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Research Article

The Effect of Portfolio Assessments on Metacognitive Skills and on Attitudes toward a Course*

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Abstract

The aim of this study is to determine through teacher candidates' thoughts the effects of a portfolio assessment implementation on their metacognitive skills and attitudes towards a course on measurement and evaluation. Exploratory sequential mixed-methods design is employed within the study. The pretest/posttest control group design was used in the qualitative phase of the study and a semi-structured interview form in the quantitative phase. The study was conducted with the participation of 42 teacher candidates. Data has been gathered using the metacognitive skills scale, an attitude scale on the measurement and evaluation course, and a semi-structured interview form. While analyzing quantitative data, assumptions were detected using the SPSS 17.0 program (multi-normality, extreme values, emission, covariance matrices' homogeneity, linearity, absence of multi-link issues); descriptive statistics and MANCOVA analysis were also been made. The NVivo 8 program was used in the analyzing the quantitative data gathered from the semi-structured interview form. Portfolio assessments were determined to have positive effects on attendants' metacognitive skills and attitudes towards the course, and the implementation positively affected their attitudes.

Keywords

Portfolio assessment • Metacognitive skills • Teacher candidates • Mixed-method • MANCOVA

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Within the learning process, requirements like guiding learners and evaluating learning tools at different levels put learning into practice, and the concepts of learning and evaluating identify with each other instead of competing (Giralt & Varela, 2015; Schön, 1987). On this basis and in accordance with the constructivist education philosophy, portfolio assessments are recommended for learners' knowledge, skill, and performance to promote their critical and reflective thinking skills (Bahous, 2008; Conrad, 2008).

A portfolio is defined as a collection of products that students produce during the learning process, and it creates an opportunity for learners, as well as their peers, families, and teachers, to observe and evaluate changes over time. Portfolios are also thought to be very important in terms of providing direct evidence for quality learning media and in-class activities created by teachers (Denney, Grier, & Buchanan, 2012; Ledoux & McHenry, 2006). Students gather their works systematically and methodically in a folder under predetermined criteria. In this way, aside from students' improvements over time, their strengths and weaknesses can also be observed.

In regard to representing decisions about programs, the teaching process, and students, portfolios are significant as a flexible evaluation tool in which different students' products are used as indicators (Davies & Le Mahieu, 2003). Cameron, Tate, Macnaughton, and Politano (1998, p. 6) claim that learning takes place only by thinking about, problem-solving, constructing, regressing, transforming, reflecting on, taking responsibility for, questioning, answering, and implementing knowledge about a new situation. Davies and Le Mahieu (2003) also state the main purpose of evaluations is to support this. From this perspective, a portfolio is about the concept of "evaluating for learning" (Dannefer, 2013; Elango, Jutti, & Lee, 2005; Fung, 2006). It reveals the negative effect of evaluating students according to their answers and telling them their mistakes (Marzano, 2006; Marzano, Pickering, & Pollock, 2001). Evaluations are highlighted as having as much importance as students' learning processes are in portfolio assessments. Becoming involved in the evaluation process requires students to reflect and self-evaluate, as well as to follow learning and thinking processes; in other words, students need to use their metacognitive skills.

The metacognitive concept was coined by Flavell in the 1970s through the results of experimental studies on memory processes; it is defined as individual thought about one's cognition by observing one's own cognitive activities (Flavell, 1979, 1981). Flavell considers metacognition in the new millennium to be knowledge and processes. Knowledge of metacognition includes a comprehensive mental working structure in general and the comprehension of one's own mental working structure in particular. On the other hand, metacognition processes include planning, following, and arranging thoughts (Flavell, 2000, 2004; Papaleontiou-Louca, 2008). In this context, metacognitive skills can be defined as one's own self-awareness, learning

characteristics, and ability to regulate one's cognitive processes. Hence, Flavell, Miller, and Miller (2002) draw attention to metacognition as the key for success in different areas like verbal skills, reading, writing, language acquisition, care, memory, and social interaction. Senemoğlu (2007) also says that metacognitive knowledge is rearranged according to metacognitive experiences in the process of arranging an individual's learning activities.

Metacognition generally means that individuals control their competences and skills by observing and making the arrangements they think are necessary. Students with metacognitive skills possess the ability to succeed in learning activities and responsibilities, and also have a high level of thought when evaluating their own comprehension process. In this way, students turn out to be those who make related reflections, proving and developing strategies to solve the problems they face in this period (Schunk, 2008; Tarricone, 2011). Metacognitive skills are the abilities to control and develop cognitive performance. Individuals with metacognitive skills often have self-confidence and feelings of self-efficacy, and this situation has a positive influence on motivated learning and success (Eisenberg, 2010; Hacker, Dunlosky, & Graesser, 2009).

Reflection and self-arrangement of metacognitive skills are emphasized as they are related to critical thinking. At the fore of these skills come thoughts about ideas underlying individual's beliefs and ideas concerning relationships between specific concepts and rules (Martinez, 2006). Metacognitive skills include abilities like using and choosing proper strategies for learning a subject or condition, evaluating these strategies, and making new arrangements by looking at the evaluation results and then choosing new strategies. In order for students to gain these skills, they need to be placed in learning environments where these skills can be gained effectively. Developing metacognitive skills depends on an abundance of previous cognitive experiences (Camalahan, 2006; Flavell, 1979; Senemoğlu, 2007). Cooper and Sandi-Urena (2009) define those with metacognitive skills as ones who can do things properly even when they have no experience doing something.

