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Full Length Research Paper

Pre-service mathematics teachers' views on the use of portfolios in their education as an alternative assessment method

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The purpose of this study was to ascertain the views of pre-service mathematics (PSM) teachers on the use of portfolios as an alternative assessment method. This study was conducted with 146 Turkish PSM teachers participating in a semester-long portfolio assessment application. Data were collected with a questionnaire comprising 34 items on a 5-point Likert-type scale. Data were analyzed using SPSS 15.0 software and presented with frequency and percentage. The findings indicated that most of the PSM teachers believed that the portfolio assessment application facilitated an active learning process, allowed them to monitor their progress and to remedy their deficiencies, and to gain professional knowledge and experiences in portfolio assessment method. However, it was determined that they were most challenged by time management. This study revealed that use of the portfolio assessment contributed to the PSM teachers' individual, social, and professional development.

Key words: Teacher education, pre-service mathematics teacher, alternative assessment methods, portfolio assessment.

INTRODUCTION

Traditional assessment approaches mostly focus on products rather than progress and process (Birenbaum, 1996). Therefore, in many educational contexts, assessment is generally conducted at the end of a school year to assign grades, grant certificates, or promote students to the next grade/level. In this sense, traditional assessment approaches are used more for summative purposes. From this perspective, instruction and assessment are taken as separate entities (Birgin and Baki, 2007; Ok and Erdogan, 2010). For these reasons, traditional teaching and assessment approaches have a negative impact on the teaching and learning process (Black and Willam, 1998; De Fina, 1992; McMillan, 2004; Mumme, 1991; Shepard, 2000; Stiggins, 2002). These approaches generally induce students to memorize rules or algorithms rather than developing conceptual understanding and focus on small, discrete components of the domain. McMillan (2004) summarized the main characteristics of traditional assessment approaches as follows: They emphasize outcomes, assess isolated skills or facts, employ secret standards and criteria, and provide little feedback to learners. Similarly, De Fina (1992) stated that traditional assessment methods with a multiple choice format and limited time restriction do not provide valid data about individual student achievement and that the resulting scores do not convert into information that is helpful for classroom instruction. Therefore, traditional assessment methods do not assess higher order cognitive skills, such as problem solving, critical thinking, and reasoning (Birenbaum, 1996; Birgin, 2003; Stiggins, 2002), or students' ability to organize relevant information (Shepard, 2000).

Today, simply retaining new knowledge is not considered a sufficient achievement for students. On the contrary, competencies such as successfully retrieving knowledge and effectively applying it to new and unfamiliar situations are deemed more important. Various professions and the business world demand a labor force equipped with the necessary skills and knowledge to solve problems, think critically, analyze and present data effectively, use verbal or written communication, and make self - assessments. These demands entail new

approaches to learning, teaching, and assessment (Dochy, 2001). In this context, more recent learning theories, such as constructivism, multiple intelligences, and brain-based learning, focus more on prior learning, problem-solving skills, and collaborative learning to promote active engagement in the learning process and to assess learning output and the learning process. In these learning environments, students' learning cannot be assessed with the traditional assessment approach, such as multiple choice tests (Birgin and Baki, 2007).

Moreover, the failure of traditional assessment approaches has led to the investigation of a range of alternative assessment methods that would be fairer to all students, reduce students' anxiety, and lessen teachers' burden while grading learners' work (Bahous, 2008). In fact, the "Assessment Standards for School Mathematics" produced by the National Council of Teachers of Mathematics (NCTM, 1995) highlight the importance of alternative and authentic assessment tools that determine what students can or cannot achieve, support their learning, assess their verbal and written communication skills and content knowledge, and provide consistent and valid data. Therefore, alternative assessment tools, such as project and performance-based tasks, portfolios, exhibitions, rubrics, student journals, self-assessments, and peer/group assessments, are necessary to determine what students actually know and where they are in the learning process (Anderson, 1998; Baki and Birgin, 2004; Shepard, 2000).

One alternative assessment method is portfolios (Baki and Birgin, 2002; Paulson, Paulson and Meyer, 1991; Wolf, 1991). Various definitions of portfolios are available, as they have different features depending on their aims and uses. According to Paulson et al. (1991: 60), a portfolio is "a purposeful collection of student work that exhibits the student's efforts, progress and achievement in one or more areas. The collection must include student participation in selecting contents, the criteria for selection, the criteria for judging merit and evidence of student self-reflection". Therefore, portfolio creation involves reflection, selection, justification, and evaluation. Winsor and Ellefson (1995: 68) stated that a portfolio is a "fusion of process and product". Simon and Forgette-Giroux (2000: 36) defined a portfolio as "a cumulative and ongoing collection of entries that are selected and commented on by the student, the teacher and/or peers, to assess the student's progress in the development of a competency". De Fina (1992: 13) also described portfolios as a "systematic, purposeful, and meaningful collection of a student's work in one or more subject areas". In this context, a simple collection of work, scrapbook, or album of events does not make a portfolio. Thus, the nature and content of a portfolio may vary according to the purpose of its use. How its content is selected, collected, and reflected upon is more important than what it looks like. The above definitions acknowledge the developmental nature of the learning and assessment process and emphasize the importance of students' active involvement.

