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Determining the Effectiveness of Distance Teaching Model Based on the Constructivism approach on Learning Performance, Satisfaction and Attitude of Payam-e- Noor University Students

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Abstract

The purpose of this study was to determine the effectiveness of web-based distance learning model in the context of a constructivist learning approach on learning performance, satisfaction and attitude of Sardasht Payam-e- Noor students. The research method was quasi-experimental with pretest and posttest design. The statistical population of the study included the students of Payam-e-Noor University of Sardasht from whom 45 people were selected as the research sample, using Morgan table and cluster sampling method. Of these, 15 students were assigned to conventional distance education group, 15 to the distance education group based on reproductive learning, and 15 to the project-based group. Data collection instruments included a teacher-made test to measure learning performance as well as a researcher-made satisfaction and attitude questionnaire. The content validity of the teacher-made test was reviewed and approved by some professors and its reliability measured through splitting method was 82% in pre-test and 85% in post-test using Spearman-Brown formula. The content validity of the satisfaction questionnaire and the attitude questionnaire were reviewed and approved by experts and the reliability of the satisfaction questionnaire and the attitude questionnaire were 84% and 80% respectively using Cronbach's alpha. Data analysis was performed using inferential statistics and one-way analysis of variance. Based on the research findings, it can be claimed that both web-based distance learning models have a positive effect on students learning, satisfaction and attitude, and increased the level of students' learning, satisfaction and attitude compared to conventional distance education. Therefore, it can be concluded that these two educational models (project-based learning and reproductive learning) have a great impact on increasing students' learning performance, satisfaction and attitude.

***Keywords*:** constructivism, distance-education, generative model, project-based model

Introduction

In the information age, a new paradigm called the Information and Communication Technology (ICT) has been introduced that has had an inevitable effect on all systems, including the education system. Undoubtedly, distance teaching with its new approach, is one of the most important achievements in the development of Information and Communication Technology in education (Mattar, 2018). The entry of ICT into educational environments has led educational environments to e-learning and virtualization. Virtual classes, virtual schools, smart schools, and virtual universities, and generally e-learning and web-based learning, are reliable capabilities for the development of

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Information and Communication Technology in education (Jha, 2017).

Communication and information networks, especially the internet, have evolved the face of traditional education and interaction between teacher and student at all levels from pre-school to university level. Technology has diversified and simplified teaching, has increased learning speed and has encouraged learners to contact existing sources and utilize them, and has caused meaningful and purposeful learning and changed the traditional and teacher-centered approaches into learner-centered teaching and learning (Mohammadi, Sadeghimand, & Zamanfar, 2017).

Since the development of education is one of the bases of scientific development, social growth, bloom of talents, and underlies human creativity, conventional educations alone are not enough to establish this important task; paying attention to new methods of teaching and executing continuous education and distance teaching is necessary to achieve developmental goals. The growth of the knowledge-based economy, the increasing use of ICT and increased demand of people for access to higher education are among other factors of the increasing distance teaching, especially web-based distance teaching. Distance teaching is a planned learning in which learning and training are usually carried out in isolated environments. In distance teaching, teacher-learner communication can be through letters, radio, television, telephone, conference, or internet and social networks (Mansouri, 2016).

With the development of ICT, generations of distance education have accelerated their growth and development, so that with the invention of each new technology, we witness constant changes in philosophy, content and methods of distance education. This evolution and changes in the direction of the transition of distance education move from the perspective of behaviorism toward cognitivism and especially constructivism (Mattar, 2018).

The new viewpoint of constructivism, using different philosophical and epistemological foundations, differs from previous perspectives toward teaching and learning, and has challenged the system of distance education. The philosophical approach of constructivism is one of the important theoretical frameworks in forming and directing new educational revisions and activities. Constructivism from the philosophical perspective is the opposing point of view of behaviorism and cognitivism, both of which have realistic infrastructures (Dastanpoor & Karamalian, 2017).

