

THE EFFECT OF E-CONTENT BASED ON EACH DOMAIN OF MULTIPLE INTELLIGENCES ON LEARNING IN BLENDED-LEARNING

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ABSTRACT

This study aimed to show the impact of learning strategies based on each multiple intelligences domain (analytical, introspective and interactive) on learning in blended learning. Thirty third-year computer science students in vocational high schools in Isfahan were randomly assigned to experimental and control groups (15 in each). The previous semester Average scores and multiple intelligences profiles were measured and were similar in both groups. Two groups were trained in 4 sessions (each 70 minutes) in the way of blended learning. In addition, the experimental group used an electronic content based on multiple intelligences. The Pre-test and the post-test (before and after training) were the same in both groups. The Data were analyzed using SPSS-19 software by Chi-square test and independent samples t-test. The independent samples t-test on addend scores meaningfully shows more learning achievements for students who used E-Content based on multiple intelligences in introspective domain ($P=0.014$).

KEYWORDS

Multiple intelligences, Blended Learning, E-Learning, E-Content

1. INTRODUCTION

Howard Gardner, a well-known psychologist, in 1983 categorizes the different ways of learning in a method called Multiple Intelligences include linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, interpersonal, and intrapersonal [1] after a while he added natural and Existential intelligences to this collection [2].

He makes a map of human's abilities by grouping them into the eight comprehensive categories [3]. It is important, for any teacher, to release the Intelligence type of students and adopt teaching plan to student's individual learning styles. Gardner described these intelligences as follows:

Linguistic: The Ability to understand and use spoken and written text effectively

Logical-mathematical:The capacity to understand and use logic and numerical symbols and operations effectively

Musical:The Ability to perceive, understand, transform, and express musical forms

Spatial:The capacity to perceive and manipulate three-dimensional space accurately

Bodily-kinesthetic:The capacity to coordinate physical movement to express ideas and feelings and to produce or transform things using hands.

Naturalistic:The Ability to recognize and categorize objects or species in nature

Interpersonal:The Ability to understand and interact well with other people and influence a group of people to follow a certain line of action

Intrapersonal: Ability to understand and use one's thoughts, feelings, preferences, and interests and act adaptively on the basis of self-knowledge

Existential:The Ability to think phenomena or questions related to universal existence, such as the infinite and infinitesimal. They need to see "the big picture" in order to learn details.[3][4][5].

To implement the theory of multiple intelligences, we must translate the teaching material, from one intelligence to the languages of other intelligences [3].

In recent years, with the development of technology, terms like e-learning, distance learning, blended learning and virtual training are more commonly used. In addition, the concept of e-learning as a learning method against or in combination with the traditional learning is proposed.

E-learning refers to all kinds of electronically supported learning and training include CBT (Computer-Based Training), WBT (Web-Based Training). CBTs are commonly presented via CD-ROM, while WBTs are presented via the Internet[6].

The traditional learning is combined with e-learning to create an optimum training program named blended learning [7]. It provides a solution to adopting learning to the needs of individuals and integrates advantages of e-learning and traditional learning. So, blended learning is a mix of face to face learning, in traditional classroom, with:

- Multimedia technology
- CD ROM video streaming
- Virtual classrooms
- Voicemail, email and conference calls
- Online text animation and video-streaming[8]

In fact, Blended Learning (BL) has the positive aspects of the online activities and face to face environment [9].

We know that everyone is different and recognizing these individual differences is necessary to have an effective learning. Blended learning provides a wide range of learning solutions, so it is a great opportunity to make a diverse and individual-oriented learning as a full learning[10][8].

We can use advantages of the e-learning Environment to design learning curriculum based on these eight kinds of intelligence. David Lazear suggests a "Multiple intelligence technology toolbox" to design a rich e-learning environment, as follows:

Table 1.The Lazear "Multiple intelligence technology toolbox" (taken from yi donga,[10])