There is no absolute description and content for portfolios. There are also a wide array of purposes for the portfolios, including summative, as well as formative assessment, selection, promotion, appraisal, reflective learning and professional development (Tillema and Smith, 2000). Thus, the types of portfolios are varied according to their purpose and collected items in it. In this context, many researchers (Barton and Collins, 1997; Haladyna, 1997; Slater, 1996; Smith and Tillema, 2003) define different types of portfolio. For example, Haladyna (1997) define five types of portfolios that is: ideal, showcase, documentation, evaluation, and class portfolio. The "ideal portfolio" contains all of the students' works. This portfolio is not intended to be used as a grade. Thus, it is important for students to assess their own portfolio. The showcase portfolio is a collection of the best samples of the student's work, determined through a combination of student and teacher selection. Therefore, this type of portfolio is more suitable to be used for summative assessment. The documentation portfolio involves a collection of work over time showing growth and improvement reflecting students' learning of identified outcomes. This portfolio contains quality and quantity data. The evaluation portfolio includes a standardized collection of the students' work and could be determined by the teacher or, in some cases, by the student. This portfolio is suitable for grading students. The "class portfolio" contains student's grade, teacher's view and knowledge about students in the classroom. This portfolio can be defined a classroom portfolio.

Smith and Tillema (2003) also defined four portfolio types labelled the dossier portfolio, the training portfolio, the reflective portfolio and the personal development portfolio. The "dossier portfolio" is a record of achievement or a mandated collection of work for selection or promotional purposes required for entry to a profession or programme. Establishment of standards and a precise specification of levels of competence are required. The "training portfolio" is a required or mandated exhibit of efforts collected during learning or in a curriculum programme. It highlights the core professional knowledge, skills or competencies a person has acquired and is collected during the time frame of a course as a representative sample of the students' work. Some reflective comments in the training portfolio might explain the selected evidence. This portfolio type often has a fixed format to help the collector provide appropriate evidence. The "reflective portfolio" is a purposeful and personally collected array of work providing evidence of growth and accomplishments to be brought forward for promotion and admission. The "personal development" portfolio is a personal evaluation and reflective account of professional growth during a long-term process.

On the other hand, portfolio literature often

distinguishes between a working portfolio or folder where students collect all assignments during a certain period of time, and a presentation portfolio, containing a selection of assignments to be assessed and possibly graded (Dysthe and Engelsen, 2011). This presupposes that the portfolio is kept over a period of time long enough for the students to work on a number of assignments. Therefore, each particular portfolio type requires varying processes for collection and determination of evidence and as a consequence results in different uses.

Many theoretical and empirical studies in different subject areas reported the advantages of portfolio assessment over traditional assessment tools at the elementary and college education level (Asturias, 1994; Baki and Birgin, 2004; Barton and Collins, 1997; Birgin and Baki, 2007; Calfee and Perfumo, 1993; De Fina, 1992; Ersoy, 2006; Klenowski, 2000; Kuhs, 1994; Mokhtari etal., 1996; Mullin, 1998; Norman, 1998). Some of their findings are presented below. Portfolios provide an opportunity for richer, more authentic, and more valid assessment of student achievement and skills, encourage students to become independent and self-directed learners, and enhance communication among teachers, students, and parents. They can provide opportunities for students to demonstrate their strengths and weaknesses in the learning process and encourage them to take responsibility for their own learning. In addition, they give detailed information about students' development to teachers, parents, and the students themselves. Portfolios encourage teacher self-direction and reflection and form the basis for professional development. Similarly, Bahous (2008: 383) also stated that:

"Portfolios promote self-directed learning, enlarge the view of what is learned, foster learning, demonstrate progress toward goals, provide a window into students' heads and hearts, intersect instruction and assessment, provide a vehicle for students to value themselves as learners, and offer opportunities for peer-supported growth".

Moreover, portfolios provide visual and dynamic proofs of students' interests, skills, strengths, successes, and development over time. Portfolios, systematic collections of students' work, help to assess students' overall progress (Baki and Birgin, 2004). Portfolios are also tools through which students can develop important skills, such as self-assessment, critical thinking, and the ability to monitor their own learning process (Asturias, 1994; Micklo, 1997).

Despite many advantages of portfolios, they also present some disadvantages. For example, portfolios can be very time consuming for teachers. Additionally, designing and preparing a rubric (Barton and Collins, 1993; Koretz, Stecher, Klein and McCaffrey, 1994; McMillan, 2004) and scoring and giving feedback on students' work are difficult in crowded classrooms (Birgin, 2006; Wolf and Miller, 1997). Moreover, portfolios reveal different aspects of students' knowledge and ability. This leads to inconsistency/unfairness in grading, thereby making inter-rater reliability very difficult to obtain (Herman and Winters, 1994; Koretz et al., 1994; Meeus, Van Petegem, and Engels, 2009; Stecher, 1998). In this regard, portfolios may be seen as less reliable or fair than multiple choice tests (Cicmanec and Viecknicki, 1994). Thus, when portfolios are developed and used, their disadvantages should be considered.

Use of portfolios in teacher education

A portfolio in teacher education is an updateable dynamic file consisting of written document samples, projects, and professional work. Klenowski (2000) viewed the portfolio as a tool for demonstrating pre-service teachers' growth over time, while Zeichner and Wray (2001: 614) stated that the portfolio "encourages student teachers to think more deeply about their teaching and about subject matter content, to become more conscious of the theories and assumptions that guide their practices, and to develop a greater desire to engage in collaborative dialogues about teaching". For this reason, portfolio assessment is dynamic in "that the richest portrayals of teacher (and student) performance are based on multiple sources of evidence collected over time in authentic settings" (Wolf, 1991: 130).

In pre-service teacher education, portfolios are valued for two reasons (Chetcuti et al., 2006). First, while developing their portfolios, pre-service teachers become immersed in a constructivist learning environment. The process of portfolio development induces pre-service teachers to focus on their individual strengths and weaknesses, obtain feedback from lecturers, and develop specific learning goals. The collaboration between pre-service teachers and lecturers enables pre-service teachers to value both the process and products of learning. In teacher education, portfolios also allow pre-service teachers to demonstrate their developing teaching competencies by using evidence from their own teaching and learning practices (Klenowski, 1998). In this way, portfolios are seen as assessments that integrate theory and practice, reflecting pre-service teachers' learning, documenting their individual and professional development, and helping them to become self-directed and reflective practitioners (Mokhtari et al., 1996).

