World Applied Sciences Journal 4 (6): 837-848, 2008
ISSN 1818-4952

The Effects of Constructivist Learning Activities on Trainee Teachers' Academic Achievement and Attitudes

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Abstract: The aim of this study is to find out the effects of active learning methods based on constructivist approach on the prospective teachers' achievements, attitudes towards the subject matter and perceptions about the learning process. Experimental design and qualitative research method were used in the study. In the experimental group, constructivist learning methods were applied and in the control group, traditional learning approach was followed. The participants consisted of 43 sophomores at Dumlupinar University Education Faculty. The results revealed a significant difference between the achievement levels of the experimental and control groups in favor of the experimental group, but no significant difference was found in their attitudes. Depending on the findings, it can be said that constructivist learning activities enabled the students to become more successful and to develop positive perceptions.

Key words: Trainee teachers · Constructivist learning · Learning environment

INTRODUCTION

Today, it is essential to organize the learning environments in a student centered and democratic way facilitating the student development in various respects. The traditional learning environments in which students memorize information as it is without questioning and researching result in negative consequences. Some of the problems that arise from traditional learning enviroments are that the learned information cannot be permanent, just memorized for the exams and are forgotten later on, most information is understood either imperfectly or wrongly and that the students cannot apply learned material into real life [1,2]. To eliminate that kind of problems, student-centered approaches should be taken into consideration.

Recently, one of the approaches that closely influence the organization of the learning environments is the constructivist approach. The constructivist learning approach gives importance to the students' constructing knowledge themselves and developing higher order thinking skills [3]. For the students to construct knowledge, different principles are applied in constructivist learning environments compared to traditional learning environments [4-6]. Traditional learning environments are teacher-centered. While teacher has the role of transferring information and directing the students, students are passive receivers. However, students are active in constructivist learning environments. Their roles are to organize knowledge and the learning environment, carry out the learning activities and to monitor their own learning [7]. In such an environment, teacher's role is to guide the students in the learning process and to do various evaluations based on various techniques such as diaries, research reports, etc [8]. Teachers should design classroom activities that will develop students' higher-order thinking skills, enable them to learn new concepts and unify the previously learned information with the new one [2,9]. For the students to learn in a meaningful way, teachers can use such active methods as problem-based learning, case studies, project work, etc. [10,11]. What is important in these environments is that the student endevours to learn in a way peculiar to himself or herself. As Airasian and Walsh [3] state, the responsibility to learn must belong to the student.

Such a learning process cannot be realized in traditional learning environments [12]. Traditional teacher-centered learning environments are insufficient in developing the students' higher-order thinking skills. Organizing learning environments based on the constructivist approach is important for realizing the

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higher-order aims [2,5]. When the students participate in the learning process actively, their learning becomes meaningful and they can develop themselves in various respects. Learning, in this approach, is reinterpreting the previous knowledge in the light of new experiences. Teaching, on the other hand, is the process of organizing the environments that will enable the learners to benefit from their previous experiences and preparing the environments that are based on mutual interactions [13]. Constructivist approach focuses on learning rather than teaching. In these environments teacher and content are not in the forefront. Student and guiding the student to learn with his or her own interactions are important.

Constructivist approach influenced the teacher training programs closely. To increase the quality in teacher education programs, it is important that constructivist learning activities and performance-based or authentic assessment methods be used [14]. As the teacher education models which lack holistic and spiral approaches are insufficient for teacher education, approaches regarding the acqusition of constructivist teaching skills and constructivist learning principles are applied [15,16]. In this respect, a lot of models have been developed and researches have been done regarding how constructivist learning environments can be designed [17-25]. These studies point out that modern teacher education programs should have constructivist features.

Constructivist learning experiences can provide the prospective teachers with the opportunities for self-development based on their interests and needs and to learn effectively. Moreover, prospective teachers, if trained with constructivist principles and methods, can train their students using these principles and methods in the future. It is difficult for the teachers trained in the traditional learning environments to carry out constructivist teacher roles. The constructivist activities in teacher training programs influence the trainee teachers' opininons about concepts, planning, instruction and reflection positively [25]. In this way, trainee teachers do not memorize information, but learn in a meaningful way. Learners learn how to learn in constructivist learning environments [22].