Intelligences types	The design strategy of e-Learning environment
Linguistic	1. Providing text resources
	2. Using of video on demand technology ,provide video and audio
	3. Providing the opportunity to dictation
	4. Through via voice chat rooms ,or OICQ debating and communicating on the exchange of voice
	5. Through electronic forums, E-Mail, chat rooms, virtual classrooms, OICQ, etc. to discuss and exchange Comments
	6. Students tell stories to the students or lecture
	7. Using network to Collect resources
	8. Providing read aloud opportunities
	9. Using Microsoft Word software for writing, keep a diary
	10. Providing With CD-ROM, interactive books, e-books
Logical	1.Using concrete steps, computing processes, methods, formulas and equations to solve problems
	2.Use sign language to understand and exchange, sorting the logical order of things
	3. Using the database to overview and organization a variety of information
	4. Use spreadsheet programs (such as Excel)to process and analysis data for some subject
	5. Using the data model represents the relationship between things
	6. Searching and analyzing for the required network resources
	7. Using the programming language programming
	8. Setting out appropriate procedures to solve the problem
	9. On an issue in logical deductive reasoning
	10. Participating in the network math games
Spatial	1. Using charts, diagrams or photographs to support the textual representation
	2. Using visual outline, concept mapping, mind mapping, clustering, or thinking depicted [3] records of learning content
	3. Express the meaning implied in graphics or images
	4. Creating abstract graphics and patterns to reflect the relationship of the different concepts, ideas or methods
	5. Designing charts, concepts, ideas and methods of learning
	6. Using PhotoShop to create and edit photos , using web processing to produce web pages
	7. Using animation and video media to characterize learning content
	8. Making full use of color to emphasize on learning content
	9. Changing the shape or the size of the graphic, and improving their memory from the visual attention
	10. Using animation software, video editing software, and computer-aided design software to create
Musical	1. Show learning materials, provide background music
	2. Through the music to create a pleasant atmosphere, relax, inspire, focus and achieve the transition

	3. Play music, ask students to concept f the screen through the music
	4. Play music so that students take the initiative to construct listening
	5. Spell the word through music
	6. Learn to read through music
	7. use computer software to do music composition
	8. use music and sound production and editing software (such as Sound Maker) to edit sound
	9. Sing the song in Concert with the title of studying
	10. Provide through poetry, song lyrics to carry out learning opportunities
Bodily-kinesthetic	1. creating virtual reality environment, giving students the opportunity to simulate the operation
	2. Provide a virtual laboratory for students to conduct virtual experiments by computer
	3. The establishment of a variety of interactive navigation methods to enable students to learn through the operation
	4. According to learning content design needs keyboard, mouse, joystick or other device of the game
Interpersonal	1. Through the network to carry out distance learning courses
	2. through OICQ ,chat rooms or E-mail to communicate
	3. Holding an online forum
	4. The use of video conferencing systems to communicate and discuss
	5. Simulating games, using software or games need to work together
	6. Organizing cooperative learning with others in the group to study a topic
	7. Playing different roles in the virtual community to, express their understanding, empathy training from themselves points of view or life experiences .
	8. accepting others opinions or responding to others performance or views
	9. predict the emotion or experience of people in a particular scenario
	10. Concerned about the relationship between people and how to improve this relationship
intrapersonal	1. Students choose learning contents and self-paced
	2. enable students to learn independently
	3. help students set goals and provide feedback
	4. Using a variety of scales for detect themselves
	5. The use of blog which enable students to learn to write diaries, records, or reflective thinking diary
	6. Provide only one person to do or to encourage independent learning computer games or programs
	7. enable students to describe their own thought processes
	8. provide an opportunity to students with a particular subject to express personal feelings and ideas
	9. ask students to use different ways of thinking to solve different problems
	10. provide material about the personal reality life for students to consider and choose
Naturalistic	1. Provide the image of a real response to the natural environment for students

	2. Provide students with video information of a real response to the operation of natural
	3. Provide the natural world, weather, animals, sounds, etc
	4. The use of multimedia information simulated such as natural environment, animal behavior, weather conditions, geographical features
	5. The use of virtual technology virtual field nature study (such as the surface of the moon, etc.)
	6. Using web search to research or to learn more about natural phenomena
	7. Understand the natural phenomena of the data organization, mapping or through a computer program for analysis
	8. Visit Online Zoo and Botanical Gardens
	9. Students through the computer simulation of nature paintings
	10. The full network of abundant resources provide students with a variety of natural landscapes to explore the natural opportunities. Such as conducting "Man and Nature" as its theme Learning Web-quest

Walter McKenzie suggested 3 intelligences domains as Figure (1). He organized logical, musical and naturalistic intelligences as analytic domain because they are exploratory processes and they essentially develop the process of analyzing and incorporating data into existing schema.