Second, the experience of creating a portfolio enables pre-service teachers to develop an understanding of the underlying principles of portfolio assessment and equips them to adopt portfolios as part of their own practice as teachers (Klenowski, 2000). Portfolio assessment can enhance reflective practice if teachers understand their role in developing a structured environment where their students are given support and guidance to attain the skills of critical self-reflection and independent learning.

In recent decades, portfolios have become popular

assessment methods in teacher education programs (Adams, 1995; Ersoy, 2006; Groom and Maunonen-Eskelinen, 2006; Klenowski, 1998; 2000; Krause, 1996; Meeus et al., 2009; Mokhtari et al., 1996; Otis-Wilborn and Winn, 2000; Zeichner and Wray, 2001). For example, Mokhtari et al. (1996) found that the majority of their elementary education candidates reported that the use of portfolio assessment promoted more collaborative learning (86%), increased student reflection (71%), and aided in the establishment of a psychologically secure environment in the classroom (63%). During a study in Hong Kong, Klenowski (2000) reported that the experience of developing and presenting portfolios appeared to help pre-service teachers to develop teaching, questioning, presentation, organization, group participation, self-assessment, and independent learning skills, integrate procedural and declarative knowledge, understand their preferred learning styles, and enhance personal growth. He also indicated that the use of portfolio assessment improved not only the pedagogical skills of pre-service teachers but also the pedagogical and reflective skills of the instructors in the program.

Similarly, Groom and Maunonen-Eskelinen (2006) demonstrated that portfolios can have an impact on the development of pre-service teachers' reflective practice. In this way, they better perceive their role in the classroom. Wade and Yarbrough (1996) stated that portfolios are a potentially valuable method in pre-service education that are based on the construction of pre-service teachers' learning from experience, creating their own meaning, and developing both expertise and commitment to the process of reflection. Some studies (Ersoy, 2006; Groom and Maunonen-Eskelinen, 2006; Jarvinen and Kohonen, 1995; Klenowski et al., 1996; Mokhtari et al., 1996; Ryan and Kuhs, 1993; Woodward, 1998) in diverse international contexts also indicated that using portfolios in teacher education presented several benefits for pre-service teachers in terms of higher order thinking, problem solving, self-assessment, professional preparation and growth, and the development of reflective practice. In addition, portfolios help pre-service teachers to track their professional development, increase their knowledge about learning, teaching, and planning, find ways to apply their professional knowledge to instruction, reflect on their instructional experiences, and build a reliable source file that can be consulted in their future professional life. From this perspective, using portfolios for assessment in pre-service teacher education is important.

2005 education reform in Turkey and portfolio assessment

The Turkish Ministry of National Education (MoNE) initiated a radical reform in elementary and secondary curricula in 2005 by taking into account the expectations of society and the low achievement levels of Turkish students in TIMSS and PISA results. New progressive curricula started to take effect in the 2005-2006 school years (MoNE, 2005). These new curricula were based on contemporary learning approaches, such as constructivism and the theory of multiple intelligences. For this reason, the new curricula included many changes in terms of aims, content, teaching-learning process, and assessment approaches. In particular, they highlighted the assessment of the learning process, the active involvement of students in the learning process, and remedies for learning deficiencies, along with the learning product itself. This implies the use of alternative assessment tools, such as performance, portfolios, projects, self-assessments and peer assessments, rubrics, journals, group work, and oral presentation assessments (Birgin, 2010). However, the in-service training programs implemented in the context of the new curricula in Turkey were not very effective in providing teachers with sufficient experience in alternative assessment tools because of lack of duration, organizations, give sample activities and gain experiences about new teaching methods and alternative assessment techniques (Birgin, Tutak and Catlioglu, 2008; Ozen, 2006). Moreover, several recent researchers demonstrated that Turkish in-service teachers (Birgin and Baki, 2009; Birgin, Tutak and Turkdogan, 2009; Cakan, 2004; Gelbal and Kelecioglu, 2007; Kazu and Yorulmaz, 2007) and pre-service teachers (Birgin and Gurbuz, 2008; Birgin, Gurbuz and Catlioglu, 2012; Ersoy, 2006; Ok and Erdogan, 2010; Saglam-Arslan, Avcı and Iyibil, 2008) do not have the necessary knowledge and experience about alternative assessment methods required by the new curricula, specifically portfolios. This reveals the need to improve the competencies of pre-service teachers in alternative assessment techniques.

Important changes were introduced after 1998 in Turkey in order to remedy the deficiencies in teacher education. These changes are known as "restructuring in teacher education". In the context of restructuring, pedagogical knowledge and practical knowledge received more attention. One of the courses now offered in teacher preparation programs is Planning and Assessment in Instruction. This course is offered in two parts (that is, 3 h theoretical and 2 h practical part every week). The main objective of the applications in this course is to allow students to reinforce their theoretical knowledge with in- and out-of-school activities and with individual and group work to provide permanent learning. The content of this course is stated as: fundamental curriculum development concepts and processes; development of lesson, unit, and daily programs; content selection and organization; teaching methods and strategies; characteristics and selection of instructional materials; measurement and assessment; assessment approaches; test types; development of follow-up and performance tests; test item preparation techniques; and

scoring (HEC, 1998: 55).

