCMC	ACMC
Grammar	Bax, 2003; Fiori, 2005; Fitze, 2006; Kern, 1995; Lee, 2006; M. R. Salaberry, 2000; Sotillo, 2005; Van Deusen-Scholl, Frei, & Dixon, 2005	√	
	Abrams, 2003; Dussias, 2006; Honeycutt, 2001; Sotillo, 2000	√	√
	Gonzalez-Bueno & Perez, 2000; Li, 2000; Shang, 2007		√
Vocabulary	Fitze, 2006; Fuente, 2003; Toyoda & Harrison, 2002	√	
	Fotos, 2004; Li, 2000		√
Pronunciation	Jepson, 2005	√	

3.2.3 Language skills

Both written and spoken language skills are enhanced through various CMC in language learning projects (Table 4). In fact, there is a common tendency to associate CMC with the development of specific language skills (Levy & Stockwell, 2006). Authentic communication through CMC, especially ACMC, is reported to develop writing skill due to the fact various forms of text-based CMC resemble written language and allow more time, more autonomy, and more opportunity for learners to brainstorm and discuss the topic among groups, in comparison with in-class teacher-

fronted writing classes (Davis & Thiede, 2000). Also, the teacher is able to participate in collaborative activities, thus models the writing process in real time and real situation, thereby creating the Vygotsky's concept of ZPD. Improvement in reading abilities is also provided via CMC. Authentic interactions in ACMC, such as email, blog, and wikis, provide meaningful reading for learners (Levy & Stockwell, 2006). In addition, during text chat exchanges, learners are more adept at skimming and scanning at rapid speeds in order to follow and participate fully in the conversation thread (Godwin-Jones, 2008).

Furthermore, possibility for cross-modality transfer between real time, online conversational exchange text and oral language production has recently mentioned in various CMC projects (D. M. Chun, 2008; Lund, 2006; Thorne & Payne, 2005). The hypothesis that SCMC may improve speaking proficiency has been tested by Payne and Whitney (2002), who found that participants in a chatroom have a significantly higher oral proficiency than those just spending time in traditional oral classes. This obvious benefit of CMC for speaking competence is confirmed by Dussias (2006), who suggested that the language competence mediated via CMC appeared to readily transfer to spontaneous oral language production. In general, as learners traverse the boundary zone, they introduce language elements from one modality to another (Lund, 2006).

Table 4
Benefits of CMC in language skills development

Language skills	Sample research publications	Mode of CMC	
		SCMC	ACMC
Writing	Li, 2000	√	
	Blake, 2000	√	√
	Davis & Thiede, 2000; Meunier, 1998		√
Reading	Godwin-Jones, 2008; Greenfield, 2003	√	
	Fotos, 2004; Gruber-Miller & Benton, 2001	√	√
Speaking	Stockwell, 2003	√	
	S. Chun, 2003; Jepson, 2005; Payne & Whitney, 2002; Tudini, 2005	√	√
	Abrams, 2003; Dussias, 2006		√
Listening	Volle, 2005	√	

To recap, the text-based nature of CMC brings about many meaningful applications in language education. This medium, according to Blake (2000), Hampel and Hauck (2004), and Y. Wang (2004), not only amplifies students' attention to linguistic forms, but it also stimulates increased written production of the target language as well as creates a less stressful and more equitable environment for discussion. It can therefore be seen from the tables that CMC has been used

widely in developing most of language areas and skills, except for listening skill which is normally supported and developed through other forms of visual and audio technology (Blake, 2000).

4 Conclusion

The discussion has shown that CMC with its particular characteristics, modes, and scopes possesses potential benefits applicable to language development, from metalinguistic aspects to language components and skills. The conclusion drawn from the article will hopefully sketch an overall picture of naturally integrating CMC into language education. This will then foster a confident attitude among language institutes and teachers in bringing various CMC types into language classroom settings.

However, as far as SCT is concerned, "one size fits all" is not certainly pertinent to the prospect of integrating CMC into language education in all contexts. This opens a wide avenue of inquiry for language practitioners and researchers. In other words, more comprehensive studies about the introduction and application of CMC into language learning and teaching in different sociocultural, institutional, and individual contexts are required. Let us take research on computer mediated collaborative learning in language development as an example. Even though collaborative approaches to foreign language learning via various forms of CMC have now been well established with a theoretical underpinning (Warschauer, 1997), there are still questions left unanswered. What actually is CMC in regard to collaborative learning? What are the unique social activities of the online collaborative environment? What theories and forms of collaboration can be applied in the CMC environment? What are learners really doing in the process of online collaboration? How do learners view CMC and what are they doing in collaborative processes? Does proficient collaboration in CMC contribute to language improvement? How may differences in learners' sociocultural backgrounds affect the learning process? How can SCMC and ACMC complement each other in collaboration? And most importantly, how can CMC be naturally immersed into the collaborative learning so that the use of computers should not be framed as a special case but rather as an integral aspect of foreign language education? As a result, further research on authentic online collaborative learning is needed.

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Editor's Note: Educators talk about thinking "outside of the box". This paper uses three dimensional graphics to facilitate problem solving, creativity, and higher levels of learning. Dr. Abumosa explores math ideas and new approaches to math education using a Geometers SketchPad (GSP) and Dynamic Geometry Software .

Using a Dynamic Software as a Tool for Developing Geometrical Thinking

Mofeed A. Abumosa

Jordan

Abstract

This paper researches the relationship between van Hiele theory and its levels of geometric thinking with the dynamic software program geometry sketchpad. The paper reveals the harmony between the Graphic SketchPad (GSP) software and the van Hiele theory. Moreover, it suggests a method of using GSP to teach geometry in schools and using it as a tool to develop geometric thinking. Examples show and explain how GSP was used to develop a new theory from Pythagorean Theorem.

Keywords: geometric thinking, van Hiele theory, dynamic software, graphic sketchpad, GSP, technology.