The interactive domain includes verbal, interpersonal, and kinesthetic intelligences that generally used by learners to express themselves and discover their environment.

The introspective domain includes existential, intrapersonal and spatial intelligences that have a distinctly affective component to them. Mackenzie emphasized on a balance between these three domains in instructional design [11].

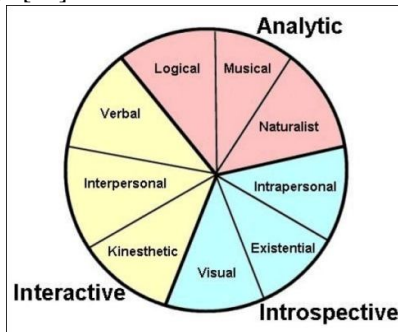


Figure 1. multiple intelligences domains(taken from:McKenzie, [11])

1.1. LITERATURE REVIEW

There are so many studies on the effectiveness of teaching methods based on Gardner's multiple intelligences:

Based on research of Avila [12] and Pahuski (1999) [12], instructional strategies based on Gardner's theory to learn academic language skills meaningfully increased the learning achievement of students who have difficulty in learning language skills. Xie, Lin (2009) [13] and Abdi & et al (2011) [14] also in their research said that using the theory of multiple intelligences in teaching, lead to higher academic achievement. Niroom, et al (2011) [15] believed that educational methods based on the theory of multiple intelligences, meaningfully increased math academic

achievement of students with low logical intelligence, but there was no significant difference in other students. The results of Rahimi's [16] research (2011) showed a higher reading ability for students with a higher level of linguistic intelligence than those who had a lower level of this intelligence. Moreover, the results indicated that linguistic intelligence is a relatively strong predictor of reading performance, accounting for more than 40% of the variance observed in the students' performance on the reading comprehension test. The results of Razmjoo's [17] research (2008) on the Iranian learners, revealed no significant relationship between multiple intelligences and English language proficiency. According to Johnson's literature (2007) [18], implementation of multiple intelligences theory in teaching significantly increased students' achievement in all areas of the core curriculum. In the field of e-learning, Hassan (2009) [19] performed a research to explore the reaction of learners to CBL material based on different learning styles and compared between pre and post test scores and these scores were broken down by learning styles and experimental and control groups and found no significant relationship between academic achievements and either learning styles or experimental and control groups.

But, only a few researches were performed on multiple intelligences learning strategies in electronic or blended learning and their effects.

1.2. RESEARCH QUESTIONS

In this study, we have following three research questions:

Would the use of e-content designed based on the analytical intelligences domain, increase the learning achievement of the students, in blended learning?

Would the use of e-content designed based on the introspective intelligences domain, increase the learning achievement of the students, in blended learning?

Would the use of e-content designed based on the interactive intelligences domain, increase the learning achievement of the students, in blended learning?

2. METHODS:

This study aimed to show the impact of learning strategies based on each multiple intelligences domain (analytical, introspective and interactive) on learning in blended learning. The participants for this study were female third graders computer science students (N=30) at a public vocational high school in Isfahan. They were randomly divided into two groups, an experimental group (N=15) and a control group (N=15).

Multiple intelligences profiles were measured in two groups by Mackenzie questionnaire [20] with 80 items, before investigation. Also, the previous semester average scores of all students were measured. A researcher made a multiple choice test designed in 3 parts (each part related to teaching content based on one of the domains) as the pre-test and the post-test. The pre-test was performed in both groups and then both groups were trained in a blended learning environment by the same teacher, in the same lesson, using the same textbook, in the same time for 4 sessions (each 70 minutes). In addition, the experimental group used an electronic content based on multiple intelligences theory. This e-content was made in three parts (each part designed based on one of the multiple intelligences domains) and was shared via network in the classroom. For making this e-content, the researcher used Lazear "Multiple intelligence technology toolbox" (table 2), regardless of the implementation of the Existential intelligence, because of the lack of sufficient

information about it. A week after the learning process, the same test was performed in both groups (as a post- test) and then, the addend scores in academic achievement for students who taught with each method, was calculated. Data analyses were performed using SPSS-19 software. The researcher used a chi-square test to check consistency of two groups in terms of age, multiple intelligences profiles;and used a t-test analysis for non-independent samples to comparing the addend scores.

