



TEACHER CANDIDATES' POINT OF VIEWS ABOUT PORTFOLIO PREPARATION (TURKEY SETTING)

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ABSTRACT

This study aims at identifying teacher candidates' perspectives about the process of portfolio (the file of product) preparation. The quantitative data of this study was based on 110 first-year students at the primary school teacher education department (teacher candidates) and the qualitative data was composed of 15 teacher candidates' semi-structured interviews. As data collection tools, "The Inventory of Portfolio Preparation (PPI)" and semi-structured interview forms were used. The data was analysed through descriptive statistics and content analysis. The results of the study indicated that PPI develops teacher candidates' research and thinking skills and it is an important assessment technique. In addition; teacher candidates mentioned that time is one of their essential problems in the process of portfolio preparation and in order for a productive practice of this process, guidance should be given more effectively.

Keywords: *Mathematics teaching, Portfolio, Alternative testing and evaluation techniques.*

INTRODUCTION

In recent years, as a result of changes in epistemological theories, behaviourism has been replaced by constructivist approach. In line with this, the standards of "teaching" and "evaluation" have been revised and the objectives of learning have been re-defined (NCTM, 1995; Stiggins, 1999). The roles of students and teachers have been changed and from the testing and evaluation perspective, not only learning, itself, but also learning processes have been assessed (Webb, 1992; Eisner, 1999; Shepard, 2000; Stiggins, 2002; Mcmillan, 2004). Therefore; alternative testing and evaluation techniques which highlight students' individual abilities, manual skills and high-level thinking skills have emerged as well as traditional assessment methods (Stiggins, 1999; Sheffield & Cruikshank, 2000; Krulick, Rudnick & Milou, 2003; Dominguez Carmino, 2004).

Alternative testing and evaluation includes all assessment excluding the concept of traditional testing (Atkin, Black & Coffey, 2001; Bryant, 2001; Atılgan, 2006; Bahar, Nartgün, Durmuş & Bıçak, 2006). Alternative evaluation enables students to acquire the skills which are necessary to overcome difficulties or problems in daily or business lives. (Green & Emerson, 2008; Weigold, 1999). Giving emphasis on process as well as product, alternative testing and evaluation approaches highlight learners' high-level thoughts, problem solving skills and creativity. In addition, they motivate students to take the responsibility of their own learning and to feel proud of their acquisition. Wiggins (1989) also claims that the alternative assessment methods are realistic, judicative and innovative.

Since the reform in elementary school programmes in 2005 in Turkey, alternative testing and evaluation techniques have been used. One of these techniques is portfolio, which is one of the

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most extensively used ones. In fact, portfolio had been used in arts, photography and architecture, the professional fields in which best products were presented. Its use in education; however, dates back to 1990 (Payne, 1994; Wortham, 2005). Portfolio draws a picture of a learner's skills and this helps to decide on his future education life (Kulm, 1994).

In general, portfolio is a compilation of a learner's works in a specific period, revealing his skills. Also, these files show students' development, achievements and special interest. In short, a portfolio is composed of students' works, experiences and self-evaluation, which are based on different data resources and can be analysable and assessable. At the heart of portfolio, there is a systematic evaluation of students' works indicating their capacity (Moya and O'Malley, 1994).

Moreover; it is an essential evaluation tool giving descriptive, formative and summative information about students and their products. It also gives information about students' strengths and weaknesses in line with the organization of the education. Before the start of portfolio practice, the most important step is to identify the aim and the use of portfolio. At that step, it is important to plan the objectives of portfolio practice and what to put into the portfolio (Kulm, 1994).