In constructivism approach, the learner actively tries to make knowledge and create meaning via constant interaction with the environment. In education based on this theory, the processes of learning and thinking are mostly considered rather that their products. Thus, in the constructivism approach, the learner achieves the creation of meaning and, gradually gains enough skill in this field, and is fully confident in dealing with new subjects, which can be successful, according to the skill and background he has; that is, in fact, the expectation of success has increased in them and they will have more internal control. Therefore, they have sufficient enthusiasm and willing to accept their learning responsibility (Mattar, 2018). Given that the main learning responsibility in a variety of forms of distance education is on the learner himself, this approach is appropriate for distance education, and it is very worthwhile that with extensive theoretical and practical research studies in this regard, the context of applying its approaches in this type of training is provided. In the era of ICT, distance educational systems are required to re-think and rehabilitate their educational systems in order to adapt to the new educational technologies for their use in the educational process and, on the other hand, they are required to revitalize and enrich the learning environment to interact between learners and learning resources based on new approaches such as constructivism.

Among the main objectives and aims of this research is the study of the epistemological and psychological foundations of constructivism approaches and their implications for designing constructive environments and web-based distance learning environments for creative development, innovation and high-level learning outcomes for those who are looking for good models in education, higher education, service organizations, educational, industrial, and administrative institutes in order to foster creative and critique human sources proportional to the age of information. In this research, we intended to study the effectiveness of a distance education model based on the two generative educational design model and project-based educational design model, whose theoretical foundations arein line with the framework of constructivist approach. To achieve this goal, the following questions were considered:

1) What is the performance of learners with web-based distance education based on two models of constructivism approach in comparison with conventional distance education?

2) How is the satisfaction of web-based learners based on two models of constructivism approach in comparison with conventional distance education?

3) What is the attitude of learners with web-based distance education based on two models of constructivism approach in comparison with conventional distance education?

Theoretical Foundations

With the development of ICT in the present era and the development and evolution of educational and transformational models that took place in the concept of learning, changing the approach of teaching from traditional methods to the process of distance teaching has gained much importance in order to use the electronic facilities and resources. With the advent of any new technology into the field of distance education system at different times, this type of training has experienced various paradigms, and at each stage specific examples (including educational TV, compact discs, video conferencing, etc.) and specific strategies (such as independent, meaningful, active, creative, analytical, and critical learning, etc.) are addressed (Jahanara et al., 2019).

Thus, with the ever-increasing levels of information and technology development, generations of distance teaching have grown with a high speed, and so far, five generations of these teachings have been raised (Ashrafi & Zinabadi, 2020). The first generation of distance teaching was correspondence education which took place in the 19th century through post. The first generation coincided with the epistemology of positivism and the approach to behavioral learning. With the fall of behaviorism perspective and the emergence of a cognitive learning approach, distance teaching was done via radio and television. Despite the fact that distance teaching through radio and television was superior to correspondence education and used visual and audio materials, the vacuum of interaction elements between learners and teachers was still considered a problem of distance learning. As it emerged in the late decades of the twentieth century, along with the emergence and expansion of computer and the 3G internet, distance-teaching appeared. In other words, alongside communication tools such as the Internet, the evolution of the foundations of epistemology and learning approaches has doubled the need for attention to web-based education. Strictly speaking, the last two decades of the twentieth century, with the emergence of a constructivism education approach based on the foundations of postmodern epistemology, promises fundamental changes in the field of education, especially web-based distance education. The third generation of distance education hitherto, the philosophical and cognitive approach of the generations, is constructivism (Sarmadi & Zare, 2018).

Therefore, the constructivism school is amongst the theories and models that can somehow meet the needs of the information age. Constructivism is one of the philosophical schools which, based on the necessity and nature of the information age, is formed as a combination of theories of information processing, the theory of Aptitude-Treatment Interaction (ATI), cognitive development and neuro cognitive, which considering its great merits and benefits, can be useful and effective in distance education (Mavroudi & Hadzilacos, 2016).

Many teachers and educators are looking for teaching-learning models and providing environments that can help them improve their learners' analytical learning and assessment skills and learned materials, while an attractive learning space should be provided for them to have a sense of success and satisfaction of their academic performance. Constructivism approaches can be very suitable for this purpose and meet their needs. Of course, the consequences of this will also be considered, which will lead to the development of innovative, analyst and critique human sources can play a vital role in the knowledge age.