Introduction

Principles and Standards for School Mathematics document (NCTM, 2000, p42) identifies the foundations of quality mathematics that should be taught in schools. It clears that "through the study of geometry, students will learn about geometric shapes and structures and how to analyze their characteristics and relationships and geometry is a natural place for the development of students' reasoning and justification skills, culminating in work with proof in the secondary grades".

Principles and Standards for School Mathematics document also clears the role of Technology in the teaching and learning of geometry. Tools such as dynamic geometry software enable students to model, and have an interactive experience with, a large variety of two-dimensional shapes. By using technology, students can generate many examples as a way of forming and exploring conjectures, but it is important for them to recognize that generating many examples of a particular phenomenon does not constitute a proof. Visualization and spatial reasoning are also improved by interaction with computer animations and in other technological settings (Clements et al. 1997; Yates 1988).

The attempt to develop a comprehensive theory that describes how students learn specific mathematical domains or concepts is rather rare in the field of mathematics education. A prominent example is the Van Hiele theory; the most comprehensive theory yet formulated concerning geometry learning. It was developed by Pierre and Dina van Hiele almost half a century ago (Evan, Ruhama & Tirosh, Dina, 2003). The theory claims that when students learn geometry they progress from one discrete level of geometrical thinking to another. This progress is discontinuous and the levels are sequential and hierarchical. The Van Hiele theory also suggests phases of instruction that help students progress through the levels.

Problem/Research Questions

The rapid development of computer technology adds new pressure on math educators. The ease of using computer software and the drop in their prices put math educators in front of a big question: How computer technology can be used to enhance math learning and teaching?. The "How" question was the motivate factor behind this paper.

Specifically, this paper tries to answer these questions:

1. How dynamic software like GSP can be used as a tool of developing geometric thinking?
2. How dynamic software like GSP can be related to Van Hiele theory?

The attempt of answering the questions is based on analyzing the characteristics of GSP and look for its' harmony with Van Hiele theory.

Theoretical framework

Hoffer invented a two dimensional matrix to represent geometrical thinking: the first dimension consists of five geometrical skills (Visual, Descriptive, Drawing, Logical and Applied). The second one deals with the levels of geometric thinking (Recognition, Observation, Analysis, Ordering, Deduction and Abstraction). (Hoffer, 1981, p15). This paper restricted with three geometric skills (Visual, Descriptive and Logical) and three levels of geometrical thinking (Recognition, Analysis and Deduction).

Table 1

Levels of geometric thinking distributed according to levels of geometric skills

Level / skill	Recognition	Analysis	Deduction
Visual	Recognize geometric shapes by its' picture without knowing the shapes prosperities	Recognize the relationship between different kinds of geometric shapes	Uses information about a geometric shape to deduce more information
Descriptive	Naming a geometric shape. Explain statements that describe geometric shape	Describes the relationships between geometric shapes. Defines geometric concepts clearly.	Understand the difference between the definition, postulate and theorem
Logical	Understand the meaning of shape reservation in different situations.	Uses the prosperities of geometric shapes to identify the subset relation	Uses logic to prove and being able to deduce new knowledge from given facts

The previous matrix is considered as a tool for proving the harmony between GSP and van Hiele theory. The previous matrix can be translated into a pyramid of three levels. Figure (1) demonstrates the three levels.

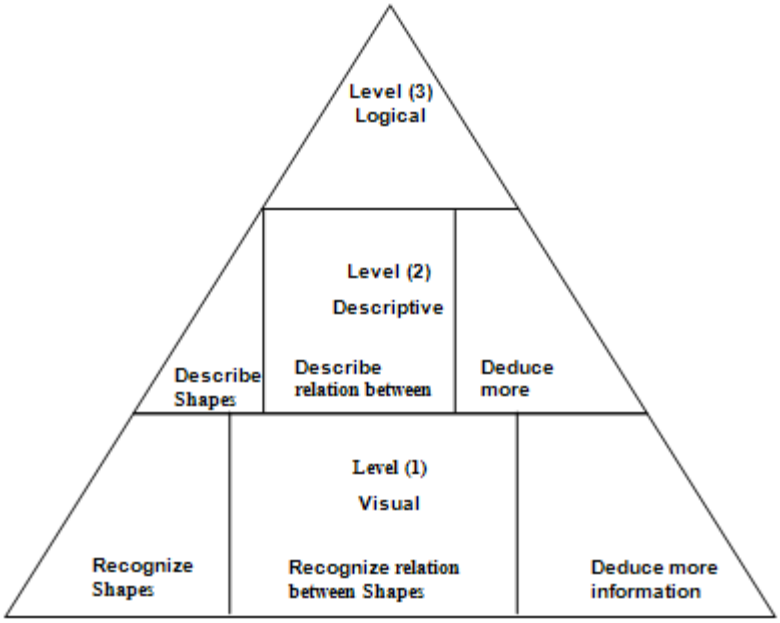

Figure 1. Pyramid of three levels of geometric thinking

Procedure

The procedure of this paper based on analyzing the characteristics of GSP and look for its' harmony with Van Hiele theory which answers the second question. The procedure of answering the first question is based on the idea of show me how. So an example of discovering a new theory will be introduced showing the process and the reflections the researcher has done.

According to the Geometer's Sketchpad Workshop Guide (Chanan,2002), and the personal experience of the researcher with GSP, the trainee starts with recognizing basic concepts (Point, Compass, Straightedge) to use them in constructing shapes (circle, square…): I considered that as level one (Visual). When you move to the next section of training you will learn to explain and describe shapes visually, which happens through drawing a shape the way he likes. In practicing the construction with GSP you will learn to recognize the relationship between different shapes and in every activity the trainee is challenged to do the same activity in another way or deduce more information. The reader can see the match between the levels of thinking and the GSP by practicing the work.