According to Klenowski (2000), pre-service teachers must understand that assessment is integral to teaching and learning. This is best achieved by making explicit the way in which teachers use assessment for learning in teaching and learning environments. Teaching about assessment for learning and new forms of assessment can be achieved by illustration in pre-service teacher education where there are opportunities to experience these new forms of assessment. Thus, pre-service teachers need to be participant-observers of these new forms of assessment. They need to not only reflect and self-evaluate as part of the assessment practice but also understand the importance of an educational model of assessment. Therefore, this study allowed pre-service mathematics (PSM) teachers to experience portfolios in the context of the course Planning and Assessment in Instruction. In this context, in-class performances of PSM teachers were also assessed according to their portfolios and contribute to them this course achievement score. In this way, PSM teachers would able to learn how to apply portfolio assessment on their own. The aim of this study was to reveal the views of the PSM teachers about portfolio assessment practice.

Despite the increasing use of portfolios in education around the world, the use of portfolios for assessment is a relatively new concept in elementary and higher education in Turkey. Several studies were carried out at the pre-service teacher education level (Deveci, Ersoy and Ersoy, 2006; Ersoy 2006; Gulbahar and Kose, 2006; Ok and Erdogan, 2010) in Turkey after the new curricula were established in 2005. The present study will shed light on the use of portfolios for assessment in Turkish higher education. Furthermore, the results of this study will help instructors and pre-service teachers to develop a new understanding of and glean in-depth insight into the use of portfolios in assessment.

METHODS

Participants

This study was conducted with 146 PSM teachers who were taking the course Planning and Assessment in Instruction at Karadeniz Technical University, Fatih Faculty of Education, in Turkey. They participated to in a semester-long portfolio assessment application in this course. Of the participants, 71 (48.6%) were male and 75 (51.4%) were female. Of the participants, 51 (34.9%) and 46 (31.5%) were enrolled in the Elementary Mathematics Education Department (evening and day classes, respectively) and 49 (33.6%) in the Secondary Mathematics Education Department.

Portfolio implementation process

The application part of the course Planning and Assessment in Instruction was carried out two hours a week. The practical part of the course aimed to allow PSM teachers to apply the knowledge they gained during the theoretical part. For this reason, portfolios were used during the application of the course in order to assess PSM teachers' performance during the process and to help them gain experience in portfolio assessment. In this context, first, the types of activities that would be carried out by the PSM teachers and the work that would be included in the portfolio in accordance with the aims of the course were determined by the four lecturers teaching the theoretical and practical parts. Detailed information about the work type to be included in the portfolio is presented in Table 1.

As seen Table 1, various types of work were included in the portfolio in order to allow the PSM teachers to gain different knowledge and skills, such as individual and group work, research, self- and peer-assessments, discussion, exhibition, critical thinking, and reflection. In this context, some work was completed as an individual or a group and other work in or out of class. In this way, it was aimed that PSM teachers can gain experience in portfolio implementation by actively becoming involved in both the learning and evaluation process.

Some researches state that the types of portfolios can be varied according to their purpose and collected items in it. In this study, PSM teachers' portfolios include a standardized collection of pre-service teacher' work and determined by the lecture according to course content and aims. These portfolios are also assessed every week and end of the semester. Therefore, the portfolios organized by PSM teachers can be named the evaluation portfolio according to the definition of Haladyna (1997). They can be also classified as the training portfolio according to the definition of Smith and Tillema (2003). Moreover, they are seemed as student work-based portfolio and presentation portfolio.

Before implementation, PSM teachers were informed about the weekly distribution of work to be added to the portfolio, the way the portfolio work would be completed and used, and the available materials and sources (e.g., the Internet, books, and articles). Additionally, they were stated that each work in the portfolio would be scored separately, that a total score would be given at the end of the semester, and that the contribution of these scores to their course grade would be 20%. In this way, PSM teachers were guided through the process of preparing a portfolio.

PSM teachers prepared the work/item designated in Table 1 and put them in theirs portfolios. They were stated to use various original materials and sources (from books, the Internet, articles, pictures, worksheets, and so on) in preparing each work. At developing process of each work in portfolio, PSM teachers can be get feedback from their supervisors, mentors, as well as peers. Each work was assessed by the lecturers using the rubric developed by researcher (Appendix 1a). It was also given explanatory feedback to PSM teachers from lecture and peers (for some works) his/her work in order to make any revision and improvement. Moreover, discussions were held every week at the beginning of the course, and PSM teachers were provided with oral feedback of theirs works. Pre-service mathematics teacher rearranged his/her work according to advice, feedback, and revision from the lecturers and peers. In this way, PSM teachers were encouraged to make self-assessments and improve upon their weaknesses. Because, portfolio developing process includes advice, feedback, and revision (formative), it was used as formative assessment, as suggested by Klenowski (2000).

On the other hand, Tillema and Smith (2007) stated that portfolio offers opportunities for ongoing supervision and guidance of learning for formative purposes, while it examines the product of learning at the end of the process for summative assessment purposes. Therefore, portfolios of PSM teachers were also used for purpose of summative assessment in this study. In this context, over all portfolios were also re-examined and scored using the rubric (Appendix 1b) at the end of the semester. The scores given for each work in the portfolio and the over all score of portfolio that given at the end of the semester contributed to their final grade in proportion as 20%. However, it was mostly focused on the former aspect of portfolio in the present study.

