



The Effect Of Electronic-Homework (E-Homework) On Learning Of Field Dependent And Field Independent Learners' With Cognitive Style

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Abstract: *Given the growth of technology ending in the emergence of smart schools in educational systems, the study improvement and extension of innovative teaching methods are of great importance. Thus, this paper studies the effect of doing e-homework on learning of learners with field dependent and independent learning styles in a semi-experimental design with pre-test and post-test, which is the purpose of this paper. The sample of this paper consists of 76 students from vocational schools of Tehran 15th District, who are non-randomly assigned (in two groups of 38 as experimental and control groups). This study examined the performance of both groups in one subject before and after training through pre-test and post-test using a researcher-made test. To determine the cognitive style, students are asked to respond to Witkin Group Embedded Figures Test (GEFT). Both groups are exposed to the same education with the difference that the students of the experimental group - in contrast to the control group - did their homework electronically. As a result, statistical analysis of data - performed using the mean differences and covariance analysis - showed that doing the homework electronically enhanced learning of field independent learners more than the ones field dependent learning style.*

Keywords: *E-homework, cognitive style, learning*

INTRODUCTION

The questions of what process has learning and what conditions could cause that learning have always been of interest to psychologists and thinkers of education. Furthermore, teachers who play a key role in learning always seek solutions to increase and deepen learning (Shayan, S, 2009).

One of the topics that besides meta-cognitive concepts have a great effect on learning is learning style. Learning style is not the same; it is the preferred method of learning of each person. This term was first used by Herb Talan in 1954 (Emamipour. S et al., 2007).

One of the factors affecting learning among students is that each individual uses his own learning style to get a desirable level of learning that needs to be distinguished from other students and their learning styles. They paid attention.

Researchers found that people have their unique styles while learning. Learning style is a different concept of learning abilities. In fact, learning style can be seen as the person's preference in the learning process.

Based on Hohen's classification, various learning styles hold three significant spheres: physiological styles, emotional styles, and cognitive styles.

Studies conducted in psychology of cognition show that individuals have important cognitive issues helping them decide and solve problems. Cognition in each person has different backgrounds and aspects, and one of these dimensions is the cognitive styles that have a special place in this classification.

Among the learning styles, cognitive learning style has been more of researchers' interest. Theories and models of learning and cognitive styles are increasing.

In his paper, Karimi (Karimi Y, 2012) categorized the variety of cognitive learning styles as follows:

- Field-dependent learning (or holistic) and field-independent (or analytical) learning style
- Impulsive and reflective learning styles
- Surface and deep learning styles

Intuitive, visual-verbal, action-reflective and stage-general environmental styles

- Converging, diverging, assimilating and accommodating (Kleeb's Learning Style).

The field-dependent and independent cognitive styles are of the most well-known cognitive styles Witkin presented for the first time. He believed that the perceptive judgments of some people are affected by the field while not affected the little of the other people. General-analytical concepts are synonymous with this style today (Riding, R et al., 1991).

In a study entitled "Comparing the effect of two teaching methods on the academic achievement of female students with different cognitive styles (field dependent and independent), the results showed similar effects of different teaching methods (problem solving and lecture) on students' cognitive style scores. In this study, it was found that the problem solving method does not affect the academic achievement of the experimental group with different cognitive styles (dependent and independent of the field) (Azadi M, 2008).

The rapid growth of information and communication technology (ICT) has made changes to the uses and processes associated with the diverse education phenomenon (Mossman, et al., 2010). This technology plays a key role in education (Tender j, 2006). The readiness and attendance of teachers in the age of ICT is essential for the training of students who can play an important role in this era (Garrison D et al., 2003). Thus, this companionship should be in all spheres of the educational system. The interest of students at this age has evolved with the emergence of more electronic technology, so all the things related to education and learning should be strengthened in the light of update technologies (Najjarian F, 2001).

In general, E-learning means the use of electronic systems such as computers, the Internet, multimedia discs, electronic publications, virtual newsletters, and so on in distance learning to reduce commuting and save time and money while learning better and easier. The goal of e-learning is to run appropriate training methods using tools and systems, hardware, and so on that deals with many of the educational problems and issues. These include the elimination of time and space, making education public and global, the use and transfer of knowledge and training from real-world environments to virtual and unrealistic environments. This issue is also important in the field of public education and can be used as a leverage to empower individuals to address illiteracy or improve education (Abdullahi M, 2011).

In a study on high school students, (Lee S, 2012) studied the effect of online homework and concluded that with the support of the teacher, learners are encouraged to solve problems independently. In this paper, educational design and the use of educational technology are presented as a learning scaffold.