In Turkey, there are some attempts to train more qualified teachers. In this respect teacher training curricula were renewed with the cooperation of Council of Higher Education (CHE) and Ministry of Education (ME) in Turkey and the new program has been used at education faculties since 1998-1999 academic year [26,27]. Like in many countries, in Turkey there are some studies regarding teacher education based on the constructivist approach. In these studies, it was found out that constructivist learning activities were efficacious for teacher training and had positive influences on trainee teachers [12, 13, 28-31]. However, there are few studies in which the effects of constructivist approach on teacher training are studied. More research findings conducted in various education programs and courses are needed regarding this matter.

Moreover, the primary education curricula in Turkey was re-designed and developed depending on the constructivist approach [32] and it started to be used in the primary schools in 2005-2006 academic year. A constructivist curriculum requires constructivist teachers for it to be applied effectively. However, some research findings in Turkey show that teachers have some problems in the planning and application processes of instruction and that they are insufficient in some respects [33-36]. The incompetences of teachers mostly result from the fact that they have not acquired the necessary behaviours. Organizing constructivist learning environments and using active teaching methods in teacher training programs can enable the trainee teachers to acquire teaching behaviours more effectively.

For this reason, experimental research findings that will put forth the effects of constructivist teaching activities on the cognitive and affective behaviours of trainee teachers are needed. After the constructivist learning activities in teacher training, research findings regarding the evaluation of this process may contribute to the development of further studies. This research is conducted due to the mentioned nececessities. The research findings are believed to contribute to the development of the teacher training programs and to the training of more qualified teachers.

The main purpose of the study was to determine the effects of active learning methods based on constructivist approach designed to realize the aims of "Instructional Measurement and Evaluation" unit in Instructional Planning and Evaluation course on the students' achievements, attitudes towards the subject matter and perceptions about the learning process. Based on this purpose, the present study attempted to answer the following research questions:

1. Is there a significant difference between the achievement levels of the students in the experimental group, in which constructivist learning methods were applied and the students in the control group, in which traditional learning approach were

applied, in favor of the experimental group, regarding "Instructional Measurement and Evaluation" unit?
2. Is there a significant difference between the attitudes of the students in the experimental group, in which constructivist learning methods were applied and the students in the control group, in which traditional learning approach were applied, in favor of the experimental group, regarding "Instructional Measurement and Evaluation" unit?
3. What are the views of the students in the experimental group, in which constructivist learning methods were applied, regarding the learning process?

MATERIALS AND METHODS

This study, which attempts to determine the effects of constructivist learning methods on the students' achievement levels, attitudes regarding "Instructional Measurement and Evaluation" unit and views towards the learning process, was carried out by the controlled pre/post-test model of the experimental model [37]. In the study, both the qualitative and quantitative research methods were used. Qualitative data related to the student perceptions regarding constructivist learning process were gathered through a questionnaire. Then, open-ended questions were interpreted through the descriptive analysis method.

Participants: The participants consisted of 43 sophomores taking "Instructional Planning and Evaluation" course at Dumlupinar University Education Faculty Department of Primary Education Program in Primary School Education and Social Studies Education in 2005-2006 Academic year spring term. The students were randomly assigned to experimental group and control group. The experimental group of the study consisted of the Primary School Education Program second year students taking Instructional Planning and Evaluation course and the control group consisted of the Social Studies Program second year students taking the same course from the same lecturer. The experimental group was composed of 20 students -12 females and eight males- and the control group of 23 students -15 females and eight males. In both groups, the students who did not take the either pre-test or post-test were not included in the research.

Data Collection Instruments: As data collection instruments, Instructional Measurement and Evaluation Achievement Test, attitude scale and questionnaire were used in the study. 3 Experts from the field of study and 2 measurement and evaluation experts were consulted while developing instruments.

Unit Achievement Test for Instructional Measurement and Evaluation: To determine how much the students acquired the cognitive objectives of the "Instructional Measurement and Evaluation" unit of Instructional Planning and Evaluation course, a unit achievement test was developed by the researcher. The test was composed of 45 multiple-choice items. To develop the test, first, a pilot test with 70 items was prepared consulting the experts and in 2005-2006 academic year fall term it was applied to 98 students who had taken this course before. After the pilot test, item analyses were done and validity and reliability studies were conducted. Then, the necessary changes were done after taking the views of the experts and the final test with 45 items was prepared. The difficulty of the test was about 0.50 and KR-20 reliability coefficient was 0.88.