Constructivism approaches lead to the development of positive self-reflection in learners. In constructive learning environments, learners play an active role in learning, and recognize themselves to be very effective in creating knowledge. According to the theory of Bernard Weiner, they see this success as a result of their own efforts, which leads to the formation of positive self-reflection, increased self-esteem and motivation, as well as satisfaction and sense of success in them. This approach also promotes the development of a sense of responsibility in learners. Considering that learners attribute any kind of success to their own efforts and activities, their responsibility is more than others, and this reinforces it (Ebrahimi, Karami, Ahanchian, & Mozaffari, 2014). Educational environments in the age of information require decision making, innovation, creativity, critique and analysis. Constructivism approaches in distance learning can meet this important need in the information age and educate learners who are more adapted to the information age and, while self-control, self-regulation, and self-motivation, create new ideas by actively using skills and knowledge.

The constructivist learning approach is a good platform for designing distance teaching courses. In the constructivist teaching approach, there is no constant and independent knowledge of the mind that the teacher transfers to the minds of the learners, but learners achieve their perception of the truth with their own experience and effort. By this presumption, the teacher has a facilitator and conductor role for learning process, as well as providing learning resources, and learners must be fully involved in the learning process (Jha, 2017).

Project-based learning is one of the major models based on the constructivism approach in which learners are at the learning center and their needs are primarily

important. In this model, learning content is selected from the text of real life of learners, and content organization is based on the integrated approach and thus makes meaningful learning. Research on project-based learning has reported positive results with regards to content knowledge, participation and collaboration skills, engagement and motivation, critical thinking skills and student problem solving (Jahanara et al., 2020).

The effects of the project-based learning model can be studied in different aspects, where the studies by Damon (2017) and Rossman and Rollis (2017) suggested increased team engagement and collaboration and increased learner motivation. In a study, Kalra et al. (2017) observed that learners of content knowledge in project-based learning classes performed better than conventional classrooms, and this model, while fostering group and social skills, brings upon high cognitive engagement and effects on the understanding of multiple perspectives. The results of the study by Taija et al. (2018) suggested that the critical thinking and problem solving skills as well as the learners' self-confidence that participated in project-based learning were far better and the participation in the project was very satisfactory for them (Puolitaival et al., 2018).

Generative learning was raised by Wittrock (1974), which roots in his neurological research studies. His ideas in terms of growth and enhancement of mental skills of students are mostly influenced by cognitive psychology and somehow emphasize the constructivism in the design of teaching-learning activities, that learners must play an active role in the process of learning and create personal and group meaning by themselves (as cited in Zanganeh, 2014). The basic assumption in this theory is that the learner is active during the learning process as well as the set of activities that he does to gain a deep understanding of the subject through meaning. Moreover, this model includes processes such as attention, motivation, knowledge, and generation. Generative learning is the creation of a meaning that learners deliberately create by using cognitive strategies through connecting new information with their prior knowledge, which ultimately lead to a relatively deep understanding of the subject. Therefore, the learner in this model deliberately and intentionally connects the prior knowledge with the new findings and is in the position of encountering new information and data that has no information about, established connection between them using cognitive strategies, thereby making the content meaningful for itself, making its understanding of the subject relatively deep (Sarikhani et al., 2017).

In the era of Information and Communication Technology (ICT), given the explosion of information and the daily proliferation of knowledge and information, the transfer of information by means of remembering is not a scientific and wise approach for teaching, and it is necessary to look for methods that, while facilitating and expediting and accuracy in learning, also provides a background for lifelong learning for learners. For lifelong learning, learners must actively engage in the process of building knowledge and create the knowledge they need. In order to achieve lifelong learning, project-based learning models and generative learning will be very influential. Using these models, many of their benefits can be gained so as to attain education related to the motivation and needs of learners and in line with the real-life needs.

Method

In the present study, a quasi-experimental design with a 'pretest-posttest and a control group' was used.

Participants

The statistical population of this research consisted of students of Payame Noor University of Sardasht from whom 45 individuals were selected by Cochran formula as the sample, through cluster sampling method. Of these, 15 students were randomly assigned to learning model group based on project (the experiment group 1), 15 to the reproductive learning model (the experiment group 2) and the remaining 15 students to control group who were trained in the conventional distance learning method.

Table 1.