What is expected from individuals who use metacognitive skills is to know the aim of learning, what is expected of them, their position related to the subject, the time they need for learning, how to plan as needed for effective learning, how to see the positive and negative sides of a plan, how to make the changes a plan needs if the majority of its aspects are negative, how to find the strategies needed for use in the learning process, and after all of these, how to question whether or not it meets their expectations (Çalışkan & Sünbül, 2011; Senemoğlu, 2007). In the problem-solving phase, individuals are expected to identify and understand the problem, remember and recall prior knowledge, develop a high level of conceptual comprehension, handle the problem within a few steps, develop strategies for solving and checking their strategy's

flexibility, and self-evaluate in terms of what is to be done to solve a problem (Haidar & Naqabi, 2008; Howard, McGee, Shia, & Hong, 2001). Metacognitive skills have the function of both simplifying learning and developing effective problem solving. In this respect, it is important to develop media that can improve these skills (Gredler, 2009; Kapa, 2007).

In terms of the importance of being active, one characteristic that needs to be developed during teacher training for individuals to be effective and life-long learners is metacognitive skills. Furthering teacher candidates' personal and professional development requires them to gain efficacy at arranging activities towards improving students' metacognitive skills and at developing the relevant characteristics in their pre-service period. Hence, aside from studies in the literature on students of teacher candidates, students using web-based training (Baltacı & Akpınar, 2011), strategy teaching (Burchard & Swerdzewski, 2009; Chularut & DeBacker, 2004; Pelton, 2010) and problem-based training (Downing, Kwong, Chan, Lam, & Downing, 2009; Zhang, Rigdway, & Sachs, 2015) are studies that show the positive effects that metacognitive skills have on self-efficacy, success, and self-arrangement (Haryani, Prsetya, & Permanasari, 2014; Papaleontiou-Louca, 2003; Metallidou, 2009). Portfolio assessment has the feature of supporting high-level thinking skills (Meeus, van Petegem, & Meijer, 2008). Teachers and students can clearly see the kind of study that needs to be done with portfolios related to concept-learning evaluations and students' learner characteristics and levels. Therefore, students have to think about the feedback they receive as a result of their actions and what is expected from them. From this point of view, portfolios help students become individuals who can use metacognitive knowledge and skills (Clark, 2010). On the other hand, portfolio usage is effective in transforming self-regulation into a behavior. In a portfolio evaluation process, metacognition is prompted by planning, following, and arranging (Zimmerman, 2002). Thus in Baas, Casteljins, Vermulen, Marten, and Segers's (2014) study, metacognition was determined to be stimulated when portfolio evaluations are performed. Meyer, Abrami, Wade, Aslan, and Deault (2010) also say that portfolio assessment influences the construction of basic metacognitive skills, such as students placing themselves in the center of the learning process, setting goals, choosing necessary-to-follow strategies, and reflecting on the learning process. Students have to think about themselves as both the learning subject and the learner in portfolio assessments (McLeod & Vasinda, 2009). In this context, researching the usability of portfolio assessment with the aim of developing metacognitive skills in teacher education is also seen as important. Portfolio usage in higher education and in teacher training has increased since the end of the 1990s. The portfolios used in teacher training can be different in content, function, and implementation. All the best, complete, and incomplete products teachers put in portfolios can be seen gathered. All types of portfolios can be examined under three main topics: efficacy-

oriented; action-reflection cycle, and material-focused. Efficacy-oriented portfolios create the opportunity to evaluate by integrating with other knowledge and skill-measurement tools. Action-reflection cycle portfolios require teacher candidates to implement teaching and reflect on their actions. Portfolios focused on media and materials require teacher candidates to perform activities where they can show personal and learning-related creativity, such as materials, drawings, photographs, posters, and created texts (Strijbos, Meeus, & Libotton, 2007).

Portfolio usage in teacher training is said to have functions like determining teacher candidates' training performance, showing the degree of activity in the aims of the teacher-training program (Ledoux & MacHenry, 2006), and creating opportunities for teacher candidates to reflect on their training process, output, and materials (Zeichner & Wray, 2001). Bloom and Bacon (1995) suggested that portfolios develop teacher candidates' self-reflection and self-evaluation skills and simplify integrating decision and problem-solving strategies with teacher candidates' professional skills. Studies emphasizing the importance of portfolio use in teacher education underline its effectiveness at developing reflective thinking and learning skills (Klenowski, Askew, & Carnell, 2006; Lyons, Hyland, & Ryan, 2002); when teacher candidates evaluate their own skills, they find opportunities to reflect on their in-class activities, knowledge, and skills (Hopfer, 1999). Also, Xu (2004) stated that the best aspect of portfolio use in teacher training is that how and when teacher candidates do something is known. Denney, Grier, & Buchanan (2012) pointed out that portfolios develop professional skills during the pre-service education process; they highlighted the importance of expanding portfolio use in teacher-training programs. Some findings show that portfolio implementation has a positive effect on teacher candidates' attitudes towards a course (Campbell, Melenyzer, Nettles, & Wyman, 2000; Xerri & Campbell, 2015), and that evaluations strengthen motivation because it is a stress-free process for learners (Alexiou & Paraskeva, 2010; 2013).

As no study can be found that emphasizes portfolio assessment's effects on teacher candidates' metacognitive skills and attitudes towards courses and works with both qualitative and quantitative data, this is the basis of our study. A measurement and evaluation course has been selected as the main course because attention is drawn to the fact that findings in the literature show teacher candidates' attitudes toward measurement and evaluation courses and their sense of efficacy to be at low and medium levels (Alkharusi, Kazem, & Al-Musawai, 2011; Evin-Gencel & Özbaşı, 2013; Yaşar, 2014). On that note, the aim of this study is to determine the effects of portfolio assessment through teacher candidates' thoughts about the implementation in a measurement and evaluation course, on their attitudes towards this course, and on their metacognitive skills. With this aim, answers to the following questions are sought:

Teacher candidates;

- When checking pretest scores, do metacognitive skills and attitudes about the measurement and evaluation course show a meaningful statistical difference for the experimental and control groups?
- What are their opinions about portfolio use in the measurement and evaluation course in terms of their attitudes towards the course and their metacognitive skills?