Example

Tour (1) in the GSP training guide is: constructing a square. The way it is explained matches the levels of thinking mentioned in Fig (1). A trainee can construct a square in many ways:

1. Draw segments (parallel and perpendicular) and try to make them congruent by daggering the points (level (1)).
2. Construct a grid and join between points on the grid level (1) see Fig (2).
3. Construct a circle and perpendicular and parallel lines level (2) see Fig (3).
4. Using transformations to do the construction level (2).

5. Use the measure tool to justify your work level (3)
6. Do the same construction in other ways level (3)
7. Ask the trainee to prove the construction in an abstract way level (3).

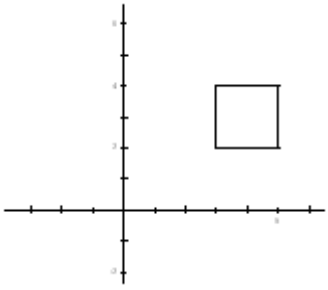

Figure 2. Drawing square on the grid

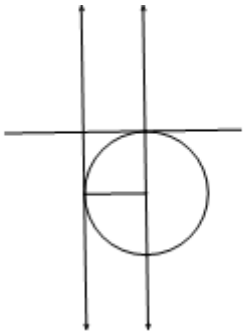

Figure 3. Drawing square using a circle

When you move on with the training guide you will easily see the harmony between GSP and van Hiele theory. While working actively with the software users can and should master geometric concepts, theorems, skills and problems. GSP is considered as a comprehensive thinking tool. So, I recommend the curriculum writers to adopt GSP not only as an auxiliary tool but to build the activities in a way that makes the advantage of the software is max.

It can be seen easily that most of geometric constructions can be done the same way. So, I suggest that curriculum experts can rebuild all the geometry content in a way to make advantage of such dynamic software.

How GSP can also be used for teaching geometry?

By using GSP students can construct geometric shapes, describe the relation between them, discover and prove new theorems. By using the Custom Tool teachers can follow the thinking of every student and assess the level he (she) reaches, since the Custom Tool shows the steps the student follow to accomplish the assignment.

Figure (4) shows the script of drawing a square by using the circle and the script of drawing the same shape by using the transformation tool. It is clear that such tools as so important in developing metacognition skills.

I was impressed by the previous theoretical frame and start to investigate how the dynamic software can be used as a tool of thinking in geometry.

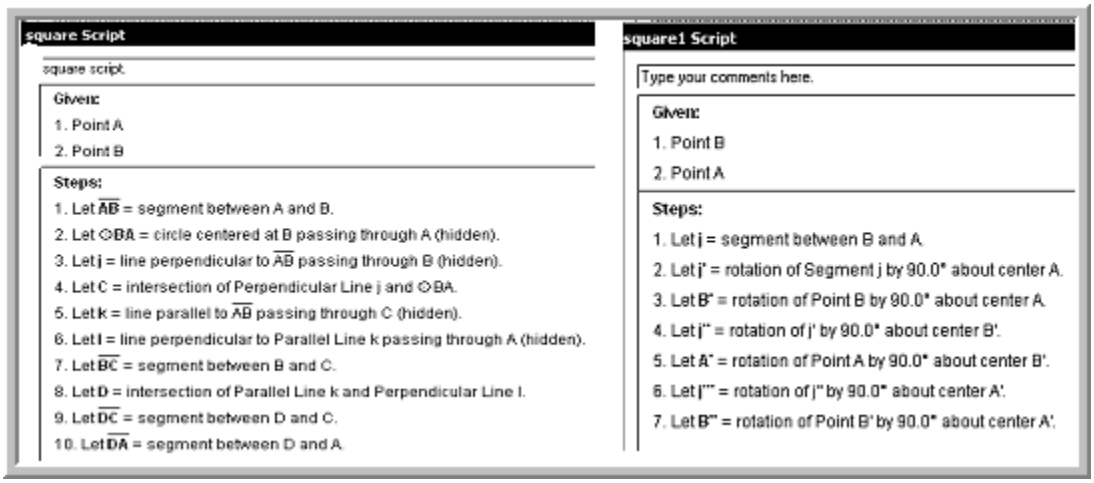

Figure 4. The script of drawing a square

A New Theory:

I start reading many studies that dial with dynamic software and geometry for example Hollebrands (Hollebrands, 2007), investigated the ways in which the technological tool, "Geometry Sketchpad", mediated the understandings that high school Honors Geometry students developed about geometric transformations by focusing on their uses of technological affordances and the ways in which they interpreted technological results in terms of figure and drawing. The researcher identified purposes for which students used dragging and different purposes for which students used measures. These purposes appeared to be influenced by students' mathematical understandings that were reflected in how they reasoned about physical representations, the types of abstractions they made and the reactive or proactive strategies employed.

But I was attached by Ron's Theorem (MeAlister & others 2004). Ron MeAlister, a middle school teacher, becomes fascinated with geometric patterns produced with GSP, explored an idea, conjectured a result, and proved it (Jackiw, 1995).

Ron was a trainee in one of the professional development workshops. It was about using GSP in finding geometric patterns, exploring, and conjecturing. During the workshop, Ron came upon a nice result while using GSP to explore the Pythagorean Theorem. His theorem is illustrated in the figure (5).