Table 1. Pre-service teachers' portfolio items according to work type and time

Week	Item	Tasks	Work type	Study time
1st	-----	Meeting with the pre-service teachers, inform and discuss to the application of the course and portfolio, and its' implementation process.	-------	------
2nd	-----	Theoretical lecture.	-------	------
3rd	1	Grouping objectives specified in any unit in the curriculum according to Bloom's taxonomy of learning domain	Group work	In class
4th	2	Giving appropriate examples for every step of Bloom's taxonomy of learning domain.	Group work	In class
5th	3	Exemplifying and explaining the affective and psychomotor learning domains.	Group work	In class
6th	4	Criticizing and reporting a unit in a textbook according to content criteria.	Individual work	Weekly
7th	5	Preparing activities by selecting appropriate teaching methods and strategies for the objectives of any unit in a curriculum.	Group work	In class
8th	6	Criticizing and reporting Item 5 from one of peers.	Group work	In class
9th	7	Preparing a lesson plan related to any subject included in the curriculum.	Individual work	Weekly
10th	8	Criticizing and reporting Item 7 from one of peers.	Individual work	In class
11th	9	Preparing test items for the different stages of the cognitive learning domain for each test type regarding a subject/unit of the curriculum.	Individual work	Weekly
12th	10	Criticizing and reporting Item 9 from one of peers.	Individual work	In class
13th	11	Item and reliability analysis of the developed and reorganized test according to peer and lecture assessment and feedbacks (Items10).	Group work	Weekly

Instrument and data analysis

In this study, data were collected using a questionnaire developed by researcher. The questionnaire consisted of 34 items on a 5-Likert type scale (1 = "strongly disagree" to 5 = "strongly agree") related to their views on the portfolio assessment. The questionnaire consisted of three subsections. The first subsection contained 15 items related to general views on the portfolio assessment. The second subsection contained 10 items related to the views of the portfolio's contribution to PSM teachers' individual and social development, and the third subsection contained 9 items related to views of the portfolio's impact to PSM teachers' professional development. The items in the questionnaire were prepared by making use of previous studies about portfolio assessment (Ascroft and Hall, 2006; Barton and Collins, 1993; Ersoy, 2006; Mokhtari et al., 1996). Three experts were consulted in order to provide content validity for the questionnaire. Some expressions were modified in several items, and 3 items were removed from the first draft.

The final questionnaire form was administered to 146 PSM teachers after a semester-long portfolio implementation. Each item on the questionnaire were scored from 1 (strongly disagree) to 5 (strongly agree). In the present study, the Cronbach alpha for internal reliability of the subsections and total of the instrument were found to be 0.86, 0.90, 0.83 and 0.91, respectively. Data were analyzed using SPSS 15.0 software and presented with frequency and percentage. In this study, percentages of the positive and negative views were calculated as the sum of "strongly agree" and "agree" categories, and the "strongly disagree" and "disagree" categories respectively.

FINDINGS

PSM teachers' views on the use of portfolio as a means of assessment method

As seen in Table 2, more than half of the PSM teachers believed that the portfolio assessment helped in applying theoretical knowledge (74.7%), evaluated students based on both the product and the process (71.9%), facilitated permanent learning (68.5%), provided opportunities to show ability rather than just knowledge (68.5%), encouraged research (67.1%), provided detailed feedback to students (67.1%), was an active learning process (65.8%), encouraged students to demonstrate better performance as compared to traditional exams (65.1%), and should be used in education (66.4%). However, some of them stated that portfolio assessment was time consuming (63%) and not an economical assessment approach (58.9%), and was a source of stress and anxiety for students (40.4%). From this point,

Table 2. Pre-service mathematics teachers' views on the use of portfolio assessment (n = 146).

Pre-service mathematics teachers' views	SD	D	U	A	SA
			(%)		
Portfolio assessment is worthwhile.	2.1	22.6	23.3	39	13.0
It encourages more hard work and investigation.	2.7	6.9	21.2	50	16.4
It creates an active learning process.	0.0	14.4	29.5	41.8	14.4
It allows for application of theoretical knowledge.	2.7	5.5	17.8	53.4	20.5
It encourages enjoyment of learning.	11.0	24.0	34.9	24.7	5.5
It does not cause as much stress and anxiety as multiple choice tests.	10.3	29.5	11.6	25.3	23.3
It has provides an opportunity for students to demonstrate their ability and knowledge.	2.7	15.1	26.0	47.3	8.9
It encourages students to perform better than traditional exams.	8.9	20.5	14.4	39.7	16.4
It should be used in education.	1.4	11.6	21.9	47.9	17.1
It is an economical assessment approach.	0.7	5.5	11.0	65.8	17.1
It is quite time consuming.	15.8	42.5	17.8	16.4	7.5
It facilitates permanent conceptual learning.	6.2	18.5	20.5	39.7	15.1
It provides students with detailed feedback about their progress.	2.1	20.3	32.2	43.8	11.6
It allows students to assess their progress and product.	6.8	19.9	27.4	37.7	8.2
It is a fairer form of evaluation of all students than traditional assessment.	2.7	13.0	32.9	41.8	9.6

SD: Strongly Disagree, D: Disagree, U: Uncertain, A: Agree, SA: Strongly Agree.

it can be deduced that most of the PSM teachers generally had positive views on use of the portfolio as a means of assessment.

PSM teachers' views on the impact of portfolio assessment to their individual and social development

As seen in Table 3, most of the PSM teachers believed that portfolio assessment helped them to demonstrate different skills (78.8%), encouraged them to take responsibility for their learning (77.4%), encouraged them to generate original products (74.5%), forced them to engage in a continuous exchange of information with peers (73.3%), and helped them to monitor their own progress and to assess themselves (71.9%). More than half of them thought that portfolio assessment improved their critical thinking skills (69.9%), allowed them to realize their own strengths and weaknesses (67.8%), and improved their social relationships with peers (66.4%). Additionally, nearly 43% of them stated that portfolio assessment increased their engagement in lessons, and 52% of them felt that portfolio assessment increased their self-confidence. Based on Table 3, it can be concluded that portfolio assessment practice made important contributions to PSM teachers' individual and social development.