Method

Research Design

This study uses the exploratory sequential mixed-method design. In the qualitative phase of the study, a pretest-posttest control group match-up design was used; a semi-structured interview form was used in the quantitative phase. The mixed research method includes gathering and using both qualitative and quantitative methods. In this way, a researcher empowers the study by supporting a deficient method with another one. The mixed-methods research aims to provide this strength by using different methods' perspectives and their impressions (Creswell, 2006; Johnson & Christensen, 2014; Johnson & Onwuegbuzie, 2004). In the first phase of an exploratory consecutive mixed-methods design, the process begins with gathering quantitative data, and qualitative data is obtained to make better sense of the quantitative data. Thus, qualitative data helps explain quantitative data (Creswell, 2013).

Study Group

The research study group consists of 42 third-year teacher-candidate students studying in a foreign language department at a faculty of education in a Marmara area university. The foreign language department was chosen because it had enough students to create an experimental group and a control group. Within this study, which used a pretest/posttest control group design in its qualitative phase, 15 female and 6 male teacher candidates participated in the experimental group, and 16 female and 5 male teacher candidates participated in the control group.

Data Collection Instruments

Research data were obtained through the metacognitive skills scale (MS), the attitudes toward the measurement and evaluation course scale (ATMEC), and a semi-structured interview form.

Metacognitive Skills Scale (MS). The MS, developed by Altındağ and Senemoğlu (2013), is a 5-point Likert-type, one dimensional scale consisting of 30 items. Cronbach's alpha-reliability coefficient for the original scale is .94. The one-dimensional structure of the scale is seen to explain 35.74% of its general variance. In the current study, Cronbach's alpha has been found as .87, which means it provides the same reliability as the original. The lowest and the highest scores that can be gained from the scale are 30 and 150.

Attitudes toward the "Measurement and Evaluation" Course Scale (ATMEC). This scale, developed by Bryant and Barnes (1997) and adapted to Turkish by Ozan and Köse (2013), consists of a 5-point Likert structure with three factors. Cronbach's alpha-reliability coefficient for the scale was found as .92 by Ozan and Köse (2013). In this study, Cronbach's alpha reliability coefficient for this scale has been calculated as .87. Additionally, the three-dimensional structure of the scale explains 47.7% of its general variance. The lowest and highest score that can be achieved from the scale are 31 and 155.

Semi-structured interview form. The semi-structured interview form was used with the aim of obtaining the qualitative data of the research. When preparing the form, the researcher prepared the questions necessary for finding answers to the research questions. These questions were varied with different expressions and then presented to specialists in their fields. While taking specialists' advice, criteria were determined as being an expert in education programs, teaching, teaching the measurement and evaluation course, and having experience with qualitative studies. With these criteria and in light of the specialists' advice, the semi-structured interview form was put into its final structure.

In the interview form's final structure were three questions for finding answers to the research problems. The researcher read the final state of the form aloud to three students who were taking the measurement and evaluation course to test the understandability of the questions. The interview process began after this phase. Interviews were conducted with voice recordings and the participants' permission. In this sense, interviews were conducted with 14 teacher candidates from the experimental group on a volunteer basis. Participants were asked about the portfolio assessment method and to be sincere with their answers. The questions directed to the participants are listed as follows:

1. What did you think about the measurement and evaluation course before the implementation? What did you think about your own learning process before the implementation?

2. What do you think about the portfolio assessment method?

3. What do you now think about the measurement and evaluation course after the implementations? What do you think about your own learning process after the implementation?

Data Analysis

In analyzing the qualitative data, assumptions were detected using the SPSS 17.0 program (multi-normality, extracting extreme values, homogeneity of covariance matrixes, linearity, absence of multi-link problems); MANCOVA and descriptive statistics analyses were made. The NVivo 8 program was used in analyzing the quantitative data gathered from the semi-structured interview forms.

Content analysis was performed during quantitative data analysis. In the process of content analysis, a three-person committee (the researcher and two specialists) were placed to provide reliability. Each of the three committee members separately codified each data that had been turned in on the written forms. Miles and Huberman's (1984) formula (Agreement ÷ [Agreement + Divergence] x 100) was used in the coding process that committee members conducted. The agreement percentage among encoders was determined to be 75% for the codes in the first question, 80% for the codes in the second question, and 75% for the codes in the third question. These percentages show that the research data is reliable. Thus, themes were reached by extracting non-concordant codes among the codes constructed by the committee from the analysis. To increase the internal validity of the research, a detailed literature review was performed before the interviews. Additionally, analysis began after receiving confirmation from the participants about their written opinions. Ensuring that attendants were sincerely expressing their thoughts was attempted during the interview process. To increase external validity of the research, what has been performed in the research is explained in detail, and learning products and pictures relevant to the portfolio exhibition have been included in the appendix with participants' permissions. Moreover, achieving external validity was attempted by allowing explanations on the working group, data gathering process, and analysis to occur.

Processes

The measurement and evaluation course was taught using the active learning method for the experimental and control groups. The semester syllabus was given to each group the week before the course began. It explained that evaluations are made through a midterm and a final exam. The experimental group received information about a three course-hour portfolio assessment, and teacher candidates opted to choose the scales for portfolio practice. The experimental process occurred for 10 weeks after the pretest had been implemented on both groups. The active learning

techniques used in the course are the *snowball technique*, in which individual study on a given subject happens first, then in groups of two, four, and eight; the *roller technique*, where discussions are made on a given subject by creating two concentric circles; the *everyone-is-teacher-here technique*, where students write questions about the subject and points that need to be explained on small slips of paper which are then randomly distributed to the students to await answers; the *station technique*, which requires students to complete other's incomplete material by creating different activity topics; the *paper-bag-of-knowledge technique*, in which prior knowledge about the subject is written on the outside of a paper bag and newly learned information is written on small slips of paper; the *learning-gallery technique*, where what has been learned is reviewed and listed, and others add what needs to be added; and the *flash-card technique*, in which green means agree and red means disagree. Courses that use active learning techniques perform academic duties such as slogan writing, poetry, composition, caricature drawing, educational game development, creative story writing, picture-poster drawing, and concept map drawing. Teacher candidates create their portfolios by choosing products at the end of these duties under predetermined criteria. Data collection instruments were administered as posttests at the end of the 10 weeks, after which the products created in relation to the measurement and evaluation course and chosen for the experimental group's portfolios were presented as a measurement and evaluation exhibition. The exhibition took place at the faculty of education and was open to all instructors and teacher candidates. The exhibition invitation cards were made by the teacher candidates, who invited instructors to the exhibition by offering instructors an invitation card individually. In the last part of the process, interviews were conducted with the experimental group teacher candidates using the portfolio semi-structured interview form on portfolio assessments in the measurement and evaluation course.