Instructional Measurement and Evaluation Attitude Scale: A Likert type attitude scale with 28 items was developed by the researcher to determine the attitudes of the students towards 'Instructional Measurement and Evaluation' unit. The scale was composed of 14 positive, 14 negative attitude items. The items were rated on a five-point Likert scale ranging from (5) strongly agree to (1) strongly disagree. In this scale, there were 14 positive and 14 negative attitude questions. The pilot form of the attitude scale with 30 items was applied to 152 students who took this course beforehand.

Later on, the validity and reliability analyses of the scale were done. The suitability of each intercorrelation matrix for factor analysis was determined by utilising the Kaiser-Meyer Olkin (KMO) Measure of Sampling Adequacy (MSA) and Bartlett's Test of sphericity. Kaiser-Meyer Olkin (KMO) value was 0.871 and Bartlett's Test result was χ^2 =1917.9, df= 378, p<0.001. The KMO sampling adequacy test statistic is 0.871 which is higher than the threshold value of 0.60 and Barlett's test of spherincity statistic is significant at 0.001 level. The data obtained show that the scale was suitable for the factor analysis.

The psychometric properties of the scale were examined by factor analysis. Two items (24 and 30) with less than 0.30 loading on one of the factors were eliminated. After eliminating these two items, the communalities of the 28 items were between 0.466-0.753.

The scale explains 61.22 % of the overall variability of the sample. For the analyses in social sciences, variance rates between 40 % and 60 % are regarded to be sufficient [59]. Moreover, the component matrix table showed that the first factor loading values of the all 28 items were bigger than 0.34. It is seen that the first principal component, alone, explains 32,05 % of the total variance. According to Büyüköztürk [39], the variance explained in one-factor scales was seen sufficient as 30% and more. The data obtained show that the scale has a general factor structure. The scale can be used as one-factor scale in accordance with the researcher's aims. Cronbach Alpha reliability coefficient of the scale was 0.92 and seemed acceptable. This value can be thought to be quite good. These results appear to support the validity of the factor analysis usage for this study [39].

Learning Process Questionnaire: To find out the perceptions of the students in the experimental group regarding the constructivist learning activities when Instructional Measurement and Evaluation unit was being covered, a learning process questionnaire composed of open-ended questions was administered to the students in the experimental group and they were asked to write their answers in the essay form. Students were asked the following questions in the questionnaire: What do you think about the way measurement and evaluation topics were covered? Was it different from the way the previous topics were covered? In what way? What do you think about the in-class learning activities and preparing portfolios? How did these activities influence your learning? Do you think you will use portfolios when you are a teacher in the future? Why?

To make sure that the questionnaire forms are valid, experts' views were asked for and the questionnaires were re-developed taking the experts' criticisms and commentaries. Before the questionnaire was applied to the whole group, it was applied to 10 students to test it. The questionnaire which was bettered based on expert views and the pilot study results became ready to be applied. Data obtained from open–ended questions was examined by the researcher and an expert from the field to establish the reliability of the study. The written answers of the students were examined, discussed and agreed on with a researcher and an expert from the field of study. A consensus was made for all questions (P=100). For the research reliability, the formula suggested by Miles and Huberman [40] was taken into consideration. The research was accepted as reliable.

Data Analysis: Unit achievement grade means and attitude grade means of the experimental and control groups were calculated and groups were compared using the t-test technique. Data were analyzed using the SPSS 11.5 program. The comparisons were tested on 0.05 significance level and the data obtained were shown in a table. The qualitative data, on the other hand, were coded using induction content analysis method. The data coded in themes were put into general categories and sub-categories and the frequency of each category was found. Thus, the qualitative data were made quantitative to increase the reliability, to decrease biases and to make comparisons between the categories [41].

Procedures: The application of the study was done in 2005-2006 academic year spring term. Before the experimental processes, achievement test and attitude scale were applied in the same week as the pre-test to the students of Elementary Education and Social Studies Education Programs to determine whether there were any differences between them in terms of prior knowledge. No significant difference was found between neither the academic achievement test scores nor the attitude pre-test scores of both groups regarding the "Instructional Measurement and Evaluation" Unit (Table 1, Table 2). The experimental and control group were determined randomly. The activities in both groups were carried out by the course lecturer, the researcher herself, for five class hours in each group throughout three weeks. All the students carried out the activities as the requirements of the course.