A revision in the related literature shows various studies about portfolio. Some of these studies are based on theoretical knowledge (Saracaloğlu, Akamca & Yeşildere, 2006; Bekiroğlu, 2008; Ocağ, 2006; Zou, 2002; Payne, 1994, Kulm, 1994), some on primary education level (Bedir, Polat & Sakacı, 2009; Birgin, 2008; Baki & Birgin 2004; Kabaş, 2007; Ocağ, 2006; Özbaykuş, 2008), some on secondary education (English & Keshavarz, 2002; Erdoğan, 2006; Güngör, 2005; Maxwell & Lassak, 2008), some on university level (Bahçeci, 2006; Ersoy, 2006; Deveci, Ersoy and Ersoy, 2006; Morgil, Cingör, Erökten, Yavuz and Oskay, 2004; Parlakyıldız, 2008; Taşdemir, Taşdemir & Yıldırım, 2009) and the target audience in some of these studies are teachers (Kazu & Yorulmaz, 2007; Oğuz, 2008; Sırkıntı, 2007). Also, there are studies about electronic developmental portfolios (Achrazoglou, 2003; Funk, 2005; Korkmaz & Kaptan, 2005; Sivakumaran, 2005). Though this is the case, the use of portfolio in mathematics course has only been studied with primary school students in the related literature (Özbaykuş 2008).

As a result, this study investigates primary school teacher education department students' opinions about the process of portfolio preparation in terms of mathematics course. The study is thought to be beneficial for teacher candidates who will probably use portfolio in their teaching career. In line with these objectives, this study addresses the following research questions:

- 1) To what extent does the teacher candidates' portfolio preparation process influence their personal development?
- 2) Does the teacher candidates' portfolio preparation process lead to a significant difference in terms of gender and academic achievement?
- 3) To what extent does the teacher candidates' portfolio preparation process influence their professional development?
- 4) What are the teacher candidates' problems during the portfolio preparation process and how can these problems be solved?

METHOD

Aiming to investigate teacher candidates' point of views about portfolio preparation process, this study is based on both qualitative and quantitative methods. The reason of using two methods is to increase the advantages and to decrease the disadvantages of qualitative and quantitative methods (Johnson & Onwuegbuzie, 2004; Punch, 2005).

Subjects

The participants of this study are 110 (70 females, 40 males) first year students at Cukurova University, Education Faculty, Primary School Education Department. They are teacher candidates who take Basic Mathematics II course and who take part in the process of portfolio preparation. As the aim is to be able to reach all teacher candidates who are involved in portfolio preparation process, no sampling method is preferred. 63.1 % of the participants are females; whereas, 36.9 % of them are males. The mean of the participants' mathematics achievement is 34.3% "low", 54.9 % "mid" and 10.8 % "high".

Data Collection and Analysis

Two data collection tools are used in the study: a) The Inventory of Portfolio Preparation (PPI) developed by the researcher, herself b) semi-structured interview forms. No measurement tool is used for the teacher candidates' academic achievement in the mathematics course. Their actual scores taken in their course are considered. According to this, three groups have emerged: a) when the mean score at the end of the term in the mathematics course is 1.99 and below 1.99, this is categorized as "low", b) when the mean score at the end of the term in the mathematics course is between 2.00 and 2.99, it is grouped as "mid", c) when the mean score at the end of the term in the mathematics course is 3.00 or higher than 3.00, it is classified as "high".

During the preparation of PPI, related literature has been considered and thirty two positive and eight negative items have been prepared. These items have been analysed by six instructors specialized in curriculum development and mathematics teaching at Cukurova University, Education Faculty, Educational Sciences and Primary School Education Department. Following this revision, required changes have been made and then thirty one items have been chosen.

The pilot version of PPI was administered to four teacher candidates in face to face sessions. These participants had already experienced portfolio and they were excluded from the actual sampling of the study. During the administration, each item was read to each participant and their responses were marked on the inventory, so it was tested whether the statements were clear enough to understand or not. Then, the items were controlled again and PPI was finalized. For the responses, the participants were expected to give an answer through a five-point rating scale (completely agree-disagree). The participants were also asked personal information such as their gender and achievement score.

The data based on 110 first year students were transferred to the computer and structural validity of items were tested through factor analysis. The positive items in the inventory were scored from one to five and negative items were scored from five to one. Then, main components analysis was done in order to reveal factor analysis of the inventory.