Data Analysis

First, the data gathered from the teacher candidates was examined carefully. Whether there were any missing or false conveyances within the data was checked and any that were found were extracted from the research. Afterwards the data were transferred to a computer and examined using SPSS. Points were assigned for missing values within the data. Operations were performed that included detecting single and multi-directional extreme data values. The *Z*-value, which is calculated over the total scores of the scales to examine unidirectional extreme values, is between +3 and -3. Mahalanobis values, which are examined to detect multi-directional extreme values, are seen in the square values from Table 5.

Findings

After preparing the data for analysis, it was necessary to question whether the assumptions had been met or not in order to perform MANCOVA analysis. Therefore, skewness, kurtosis, and histogram graphs of data gathered from scales were first examined. As a result of this examination, data was seen to have a normal range. Table 1 shows descriptive statistics related to average scores, standard deviations, and minimum and maximum skewness and kurtosis values.

Table 1
Descriptive Statistics of Data

Data Collection Instruments		N	$\bar{x}$	*S*	Min.	Max.	Skewness	Kurtosis
MS	Pretest	21	108.29	12.46	139	-0.451	0.167	87
	Posttest	21	121.93	8.65	141	0.779	-0.130	97
ATMEC	Pretest	21	94.48	15.14	119	-0.333	-0.420	59
	Posttest	21	121.38	10.02	138	0.098	-0.663	95

Table 1 shows descriptive statistics related to scores gathered from the MS and ATMEC scales. Skewness and kurtosis values related to the scales' values provide normality ranges of +/-1. Normal distribution of values, apart from skewness and kurtosis coefficients, were examined from the perspective of the Shapiro-Wilk (S-W) test. Results of the analysis performed with this aim are shown in Table 2.

Table 2
Shapiro-Wilk Test Results for the Values

	S-W Statistic	*Sd*	*p*
MS Pretest Total	.980	42	.658
ATMEC Pretest Total	.969	42	.295
MS Posttest Total	.979	42	.626
ATMEC Posttest Total	.961	42	.166

$p > .05$.

In Table 2, scale scores show regular percentages according to the S-W test results performed to examine whether or not the MS and ATMEC scales' pretest and posttest scores have a normal rate of distribution, $p > .05$, $n = 42$. Descriptive statistics for the MS and ATMEC scales and their data are given in Table 3.

Table 3
Pretest-Posttest Descriptive Statistics

	Group	Mean	N	Adjusted Mean
MS Pretest	Experimentation	104.00	42	104.00
	Control	112.57	42	112.57
ATMEC Pretest	Experimentation	84.57	42	84.57
	Control	104.38	42	104.38
MS Posttest	Experimentation	124.62	42	129.01
	Control	119.24	42	114.76
ATMEC Posttest	Experimentation	127.19	42	130.06
	Control	115.57	42	112.70

Table 3 shows the mean scores and adjusted mean scores of the experimental and control groups' pre- and posttests. The experimental group's (who practiced the implementation) average MS scale score before the implementation was $\hat{x}_1$ = 104.00; after the implementation, it was $\hat{x}_2$ = 124. When examining the control group's average MS scores, their pretest mean score was $\hat{x}_1$ = 112.57 and posttest mean was $\hat{x}_2$ = 119.24. When examined from the perspective of attitudes toward the measurement and evaluation course, before the implementation, the ATMEC mean for the experimental group who conducted portfolio assessments was $\hat{x}_1$ = 84.57; after the implementation, it was $\hat{x}_2$ = 130.06. When examining the control group's average ATMEC scores, their pretest mean score was $\hat{x}_1$ = 104.38; for the posttest, it was $\hat{x}_2$ = 112.70.

Apart from the normal distribution of data, there is also a need to prove some assumptions in order to be able to conduct MANCOVA analysis. One of these is the homogeneity of matrixes' covariance, whose results were revealed as $F_{(3,\ -288{,}000)}$ = 1.414, *Box's M* = 4.484, p = .237, p > .05. For covariance matrixes to be homogeneous, p values needed to be insignificant (Tabachnick & Fidell, 2007). When examining p values, they are seen to be insignificant, and therefore the matrixes' covariance is homogeneous.

Another important assumption of MANCOVA analysis is to provide univariate homogeneity. Levene test results for the MS posttest total scores, implemented to show if there is univariate homogeneity, are $F_{(1,\ 40)}$ = 2.675, p = .110, p > .05, and for the ATMEC posttest total scores, $F_{(1,\ 40)}$ = 3.220, p = .080, p > .05. According to these results, p > .05 shows the homogeneity assumption is met. Moreover, the number of participants in the experimental and control groups is equal (n = 21). These results show it is appropriate to conduct MANCOVA analysis.

After assuring the MANCOVA assumptions had been met, MANCOVA analysis began. The main question of the research is to determine from the results of MANCOVA analysis if the posttest scores related to the scales show meaningful difference when compared to the pretest scores according to whether or not the evaluation method had been implemented for teacher candidates' metacognitive skills and attitudes towards the measurement and evaluation course. The results are presented in Table 4.

Table 4
Multi-Variance Analysis Pretest Results

Variable Source(s)	Wilk's Lamda	Hypothesis *df*	Error *df*	*F*	*p*	Partial sum square
MS Pretest	.32	2.000	37.00	39.337	.000*	.680
ATMEC Pretest	.37	2.000	37.00	31.001	.000*	.626

N = 42, * p < .05.