PSM Teachers' views on the impact of the portfolio assessment on their professional development

As seen in Table 4, most of the PSM teachers felt that portfolio assessment helped in applying theoretical professional knowledge (75.3%), seeing their own deficiencies (67.1%) and monitoring their improvement (69.2%) and facilitated permanent learning (72.6%), taking responsibility (71.2%) and reaching the objectives of the course (73.3%). Furthermore, most of them stated that portfolio assessment provided experience (74%) and encouraged the use of this method in their professional practice (66.4%). Based on these views, it can be concluded that portfolio assessment practices contributed to PSM teachers' professional development.

DISCUSSION

In this study, more than half of the PSM teachers stated that portfolio assessment provided an active learning process, encouraged research and investigation, furnished more opportunities to show ability as compared to traditional assessment, facilitated permanent learning, and should be used in education. Thus, one may argue that portfolio assessment has positive effects on PSM teachers' views. This may be explained, as stated by Klenowski (2000), by the positive experiences PSM teachers have with portfolio assessment. The finding that portfolio assessment provided an active learning process, encouraged research, and facilitated permanent learning aligns with the results of many previous studies on pre-service teachers (Darlin, 2001; Ersoy, 2006; Gulbahar and Kose, 2006; Klenowski, Askew and Carnell, 2006; Krause, 1996; Mokhtari et al., 1996; Slater, 1996). Similarly, the finding that portfolio assessment helped pre-service mathematics teachers demonstrate their

Table 3. Pre-service mathematics teacher' views on impact of the portfolio assessment on theirs individual and social development (n = 146).

Pre-service mathematics teacher' views	SD	D	U	A	SA
			(%)		
Portfolio assessment helps to extend my critical thinking skills.	0.7	8.9	34.9	52.1	3.4
It encourages me to take responsibility for my learning.	8.2	21.9	32.2	29.5	8.2
It helps me to realize my own strengths and weaknesses.	1.4	11.0	17.8	59.6	10.3
It increases my individual attainment in the course.	0.7	7.5	14.4	58.9	18.5
It helps to increase my self-confidence.	1.4	10.3	27.4	48.6	12.3
It promotes the development of better relationships with my peers.	8.9	25.3	38.4	21.9	5.5
It helps me to perform self-assessments and to follow my own progress over time.	5.5	18.5	37.0	32.9	6.2
It encourages me to generate original products.	4.1	11.6	25.3	48.6	10.3
It forces me to exchange information with peers.	0.7	15.8	28.8	47.3	7.5
It helps to demonstrate my own different skills and abilities.	2.7	13.7	21.9	50.0	11.6

SD: Strongly Disagree, D: Disagree, U: Uncertain, A: Agree, SA: Strongly Agree.

Table 4. Pre-service mathematics teachers' views on the impact of the portfolio assessment on theirs professional development (n =146)

Pre-service mathematics teachers' views	SD	D	U	A	SA
			(%)		
Portfolio assessment provides opportunities for me to apply knowledge acquired in class in the field.	4.8	11.0	11.6	50.7	21.9
It facilitates permanent learning in the professional field.	0.7	9.6	14.4	61.6	13.7
It encourages me to use portfolios in my future professional life.	3.4	11.0	31.5	43.2	11.0
It helps me to realize my own weaknesses in the professional field.	2.1	17.1	19.9	50.0	11.0
It provides a better understanding of taking responsibility for learning as a pre-service teacher.	1.4	11.0	16.4	56.2	15.1
It allows me to monitor my own progress as a pre-service teacher over time.	0.7	13.7	29.5	48.6	7.5
It helps me to reach the objectives of the course.	0.7	9.6	19.9	56.2	13.7
It provides a file that I can use in my future in professional life.	6.2	22.6	33.6	32.9	4.8
It provides experience for me as a pre-service teacher in how to use portfolios in education.	0.7	5.5	19.9	65.8	8.2

SD: Strongly Disagree, D: Disagree, U: Uncertain, A: Agree, SA: Strongly Agree.

abilities better meshes well with the results of studies by Birgin (2003), Dut-Doner and Gilman (1998), and Norman (1998) at the elementary level.

In this study, some of the PSM teachers stated that portfolio assessment is quite time consuming, is not an economical assessment approach, and caused stress and anxiety for students. This finding may be explained by the fact that they had never before participated in portfolio assessment, they were given severe time constraints for some of the work in the portfolios (2 lecture hours), some had difficulty cooperating effectively, and some had difficulty accessing books and other materials. Indeed, many of them continuously complained about these types of difficulties throughout the portfolio application. Similarly, previous researches conducted at different educational levels also stated that portfolio assessment was time consuming (Birgin, 2006; 2010; Breault, 2004; Koretz et al., 1994; Wolf and Miller, 1997) and caused anxiety for students (Darlin, 2001; Ersoy, 2006). However, Slater (1996) asserted in his study on university students that portfolio assessment did not cause as much anxiety in students as traditional assessment did. On the other hand, 48% of the PSM teachers did not agree that it provided greater enjoyment in learning in this study. This may be explained by the fact that portfolio assessment forces them to do more research and investigation and generate original work, which are both time consuming.

In this study, most of the PSM teachers stated that portfolio assessment contributed to their individual and professional development. They also believed that portfolio assessment helped to take responsibility for their own learning and monitor and evaluate their own development. These findings align with the results of the studies by Cook-Benjamin (2001), Klenowski et al. (2006), Norman (1998), Birgin (2008), and Ersoy (2006). In their study, Groom and Maunonen-Eskelinen (2006) found that portfolio assessment helped pre-service teachers improve their skills assessing, criticizing, and reflecting on their own learning and teaching experiences. Moreover, the present study revealed that most of PSM teachers believed that portfolio assessment

helped to develop theirs critical thinking skills, encouraged them to demonstrate their different skills, and increased their self-confidence. This findings are consistent with the finding of Darlin (2001) that portfolio assessment improved pre-service teachers' thinking skills, of Ryan and Kuhs (2003) that it allowed pre-service teachers to show their different knowledge and skills, of Klenowski (2000) that it helped pre-service teachers to improve their self-confidence, of Krause (1996) and Woodward (1998) that it provided more opportunities to reflect on teaching.