3. RESULTS

In this study, the mean and the Standard deviation of age in the experimental group was 17.2 ± 0.56 and in the control group was 17.13 ± 0.35 . There was no significant difference between the groups in terms of age ($t = -0.699$, $p = 0.035$). The mean of previous semester Average scores and the standard deviation of the experimental group was 15.61 ± 1.5 and in the control group was 15.76 ± 1.6 . There was no significant difference between the groups in terms the mean of previous semester Average scores ($t = -0.254$, $p = 0.802$) and all participants were female.

The results in Table (1) show that in both groups, the most frequent intelligences are interpersonal intelligence and then spatial intelligence.

Table 2. The number and frequency of people with any intelligence, in two groups

Intelligence type	the experimental group count (Percent)	the control group count (Percent)
Intrapersonal	9(60%)	7(46.7)
Bodily- Kinesthetic	1(6.7)	0(0%)
Spatial	4(26.7)	4(26.7)
Logical	0(0%)	1(6.7)
Musical	1(6.7)	2(13.3)
Multiple	0(0%)	1(6.7)

According to table (3), the intelligences of the two groups were significantly not different ($p < 0.05$).

Table 3. The Comparison of two groups in term of multiple intelligence, using chi-square test

value	df	p
3.583	5	0.611

The comparison of mean scores in two groups reveals that before the experiment, control group's scores were higher than experimental group, while after the experiment, control group's scores were less than experimental group. The comparison of addend scores shows that the addend scores of the experimental group, who used e-content based on introspective intelligences domain, significantly ($p < 0.05$) higher than the addend scores of the control group (table 4).

This comparison in analytical domain shows that in this method, that pre-test and post test scores of control group were higher than experimental group. The comparison of addend scores shows that they were significantly not different ($p < 0.05$) and this method had no effect on learning achievements (table 4).

This comparison in interactive domain reveals that in this method, the pre-test and the post test scores of the experimental group were higher than the control group. The comparison of addend scores shows that they were significantly not different ($p < 0.05$) and this method had no effect on learning achievements (table 4).

Table 4. The comparison of mean of addend scores in two groups

Intelligences Domain	Group	Pre-Test Scores	Post-Test Scores	Addend Scores	t	P
analytical	Experimental	4.93±1.44	5.6±1.40	0.67±1.54	-0.101	0.921
	Control	4.6±1.50	5.33±1.80	0.73±2.05		
introspective	Experimental	4.2±1.52	7.13±1.30	3.07±1.58	2.614	0.014
	Control	4.6±1.68	5.80±2.21	1.47±1.77		
interactive	Experimental	3.47±2.36	5.07±1.94	1.6±2.38	.0169	0.867
	Control	4.67±1.92	6.13±1.96	1.47±1.92		

4. CONCLUSION

This study aimed to show the impact of learning strategies based on each multiple intelligences domain (analytical, introspective and interactive) on learning in blended learning. According to the results, the study groups were not significantly different in terms of gender, age, last previous semester Average scores and multiple intelligences profiles. The results of this study reveal that learning strategies based on introspective intelligences domain, has been effective to increase learning, in blended learning.

These findings in introspective intelligences domain are consistent with the results of researches conducted by Avila(1999), Niroo(2011), Xie(2009), Johnson(2007) and Abdi(2011) those researches were performed in face to face learning method, while this study conducted in blending learning method. This study shows that the results be generalized, and e-content designed based on Gardner's theory can improve the learning achievements in blended learning. The success of introspective domain can be due to dominance of intelligences within this domain (intrapersonal and spatial) in participants in this study and diversity of the visual tools in e-learning environment.

According to the results of this study, the blended Learning strategies based on analytical and interactive domain were not effective to increasing learning achievements. These findings are inconsistent with the findings of previous studies that mentioned above. Weaknesses of e-learning tools in creating desirable interact can be a good reason for failure of e-content designed based on interactive domain in blended learning.

Similar studies on other groups of learners with different characteristics are suggested. It is recommended to use the Learning strategies based on the theory of multiple intelligences, especially intrapersonal and spatial intelligences, to designing the e-content.

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