One can see that Wilk's Lambda values related to both tests are meaningful ($p = 0$, $-p < .05$). When teacher candidates' pretest scores from the MS and ATMEC scales are checked in Table 4 according to the evaluation method used (classic evaluation or portfolio assessment), a meaningful difference between teacher candidates' scores is seen, $F_{(1, 40)} = 39.337$, $p < .05$ and $F_{(1, 40)} = 31.001$, $p < .05$). Table 5 shows the ANCOVA analysis of adjusted posttest scores according to experimental and control groups by retaining the MS and ATMEC scales pretest points.

Table 5
ANCOVA Results of Adjusted Posttest Scores according to MS and ATMEC Scales' Pretest Scores

Source	Dependent Variable	Average of Squares	*sd*	Squares total	*F*	*p*	Partial eta-squared
Adjusted Model	MS_ Posttest Total	730.309[a]	3	243.436	3.952	.015*	.238
	ATMEC _ Posttest Total	1,552.184[b]	3	517.395	7.675	.000*	.377
Intercept	MS_ Posttest Total	238.878	1	238.878	3.878	.056*	.093
	ATMEC _ Posttest Total	564.550	1	564.550	8.374	.006*	.181
Group	MS_ Posttest Total	601.152	1	601.152	9.760	.003*	.204
	ATMEC _ Posttest Total	882.306	1	882.306	13.088	.001*	.256
Error	MS_ Posttest Total	2,340.477	38	61.592			
	ATMEC _ Posttest Total	2,561.721	38	67.414			
Total	MS_ Posttest Total	627,467.000	42				
	ATMEC _ Posttest Total	622,914.000	42				
Adjusted total	MS_ Posttest Total	3,070.786	41				
	ATMEC _ Posttest Total	4,113.905	41				

a. $R^2 = 0.238$ (Adjusted $R^2 = 0.178$)
b. $R^2 = 0.377$ (Adjusted $R^2 = 0.328$)
$p < .05$.

As seen in Table 5, students' MS and ATMEC posttest scores show a meaningful difference compared to their pretest scores related to the experimental ($F_{(1, 38)} = 9.760$, $p < .05$) and control groups ($F_{(1, 38)} = 13.088$, $p < .05$). Also, eta-squared values related to groups' scale scores are presented in Table 5. The eta-squared values show a significant effect or relationship between variables. This value is important because it also defines the degree of significance. By looking at the table above, eta-squared values can be seen as .204 and .256, respectively. These results define a mid-level effect size for values when comparing the experimental and control groups (Cohen, 1988; Green & Salkind, 2003).

Multi-comparisons of posttest scores for the experiment and control groups are presented in Table 6.

Table 6
Multi-Comparison of Experimental (ExpGr) and Control (ConGr) Groups' Posttest Scores

Dependent Variable	(I) Group	(J) Group	Average Difference (I-J)	Standard error	*p*	95% Confidence Interval of Change[a]	
						Lowest Value	Highest Value
MS Posttest Total	ExpGr	ConGr	14.334*	4.588	.003*	5.046	23.623
	ConGr	ExpGr	-14.334*	4.588	.003*	-23.623	-5.046
ATMEC Posttest Total	ExpGr	ConGr	17.366*	4.800	.001*	7.648	27.083
	ConGr	ExpGr	-17.366*	4.800	.001*	-27.083	-7.648

By looking at Table 6, the change related to MS and ATMEC scores can be seen to favor the experimental group. While the groups showed no difference for pretest scores, the MS and ATMEC scores for the experimental group who had implemented portfolio assessments are considerably higher than the control group's scores.

Quantitative findings of the research have revealed that portfolio assessments positively affect teacher candidates' metacognitive skills and attitudes towards the measurement and evaluation course. The research's qualitative findings are presented under two headings: participants' opinions about the measurement and evaluation course *before* and *after* the implementation.

Participants' Opinions of the Course before Implementation

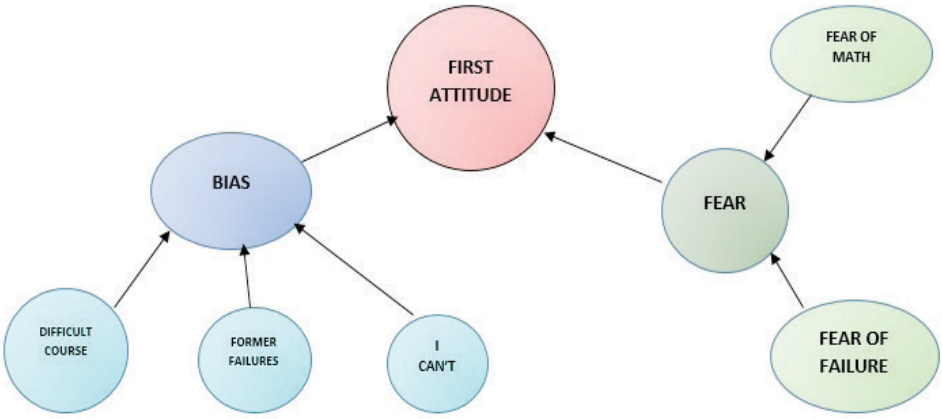

Figure 1. Pre-implementation NVIVO analysis scheme for emotions that affect attitudes towards the course.

After the interviews with teacher candidates, their pre-intervention opinions on the measurement and evaluation course revealed two different themes, prejudgment and fear. Looking at the prejudgment theme, one sees the subthemes of difficult course, former failures, and I can't.

> At the beginning of the school year, former graduates said the measurement and evaluation course was hard because of its math. I have no idea about the content because our problem was numerical. (T1)

Teacher candidates are clearly seen to have had pre-judgmental attitudes toward the measurement and evaluation course due to numerical skills and what former graduates had said. Thus with regards to group features, some foreign language department teacher candidates expressed being pre-judgmental towards courses that include math.