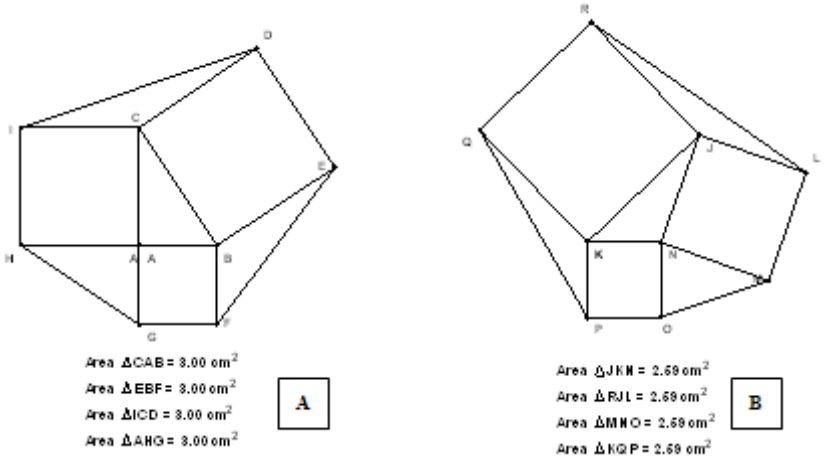

Figure 5. Ron's Theorem and its extension

The theorem says that when you construct squares on the sides of any triangle and join the ends to form new triangles then the area of the new triangles and the original one are equal.

In fig (5) A, the area of the right triangle ABC is 3 cm2 which is the same as the area of the other three triangles shaded in yellow. Fig (5) B shows the same result with a triangle which not right.

Ron constructs a mathematical proof that depends on sine law and cosine law. Ron's work illustrates the way GSP should be used "can make and extend conjectures easily" (NCTM, 2000, P25). Ron's severed as a springboard for other geometrical discoveries. He said "this discovery has inspired me to understand and enjoy geometry more than I ever thought I would" P150.

While I was working as a subject matter expert in preparing e-math curriculum in Jordan, Ron's discovery inspired me, and opens my mind to prepare the e-math content toward thinking and problem solving. So, I start working on GSP to discover geometry content in my way employing my knowledge with mathematics and teaching. My way to do things depends on recreation of what we know that I think leads to new knowledge, and new methods of teaching both the students in schools and teachers in education programs.

My new theory

Depending on Ron's theorem I construct new squares on the sides of triangles Ron has built. And join the end points to have trapezoids see fig (6) starting with right angled triangle. The theorem states that the areas of the trapezoids are equal, and if we continuo the construction in the same way it can be seen that the areas of trapezoids in each step are equal. Then I tried to change the core triangle to be not right see Fig (7) I still have the same result.

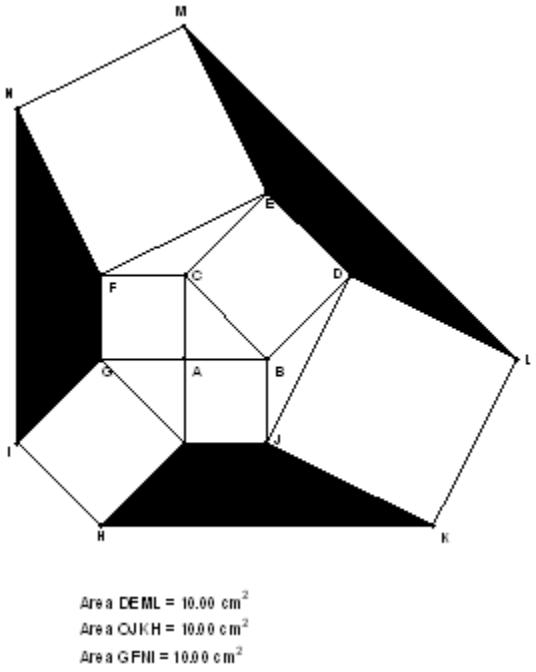

Figure 6. The new Theorem (the core triangle is right)