In the experimental group, the way "Instructional Measurement and Evaluation" unit would be covered was planned together with the students. In this group, the

Table 1: Independent groups t-test comparisons of the achievement pre and post-test mean scores of the experimental and control groups

Achievement test	Groups	N	M	SD	t	df	p
Pre-Test	Experimental	20	19.70	4.88			
	Control	23	17.86	4.51	1.276	41	0.209
Post-Test	Experimental	20	33.10	6.12			
	Control	23	24.82	5.69	4.587	41	0.000*

*p<0.001

Table 2: Independent groups t-test comparisons of the attitude pre and post-test mean scores of the experimental and control groups

Attitude	Groups	N	M	SD	t	df	p
Pre-Test	Experimental	20	3.21	0.63			
	Control	23	3.02	0.55	1.094	41	0.281
Post-Test	Experimental	20	3.46	0.53			
	Control	23	3.07	0.80	1.837	41	0.074

p>0.05

classes were done using the constructivist learning activities. When designing the constructivist learning environment, six elements suggested by Gagnon and Collay [2] were taken into consideration. On the other hand, in the control group, the sessions were covered in traditional teaching method in which teacher centered, mainly lecturing method was used.

The students in the experimental group carried out their studies in and outside class both individually and in groups with the guidance of the lecturer. Students prepared the materials (worksheets, concept maps, quizzes, transparencies for the over-head-projector, computer CDs, journals, etc.) and made the necessary preparation. They presented in class what they prepared in groups. The activities that would enable all the students participate in the classes actively were used. The constructivist learning activities used are as follows: Brain storming, big group discussions, pair works, dialogues, preparing concept maps, studying on worksheets, question and answer, lecturing, criticizing the friends orally or in writing, self evaluation, preparing portfolios, preparing materials for overhead projector or projection, making use of various sources (internet, books, articles, etc.), giving examples, keeping journals.

After the classroom practices, the students in the experimental group kept journals about their learning. In these journals, students were asked to state their aims, what they learned in class and what they could not and what they should search. Handing the portfolios including their journals, concept maps and the other works in the lecturer each week, students were given written and oral feedback. Based on the feedback given, the students tried to handle and correct their mistakes. In that way, the students prepared a portfolio including their studies regarding learning activities. After the experimental processes, the unit achievement test and the attitude scale were applied to the experimental and the control groups one more time as the post-test in the same week. Also, the students in the experimental group were given a questionnaire and were asked to put forward their feelings and opinions about the learning process.

RESULTS

Before the experimental treatments, it was tested whether there was a significant difference between the subjects' -in the experimental and control groups- academic achievement pre-test mean scores regarding "Instructional Measurement and Evaluation" unit. As seen in t test results in Table 1, no statistically significant difference was found between the groups' achievement pre-test mean scores [$t_{(41)}$=1.276, p>0.05]. It was found out that both groups' achievement levels in this unit were low before the experiment. It was examined whether there was a difference between the attitude pre-test mean scores of the subjects in the experimental and control groups regarding "Instructional Measurement and Evaluation" subject. According to the t test results seen in Table 2, no statistically significant difference was found between the attitude pre-test score means of the students in the experimental and control groups regarding "Instructional Measurement and Evaluation" subject (t= 1.094, p>0.05). It is seen that the pre-experimental attitudes of both groups were undecided. It can be said that the academic achievement levels and attitudes of the students in the experimental and control groups towards this unit were equal.

Related with the first question of the research, using the independent groups t-test it was examined whether there was a significant difference -in favor of the experimental group- between the achievement levels of the students in the experimental group, in which constructivist learning methods were applied and the students in the control group, where the traditional learning approach was applied. As seen in Table 1, that there was a significant difference between the unit achievement post-test mean scores of the two groups, in favor of the experimental group. [$t_{(41)}$= 4.587, p<0.001]. As a result of the experimental processes, it was found out that the academic achievement of the students in the experimental group was higher than that of the control group.