(Adib Y et al., 2012) examined the relation between cognitive styles (field dependent and independent) and their learning and study methods among the female students of the third grade of the high schools in Tabriz. The results showed a direct and weak relationship between cognitive styles and students' learning styles. Another result of the study was that the study and learning methods differ between students of different disciplines; the highest rate of application of study methods was among students in mathematical and experimental fields, and the least amount of learning and study were among students of humanities.

Since giving homework is one of the important aspects of the education system considering the developing and diverse learning environments at home and the lack of interest in training and repetition of the lessons learned through homework assignments electronically and the right selection of students' cognitive learning skills are of special importance and seem to be unnecessary.

In each period, in accordance with the perception of learning, the form and type of task were different. However today, with the definition of learning, there are expectations beyond its reach. The views of contemporary experts on classroom teaching affected the philosophy and educational methods popular for centuries. For many years, retention was considered as the only type of task and even learning and as a result, the same insight attributed academic failure to students' inability rather than to educational methods. One of the factors contributing to the emergence of new approaches to education was the recognition of the importance of activating the student. Most contemporary insights pay attention to stimulate the power of initiative and universal accountability in learning and emphasize student's best and most efficient use out of school for learning (Najjarian F, 2001). Thus, studying the effect of e-homework on learner learning with field dependent and independent cognitive styles is of important innovations of this paper.

Problem statement

This paper has a hypothesis as follows:

“The effect of doing e-homework is different on learners with field dependent and independent cognitive styles.”

Moreover, the variables of the study are:

Independent variable: homework (electronic and traditional)

Dependent variable: learning

Control variable: gender and academic grade

Moderating variable: cognitive style (field dependent and independent)

Conceptual definition of field dependent (FD) cognitive style: FD individuals have a holistic view, look at patterns and models as a whole, and have problems in separating and analyzing specific aspects of a situation or pattern. These individuals need defined external goals and need to have organized arrangements (Wolfowlack, 1995).

Conceptual definition of field independent (FID) cognitive style: FID individuals can easily understand separate components of a general pattern and analyze a particular pattern according to its components. They are interested in numerical and empirical sciences and problem solving assignments (Witkin H et al., 1981).

The operational definition of FD learning style: the scores obtained from the implementation of GEFT range from 0 to 18 in this test with 0 meaning completely dependent on the field and 18 completely independent of the field.

Conceptual definition of homework: it is a task that teacher gives to students in non-school hours.

Operational definition of the electronic homework: electronic homework is the activity that the teacher, according to the lessons learned, wants the students to use their computer and ability in various formats (educational poster design, website design, electronic content production, content presentation, PowerPoint and so on) and do deliver to the teacher in person or in from distance (via email).

The present study was applied considering its purpose and nature and quasi-experimental in terms of method carried out through a pre-test and post-test design by a control group. The learning of both experimental and control groups was compared with two different methods of doing homework (electronic and conventional). Moreover, learning of students with FD and FID cognitive styles was compared with the learning of students who are not familiar with the field under the influence of two methods of doing assignments.

Population of the study was all female students of the second grade of vocational school at District 15 of Tehran in academic year 2014-2015. According to the report by Education of District 15, they were 1,200 people.

Due to the lack of cooperation of managers and timely implementation of the stages of graphic design curriculum training, the selection of the sample of this research was not possible as completely random, so the sample of this study was selected among the vocational conservatories of District 15 - four schools with sufficient computer and Internet facilities for conducting research. This research was conducted among the second grade students of the mentioned conservatories, which consisted of two with 38 subjects in each class.

In this study, the reliability coefficient was 0.85 with test retest method and with Cronbach's alpha was 0.87. In the present study, the coefficient of internal consistency was 0.697 showing the proper internal consistency of this test.

Methods

Witkin's Group Embedded Figures Test (GEFT) was first used to determine the type of student's learning style and their field dependent and independent style of learning. An important point in this test implementation was that before it, the main sections of the test were necessary to provide guidance to the subjects to complete it. In doing so, at first, two exercises were presented along with instructions where the students were asked to pay attention to the examples provided. Moreover, general instructions were given to the subjects to complete the main sections of the test, which was read aloud by the researcher for further attention. Then, according to the results of this test, students' learning styles were identified in two levels of dependent and independent. Then, to carry out the next steps in the implementation of the research, a pre-test was initially given to both groups to determine the level of familiarity and field dependence and independence of the learners by graphic design of the lessons (Photoshop). FD individuals were placed in a class, and FID were placed in another class. Students of FD and FID groups were divided into two groups and randomly assigned into two experimental and control groups. In pre-test, the questions were conducted as computerized and traditional (dependents in the test and control group) and the class (independents in the test and control group). Finally, the mean score of the test implementation for the control and experimental groups in the pretest was investigated. In the next step, in the dependent style class, for the experimental group, the Photoshop lesson was conducted with the electronic learning method and the training for the control group was traditionally carried out. The same method was used for independent class, so the Photoshop lesson was presented electronically for the experimental group of FID and the traditional lessons were taught for the control group of FID style. The discussions needed to teach designing business cards and posters taught based on the textbook of knowledge work students. The learners were trained in the skills of creating a business card, posters and restoration and retouching photos. Here, the main Photoshop environment was introduced, and then the graphic file storage templates, working with the tools in the toolbox, the Photoshop menus, the color mods and channels, the design filters, and the various palettes were taught. In each session, one part of the design of the business card was done according to the materials taught by the learners, after a period of one semester (about 5 months) at the end of the semester with the aim of determining the amount of students' learning in both groups (dependent and independent) from the experimental and confirmatory test groups in an electronic