Several levels of analysis were respectively conducted on the items taken in the portfolio preparation process: skewness and sharpness coefficient, item-total item correlations, correlation matrix values of items, factor loads (the least .30) and differences among factor loads of items loaded not onto more than one factor. As a result of this analysis, items numbered as 1, 2, 3, 5, 7, 8, 10, 12, 16, 17, 18, 19, 21, 24, 25, 27, 28, 29, 30, 31 were taken out of the inventory. 11 items on which main components analysis were conducted were gathered in three factors of which absolute values were higher than 1.00. According to main components analysis, the absolute value of the first factor was 3.480, the variance value that it explained was 31.64 %. The absolute value of the second factor was 2.06 and the variance value that it explained was 18.71 %. The absolute value of the third factor was 1.34 and the variance value that it explained was 12.213 %. The higher variance rates obtained at the end of the factor analysis was, the stronger the factor structure of the inventory was. The total variance that was explained by these three factors 62.57 %. In social sciences, variance rates ranging from 40 % to 60 % were regarded as satisfactory (Tavşancıl, 2010).

As a result of the analysis, it was seen that all items measuring teacher candidates' skill development level met all required conditions (factor loads higher than .30 and the difference between loads accumulated below two factors higher than .18). These items were, shortly, related to the development of the skills about communication, reasoning and decision taking. That's why; this sub-scale has been called "Thinking Skill". The item-total item correlation of the five items in this sub-scale changed from .73 to .81. Also, Cronbach Alpha inner consistency coefficient was found as .80. When the value is higher than .70, it means that the inventory is reliable.

Items numbered as 20, 22 and 23 were named as "*The Effect of the Process on the Individual*" which were about long-term learning and difficulties of portfolio preparation process. The item-total correlation value of these items in this sub-scale was between .80 and .86. Also, Cronbach Alpha inner consistency coefficient was found as .84.

The items numbered as 4, 6 and 9 were categorized as "*Research Skill*" which were about taking decision comfortably on the subject being searched, the access to the sources and the development of this skill during portfolio preparation process. The item-total correlation of this sub-scale was between .68 and .75. In addition to this, Cronbach Alpha inner consistency coefficient was found as .78.

Table 1 illustrates factor loads, item-total score correlation (r), absolute values and rate of explaining variance, item numbers, ranges and Cronbach Alpha values of items related to portfolio preparation process, based on the factor and reliability analysis.

According to the analysis conducted to evaluate whether the items were distinctive or not as shown in Table 1, item total correlation coefficient ranged from .68 to .86. The means of 11 items in the "*Thinking Skill*", "*The Effect of the Process on the Individual*" and "*Research Skill*" sub-scales were 3.27-4.51 and their standard deviations were 0.55-1.15. Moreover, total scores that individuals took from the data accumulated were ranked from the highest to the lowest. Following this ranking, low 27 % and high 27 % groups were identified and it was analysed that whether items could differentiate these two groups. It was seen that all items differentiated the groups significantly ($p < 0.01$). For this solution reached at four iterations, KMO coefficient sampling efficiency value was found as .74.

Table 1. Factor loads of Items, Corrected Item-Total Score Correlation of Items (r), Absolute Value of Items (r), Rate of Explaining Variance of Items, Number of Items and Cronbach Alpha Values of Items related to Portfolio Preparation Process

Item no	Thinking Skill	The Effect of the Process on the Individual	Research Skill	r*
15	.81			.76
13	.78			.81
14	.78			.78
11	.77			.73
26	.64		.46	.77
22		.88		.86
20		.81		.80
23		.80		.80
4			.77	.72
9	.36		.66	.75
6			.65	.68
<i>Absolute Value</i>	3.48	1.64	1.34	Total
<i>Variance Explained</i>	31.64	18.71	12.21	%62.57
<i>Cronbach Alpha</i>	.80	.84	.78	.72
<i>Range</i>	.64-.81	.80-.88	.65-.77	.64-.88
<i>Number of Items</i>	5	3	3	11

Note: Factor loads lower than .20 were not reported in order to make the table easy to follow.

r* : Item-total item correlation; * p<0.01

For the qualitative data of the study, 15 teacher candidates were interviewed through semi-structured interviews. While preparing the interview forms, related literature was reviewed and specialists' points of views were taken. After these interactions, the form was analysed by six instructors who were specialized in curriculum development and mathematics teaching at Çukurova University, Education Faculty, Educational Sciences and Primary School Education Department. Then, the form was finalized. In order to see whether the questions were comprehensible and applicable enough, two teacher candidates volunteered to take part in the pilot administration of the inventory. As a result of this, no problems were seen about the inventory.