Related with the second question of the research, using the independent groups t-test, it was examined whether there was a significant difference between the attitudes of the experimental and the control groups towards "Instructional Measurement and Evaluation" subject -in favor of the experimental group. As shown in Table 2, there was no statistically significant difference between the attitude post-test mean scores (t= 1.837, p>0.05). The attitude post-test score of the experimental group was higher than that of control group. However, after the experimental processes, the attitudes of the students in the experimental and control groups towards this unit did not differ at a statistically significant level. Although, depending on these findings, some more positive increase was seen in post experimental attitudes of the students in the experimental group, students can be said to be still undecided about this matter. It can be said that the prior knowledge and attitudes of the students in

Table 3: The views of the students in the experimental group regarding the constructivist learning process

A. Views regarding the difference of the way the course was covered from the way the other courses were covered	Frequency
1. The way the lesson was covered is different from the way the previous subjects were covered	20
2. The way the lesson was covered is not different from the the way the previous subjects were covered	0
B. The Reasons Why the Students Find the Way the Course was Covered Different	
1. Because students participated actively, it was more based on practice, various methods were used in the lesson. Because preparing portfolios	20
2. Because it made the lesson more interesting, enjoyable and amusing	10
3. Because the topics were not complicated, but easy thanks to the way the course was covered; it was paid attention to make the subject clearer and more understandable.	6
4. Because the topics were more focused on.	3
5. Because it was more instructive and the learnings were long-lasting (permanent).	3
6. Because we were unconstrained when making the presentations, I learned better how to lecture.	2
C. Views Regarding the Influence of Teaching Activities on the Students' Learning	
1. I learned better thanks to these activities.	19
2. As I learned a little with these activities, the teacher had better lecture himself/herself.	1
D. Students' Views Regarding Why They Thought They Learned Better	
1. Because I prepared portfolios and revised the topics after each class to be able to prepare them; I studied for the lesson continually.	9
2. Because the in-class activities made learning permanent; the activities were a lot, interesting and prevented distraction; I listened to the lesson more actively and participation in the class developed thinking and interpretation.	8
3. Because I had the chance to see my mistakes and the points that I could not understand; the feedback given made understanding easier.	3
4. Because I prepared journals.	2
5. Because the lessons were effective.	1
6. Because preparing the concept maps and sample questions improved us.	1
7. Because peer evaluation worked.	1
8. Because the lecturer was guiding.	1

Table 4: The views of the students in the experimental group on preparing portfolios

A.	Positive Views	Frequency
1.	It gives a chance to review the learned material.	6
2.	It gives a chance to be aware of the unknown points and my incompetences; It gives a chance to make up for the incompetences.	6
3.	It enables me to learn better and more easily.	5
4.	I do not have to study very hard for the exam because the portfolio prepares me for the exam.	4
5.	It makes the learned material permanent.	3
6.	It makes the students to listen to the lesson actively.	2
B.	Negative Views	
1.	Thinking that it is boring and difficult at first, but understanding its importance later on.	6
2.	Preparing portfolios is time-taking, It is too much with the other classes and I cannot prepare it with enough attention.	2
3.	It is distressing to think that the portfolios will be graded.	1
4.	It would be better if the teacher lectured himself or herself.	1
C. Whether they would like to make use of portfolios when they become teachers		
1.	The ones who want to make use of portfolios.	18
2.	The ones who do not want to make use of portfolios.	2
D. The reasons why they would like to make use of portfolios		
1.To make the students study continuously and to enable them understand the lesson better, to make the learned material clear, to make learning effective and permanent and to make the students more successful.		9
2.To see the students' understanding, incompetences and mistakes and to make the students be aware of their own mistakes, to prepare them to be assessed any moment and to check knowledge well.		5
3. Because they include a lot of useful information; I saw that it worked.		2
4. Because the teacher acts according to the student level.		1
5. Because it makes learning enjoyable		1
6. Because it is an interesting method.		1
E. The reasons why they would not like to make use of portfolios		
1. I will make use of not portfolios, but journals.		1
2. I will make the students study giving some assignments which will make them do some researches.		1

the experimental and control groups towards this unit were equivalent at the beginning of the experiment. Students of the both groups had an undecided attitude before and after the experiment.

Related with the third question of the research, the experimental group students' views regarding the learning process were taken through the answers given to close and open-ended questions in the questionnaire. The qualitative data obtained from the written answers given to the questions in the questionnaire were analyzed using the qualitative content analysis method and the frequencies were found (Table 3, Table 4). The data were put into categories and summarized in this way and were interpreted giving the original examples.

As seen in the Table 3, all of the students stated that they found the way the topics related with Instructional Measurement and Evaluation was covered was different from the way the previous topics were covered. They pointed out a lot of reasons for that and the main ones were that the lessons were based on more practice, active student participation and different methods; the way the classes were covered made the topics more interesting, enjoyable comprehensible and easy rather than complex and the preparation of portfolios contributed to understanding the topics better.