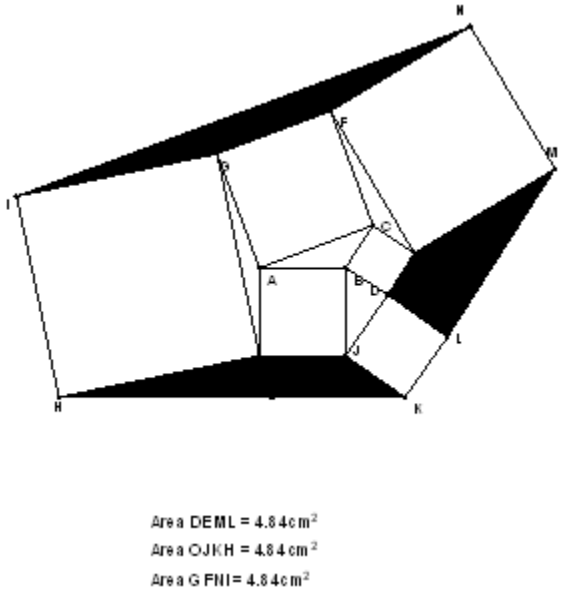

Figure 7. The theorem with a core triangle not right

Other Figures showing the same theorem

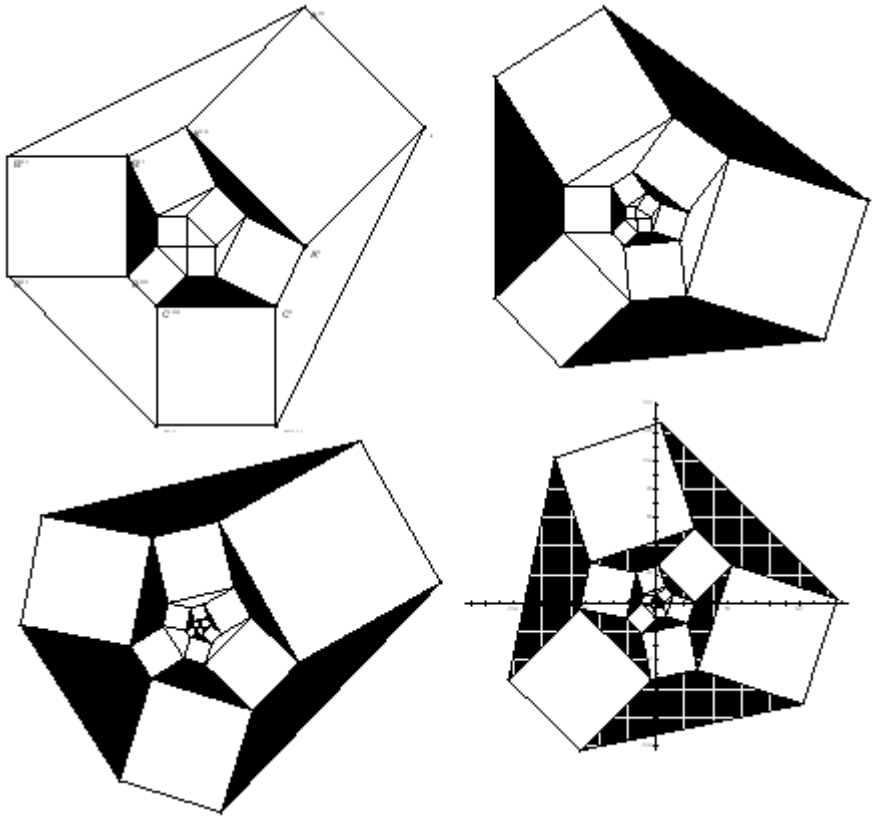

Figure 8. Figures showing the same theorem

The previous shapes shows the theorem when the pattern continuous.

The following figure illustrates an idea of proving the theorem.

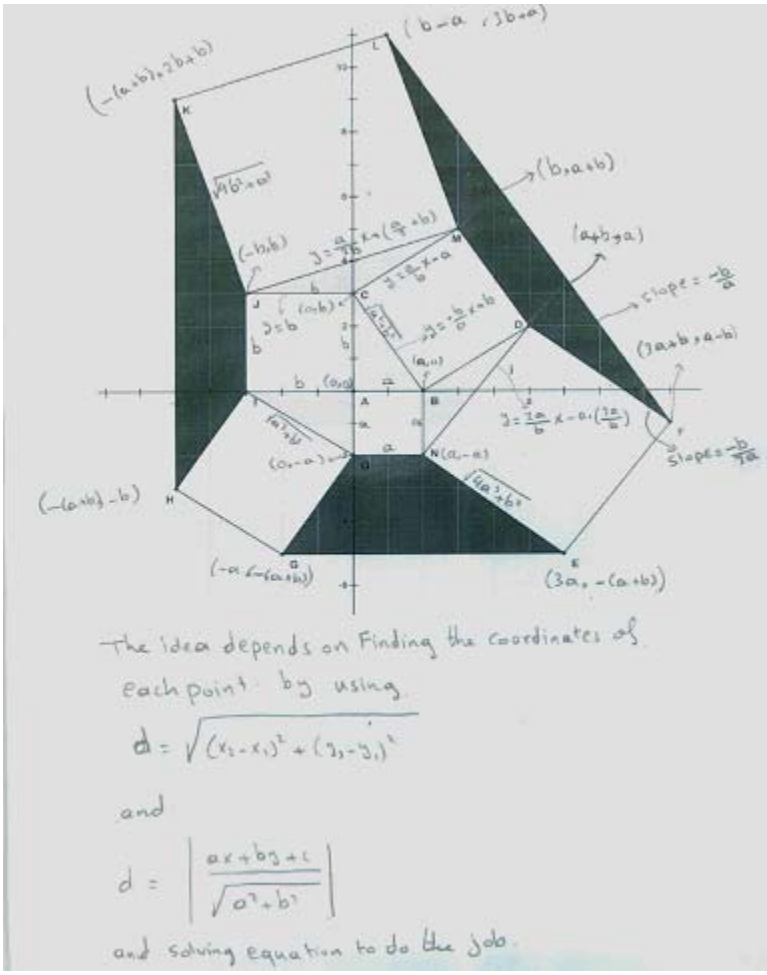

Figure 9. The idea of the proof

At last I tried to discover a relation between the area of the origin triangle and the area of constructed trapezoids

Table 2

Discovering relationship between area of core triangle and areas of trapezoids

AREA OF					
Triangle	Trapezoid1	Trapezoid2	Trapezoid3	Trapezoid4	Trapezoid5
1	5	24	115	551	2640
2	10	48	230	1102	5280
3	15	72	345	1653	7920
4	20	96	460	2204	10560
5	25	120	575	2755	13200
6	30	144	690	3306	15840
7	35	168	805	3857	18480

The previous table shows the areas of the origin triangle in different situations and how it relates to the areas of trapezoids. I don't have the time to finish the work so I do it by excel and fin the best fit polynomial that represents the relation.

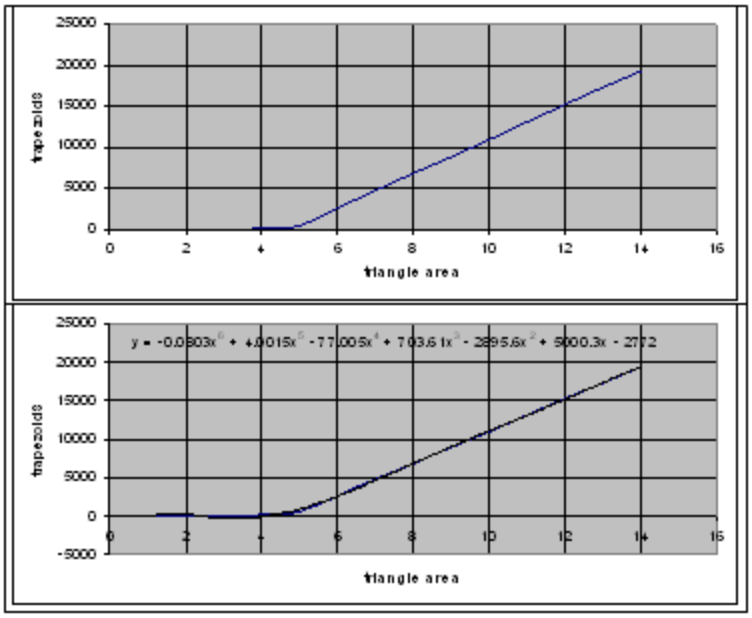

Figure 10. Using Excel to find the best fit function

It can be seen easily that the geometric pattern can be converted into algebraic one.