Semi-structured interview forms included some information about: teacher candidates' perspectives about portfolio preparation process, the effect of portfolio preparation process on their professional development, their problems about this process and probable solutions for these problems. In addition to the questions in the interview forms, some further questions were asked at the end of interviews. Interviews lasting 8-12 minutes were audio-recorded. Some required information about the date, setting and time of the interviews were also recorded. The participants interviewed were coded as S1, S2 etc.

For the analysis of the quantitative data, descriptive statistics, explanatory factor analysis, independent samples t-test and one-way ANOVA were used. Content analysis was used for qualitative data. At this step, it was required to conceptualize the data, and then to organize and to identify related codes and themes. While coding, the data was read line by line and related themes were identified. The coded data were grouped according to differences and similarities. Next, related codes were gathered and themes emerged (Yıldırım & Şimşek, 2005). During the content analysis, an instructor specialised in programme development coded two teacher candidates' interview forms as a second coder. The agreement rate between two coders was

.87. Also, the researcher, herself, reanalysed her consistency on the data coding done at two different times. She coded two teacher candidates' interview forms in fortnight-intervals and tested her consistency. Her coding reliability coefficient was .92.

FINDINGS

In this part, teacher candidates' points of views about portfolio preparation process are given.

The effect of portfolio preparation process on teacher candidates' personal development

Teacher candidates' points of views about portfolio preparation process were investigated by doing factor analysis. Accordingly, the data were gathered under the sub-scales of “*Thinking Skill*”, “*The Effect of the Process on the Individual*” and “*Research Skill*”. The mean and the standard deviation values of these sub-scales are presented in Table 2.

Table 2. The Effect Of Portfolio Preparation Process On The Personal Development Of The Teacher Candidates And The Mean And The Standard Deviation Values Of This Effect

Sub-scales	N	\bar{X}	S
<i>Thinking Scale</i>	108	4.37	.49
<i>The Effect of the Process on the Individual</i>	106	4.11	.60
<i>Research Skill</i>	106	3.33	.93

In Table 2, it is seen that the mean of the sub-scale of “*Thinking Skill*” is 4.37 and the teacher candidates' point of views are at the level of “I completely agree”. Besides, the mean of the sub-scale of “*The Effect of the Process on the Individual*” is 4.11 and the teacher candidates agreed on this sub-scale. However, it is seen that the teacher candidates hesitated for the sub-scale of “*Research Skill*” as the mean of this sub-scale is 3.33.

The teacher candidates were asked for their point of views about the portfolio preparation process in mathematics course during the interviews. The theme, code and frequency distribution of the responses given to this question are presented in Table 3.

Table 3. Teacher Candidates' Point of Views about Portfolio Preparation Process in Terms of Themes, Codes and Frequency

Theme	Codes	f
<i>Skill</i>	Creative Thinking Skill	11
	Research Skill	4
	Skill of Relating	1
<i>Affective</i>	Liking	3
	Wondering	2
	Responsibility Feeling	1
<i>Cognitive</i>	Cognitive Development	5

As it is seen in Table 3, the teacher candidates' points of views were discussed in three main themes, skill, affective and cognitive. The majority of the teacher candidates expressed that their skills improved in the first theme and their affective characteristics had improved in the second theme. In the last theme, one third of the teacher candidates expressed that their cognitive development had improved.

About two third of the teacher candidates (11 teacher candidates) who were interviewed about the theme of skill stated that the studies in the portfolio preparation process improved their thinking skills. The point of view of a teacher candidate was as follows: *“I had perceived geometry only as answering questions and drawing some figures. I had never prepared a portfolio like this. We did some creative studies and the figures that we drew improved our creativity. In the end, we learnt the pi number which we hadn’t known before and where the area of the circle came from.”* (S7). In parallelism with this, about one fourth of the teacher candidates (4 teacher candidates) expressed that they improved their research skill. In the scope of the same theme, one teacher candidate stated as follows that he improved his associating skills by associating the mathematics with daily life. *“At first, I couldn’t understand what was happening, but as time passed, I noticed that it was useful. In the past, I had considered mathematics as unidimensional and a thing that was abstract from life. However, I noticed when I saw in our studies that we could use the figures and the mathematical expressions in our lives. I realized that I could use the things which I had learnt in my student life in my daily life. I believe that I prepared a very nice portfolio by making a great effort in my student life of 19 years. In other words, I had it as a result of my own effort.”* (S2).