Below are some original examples for these views:

"As the classes were based on more application, they were easier to understand. Continuous interaction and discussions led to better learning" (Subject 1).

"We, the students, were more active when covering .... Not only the friends who were presenting, but also the rest were active in class and in that way, the classes became more enjoyable and comprehensible" (Subject 4).

"... was more interesting as it was enriched with a lot of teaching techniques. That everybody participated in class and shared their ideas with the others made the lesson interesting. In that way, unfamiliarity with the topics and their difficulty decreased" (Subject 8).

In the study, 95 % of the students stated that the activities carried out in the instructional environment led to better learning. They stated that the primary reasons for this were their preparing portfolios, revising the learned material after each class to be able to prepare portfolios, studying continually, in-class activities' and practices' making their learning permanent, their being more active in the lesson, developing thinking and intepretation skills by participating in class, seeing the incomprehensible points and their mistakes, understanding better by taking feedback and keeping journals. Below are the related original examples:

"Yes, I believe that I learned better because I revised the learned materials after each class to be able to prepare my portfolio" (Subject 3).

"…The classes were very productive and the portfolios made the biggest contribution to them. The pre-test done in class was very different for me. I thought I would not be able to achieve this topic, but I understood that I just exaggarated it in my mind. It was really enjoyable" (Subject 4).

"Yes, I believe. I listened to the lesson more actively thinking that I would add it into my portfolio and I immediately took feedback whenever I did not understand something. In that way I understood better" (Subject 5).

As seen in Table 4, students stated mostly positive views about preparing a portfolio. They pointed out that preparing portfolios gave them a chance to revise the topics, be aware of the unknown topics, learn the incomprehensible points and understand better and more easily. Moreover, preparing portfolios prepared the students for the exams. So, they did not need to study very hard for the exams and they learned in a more permanent way. Students' negative views did not result from the fact that they did not want to prepare portfolios or did not give importance to portfolios, but from the fact that it was the first time that they prepared it and it took a lot of time to prepare.

As seen from the student views, the students who thought of portfolio preparation as boring or trivial understood its importance later on. Their positive and negative views were as follows:

"I think preparing portfolios was important both in terms of reviewing the learned materials and becoming aware of the unknown points." (Subject 1)

"Preparing portfolios worked a lot in terms of getting ready for the class and correcting our mistakes. I think they are very efficacious." (Subject 2)

"At first, I thought it was very boring and difficult…." (Subject 3)

"Preparing portfolios takes a lot of time…." (Subject 6)

It is seen that nearly all students want to make use of portfolios when they start the teaching profession. They want this to make their students study continuously, enable them to be successful, to understand better, more effectively and permanently, see their mistakes and make them realize their own mistakes. That is, they want to make use of portfolios to organize the learning and assessment process effectively and according to the students' needs. They stated their views as follows:

"….because I want my students to be more successful." (Subject 2)

"I think it will help me to be aware of how much my students have understood the topic and their incompetences and mistakes." (Subject 8)

"Thanks to portfolios, students can be aware of their learning level and then, act accordingly. In that way, learning becomes more enjoyable and permanent." (Subject 10)

CONCLUSION AND DISCUSSION

Depending on the findings regarding the first question of the study, it was found out that the use of

constructivist active learning methods had a significant influence on the students' academic achievement in this unit. Depending on the findings, it can be said that the students in the experimental group, where the constructivist learning activities were used, were significantly more successful than the ones in control group, where the traditional learning method was used. The constructivist learning activities can be said to increase the students' achievement level regarding this unit. It can be thought that students learn more meaningfully in active learning environments and become more successful in that way. Similarly, these findings support the previous research findings saying that the constructivist active learning activities lead to active students, make learning meaningful and interesting and in that way increase student success [13, 42-48].

When the findings regarding the second question of the study were examined, no statistically significant influence was found about the use of constructivist learning methods on the student attitudes towards "Instructional Measurement and Evaluation" unit. This finding is not in line with the previous research findings. Some research findings indicate that constructivist learning activities influence student attitudes positively [38,42,44,49]. This may have resulted from the fact that the courses and topics were different in the researches conducted. Students participating in such a study the first time and their dealing with these topics the first time might have led to these results. More research findings concerning the effects of constructivist learning experiences on the student attitudes towards measurement and evalution subject are needed.