Statistical Sample of Research

Group	Type of Teaching	Curriculum	Number	Duration of teaching
Experimental	Distance education based on generative teaching	Preliminary Statistics	15 people	10 sessions
	Distance education based on project	Preliminary Statistics	15 people	10 sessions
Control	Distance education	Preliminary Statistics	15 people	10 sessions

Instruments

Students' learning performance was assessed via the final evaluation of statistical scores, which was based on 20 points. In this research, content validity was utilized to determine the validity of the test of performance measurement. Also, in this research, the statistical test was prepared given the target-objective specifications table. In addition, the content validity of the instrument was approved by a professor of statistics. To examine the internal consistency of the tests, the split-half method was used, in which all the individual questions were considered as one test and all the even questions were considered as another test, and according to the same the variance of the scores of the two halves of the test (scores of odd and even questions), Spearman Brown formula was used to calculate the reliability coefficient, which was calculated 82% in the pre-test and 85% in the post-test.

he satisfaction of students with distance learning based on constructivism theory was evaluated through a researcher-made questionnaire. This questionnaire was developed using research literature and was inspired by questionnaires developed by Wang (2003) as well as Katsidis, Anastasiades and Zacharopoulos (2008). The questionnaire consists of 34 four-choice questions (from 1 with the least to 4 the most points). The first part of the questionnaire included general information like gender, work history, type of education degree (general or specialty), and experience of participation in web-based courses. The second part of the questionnaire consisted of 7 questions related to the measurement of learner satisfaction of the content, 6 questions related to learner satisfaction of the user interface, 7 questions related to learner satisfaction from feedback and evaluation, 5 questions related to learner satisfaction from personalization level of learning, 4 questions related to the learner satisfaction degree of the learner community, 5 questions related to the access component to the program, and the last 5 questions related to the satisfaction of the course in general. The content validity of the satisfaction questionnaire was determined using the opinions of 8 experts in the field of psychology, educational sciences and psychometrics, most of whom were active in the field of e-learning and virtual education. The reliability of the researcher-made satisfaction questionnaire was determined to be 0.80 using Cronbach's alpha test.

The survey of students' attitudes toward distance education based on constructivism theory was used via a questionnaire developed by Karami (2007). To prepare this questionnaire, he used the Quality of Life Questionnaire in School, which was developed by Ainley and Bourke (1992). The questionnaire consisted of 39 items of four-choice questions (from the least to 4 with the most points), which measured seven components (overall satisfaction, negative affection, teacher of social solidarity, opportunity, success and adventure). The validity of the attitude measurement questionnaire was confirmed through content validity and the correlation coefficient of each question with a positive attitude towards web-based learning was 30 to 57%. The reliability of the attitude assessment questionnaire using Cronbach's alpha was 84% (Karami, 2007, quoted by Ebrahimi et al., 2014).

The Design of Teaching Process

In this research, web-based distance teaching was performed based on Fig. 1. In a web-based distance teaching model, a combination of elements of generative-based and project-based teaching design were input to the software (Model) of learning management system and the students were taught for 10 sessions.

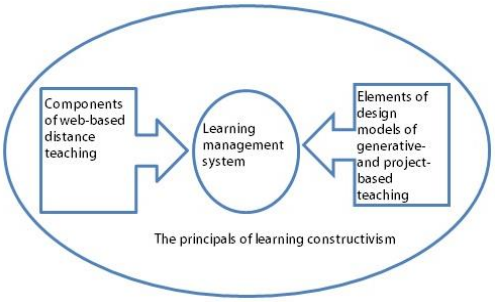

Figure 1.
A simple Web-Based Distance Learning Model with a Constructivist Approach

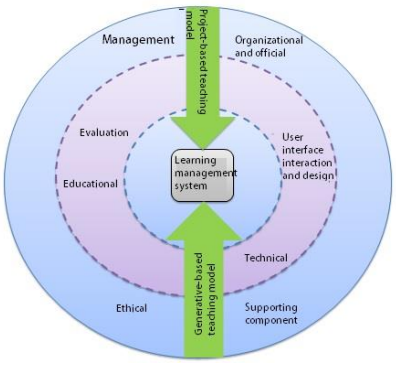

Figure 2.
The Conceptual Web-Based Distance Learning Model with a Constructivist Approach

Procedure

As mentioned in the previous section, in this study, a quasi-experimental research method with a pretest-posttest design with a control group was used. From the statistical population of the study, forty – five students were selected from all students of educational sciences at Sardasht Payame Noor university using Morgan table and cluster sampling as the research sample.