In the affective dimension as the second theme, three of the teacher candidates emphasized that they liked the portfolio preparation process, two of them told that they found the process as intriguing and one of them expressed that his sense of responsibility improved. In this context, the teacher coded as S1 mentioned his point of view as follows; *“Portfolio is a work which requires educational research, this kind of works are not difficult, they are intriguing and you can do them without getting bored, we can describe what we want to tell by figures, ... it was important as it was the first, it improved the sense of responsibility.”*

In the cognitive process as the last theme, five of the teacher candidates expressed that they comprehended the subject better and they emphasized this with the following sample words; *“we could see the relationships between the figures better while we were drawing them, we found the formulas by ourselves, we noticed the connections between hexagon and triangle and I thought it is more permanent.”* (S3).

Findings Related to Portfolio Preparation Process In Terms of Gender

Independent samples t-test was carried out so as to determine if there was a significant difference between the gender and the scores that the teacher candidates got from the sub-scales of *“Thinking skill”*, *“The Effect of the Process on the Individual”* and *“Research skill”*. The results of the analysis were presented in Table 4.

Table 4. Independent Samples t-Test Results Related to Portfolio Preparation Process In Terms of Gender

Sub-scales	Gender	N	\bar{X}	S	sd	t
<i>Thinking Skill</i>	Female	68	4.36	.47	106	-.422
	Male	40	4.40	.52		
<i>The Effect of the Process on the Individual</i>	Female	67	4.17	.55	104	1.454
	Male	39	4.00	.66		
<i>Research Skill</i>	Female	67	3.42	.95	104	1.326
	Male	39	3.17	.87		

When Table 4 is analyzed, it is seen that there is no significant difference between the variable of gender and the scores of the sub-scales of *“Thinking skill”*, *“The Effect of the*

Process on the Individual” and “*Research skill*” (respectively; $t_{[106]} = -.422$, $p > .05$; $t_{[104]} = 1.454$, $p > .05$; $t_{[104]} = -1.326$, $p > .05$). This shows that male and female teacher candidates agreed on the items related with portfolio preparation process at similar rates.

Findings Related to Portfolio Preparation Process in Terms of Academic Achievement

One-way analysis of variance was implemented in order to determine if there was a significant difference between the academic achievement and the scores that the teacher candidates got from the sub-scales of “*Thinking skill*”, “*The Effect of the Process on the Individual*” and “*Research skill*” and the results were presented in Table 5.

Table 5. The Mean, Standard Deviation and F Values Related to Portfolio Preparation Process In Terms of Academic Achievement (sd: 2)

Sub-scales	Academic Achievement	N	\bar{X}	S	F	Significant Difference (LSD)
<i>Thinking Skill</i>	Low	34	4.42	.48	.075	
	Mid	54	4.39	.49		
	High	11	4.39	.40		
<i>The Effect of the Process on the Individual</i>	Low	35	4.07	.64	.348	
	Mid	53	4.17	.55		
	High	10	4.17	.55		
<i>Research Skill</i>	Low	35	3.39	.89	3.353*	High > Mid
	Mid	52	3.13	.97		
	High	10	4.00	.68		

* $p < 0.05$

When Table 5 is taken into account, it is seen that there is a statistically significant difference between the academic achievement level and the sub-scale of “*Research Skill*” ($F_{[2]} = 3.353$, $p < .05$). When the results of LSD test which was carried out to determine the direction of the difference was taken into account, it was seen that the significant difference in the sub-scale of “*Research Skill*” was between the teacher candidates with high academic achievement and the teacher candidates with mid academic achievement and it was in favor of the teacher candidates with high academic achievement. It is seen in Table 5 that the scores that were got from the sub-scales of *Thinking Skill* and *The Effect of the Process on the Individual* in terms of academic achievement were close to each other.

The teacher candidates were asked for the effect of the portfolio preparation process on their personal development in the mathematics course during the interviews. The theme, code and frequency distributions of the responses given to this question were presented in Table 6.