Conclusion

The paper suggests a method of using dynamic software (GSP) as a tool of developing geometric thinking which can be summarized by the following steps:

1. Find an old theory in geometry.
2. Use GSP to revisit the theory.
3. Ask your self " WHAT IF" and start using GSP to discover.
4. Justify your thinking.
5. Prove your conclusion.

Most of old theorems can lead our students to new ones.

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Technical Note:

GSP stands for The Geometer's Sketchpad®. It was used in conjunction with Dynamic Geometry® Software for Exploring Mathematics, Version 4. Visit http://www.keypress.com/x5521.xml for information about the software

According to Dr. Abumosa: "I purchased the software last year and started training on it . Readings in *Mathematics Teacher* (NCTM) led me to use the software to explore new math ideas for both math and math education. This software is dynamic. It enables the user to measure length, area, etc…, it enables construction of geometric objects based on the idea of the father and child, so it gives the mathematician, the math teacher and students an opportunity to discover new concepts in mathematics and employ new techniques in teaching geometry."

Editor's Note: This is a useful exploration of the learning value of Podcasts. Hopefully, research will be expanded in the near future to provide specific data to guide instructional designers and teachers in the most productive ways to use this medium.

Students' Perceptions of Podcasts in the Classroom

Ray Pastore

USA

Abstract

In the last few years there has been a rapid increase in the popularity of podcasting. Educators have been enthusiastic to embrace this technology, which is quickly becoming a part of many classrooms. However, we have yet to understand how students view this technology and if they are willing to accept it into their curriculum. As a result, this paper aims to describe the results of a survey intended to discover college students' perceptions of podcasting in the classroom environment. Looking at students' perspectives helped uncover potential benefits and drawbacks to podcasting and led to recommendations for its use and implementation. Results of the survey revealed that students perceive podcasts as a valuable supplement to classroom material. Furthermore, it was found that students do not prefer podcasts to lectures, which suggests that while podcasts can aid student learning, they are not viewed as a replacement for classroom lectures and instruction.

Keywords: Audio, Audio Integration, Perceptions of Podcasting, Perceptions of Auditory Instruction, Mp3, Podcasting, Podcast, Podcasting in the Classroom, Technology in the Cassroom, Advantages of Podcasting

Introduction

As our society moves toward the digital age we are exploring new technological trends that will make our classrooms more efficient. In the last few years, one such trend, podcasting, has become one of the latest technologies being embraced by the American public. A survey conducted by Bridge Ratings in August of 2006 revealed that 6.3 million Americans had listened to or downloaded a podcast and projected this number would increase to 21.7 million by 2010 (Bridge Ratings, 2006). As a result, many educators have become intrigued and motivated to adopt this technology with hopes of implementing it into their classrooms (Descy, 2005). Although the education system is eager to accept this technology, its use, application, and role in the classroom has yet to be explored. This indicates that its use is currently based on trial and error techniques (Dennen, 2005). This has created a need for educators to understand the role that this technology has in the classroom for students and learning so that recommendations on its implementation can be made (Campbell, 2005). In light of this, Brown and Green (2007) have stated, "As with the advent of film, radio, television, and computer networks, educators are faced with an exciting new medium that seems to hold tremendous potential for instruction. Determining how best to exploit this new medium's strengths is no easy feat." (p. 4). Thus, there is a need for research on the use of podcasts in the classroom environment. For that reason, it is the expectation of this paper to add to the literature on podcasting by describing a survey which sought to discover how students perceive this technology in order to reveal what they recognize as its strengths and weaknesses.

What is Podcasting?

The term podcast originally referred to a digital audio file (Pastore and Pastore 2007; Lucking, Purcell, and Christmann, 2006), but has more recently been given several different media

contexts, which include: stand alone audio, video/animation and audio, and static images and audio. These media files are mobile digital files that can be used on multiple devices such as personal computers and mp3 players. The mp3 player, which was designed to play podcasts, has become a popular and common technology, one such example being Apple's iPod. In fact, most cell phones, PDAs, and even cameras have the ability to play podcasts. In addition, the cost of these devices has become relatively inexpensive, leading to greater use. This has caused a dramatic increase in podcast use for people of all ages. This popularity has sparked the interest of both schools and corporations to the effect that it is becoming common and it is expected to find podcasts as part of college courses or on corporate and news websites (Castelluccio, 2006). Nonetheless, the following questions have yet to be answered: Are educators using podcasts appropriately? Are students accepting and welcoming this method of lecture and/or content delivery?

Since podcasting technology has become so popular in and out of the classroom, its role may be as great as its promoters have led us to believe. This increase in popularity is mainly due to its shared similarities to online and distance learning, such as convenience, ease of use, and accessibility (Newberry, 2001). In the 1990's when internet technology took the world by storm, the use of audio computer technology was still new and received little attention because most personal computers couldn't process the large files (Essec, 2006). This also inhibited their online presence as most users were still using dial-up internet connections. As technology has progressed, these inconveniences have diminished. The technology used to create sound files is now standard on most computers and internet speeds have drastically increased to the point that podcasts can be downloaded in seconds.

Nonetheless, this increase has generated a push to use this technology within our classrooms without fully understanding its impacts on students and learning. Evans (2008) states, "Whilst podcasting is being utilized as a teaching tool by some educators in the secondary sector, its use in higher education, and its effectiveness as a learning tool for adults, remains to be established." (p. 491). This has created a need to understand this phenomenon and leads to many questions on its appropriate use and implementation. Since the technology has become so readily available and easy to use, educators are implementing and using podcasts as part of their curriculum. Podcasting is also being used by our students' everyday within their daily lives. With this increase in use and popularity, we have not yet explored the impact this form of mobile technology is having on learning or asked students how they feel about podcasts as part of their curriculum. Therefore, in order to understand the effects of podcasting on learning, it is important to first examine the literature on auditory instruction and multimedia to understand how and why students learn from podcasts.