Depending on the findings regarding the third question, the constructivist learning activities in the experimental group influenced the students' viewpoints about the learning process positively. All the students indicated that the way "Instructional Measurement and Evaluation" unit was covered was different and more efficacious from the way previous topics were covered. As seen in the students' own original statements, it is clear that in a constructivist learning environment, students participated in classes actively, used various methods, prepared portfolios and learned the subjects better revising them continually and also enjoyed learning. In addition, their saying that the learning process was thought-provoking, enjoyable and interesting shows that such an environment decreased their learning anxiety and increased their motivation. Similarly, in Al-Weher's [50] study, it was found out that the prospective teachers' perceptions about learning differed significantly after having taken a constructivist based education.

These findings are in line with the previous research findings. So and Watkins [25] indicated that the constructivist teaching activities carried out in education programs influence the prospective teachers' viewpoints about teaching positively. Also, in Akgun's [51] study, trainee teachers stated that they were pleased with the application of constructivist approach and added that they would use these approaches in their own professional lives. In another study done in Instructional Technology and Material Design course, it was found out that the use of constructivist approach influenced the trainee teachers' perceptions regarding the learning process positively [31]. These findings support Akar and Yildirim's [12] research findings stating that the trainee teachers educated in constructivist learning environments learn more meaningfully and in a more motivated way.

It is seen that, the constructivist learning experiences of the students in the experimental group of this study had some positive effects on them. As the students in the experimental group benefited from the constructivist learning activities and learned better, it can be said that they were more successful compared to the ones in the control group. It is because in a constructivist learning environment, students construct knowledge themselves actively rather than receiving it passively as in the traditional learning environment [8,9,52]. For this reason, students in the experimental group think that they learned better thanks to the portfolios and in-class active learning activities.

They regarded portfolio preparation important as they reviewed knowledge while preparing their portfolios, learned in an easier, more effective and permanent way, could check their understanding themselves and as they did not have to spend extra time to study for the exams. The students who had negative views about portfolio prepation stated that they found it boring and difficult at first, but understood its importance later on. As the students prepared portfolios for the first time, they had difficulty at first. Similarly, in Akar and Yildirim's [12] research trainee teachers reported that preparing portfolios contributed a lot to their learning, but said that this was a time-taking and tiring process. For this reason, it can be said that especially the students who prepare portfolios the first time need more guidance.

In the present study, it was found out that most of the trainee teachers decided to ask their students to prepare portfolios in the future. This is in line with their views regarding why they believe portfolios to be

beneficial for themselves. That is, they want to apply the method, which they believe to be beneficial for themselves today, in their own classes in the future. They view portfolio preparation to be necessary to make both the learning and assessement processes more effective.These findings are in line with lots of research findings. In these researches, it is said that portfolio preparation process had positive influences, trainee teachers viewed it as important and will make use of this method in their own teaching profession [11,53-55].

It is essential that prospective teachers regard portfolio preparation beneficial. It is because in constructivist instruction, mostly process-based assessment is done [8,14]. So, teachers should make use of portfolios in this process. Portfolios help students keep on developing and evaluating themselves, think reflectively, develop higher-order thinking skills and be evaluated by others [56-58]. For this reason, it can be said that using active teaching methods in teacher education programs and asking the students to prepare portfolios may contribute a lot to the trainee teachers' being trained with higher quality. If the students understand its importance and how the learning environment should be designed, they can use it in their own classes in the future easily.

In conclusion, it can be said that the constructivist learning activities designed to realize the aims of the "Instructional Measurement and Evaluation" unit of "Instructional Planning and Evaluation" course enabled the students to become more successful compared to the traditional lecturing method. No significant change was observed in the students' attitudes towards the unit. However, the students who carried out constructivist learning activities developed positive attitudes towards the learning process. Depending on the research findings, it can be suggested that the trainee teachers should be trained in constructivist learning environments in teacher education programs. In these environments, such active methods as collaborative group works, keeping journals, making concept maps, preparing portfolios should take place and student participation should be encouraged. For this reason, teacher educators at education faculties should have the sufficient qualities to be able to organize the constructivist learning environments.

Moreover, in teacher education programs, more experimental studies regarding the effects of constructivist learning environments should be done in the other courses and subjects, apart from Measurement and Evaluation subject. In addition, the effects of constructivist learning activities on different variables (such as trainee teachers' metacognitive skills, self-efficacies, epistemolojical beliefs, attitudes and motivation) which were not dealed with in this study can be studied in further researches. More research findings are needed to educate qualified teachers based constructivist approach.

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