Table 6. Themes, Codes and Frequency Distribution Related to Portfolio Preparation Process in Terms of the Effect on Professional Development

Theme	Codes	f
<i>Effect of Professional Development</i>	Applicability	15
	Evaluation Tool	4

When Table 6 is considered, it is seen that all of the teacher candidates (15) stated that they could implement the portfolio preparation process in their professional lives and four of them told that they could use it even in other courses. Besides, four of the teacher candidates

emphasized that it was an important assessment tool. In this context, the point of views of the teachers coded as S11 and S13 were as follows respectively; *“these kinds of activities have very important contributions to our teaching career. I think they improve us in terms of our professions. This way, it helped us to gain experience in terms of personal developments of both the teachers and the students. Better adaptation can be obtained. The portfolio preparation process provides opportunity to carry out the lesson not with examples of stereotypes but with a different perspective. It makes especially the abstract topics of geometry more concrete and this way the students’ performances go up and they become successful... (S11)”*. *“I learnt what kind of situations with which the students will face in the future in advance and I will guide my students by considering them. I learnt the situations which my students will have difficulty in dealing with and what kind of problems with which my students will have by experiencing (S13)”*.

In the interviews with the teacher candidates, the problems that they reported about the portfolio preparation process show diversity. These problems were handled under four themes as shown in Table 7.

Table 7. Themes, Codes and Frequency Distribution in Terms of Problems During the Process of Portfolio Preparation

Themes	Codes	f
Experience	Following for the first time	9
	Requirement of regular working	3
Time	Time-consuming	11
Instruction	Not using the instructions	5
Self-evaluation forms	Difficulties in expressing point of views	5

As seen in Table 7, the teacher candidates had problems in “experience” theme the most during the portfolio preparation process. In addition, the teacher candidates told that they also had problems respectively in the themes of “time”, “instruction” and “self-evaluation forms”. Moreover, one teacher candidate mentioned that he did not have any problems.

The teacher candidates had problems in the theme of “experience” the most in the portfolio preparation process. Nine of the teacher candidates expressed the reason for having a problem as they followed it for the first time and three of them told that they had problems because the process required regular studying. In this regard, the teacher candidate coded as S10 expressed his points of view as follows; *“At first, we had difficulty as we didn’t know how to implement it and we didn’t have any previous knowledge about it. We got used to it when we approached to the end. I couldn’t manage the time efficiently. I couldn’t prepare my portfolio regularly and day to day...”*. 11 of the teacher candidates stated that they found the process as time-consuming. The viewpoint of a teacher who found the process as time-consuming is as follows; *“I tried to use my own handcraft in addition to the studies done in the classroom. I searched the internet... it was very difficult and took too much time. I had difficulty in allowing some time to it when the other courses join” (S9)*.

In the context of the theme of “instruction”, five of the teacher candidates which were interviewed emphasized that they couldn’t implement the process completely. In the same context, five teacher candidates mentioned that they had difficulties in filling in the self-evaluation forms. The viewpoint of the teacher candidate coded as S14 is as follows; *“...I had difficulty in filling in the self-evaluation forms at the end of the activities. I had trouble*

especially in reflecting the viewpoints objectively to the other side and using the language fluently”.

The solution offers of the teacher candidates about the problems they had during the portfolio preparation process were handled under four themes as shown in Table 8.

Table 8. Themes, Codes and Frequency Distribution of Solutions to the Problems Experienced in the Portfolio Preparation Process

Themes	Codes	f
<i>Time</i>	It requires more time	4
<i>Guidance</i>	It requires regular feedback	3
<i>Self-evaluation</i>	Self-evaluation forms should be decreased	2
<i>Number of Activities</i>	The number of activities should be increased	1

As seen in Table 8, four themes have emerged about the problems that teacher candidates have experienced during the portfolio preparation process. It can be seen that teacher candidates have the most suggestions about timing and guidance. Also, they have recommendations self-evaluation and the number of activities.

Nearly a quarter percent of teacher candidates have said that time is not enough and they need more time. For example; the teacher candidate coded as S3 mentioned *“I wish I had had more time. A file can be prepared during the summer holiday. I wish I could have concentrated more on each subject”*.