> I considered how to prepare for the exam. When I saw math, I thought, "Can I do this?" I didn't have much trouble because it had comment sections. Someone had said there was too much math. (A3)

When examining A3's statement, math activities in the measurement and evaluation course were revealed as an important factor affecting students' prejudgments about the course. Negative comments were heard about the course beforehand and had affected individuals' basis of prejudgment.

> I had prejudgments about the measurement and evaluation course because of failing with a double F last year. I already thought there were going to be midterm and final exams. Midterms and final exams mean failure to me. (A7)

The example above shows that the teacher candidate had prejudgments about the measurement and evaluation course prior to the class. A7 also expressed that the course's classical evaluation process reinforced their negative attitude towards this course. On the other hand, individuals' attitudes toward this course were affected by their previous failures.

> I had self-confidence. I also trusted I'd be successful in the pedagogy courses. I had formed a prejudgment just because many friends had failed this class. It wasn't a boring class. It could be done. It can be done as long as there are no prejudgments. (A6)

According to A6's statement, they had self-confidence but had created a prejudgment because of their friends having failed. The participant's statement that course success can be achieved if there are no prejudgments is an important finding.

> I used to say, "Oh, I can't pass this class!" I would say to myself, "What is this x, what are these and those?" (A10)

In the statement above, the participant has pre-judgmental opinions toward the course and feelings of failure are a result of this prejudgment.

> I told myself I couldn't do that, but I saw that I could. (A3)

A3's statement shows that the participant's first impression about the course was

that they'd fail it. However, the participant is understood to have realized the fear was unfounded.

> I am also bad at math; I said "Uh-oh!" I couldn't bear my fear of math. I told myself I couldn't do the math activities on the exam, either. However, we didn't get anxious about the portfolio assessment process because there was no reason to, and we passed it. We evaluated the process. (A11)

A11 clearly fears the measurement and evaluation course for its math, and thus thinks the evaluation will have poor results. Because portfolio assessments evaluate a period rather than just being an exam hour, they are found to affect individuals' attitudes toward the evaluation.

> I already knew we would be asked about this course on the KPSS [Turkish government employee entrance exam] before I got to class. I don't like math. Nevertheless, they said my math was insufficient. That's why I was afraid. When I got to class, I realized I needn't have been afraid of it. (A12)

A12 was scared because math was in the measurement and evaluation course and they had a negative attitude towards math. However, at the end of the portfolio assessment, the participant said their fear was groundless.

Examining participants' opinions reveals that the measurement and evaluation course had created a negative perspective and fear because of its math-skills activities.

> I had no idea about the measurement and evaluation course at the beginning. I had no friend to ask, either. I was afraid of failing when I first attended the course… But there's nothing hard. Now I think I can pass the measurement and evaluation course. I think I can do most of the topics once I understand the logic. (A2)

According to A2's statement, one deduces that the participant feared failing the course before starting. But after the portfolio assessment, they had developed the idea that they could pass this course. This statement shows that the participant was fearful even before having a negative experience.

> Actually I was afraid of this course because so many students had failed… Your approach was so important. (A4)

Looking at A4's statement clearly shows they feared failing the measurement and evaluation course because of seeing others around them fail.

> I had taken the measurement and evaluation course before from another professor and failed. I was afraid of failing. After I began attending the class, I realized I really understood the course, and through the evaluations, saw that what I did every week was positive because the course was conducted very differently than I was expecting. Moreover, I am now thinking about taking undergraduate education in the field of measurement and evaluation. (A5)

A5's statement shows a fear of failing gained from previous experience. At the end of the implementation, the participant seemed to like the measurement and evaluation course, even considered that it deepened their education in this field. That the participant also believed they could succeed in their weekly performances is thought to be very significant.

> I deserved to fail, and I did fail. This year, I was afraid of not being able to graduate because of this course. I realized that I could understand the lesson. I was getting feedback from the course. I was able to perform the course's activities with fondness. (A9)

A9 shows a fear of failing then begins to believe they can do the class activities. This faith influences A9's success. Factors like being in an activity and providing different forms of feedback on the portfolio assessment are also thought to affect this situation.

> I was afraid of the course because my roommate had taken this course previously. I told myself, "I will definitely fail." (A13)

A13 clearly shows fear of failure because of their friend's previous failure.

When looking at the opinions and statements of teacher candidates about the measurement and evaluation course before the implementation, they imply having prejudgments and fears. Heading the underlying reasons for this situation are the general requirements of complex math skills, previous negative experiences, fear of being incapable, and fear of failing the course.

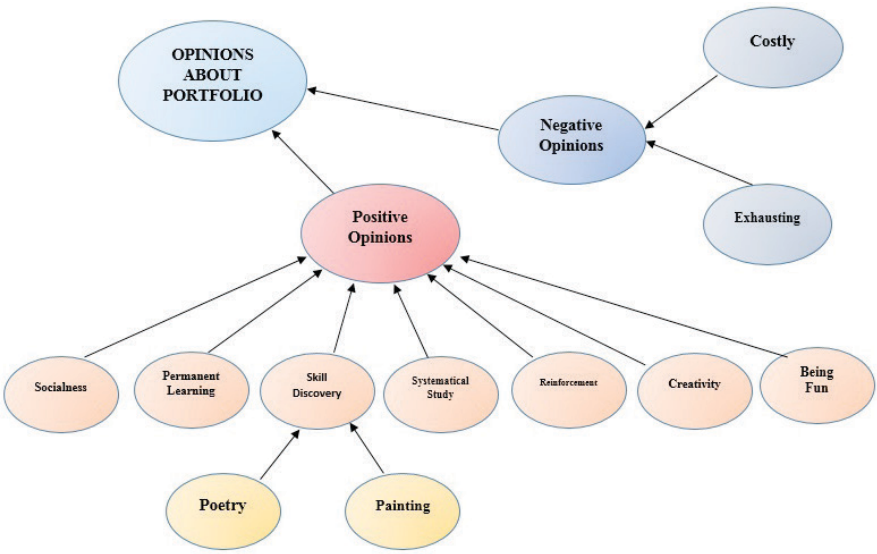

Figure 2. Post-implementation NVIVO analysis scheme of emotions that affect attitudes towards the course.