Of these, 15 were randomly assigned to the control group (conventional distance learning), 15 to the distance learning group based on reproductive learning and 15 to the project-based group (two experiment groups). First, the performance of student in all three groups was calculated separately using teacher-made inferential statistics test whose validity and reliability was explained in the previous section of this study. (Pretest)Also, the level of students' satisfaction in all three groups of distance learning was tested through a researcher-made questionnaire and also, the extent of their attitude was tested through a standard questionnaire. (Pretest of satisfaction and attitude)

All the next level for learning group based on project, ten training sessions were provided based on a project-based educational constructivist approach via the web. For the reproductive learning group necessary training was provided based on the-constructivist approach of reproductive learning – based education. But for the control group, the training was provided in the usual web-based manner and was not taught according to any model.

After ten training sessions that lasted about 20 hours for each group, the academic performance of the groups was evaluated using teacher-made test (Post-test) Also, to measure the level of satisfaction of the researcher-made questionnaire and the student's attitude in every three groups, a standard questionnaire was used whose validity and reliability were explained in the previous section. (Post – test)

To determine the effectiveness of project-based education and reproductive learning and conventional education in academic performance, satisfaction and attitude of students we used one-way analysis of variance using SPSS software, which will be explained in detail in the next section.

Findings

After collecting information through the study instruments, the results of analyzing the collected data are presented in two sections: descriptive and inferential.

Table 2.

Descriptive Indicators of the Control Group (Conventional Distance Education)

Test	Number	Mean	Standard error	Standard deviation
Pre-performance	15	19.46	0.722	2.79
Post-performance	15	19.60	0.809	3.13
Pre-satisfaction	15	90.73	1.82	7.05
Post-satisfaction	15	89.86	1.99	7.74
Pre-attitude	15	87.73	2.06	7.98
Post-attitude	15	86.80	2.03	7.89

Table 3.

Descriptive Indicators of the Generative Distance Web-Based Teaching Group

Test	Number	Mean	Standard error	Standard deviation
Pre-performance	15	20.20	0.570	2.21
Post-performance	15	21.60	0.767	2.97
Pre-satisfaction	15	92.73	1.78	6.90
Post-satisfaction	15	94.73	1.66	6.45
Pre-attitude	15	90.93	1.93	7.49
Post-attitude	15	92.26	1.98	7.70

Table 4.
Descriptive Indicators of Project-Based Learning Group

Test	Number	Mean	Standard error	Standard deviation
Pre-performance	15	19.06	0.69	2.68
Post-performance	15	20.93	0.84	3.28
Pre-satisfaction	15	83.53	2.25	8.72
Post-satisfaction	15	86.46	2.18	8.47
Pre-attitude	15	89.53	2.21	8.55
Post-attitude	15	92.60	2.24	8.68

The results of the descriptive section of this study indicate that learners with web-based distance teaching in the framework of educational models of constructivism school are better in terms of performance indicators, satisfaction and attitude.

Inferential Section

In this part, first the assumption of normality will be examined and then, the effectiveness of web - based learning in the framework of constructivism learning approach on learning performance compilations, satisfaction and attitudes of learners will be assessed. Finally, the effect ofweb - based distance education methods will be compared.

Table 5.
Results of the Assumption of the Normality of Distribution of Variables in Groups

Group	Post-attitude		Pre-attitude		Post-satisfaction		Pre-satisfaction		Post-performance		Pre-performance	
	K-S	Sig	K-S	Sig	K-S	Sig	K-S	Sig	K-S	Sig	K-S	Sig
Control	0.55	0.73	0.66	0.60	0.76	0.90	0.55	0.76	0.66	0.82	0.76	0.91
Generative	0.93	0.96	10.02	0.64	0.73	0.77	0.93	0.24	10.02	0.16	0.73	0.34
Project	0.63	0.83	0.63	0.76	0.66	0.79	0.63	0.80	0.63	0. 0.84	0.66	0.81

The table above examines whether the distribution of variables is normal in the groups. According to the results, the assumption that the distribution of variables is normal is met in all the groups under study. Thus, the significance level of Kolmogorov-Smirnov test in all groups is higher than 0.05.