Moreover; three of the teacher candidates said that giving continuous feedback about the works they have already done would be useful and two of them mentioned that self-evaluation forms should be decreased and one said that the number of activities in the portfolio should be increased. As an example; the teacher candidate coded as S8 said: *“Self-evaluation forms should not be given at the end of activities. Instead, a general self-evaluation form will be enough...The number of activities requiring manual skills should be increased...”*

DISCUSSION AND RESULTS

This study investigates primary school education department students; namely, teacher candidates' point of views regarding portfolio preparation process. The results have revealed that teacher candidates have shown development in the dimension of skills, especially thinking, gaining research skills, affective and cognitive processes.

In line with this, as a result of the factor analysis based on PPI, the teacher candidates' opinions have accumulated at the sub-factor called as “thinking skills”. This factor is also in line with qualitative data of the study. From this perspective, the findings of this study have supported the studies by Bahçeci & Kuru (2008), Darling (2001); Ersoy (2006); Kuzu & Yorulmaz (2007); Maxwell & Lassak (2008); Morgil, Cingör, Erökten, Yavuz & Oskay (2004); Özbaykuş (2008), Parlakyıldız (2008) and Stecher & Hamilton (1994). For example; in a study by Stecher and Hamilton (1994) with 4th and 8th year mathematics classes in primary school, it was found that portfolios increased students' high thinking skills and affected their problem solving and communication skills positively. Also, the related literature includes a lot of studies about revealing students' thinking and research skills such as problem solving, reasoning, communication and deducing skills in mathematics teaching (Cathcart, Pothier, Vance & Bezuk, 2006; Heddens & Speer, 2006; Krulick, Rudnick & Milou, 2003).

The findings based on the interviews are considered in collaboration with PPI, it was clearly seen that teacher candidates' research skills and relation skills into the daily life developed. These results are parallel to studies by Bahçeci & Kuru (2008), Cooney, Sanchez & Ice (2001), Kulm (1993), Long (2001), Myers (2008), Özbaykuş (2008), Pandey & Smith (1991), Santos (2007) and Wiggins (1989). Bahçeci and Kuru conducted their experimental study with 215 university students from different departments in four experimental and four control groups. In their study, they found that students participating in portfolio preparation process developed their personal and life-related skills such as research, problem solving, decision taking and critical thinking skills. Similarly; Özbaykuş found that portfolio practice in mathematics course and in a unit called as "reflections from numbers to probability" improved students' research skills.

Regarding the sub-scale "the effect of the process on the individual", the participants thought that portfolio preparation process was "tiring", "difficult" and "stressful". This finding is similar to studies by Bahçeci (2006) and Darling (2001). In a study by Bahçeci, it was seen that students in portfolio group could not make use of the process effectively and had stress and timing problems. However; Özbaykuş (2008) and Slater, Ryan and Samson (1997) found in their studies that students taking part in portfolio preparation process were less stressful and anxious and they used their time more productively.

On the other hand, the teacher candidates liked portfolio preparation process and found it challenging and positive, which supports Bahçeci (2006), Bedir et al., Benson & Smith (1998), Birgin (2008), Kabaş (2007), Korkmaz & Kaptan (2002), Özbaykuş (2008), Parlakyıldız (2008), Sırkıntı (2007) and Stecher' (1998) results. To exemplify; in a study titled as "Benefits and Difficulties of Large-Scale Portfolio Evaluation" by Stecher, it was revealed that portfolio evaluation is beneficial to teaching and teachers are willing in portfolio preparation process. In addition, it was seen that students' expectations have increased and teaching process and the objectives of the programme have changed accordingly. Similar to this, Sırkıntı carried out a study and focused on primary school and mathematics teachers' point of views about portfolio preparation in mathematics course. He found that portfolio preparation process makes students active and gives them a chance to show their skills and motivates them.

Though this is the case, a contradiction is seen between the quantitative dimension "the effect of the process on the individual" and qualitative dimension "affective theme". In other words; while teacher candidates said that portfolio preparation process was tiring, difficult and stressful, in the interviews they mentioned that they liked portfolio preparation process and found it motivating and challenging. This may have derived from the fact that teacher candidates are inexperienced in portfolio preparation process and could not use their time effectively.