Podcasts and Learning

Podcasts are currently being used in education as a tool to enhance the learning environment. It is important to understand how podcasts are interpreted and processed by students to understand how this learning occurs. Auditory information processing is recognized as being comprised of three stages or levels, which are referred to as echoic, working or short-term, and long-term memory (Baddeley, 1998). When students first hear a podcast, it enters the echoic memory stage, which is an initial encoding stage where information is interpreted and transferred to working memory where it will be used. Baddeley (1992) describes working memory as a "…system that provides temporary storage and manipulation of the information necessary for such complex cognitive tasks as language comprehension, learning, and reasoning" (p. 556). Thus, when auditory information enters the working memory, it can be used as part of a current task or problem, discarded, or transferred to long-term memory. Working memory has been shown to be able to actively process around seven units (plus or minus two) of information (Miller, 1956). In

order for learners to remember audio information presented it must be stored in their long-term memory (LTM). This has been described as memory that has an unlimited capacity for information storage. As a result, it is important to examine successful implementation strategies that have been used to promote learning and achievement in students presented with auditory content.

Past research has demonstrated that audio is an effective learning tool (Veronikas and Maushak, 2005; Mayer and Anderson, 1992; Brunken, Plass, and Leutner, 2004; Kalyuda, Chandler, and Sweller, 1999) and that practice using audio as a learning tool leads to greater comprehension (Voor and Miller, 1965). However, audio is usually seen as most effective when it is complemented with visuals, which together reduce cognitive load and burden on working memory, producing a modality effect. This has been demonstrated in Paivio's Dual Code Theory (Paivio, 1991), which explains that there are two channels for processing information in working memory, verbal (text/narration), and visual (images/video/animation). Each of the channels is processed separately and can store a certain amount of information. When instruction is designed to complement these two channels there is a reduction in the amount of cognitive load placed on working memory. This increases the comprehension of material. The Dual Coding Theory has recently been adapted by Mayer (2001) in the Cognitive Theory of Multimedia which suggests that we have a dual modality processing system comprised of a visual (image/icons/graphs) and auditory (verbal/text/narration) channel, limited capacity in working memory for each channel, and that we engage in active processing to organize the information in each channel to put it into our long-term memory for automatic retrieval. Under the assumption of the dual coding theory, audio is processed separately from images in working memory and that when used to complement one another, will increase student learning and achievement. This was demonstrated by Moreno and Mayer (1999) in an experiment, which utilized 132 college students, and tested the modality effect and the spatial relationship of text and animations by comparing treatments which consisted of narration and animation, animation and close text, and animation and far text. The narration and animation treatment significantly outperformed the text and animation treatments in tests that measured verbal recall, matching ability, and transfer. Similar results were uncovered by Mayer, Dow, and Mayer (2003) who conducted an experiment with 52 college students to see if they would perform better on transfer and problem solving tasks when presented with auditory instruction and static images or textual instruction and static images. Post-test scores revealed that students performed significantly better when presented with auditory instruction and images than textual instruction and images. Tindall-Ford, Chandler, and Sweller (1997) reaffirmed these findings in a series of three experiments, which investigated the effects of audio-visual modes of instruction when compared to text-visual and visual-only treatments. In all three experiments, they found that the audio-visual modes were superior to the visual modes, which they suggested was due to a reduction in cognitive load as explained by the modality effect. They concluded that, "When students are faced with intellectually difficult material requiring mental integration between multiple sources of information, results suggest that mental integration may be easier if written information is transferred into an auditory form (p. 285). Koroghlanian and Klein (2004) uncovered similar findings in their study, which compared text and audio using animation and static based curriculum. They put 109 high school biology students into four treatments, which consisted of text-static illustration, audio-static illustration, text-animation, and audio-animation. The study produced no significant differences between the audio and textual treatments suggesting that audio is at least as effective as text.

These studies help demonstrate that the use of audio as a classroom tool has been investigated in the past and it has been shown to be at least as effective as other means of content delivery. Thus, we can conclude that audio has its place in education, has been shown to be an effective learning tool, and when complemented with visuals produces a modality effect that can increase comprehension. Therefore, since audio has been shown to be an effective classroom tool and the

use of podcasting has grown in popularity, it is important to understand how learners perceive this technology when it is implemented into their classrooms.

Method

A survey was developed to answer the following question: What are students' perceptions of podcasting as a classroom tool? It is hoped that this question will help us gain insight into podcasting use in the classroom and assist us in understanding what students perceive are its strengths and weaknesses. If we cannot understand how students perceive this technology then we will not be able to fully understand its value, which could lead to misconceptions and misuse of a powerful technology.

Participants

The participants in this survey consisted of two educational technology classes at Penn State University who were made up of undergraduate and graduate students enrolled in the department of education. These participants were chosen based on availability and because they were currently involved in classes that utilized podcasts. Participants in the study indicated they owned the following devices which had the ability to play podcasts and/or mp3 files: computers (93.8%), mp3 players (56.3%), cell phones (43.8%), and personal handheld devices (6.3%). The participants were students in a class that was given a podcasting assignment in order to introduce and familiarize them with podcasts in the classroom. This process began with a lesson on podcasting. During the initial lesson, students were presented with basic fundamental information on podcast use and development. Students were then given an assignment which entailed creating and publishing podcasts utilizing a free online website, www.podomatic.com. Students' podcasts were then published to a web blog (created during a previous assignment) on www.blogger.com. They were then asked to listen to, give feedback to, and critique several other peers' podcasts.