Teacher candidates were asked what they thought about the portfolio assessment method to determine their opinions about it. Obtained data are gathered into two main themes: positive opinions and negative opinions. Under positive opinions, the subthemes formed are socialness, permanent learning, skill discovery, systematical study, reinforcement, creativity, and being fun. Also, the subtheme of skill discovery is observed to have two subthemes: poetry and painting. Under the other main theme, negative opinions, are two subthemes: costly and exhausting. Themes belonging to positive opinions follow below.

Positive Opinions Theme

> I started understanding once we got to the topics. With group activities like this, I had the chance to work with people I'd never even said hi to. I liked the group work as well as the individual work. (A9)

A9's statement shows that group activities conducted within the portfolio assessment process gave individuals a chance to know each other better. This shows the process is important for in-class interactions.

> We ended up talking about this course on Facebook and the phone. (A2)

One can deduce from A2's statement about the portfolio assessment method that this implementation affects teacher candidates' daily lives and provides constant communication between individuals on social media and in other areas.

> Personally, the class left permanent marks on me through its portfolio assessment. It was also a nice way for me to study for the KPSS... Portfolios answer the question I always ask myself, "How can I remember?" In this way, it becomes permanent. (A1)

By looking at A1's statement above, one sees that A1 believes what was learned in the measurement and evaluation course with portfolio assessments will benefit them in the first step of the teaching profession, the KPSS.

> While doing the assignments and activities, when things got tough I'd ask myself, "Why are we doing these?" But it was worth it. For example, hmm… While writing a slogan, it got stuck in our heads. (A3)

One sees A3 state that even if it isn't realized at the time, permanent learning reveals itself afterwards.

> I remember what I did in the process better now. This is more permanent for me. I have enjoyed learning by doing something like this. (A4)

A4 stated that because the portfolio assessment is a process-evaluation method, it deepens learning; what was learned in this process becomes more permanent and personal.

> I think portfolios are a very nice idea. We researched step-by-step and it got drilled into our brains. I think portfolios are perfect for the measurement and evaluation course. You do something with your creations. (A5)

> I especially won't forget what I wrote with that song's melody. (A6)

> Of course it was catchy. I learned the topics better, especially those that we studied in detail. (A8)

According to A5, A6 and A8's statements, one sees them say the measurement and evaluation course based on portfolio assessments is a significant factor that provides permanent learning. Implementing different activities, especially those given weekly, regularly, and step-by-step, is understood to be important with regard to the constancy and continuity of learning.

> I think portfolios were really good. After studying the topic, I tried the assignments. (A9)

> The process is more beneficial than exams, in my opinion, because we cram for exams and forget the next day what we had crammed. (A11)

A9 and A11's statements show the importance of activities in this process with regard to having students repeat information they've gained and providing the opportunity to study systematically instead of by memorizing.

> The process was fun. It was really nice to do something colorful and produce different things. (A2)

> The slogans and songs were amusing. (A3)

In light of A2 and A3's statements on the process of portfolio assessment, the process was revealed to be fun and varied, and practicing activities in class makes the course entertaining.

> The portfolio implementation seemed so different to me. I mean, last year's professor was so different. We were also learning then, but everything used to stay in the class. Now, the topics are strengthened; it is a different kind of study. (A7)

> I saw how important some concepts are, like reliability and validity. I thought these would be very useful for me. My course-awareness has increased while having fun, all the while strengthening my knowledge. This is a course that should be given to those who will be teachers because accurate evaluations are really important. (A12)

One can understand from A7 and A12's statements above that the implementations are quite considerable at strengthening knowledge that has been learned.

> During this process, it was good to produce something different. I realized that I had composed songs and written poems. This was nice. (A2)

> By the way, within the poem writing activities, I realized that I can write poems. (A4)

> When the portfolios were revealed, I said, "OK, I can." I saw that I can draw nice pictures. (A14)

By looking at the teacher candidates' statements, this process is clearly important for some teacher candidates at discovering new skills. One can say it allows for individuals to reveal some skills they already have.

> We revealed our creativeness in the process. We were seeing, thinking, and writing new things. (A6)

According to A6's statement above on the portfolio assessment process, because some new things were revealed, this process can be said to influence one's creativeness, as well.

Negative Opinions Theme

Even if it is rare, participants were identified who had stated negative opinions about the implementation.

> There were too many assignments in the process; this was exhausting. Also, because I was working, I was exhausted. I studied by looking at myself and my deficiencies. Yes it was tiring. It's tiring when there is one each week. (A1)

> The process was exhausting but it wasn't hard. (A2)

By looking at teacher candidates' opinions about the process, one confronts the theme of exhausting. According to A1 and A2's above statements, the process was revealed to be labeled as exhausting due to reasons like weekly assignments.

> I think the process was a little costly Because there's always a weekly activity and I had to buy things like poster boards, etc. (A2)

> But it was too costly. The poster boards I bought were expensive. (A11)

When looking at negative opinions on the portfolio assessment process, A2 and A11's statements reveal that they had found the preparation period of the activities to be expensive.

A general review of the negative opinions on the portfolio assessment process gathers them under the themes of exhausting and costly. The reason for calling the process exhausting is that the weekly activities and assignments were perceived as exhausting by some individuals. Also, the process was found to be costly because individuals had to buy things for activities in order to try and enrich the visual presentation and give importance to stationary things.