Moreover; the teacher candidates explained that their main problem was due to their lack of experience in portfolio preparation process. This result is also supported by a lot of researchers such as Aschbacher (1995), Baki & Birgin (2002); Darling (2001), Deveci et al. (2006) and Erdoğan (2006). Deveci et al. carried out a study with teacher candidates about portfolio use in Science and Social Sciences Teaching courses through a qualitative study. They found that teacher candidates were in panic as it was their first encounter to portfolio.

The next finding of this study is that portfolio preparation process is time taking. This is also in line with Aschbacher (1995), Baki & Birgin (2002), Benson & Smith (1998), Erdoğan (2006), Ersoy (2006), Kuzu & Yorulmaz (2007), Laverie (2002), McMillian (2004), Ocak (2006), Özbaykuş (2008), Parlakyıldız (2008), Santos (2007), Stecher (1998), and Sırkıntı (2007). In a

study by Baki and Birgin, they observed that the teacher had a trouble in scoring her students' works and in filling her observation forms in portfolio use in mathematics course as the class was overcrowded. In the same manner, in Ocak's study about students' point of views based on portfolio, it was seen that students had timing problems in preparing their portfolios because of formal exams such as Science School Examination. In addition; McMillian found that teachers had to spend much time in developing and evaluating criteria according to works in the portfolio. In contrast; Birgin (2008) found that most of the 7th year students (80.8%) did not find portfolio preparation as a time taking activity.

Also, the teacher candidates mentioned that they could use portfolio in their future professional lives. This result is in line with Bahçeci & Kuru (2008), Ersoy (2006), Kabaş (2007), Ocak (2006) and Oğuz's (2008) findings. They found out that teacher candidates could make use of portfolio as an alternative evaluation tool in their profession.

A further finding of this study is no significant difference between teacher candidates' gender and portfolio preparation process. It can be said that female and male teacher candidates' point of views are similar to each other about this issue. This finding also supports Ersoy's results (2006). He also claimed that teacher candidates from primary school education department, mathematics teaching department and pre-school education department did not show any differences about their perspectives related to portfolio in terms of gender. However; Oğuz (2008) found a significant difference in favor of female teacher candidates about portfolio preparation process.

In the, a significant difference is seen between teacher candidates' academic achievement and "research skill" ($p < .05$). In line with this, there is a significant difference between the teacher candidates who are academically successful and those who are at the mid-level, which is in favor of successful teacher candidates. Therefore; we can say that teacher candidates' research skills increase as they become more successful academically. This finding supports the results by English & Keshavarz (2002), Bedir et al. (2009), Güngör (2005), Parlakyıldız (2008) and Taşdemir, Taşdemir & Yıldırım (2009). Güngör found that experimental group participants who prepared their portfolio on the basis of constructivist approach were more successful than control group students who used traditional method. There are; however, contradictory results in the related literature (Erdoğan (2006), Ersoy (2006), Bahçeci (2006), Slater, Ryan & Samson (1997). In Erdoğan's study; no statistically significant difference was seen between the academic achievement of experimental group participants who prepared portfolio along with traditional teaching and control group teacher candidates who followed traditional method.

As well as these findings above, teacher candidates suggested being given feedback and information about portfolios which were prepared. This result is in line with Kazu & Yorulmaz (2007), Laverie (2002), Maxwell & Lassak (2008), Santos (2007) and Segers, Gijbels & Thurlings (2008). Kazu and Yorulmaz recommended that both students and teachers should be given information about portfolio.

To summarize; aiming to identify teacher candidates' point of views about portfolio preparation process by means of qualitative and quantitative data, this study shows that teacher candidates have developed their thinking skills, have gained research skills and improved themselves in the cognitive and affective process. In addition to this, no significant difference has been found between portfolio preparation process and gender but it has been found out that students who are academically more successful are more effective in using their research skills. Next; it has been seen that teacher candidates have had some problems about timing and experience. Therefore; it can be said that they should be given more time and continuous

guidance. Based on these results, we can say that there are positive effects of portfolio preparation in different fields and portfolio can be used as an important alternative evaluation tool in teacher candidates' future academic lives.

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