and traditional manner. Learners in the dependent class in the test group performed the test questions (homework) in an electronic and traditional manner, and the average of their grades was determined. In the control group, the homework test was performed in the electronic and traditional manner, and the average score obtained from the scores was calculated too. The post-test in independent group was also executed in the same way. Finally, the results were compared in terms of the difference between the mean scores of the groups in the test and the difference between the mean scores of the two groups in Witkin test. Moreover, the effect of doing e-homework on learner learning and doing non-electronic homework was compared (field dependent and independent) from both groups. The results of the experimental and control groups were compared and analyzed in both styles (dependent and independent) using SPSS software.

For statistical analysis of research data, descriptive statistics at the level of the central and peripheral indices (mean, median, mode, and standard deviations) and inferential statistics (mean difference test and covariance analysis).

Results

Given the mean scores in the experimental and control groups, it is seen in Table 1 that in the control group the post-test scores increased, whereas this increase is lower compared to the difference in the experimental group. Although this difference may be due to the training in the two groups, it may also be due to repetition effects. To study the effect of teaching method with e-homework, the covariance analysis test was performed and these changes were investigated.

The results of the implementation of the graphics academic achievement test in two groups of FID and FD in the pre-test and post-test stages, which are defined as mean and standard deviation, have been shown for each group as in Table 4-6.

A summary of descriptive results of pre-test and post-test scores in both experimental and control groups

	Pre-test		Post-test	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
FD style	9.06	1.862	18.39	2.913
FID style	11.56	1.617	20.67	3.597

Given the mean scores in FD and FID groups, it is observed that in both groups the post-test scores increased. This increase is expected given the difference in pre-test in the two groups. To study the difference between the two groups and the effectiveness of the t test, two independent groups were implemented and these changes were examined.

To conduct t test of the two independent groups, first we examine the main assumption of parametric tests, which is the normal distribution of the scores.

Summary of Shapiro–Wilk test of normal distribution of data

	Pre-test		Post-test	
	df	sig	df	sig
FD style	18	0.214	18	0.735
FID style	18	0.371	18	0.051

According to Shapiro–Wilk test results, it is seen that all sig values in the groups are greater than 0.05 and the results are insignificant. Thus, it can be concluded that the normal distribution assumption is not violated. Data distribution is normal and provides the context for use of parametric tests.

Given the studies conducted, data distribution is normal and provides the ground for use of parametric tests. To compare two cognitive styles, trained by e-homework method, t-test of two independent groups was performed and the results showed the homogeneity of variances in the two groups ($F = 1.118$, $sig = 0.298$), and the value of t was -2.088 , showing a significant difference between the two groups ($df = 34$ and $sig = 0.044$). After that, given the value of t and the following formula, the value of independent variable (cognitive styles on FD and FID levels) was calculated.

$$f^2 = \frac{t^2}{t^2 + (N1+N2-2)}$$

By placing t value in the formula, the effect size was calculated for the difference of cognitive styles 0.114. Based on the Cohen criterion, the effect size 0.41 is relatively large. Thus, the two cognitive styles have a significant difference. The level of learning was significantly more in cognitive style with FID compared with FD learning style in teaching method with e-homework. The results of the second hypothesis of the study confirmed the difference in learning between the two groups with dependent and independent cognitive styles.

One-way intergroup analysis of covariance was conducted to compare the effectiveness of the subjects participated in the Graphics classroom with e-homework learning and the control group trained with traditional method. Independent variable was the type of intervention (training with e-homework and traditional method), and the dependent variable was the grades of the test of academic achievement in the graphics course after the intervention. The grades of the test of academic achievement prior to the intervention were used as an integral part of this analysis. Initial studies were performed to ensure the non-violation of normative assumptions, linearity, homogeneity of variances, and homogeneity of regression slope. Except for the homogeneity of the regression slope, due to the robustness of the covariance analysis method, which could be ignored, the assumptions were not violated.