Discussion

Traditional evaluation methods that measure what is remembered and not learned are inefficient at determining real learning performance (Rust, 2002). The pre-service teacher-training process has changed from teacher-centered and conventionally based teaching processes to learner-centered and experience-based processes in concordance with modern developments in the teaching-learning field. Within this process, it is important that evaluations show a change from being product-focused to being period- and performance-focused, as well. However, this situation is not as common as it should be.

This study, which researched teacher candidates' perceptions of modern education's portfolio assessment's usability and compatibility as well as its influence on their attitudes toward a measurement and evaluation course and on their metacognitive skills, examined quantitative and qualitative data. The findings are thought to contribute to the literature.

Portfolio assessment is revealed to have a significant positive influence on the participants' metacognitive skills. Alexiou and Parakeva (2010; 2013) emphasized that portfolio assessments positively affect university students' self-arranged learning skills and that portfolios can be utilized to improve features like academic success and self-efficacy. On one form that supports this statement, examining the findings from the interviews with the teacher candidates in the qualitative phase of the research shows that the participants produced permanent learning and gained systematic study behaviors through the portfolio implementations.

There are studies revealing the positive effects of portfolio assessments on teacher candidates' high-level thinking and decision-making skills, as well as their problem-solving and research. Jenson (2011) stated that portfolio assessment develops critical reflection skills, and Masters (2013) said it improves self-arranged learning skills. Popescu-Mitroia, Todorescu, and Greculescu (2015) determined it to positively influence one's capacity for self-evaluation, creativeness, synthesis, and decision-making skills. To be able to guide their students in the future, teacher candidates need to have the information era's required skills (lifelong learning and high-level thinking and metacognitive skills; Evin-Gencel & Güzel-Candan, 2014). These skills can be developed through practical processes during pre-service trainings. When examining studies in the literature that had reached the same findings as this one, one sees that portfolio assessment is an implementation that can be benefitted from in developing metacognitive skills and filling the gap between concept and application. Studies can be recommended within the process of accrediting education faculties, which are at the front line of Turkey's Council of Higher Education (YÖK) as a current subject in teacher training, not just on the benefits of portfolios, but also of e-portfolios.

In this study, portfolio assessments were determined to affect teacher candidates' attitudes towards the measurement and evaluation course. Alexiou and Paraskeva (2010; 2013) stated that portfolios have an active role in developing positive attitudes and affective behaviors. Mitroa, Todorescu, and Greculescu (2015) also stated that learners develop motivation and positive attitudes, which is a result of their experience in a stress-free evaluation process. Also, there are findings that show portfolio assessment positively affects teacher candidates' attitudes towards courses and their learning (Campbell et al., 2000; Xerri & Campbell, 2015). In this context, the current research findings agree with the literature. This research's qualitative data also supports the related findings, and teacher candidates stated at the end of the study that they had left their fears and pre-judgments about the course behind and that the learning process was enjoyable. The participants expressed that in-class communication increased while preparing the products for exhibition. They studied together beautifully. This allowed them to enjoy the measurement and evaluation course, which they had previously prejudged and considered difficult.

When examining the findings, portfolio assessments are immediately seen to be a constructive method for providing both individual and professional development, as well as for evaluating their skills. It is recommended to use grading tools such as considering more than one evaluator's opinions, determining the correlation between portfolio assessment scores and test scores that record identical features, graded point-scoring devices (rubrics), and checking lists to eliminate any reliability or validity problems that might come up (Meeus, van Petegema, & Engels, 2009; Moya & O'Malley, 1994). Portfolios are significant at providing multiple data for developing and evaluating teacher candidates' performances (Deveci, Ersoy, & Ersoy, 2006; Wilborn & Winn, 2000). Within the pre-service training process for teacher candidates, learning portfolio implementation through experience can give them an opportunity to adapt it into their professional lives.

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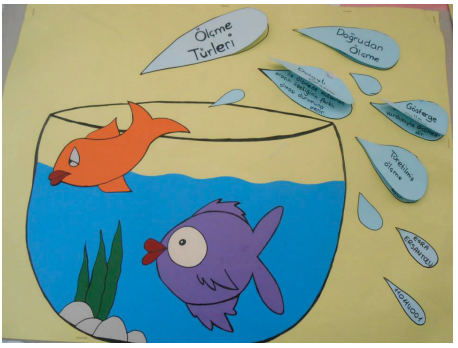
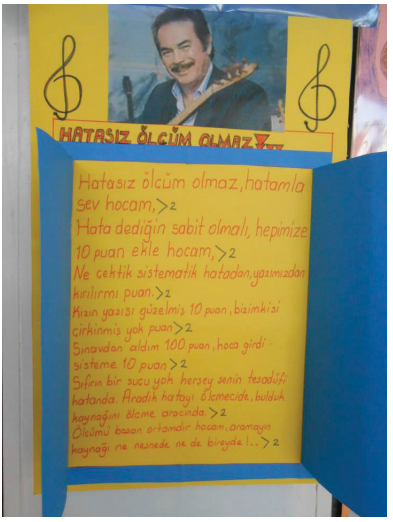
Appendix A

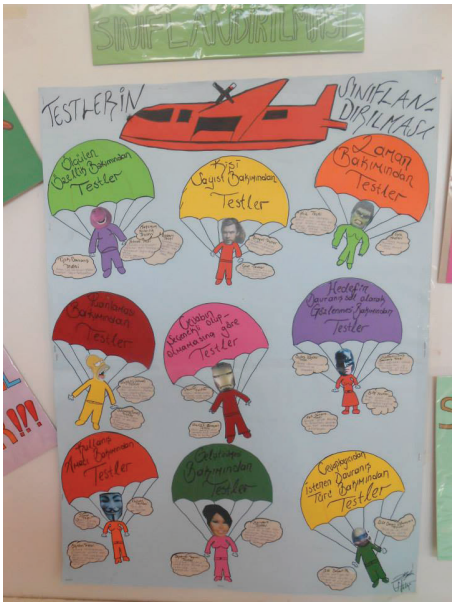
Photos from Experimental Group

Appendix B

Photos from Exhibition



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