On the other hand, most of PSM teachers stated that portfolio assessment helped them to apply their professional knowledge, contributed to their reaching the course objectives, encouraged them to use portfolios in their future professional life, and provided them experience with the application of portfolios. These findings align with some of the research results. For example, Ersoy (2006) founded that portfolio assessment allowed pre-service teachers to apply theoretical knowledge, Klenowski (2000) determined that it provided experience to pre-service teachers in instructional planning and applying teaching methods, and Mokhtari et al. (1996) revealed that it helped pre-service teachers to demonstrate positive attitudes and gain experience. Similarly, Adams (1995) also argued that portfolio assessment allowed pre-service teachers to become aware of the depth of their knowledge in their subject field, teaching strategies and methods, their beliefs about students, and their professional and personal competencies and to discover their teaching skills. In this regard, portfolio assessment practice made important contributions to PSM teachers' professional development because this application allowed them to see and learn and gain experience in applying it.

In this study, nearly half of the PSM teachers believed their portfolios as a file of documents that can be used in their future professional life. Similarly, some researches (Barton and Collins, 1993; Ersoy, 2006; Jarvinen and Kohonen, 1995; Ryan and Kuhs, 1993) also stated that portfolio assessment provided an opportunity for pre-service teachers to prepare lesson plans and other documents that would be helpful in their professional life. However, some of the PSM teachers did not view their portfolio as a file of documents that could be used in the future in the present study. This finding was ascribed to the fact that these PSM teachers were in their second year and perceived portfolio assessment application simply as an activity for the course. For this reason, pre-service teachers should be presented with more detailed information about the portfolio process.

In sum, portfolio assessment is a promising alternative assessment method in elementary and higher education in Turkey. This study revealed that using portfolio assessment in teacher education both provides PSM teachers with experience in portfolio assessment and contributes to their individual and personal development. Moreover, it was determined that portfolio assessment application contributes PSM teachers to view this assessment method positively. In this regard, it can be argued that using portfolio assessment in teacher education made important contributions to implementation of the new curricula that required the use of portfolio assessment methods in Turkey. In this context, it was recommended that pre-service teachers who will be the practitioners of the new curriculums should be provided with the experience and knowledge about alternative assessment methods in other courses in order to enhance theirs professional development as the present study.

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REFERENCES

Adams TL (1995). A paradigm for portfolio assessment in teacher education. Education, 115(4): 568-571.

Anderson SR (1998). Why talk about different ways to grade? The shift from traditional assessment to alternative assessment. New Dir. Teach. Learn., 74: 5-16.

Ascroft DM, Hall J (2006). Pharmacy students' attitudes and views about portfolio-based learning: a questionnaire survey. Pharm. Educ., 6: 1-5.

Asturias H (1994). Implementing the assessment standards for school mathematics: Using students portfolios to assess mathematical understanding. Math. Teach., 87(9): 698-701.

Bahous R (2008). The self-assessed portfolio: a case study. Assess. Eval. High. Educ., 33(4): 381-393.

Baki A, Birgin O (2002). Portfolio application as an alternative assessment method in mathematics education. Proceeding of the 5th National Congress on Science and Mathematics Education, Ankara: Ministry of National Education Press, pp. 913-920.

Baki A, Birgin O (2004). Reflections of using computer-based portfolios as an alternative assessment tools: A case study. Turk Online J. Educ. Technol., 3(3): 75-99.

Barton C, Collins A (1997). Portfolio assessment: a handbook for educators. Dale Seymour Publications, New York.

Barton J, Collins A (1993). Portfolios in teacher education. J. Teach. Educ., 44(3): 200-210.

Birenbaum M (1996). Assessment 2000: Towards a pluralistic approach to assessment. In: Birenbaum M, Dochy F (Eds.), Assessment of achievements, learning processes and prior knowledge. Kluwer Academic, Boston, pp. 9-29.

Birgin O (2003). Investigation of the application level of a computer based portfolios. Unpublished Master's thesis, Karadeniz Tech. Univ., Turkey.

Birgin O (2006). Problems confront in portfolio assessment application process in primary math education and suggestion for solution. Paper presented at the First National Mathematics Education Student Congress, Dokuz Eylul Univ., Turkey.

Birgin O (2008). Students' views about the applications of portfolio assessment as an alternative assessment method. J. Turk. Educ. Sci., 6(1): 1-24.

Birgin O (2010). Teachers' implementation level of assessment and evaluation approaches suggested by 4-5th grade mathematics curricula. Unpublished Doctoral dissertation, Karadeniz Tech. Univ., Turkey.