Table 6.
Result of Homogeneity Assumption of Variance-Covariance Matrices

Box value	f-value	Degrees of freedom	Degree of Freedom of Error	Significance level
39.847	1.503	24	1.353E4	0.05

Since the box value is not significant, the homogeneity assumption of variance-covariance is met, and it is possible to use the multivariate covariance analysis test.

Table 7.
Results of Investigation of the Assumption of Homogeneity of Variance for One-Way Analysis Of Variance

Effect	Value	F	Degrees of freedom	Degree of Freedom of Error	Significance level
Pillais trace	.626	4.41	12.000	201,000	0.001
Wilks Lambda	.387	6.20	12.000	172.265	0.001
Hotelling's trace	1.55	8.24	12.000	191,000	0.001
Roy's smallest root	1.53	25.67b	4,000	67,000	0.001

The results of the above table show that independent variables have a significant effect on the dependent variables and the observed values of Pillais trace, Wilkes and Hotteling and Roy's tests are significant at 0.01 level. Then, for the effectiveness of the independent variable levels, one-way ANOVA was used on each of the dependent variables.

Table 8.

Results of Homogeneity of Variance for One-Way Analysis Of Variance Test

Test	F	Df1	Df	Sig
Post-test of performance	0.386	4	70	0.818
Post-test of satisfaction	1.676	4	70	0.165
Post-test of attitude	2.491	4	70	0.51

Table 9.

One-way Analysis Of Variance

Statistical indicators of Change sources		Sum of squares	Degrees of freedom	Mean squares	f-value	Significance level
Intergroup	**Post-performance**	23.23	3	7.74	3.48	0.0 001
	Post-satisfaction	161.24	3	53.74	12.10	0.0001
	Post-attitude	159.13	3	53.04	11.00	0.0001
Error	**Post-performance**	149.02	67	2.224		
	Post-satisfaction	297.75	67	4.444		
	Post-attitude	323.555	67	4.829		
Total	**Post-performance**	34932.000	75			
	Post-satisfaction	639912.000	75			
	Post-attitude	636406000	75			

The table above examines the effectiveness of web-based learning in the framework of constructivism learning approach on learning performance, satisfaction and attitude of learners. The results show that independent variables (web-based distance teaching in the framework of constructivism learning) have a significant effect on all the three components, where the calculated f-value for performance is equal to 3.48, for satisfaction is equal to 12.10, for attitude is equal to 11, for degrees of freedom is 4 and 67 which is greater than the critical values. Therefore, with 99% confidence, we can say that the independent variable (web-based distance teaching) had a significant effect on the three variables. Our hypothesis, "Learners who have had web-based distance learning, have more education performance, more satisfaction, and more positive attitudes than those taught in conventional distance education" is confirmed.

Table 10.

Results of Two-By-Two Comparison of Web-Based Distance Teaching Models in Performance Variable

Dependent Variable	Group	Difference in Means	Difference in Means	Standard Deviation	Significance Level
Performance	**Control**	Generative	-1.359 *	0.555	0.017
		Project	-1.614 *	0.571	0.006
	Generative	Project	-0.255	0.593	0.668

Table 11.
Results of Two-By-Two Comparison of Web-Based Distance Learning Models in Satisfaction Variables

Dependent variable	Group	Difference in means	Difference in means	Standard deviation	Significance level
Performance	**Control**	Generative	-3.020*	0.784	0.000
		Project	-3.840*	0.571	0.000
	Generative	Project	-0.821	0.838	0.331

Table 12.
Results of Two-By-Two Comparison of Web-Based Distance Teaching Models on the Variable of Attitude

Dependent variable	Group	Difference in means	Difference in means	Standard deviation	Significance level
Performance	**Control**	Generative	-2.378*	0.818	0.000
		Project	-3.996*	0.842	0.000
	Generative	Project	-1.619	0.872	0.000

Discussion and Conclusion

This research was conducted with the aim of determining the effectiveness of web-based distance learning in the framework of constructivism learning (project-based and generative design model). The results revealed the effectiveness of generative-based and project-based distance-teaching models, compared to the conventional distance teaching.