Materials and Procedures

The instrument used in this study was comprised of a survey, which consisted of nineteen questions aimed at discovering students' perceptions of podcasting in the classroom. The survey was structured using multiple-choice, Likert-scale, and open-ended questions. The multiple-choice questions sought to capture students' current and past use of podcasts. The Likert-scale questions utilized a 5-point scale ranging from strongly agree (1) to strongly disagree (5). They were aimed at uncovering students' perceptions of podasts in the classroom environment. A reliability analysis of the Likert-scale questions was completed and produced a Cronbach's Alpha of .687. The open-ended questions sought to uncover what the students perceived as the advantages, disadvantages, and the best use of podcasts as an educational tool.

The survey was distributed to each group electronically at the conclusion of the spring 2007 school year. A total of 16 surveys were completed and returned. The results were analyzed using descriptive statistical techniques.

Results

The instrument used in this study consisted of multiple-choice, likert-scale, and open-ended questions. Results of the multiple-choice analysis revealed that most students are not using this technology outside of the classroom. When students were asked if they knew what podcasts were prior to taking this class, 56% responded that they did not. When they were asked if they had ever used podcasts before this class, 86% responded no. This indicates that not only had most of the students not used podcasts prior to this course, over half of them were unsure what they were.

The Likert-scale questions consisted of six questions aimed at discovering students' perceptions towards the podcasting phenomenon. The six questions are displayed in Table 1.

Table 1

Likert-Scale Questions

Question	Mean	Standard Deviation
I feel that I can learn through podcasts	2.63	.88
I prefer podcasts to lectures	3.56	1.15
I would like class lectures to be available as podcasts	2.88	1.25
If class lectures were available as podcasts I would use them	2.5	1.31
I would like podcasts to be used more often in my classes	3.0	.96
I like listening to podcasts	2.94	.99

* - When determining the Mean: 1= Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree, 5=Strongly Disagree

A descriptive analysis revealed that 56% of the students felt that they could learn via podcasting. However, when asked if they preferred podcasts to lectures, 69% either disagreed or strongly disagreed indicating that students do not see podcasts as a means to replace classroom lecture. Half of the students revealed that they would like to see lectures be made available as podcasts and that they would like to see them used more often in the classroom. In addition, half of the participants indicated that they enjoyed listening to podcasts. These results suggest that while students believe they can learn from podcasts, they do not view them as a replacement to lectures and class discussions. Nonetheless, they do believe that podcasts would be useful as a supplemental lecture tool and would like to see them being implemented into classroom settings more often. Results from the open-ended responses uncovered similar responses.

Responses from the open-ended questions were coded and analyzed. The most common response students provided, when asked about the advantages to podcasting, was that they were an asynchronous means of content delivery, meaning they could be used anywhere and anytime. Example responses included: "*The flexibility of time*" and "*can be obtained after the class is over as a future reference*". Students were intrigued by the idea that they could go back and listen to a part of a lecture. This was reiterated when students were asked about the best use of podcasting, which they suggested was as a supplemental lecture and content delivery tool. An example response includes: "*As a supplement to teaching lecture, or something that can be used to review lecture to pick up missed notes*". When asked about the disadvantages of podcasting, students responded that they did not like the fact that podcasts were not interactive. They indicated that if they had a question, they couldn't stop and ask for help. Example responses included: "*A podcast doesn't have the interactivity of having an actual teacher at your disposal*" and "*Not very interactive between students and the teacher*".

Discussion and Conclusions

Given the increase in use and interest of podcasting in education, this survey sought to reveal college students' perceptions of this technology in the classroom environment. This perspective helped to make known what students see as the potential strengths and weaknesses of podcasting and can help guide educators who plan to implement this technology into their curriculum. This survey revealed that most students had never used a podcast prior to the educational technology course and that over half of the students surveyed had been unsure what one was. Based on this notion, it is clear that podcast use is not as widespread in education as previously thought. Although this finding was not expected, it could be caused by the sample selected for this study, which only represents two educational technology classes at one university and did not take age,

gender, or learning style into consideration. Therefore the results cannot be generalized to other programs, disciplines, or universities.

It was also discovered that students view podcasts as a valuable learning tool and as a means to enhance the learning process when used as a supplemental lecture tool. This is inline with Copley (2007) who found that both undergraduate and graduate students enjoyed listening to podcasts and wanted to see more classroom materials be made available in podcast format. Thus, it appears that students enjoy listening to and having access to course materials in podcast format, which could be due to the nature of a their flexibility, meaning that students can use them asynchronously, anywhere, anytime, and on multiple devices. If used in this capacity, students have the opportunity to use this technology to aid their learning experience. However, it was discovered that students do not prefer podcasts to lectures. They explained that they dislike how one cannot interact with a podcast as one can with a professor. Therefore, it is not recommended that podcasts be used to replace lectures as they do not give students the ability to interact with the instructor and peers. This should help ease fears that students would stop going to class if lectures were offered via podcast. Similar findings were uncovered by Lyles Robertson, Mangino, and Cox (2007) who conducted a study with 68 undergraduate students and found that students liked having class materials be made available as podcasts and that they would not stop going to class if they were made available as lectures. For that reason, it is clear that students appreciate the advantages offered in classroom discussion and that they generally would use podcasts to enhance their learning and understanding of material.

Future Research

Future research should be geared towards learners of different age groups and academic levels including K-12, undergraduate, and graduate students in order to compare differences in their perceptions and experiences with podcasts. In addition to age and academic level, variables such as learning style and gender should be taken into consideration as they could influence students' perceptions and use of this technology. Furthermore, research should also include multiple disciplines from multiple universities in order to be able to generalize to a larger demographic population. This could help provide insight into different ways that podcasts are being utilized across schools and universities by highlighting its successes and failures. Additionally, future studies should examine instructor perceptions, uses, and experiences with this technology. This may help uncover some of the reasons for the low use of podcasting in the classroom environment as found in this survey and help us to understand the best uses for this technology.

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