The results of the one-way intergroup analysis of covariance showed a statistically significant difference at the level of 0.005 between the two groups to compare the education with e-homework and the traditional method. Moreover, according to Partial eta Squared ($\eta^2=0.128$) obtained from training with e-homework was effective with great effect size. According to the results, the first hypothesis that doing e-homework increases learning more than the traditional learning tasks was confirmed.

T-test of two independent groups was used to compare the learning of two groups with dependent and independent cognitive styles trained with e-homework. The results ($t = -2.088$, $df=34$, and $sig= 0.044$) showed a significant difference between the two groups. Moreover, for cognitive styles, Partial eta Squared was calculated 0.114%, which is relatively a large effect size. Accordingly, the second hypothesis denoting that the differences in the learning of people with different cognitive styles were confirmed.

Discussion

The present study was quasi-experimental with a pre-test and post-test design with a control group. Prior to teaching, a pre-test of the students was taken to determine the effect of the experimental work. The statistical results showed that the participants had almost the same level of knowledge. This paper studied the effect of doing e-homework on learning of learners with field dependent and independent styles of learning. The sample of this paper was 76 female students of vocational schools of District 15 of Tehran, who were selected by convenient sampling method. For conducting the study, first, through a researcher-made pretest, a test was given both to the experimental and to the control group in the two cognitive styles (FD and FID) electronically and traditionally. The mean score of grades for each group was taken into account. Then, in the experimental group, each style was taught using e-teaching and the traditional teaching method in the control group. After teaching and doing homework, students from both classes in two cognitive styles (FD and FID), the final test was performed from the experimental and control group in an electronic and traditional way, and the average score for each group was considered. After the required research data were obtained, for statistical analysis of the research data at the level of descriptive statistics, the central and peripheral indices (mean, median, faces, and standard deviations) and the inferential statistics (mean difference test and Covariance analysis) were used.

The results of the study showed that e-homework is different for learning of learners with FD and FID styles. Another result was that e-homework had a greater impact on learners than traditional homework. According to the results, the research hypothesis, which was doing e-homework would increase learning more than the traditional homework, was confirmed.

According to the aforementioned and the results of the research hypothesis, one can state that although in Iran public schools do not have proper computer facilities for conducting electronic classes, if teachers can encourage students to use computer facilities in every step of their education and doing homework, an effective step can be taken in their learning development.

Many studies have confirmed the effectiveness of e-homework compared with traditional homework assignments in learning, for example:

The results of this study are consistent with the results of Sentma and Gage and Camp (Santema S et al., 2008). who showed that e-homework has a positive effect on learning more than any other types of learning assignments and this model has great effect on stimulating learning and studying of students.

On the other hand, the results of the present study were consistent with the results of (Lee S, 2012) in a study on high school students' where the impact of online homework assignments was examined and concluded that with teacher's support, learners are independently encouraged to solve problems and do the homework. The design of education and the use of educational technology in this research was discussed as a learning scaffold.

Douglass(DouglassR, 2011) examined the effectiveness of electronic homework assignments and web-based homework assignments in enhancing mathematics learning at the University of England. In this study, there was a significant difference between those who did their based on computer or paper homework, with students who did their homework electronically showing a great development in learning mathematics.

Conclusion

As e-homework significantly increases learners' knowledge more than the traditional homework, research on the impact of e-homework seems essential. Considering the researcher's educational experiences and the observation of the difference between the e-homework and the traditional one and given the different cognitive styles of students in doing e-homework, where their learning can be influenced by their learning styles, this study examined the effect of e-learning on learning of the learners' with dependent/independent learning style (one of the most important learning styles). According to the results of the hypothesis, doing homework electronically would increase learning more than what traditional homework would do.

This research had some limitations including 1) limiting the population to female student, 2) restricting to conservatory level, and 3) non-random sample selection.

It is also possible to suggest the following areas to develop the research:

- 1) It is suggested that a study be conducted separating gender for girls and boys and with different subjects of the curriculum to finally compare the difference in learning of both sexes.
- 2) It is suggested that the degree of familiarity of the instructors of the vocational schools with how to provide e-homework in various forms, the work of electronic folders, which provides a showcase of all methods of teaching materials and training for learners be examined.

3) This study can be conducted with the help of design and testing tools in accordance with the objectives and nature of the electronic tests. The form of test can be done differently, and electronic tests can be designed with interactive questions with feedback for the whole test or single questions and multimedia features such as movie, picture, sound, animation and presentation designed to provide a brighter horizons for future studies.

In addition, the following suggestions can be put forward as applied suggestions.

1) Given the effect of the use of e-homework on the attractiveness of the course and the academic achievement of the learners and the practicality of its implementation in schools, it is suggested to the instructors to maximize the use of the methods in proportion to their syllabus and time.

2) It is suggested that an educational course be organized for these tasks to fully familiarize learners with e-assignments, both online and offline.

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