The results of the first question showed that the performance of learners with web-based distance teaching based on two models of constructivism approach was better than conventional distance teaching. This result is in line with the findings of Jafari and Mohammadi research (2017). In a pseudo-experimental study carried out for three weeks, they found that a group that was taught based on a project-based model had a more suitable and better performance than the control group. It was also, consistent with the findings of the study by Sarikhani et al. (2017) which was done on 70 nursing students in Malayer city in a physiology course for a semester, with a quasi-experimental method, with pre- and post-test with control group, where they found that the rate of learning physiology lessons in students who have been taught by generating learning design model is more and better than those taught traditionally. Moreover, applying a generative learning design model, by providing cognitive strategies and appropriate educational guidelines, increase the level of students' learning. Also, the findings of this question are consistent with the results of the study by Dias and Brantley (2017) who recognized that the project-based learning approach challenged students and created meaningful learning and increased their interaction, motivation and creativity. In explaining this finding, it must be mentioned that one of the factors that led to the fact that implementation of distance teaching based on the constructivism learning approach is effective was students' activeness and the sense of responsibility for their learning, and, with proper implementation of these models, while improving their collaborative skills, learners also promote independent learning in their own. Moreover, applying these models leads to the enhancement of the sense of responsibility of learners toward learning, and develops critical thinking and problem-solving skills.

Despite these benefits, project-based learning is also associated with challenges. Some of these challenges include the lack of content knowledge of course professors for project management, the lack of learners' experience in constructive learning environments, and, thus, prioritizing traditional learning approaches, and the time-consuming organization and management of teaching and project-based learning (Yousefi, Assareh, & Hoseini, 2019). In project-based and generative models, concepts such as "interest in learning" and "positive attitudes toward content knowledge" are considered valuable. In fact, in these models, pleasure and joy are obtained more in the flow and path of learning than in the end and destination of learning. As Eisner says, "In the classrooms and schools, we need to provide conditions where students learn the process of teaching with interest, educational trips should be a happy journey" (Mansouri, 2016).

In project-based learning, teacher is a facilitator and provider of resources, learning opportunities and conditions for learners. In cognitive and emotional terms, the learning environment in this approach for learners should be attractive and engaging and should encourage active participation, social interaction, and discovery and innovation in the students. Research on project-based learning confirms that using this model in

teaching contributes to promoting understanding, creating motivation, learning activities, improving communication skills, increasing the retention time and transferring learning (Stewart, 2007). In the generative educational model, learners deliberately associate new information with their prior knowledge and use cognitive strategies to create meaning and eventually get a deep understanding of the subject.

The findings of the present study are consistent with the findings of Zanganeh's research (2014) regarding the effectiveness of the generative-based learning model. In a research entitled "the development and validation of a generative educational design model in biology", he concluded that the generative model of learning in some elements, such as cognitive conflict, determining learning outcomes, activating previous knowledge, describing and extending learning, evaluation is consistent with the Merrill Ganieh Models. Nevertheless, in some elements, such as the physical design of the class, group discussion, creation of meaning, facilitation, and supporting is different with other models, which is due to the constructivist nature of the model, which has a more learner-centered aspect. In fact, one of the factors for the effectiveness of this research was adopting a constructivism approach to providing teaching in the form of web-based distance teaching that led to user satisfaction (Zanganeh et al., 2014).

Based on the results of the second question, the learners' satisfaction of web-based distance teaching was more than conventional teaching based on two constructivism approach models. In explaining the satisfaction of learners from the course designed based on constructivism approaches, it can be stated that since in the educational design based on constructivist principles, the design of attractive interactive learning environments with rapid feedback is taken into consideration, learners are more satisfied with this kind of presentation. These results are consistent with the findings of Ebrahimi et al. (2014). In their research, entitled "Investigating the effect of web-based teaching based on constructivism theory on the level of satisfaction and learning of participants in nursing teaching courses", which was conducted in pilot using a pretest and post-test design with a comparison group on 40 learners, found that learners in the experimental group had higher levels of satisfaction and higher learning compared to the comparison group. The use of constructivist theory models due to the creation of attractive, interactive and collaborative learning environment and the attention paid to the needs and characteristics of learners in these models make teaching more effective.

Based on their research findings, researchers such as Girvan and Savaj (2010) stated that having an active learning community and interaction in constructive learning environments has become an attractive subject for learning, with discussion, comments, and critique and leads to increasing students' satisfaction with the course.

Levy (2006) was the first to point to value and satisfaction constructs in evaluating the effectiveness of the distance learning system. He held that in order to measure the effectiveness of an information system, only paying attention to the satisfaction of users of the characteristics of that system was insufficient; rather, an information system was considered to be effective when users considered the system not only important (valuable), but they also feel satisfied with that important characteristic, i.e. the services provided by the educational organization should meet their organizational-humanistic needs (as cited in Javadi et al., 2011).

Furthermore, based on the findings of the last research question, the attitudes of learners with web-based distance teaching based on two models of constructivism approach are more positive and better than conventional teaching. In explaining the improvement of learners' attitudes in constructivist environments, we can exclaim that for reasons such as self-arousal in learning and the belief that learning is enjoyable by itself, paying attention to the learner due to change of paradigm from teacher-centered to learner-centered, the novelty of the teaching method provided by the course teacher, presence in the groups and interactive learning, more interaction with classmates, the relationship of issues and materials presented with the real life of the learners, assurance of the help and guidance of the course teacher, strength in the manner of choosing resources, the manner of solving problems and, in general, the feeling of active participation in the classroom and no obligation to memorize the content will lead to more relaxation and enjoyment of the learner and therefore will have more positive attitude as well.

Mohammadi and Taghipour (2016) in their study entitled "The Effectiveness of E-teaching in the Course of Bacteriology Based on Constructivism approach Compared to the Cognitive Approach" obtained a similar result and stated that the attitude of the e-teaching group based on the constructivism approach, compared to the e-teaching group based on the cognitive approach was higher in the components of "social solidarity" and "general satisfaction". In addition, this group had a lower negative emotion. In the component of "the course teacher" with a slight difference, the e-teaching group had a higher mean based on the constructivism approach.In supporting this claim, we can point out the

positive results of the sub-components of negative emotion (low) and general satisfaction (high) indicating a sense of relaxation in the course. By and large, in this teaching method, learners are not worried about perfectly memorizing the course, but this is a learner who learns with his own efforts and information resources and guidance provided by the teacher. This provides learners' peace during the learning process, thus, the learner's attitude will become positive to the course.

Generally, the results of this study indicated that the web-based distance teaching in the framework of constructivist learning approach has affected the performance, satisfaction and attitude components in students of Payame Noor University of Sardasht. Accordingly, the model of web-based distance teaching in the framework of two generative and project-based constructive models based on important factors and elements has played a key role in improving the academic performance, satisfaction and attitude of these students. In relation to these results, according to the research literature, it can be explained that higher learning performance, satisfaction and attitude of learners are due to some reasons such as learners' activity and involvement in performing meaningful and natural exercises; increasing learner interaction with content, coach, environment and other learners; autonomy, learner autonomy and participation in learning and enhancing cooperation skills; more exciting and enjoyable learning environments and enhancing and reinforcing skills such as creativity, critical thinking, time management, self-assessment, problem solving, group work, and initiative in these learning environments; moderating the teacher's role as the mere content transferor into a meta facilitator, advisor, guide and provider of attractive learning environments for discovery and exploration of the issues, dynamic evaluations rather than the standard evaluation etc.

Considering the results and findings of this research and similar research, and the numerous advantages of constructivism approach in increasing the performance and obtaining satisfaction and positive attitude of learners, it is recommended that university educational systems especially web-based distance learning should lead to constructivism as fast as possible, and lay the groundwork for designing and implementing the broader and better of the various models of constructivism approach, so that in addition to improving the efficiency and effectiveness of learning, time management and cost will be realized in the best way.

This requires changing the attitude of educators and teachers toward the constructivism approach and their familiarity with the teaching design based on the various models of constructivism and skills in their proper implementation, providing rich, attractive, effective and appropriate environments and equipment and the facilities needed to make these models work best. In addition, due to the positive effects of constructivism approaches in web-based distance teaching, by holding specialized training workshops for teachers and learners, the grounds for passing cognitive approaches to constructivism and communication can be provided. Moreover, by revising the content of books and resources toward the constructivism approach, the constructivism approach should also be reviewed in the training and use of teachers.

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