Birgin O, Baki A (2007). The use of portfolio to assess students' performance. J. Turk. Educ. Sci., 4(2): 75-90.
Birgin O, Baki A (2009). An investigation of primary school teachers' proficiency perceptions about measurement and assessment methods: The case of Turkey. Procedia Soc. Behav. Sci., 1(1): 681-685.
Birgin O, Gurbuz R (2008). Investigation of pre-service primary school teachers' knowledge level about measurement and assessment. Selcuk Univ. J. Inst. Soc. Sci., 20: 163-179.
Birgin O, Gurbuz R, Catlioglu H (2012). An investigation of pre-service mathematics teachers' perceptions related to the importance of measurement and assessment methods. Energy Educ. Sci. Technol. Part B, 4(2): 661-672.
Birgin O, Tutak T, Catlioglu H (2008). Teachers' views about in-service training programs related to the new primary school mathematics curriculum: The case of Trabzon. In: Demirel O, Sunbul A (Eds.), Further Education in the Balkan Countries. Konya: Education Academy Publication, pp. 965-973.
Birgin O, Tutak T, Turkdogan A (2009). Primary school teachers' views about the new Turkish primary school mathematics curriculum. J. New World Sci. Acad., 4(2): 270-280.
Black P, Wiliam D (1998). Assessment and classroom learning. Assess. Educ., 5: 7-74.
Breault RA (2004). Dissonant themes in preservice portfolio development. Teach. Teach. Educ., 20:847-859.
Cakan M (2004). Comparison of elementary and secondary school teachers in terms of their assessment practices and perceptions toward their qualification levels. Ankara Univ. J. Fac. Educ. Sci., 37(2): 99-114.
Calfee R, Perfumo P (1993). Student portfolios: Opportunities for a revolution in assessment. J. Read., 36(7): 532-537.
Chetcuti D, Murphy P, Grima G (2006). The formative and summative uses of a professional development portfolio: A Maltese case study. Assess. Educ., 13(1): 97-112.
Cicmanec KM, Viecknicki KJ (1994). Assessing mathematics skills through portfolios: Validating the claims from existing literature. Educ. Assess., 2(2): 167-178.
Cook-Benjamin L (2001). Portfolio assessment: benefits, issues of implementation, and reflections on its use. Assess. Update, 13(4): 1-7.
Darling LF (2001). Portfolio as practice: The narratives of emerging teachers. Teach. Teach. Educ., 17: 107-121.
De Fina A (1992). Portfolio assessment: Getting started. New York: Scholastic Professional Books.
Deveci H, Ersoy F, Ersoy A (2006). The views of prospective elementary school teachers on the use of portfolio assessment in teacher education. Educ. Sci. Theory Pract., 6(1): 193-199.
Dochy F (2001). A new assessment era: Different needs, new challenges. Learn. Instruc., 10: 11-20.
Dut-Doner K, Gilman DA (1998). Students react to portfolio assessment. Contemp. Educ., 69(3): 159-165.
Dysthe O, Engelsen KS (2011). Portfolio practices in higher education in Norway in an international perspective: macro-, meso- and micro-level influences. Assess. Eval. High. Educ., 36(1): 63-79.
Ersoy AF (2006). Opinions of teacher candidates as to the portfolio assessment. Elem. Educ. Online, 5: 85-95.
Gelbal S, Kelecioglu H (2007). Teachers' proficiency perceptions of about the measurement and evaluation techniques and the problems they confront. Hacettepe Univ. J. Educ., 33: 135-145.
Groom B, Maunonen-Eskelinen I (2006). The use of portfolios to develop reflective practice in teacher training: A comparative and collaborative approach between two teacher training providers in the UK and Finland. Teach. High. Educ., 11(3): 291-300.
Gulbahar Y, Kose F (2006). Perceptions of preservice teachers about the use of electronic portfolios for evaluation. Ankara Univ. J Fac. Educ. Sci., 39(2): 75-93.
Haladyna TM (1997). Writing test items to evaluate higher order thinking. Boston: Allyn and Bacon.
Herman JL, Winters L (1994). Portfolio research: A slim collection. Educ. Leadersh., 52(2): 48-55.
Higher Education Council (HEC) (1998). Reorganization of teaching training programs of faculties of education. Ankara: High. Educ. Council.
Jarvinen A, Kohonen V (1995). Promoting professional development in higher education through portfolio assessment. Assess. Eval. High. Educ., 20: 25-36.
Kazu H, Yorulmaz M (2007). Elementary school teachers' opinions and practice related to portfolios. Proceedings of 16th National Educational Sciences Congress, Ankara: Detay Pub., pp. 382-386.
Klenowski V (1998). The use of portfolios for assessment in teacher education: A perspective from Hong Kong. Asia Pac. J. Educ., 18(2): 74-86.
Klenowski V (2000). Portfolios: Promoting teaching. Assess. Educ., 7(2): 215-236.
Klenowski V, Askew S, Carnell E (2006). Portfolios for learning, assessment and professional development in higher education., Assess. Eval. High. Educ., 31(3): 267-286.
Koretz D, Stecher B, Klein S, McCaffrey D (1994). The Vermont portfolio assessment program: findings and implications. Educ. Meas. Issues Pract., 13(5): 5-16.
Krause S (1996). Portfolios in teacher education: Effects of instruction on preservice teachers' early comprehension of the portfolio process. J. Teach. Educ., 47(2): 130-139.
Kuhs T (1994). Portfolio assessment: Making it work for the first time. Math. Teach., 87(5): 332-335.
McMillan JH (2004). Classroom assessment: principles and practice for effective instruction (3rd ed). Boston, MA: Pearson.
Meeus W, Van Petegem P, Engels, N (2009). Validity and reliability of portfolio assessment in pre-service teacher education. Assess. Eval. High. Educ., 34(4): 401-413.
Micklo SJ (1997). Math portfolio in the primary grades. Child. Educ., 97: 194-199.
Ministry of National Education (MoNE) (2005). Turkish elementary school mathematics curriculum (1-5th grades). Ministry of National Education Press, Ankara.
Mokhtari K, Yellin D, Bull K, Montgomery D (1996). Portfolio assessment in teacher education: Impact on preserves teachers' knowledge and attitudes. J. Teach. Educ., 47(4): 245-252.
Mullin JA (1998). Portfolio: Purposeful collections of student work. New Dir. Teach. Learn., 74: 79-87.
Mumme J (1991). Portfolio assessment in mathematics. California Mathematics Project, University of California, Santa Barbara.
National Council of Teachers of Mathematics (NCTM) (1995). Assessment standards for school mathematics. Reston, VA.
Norman KM (1998). Investigation of the portfolios as an alternative assessment procedure. Unpulished doctoral disertaiton, University of Memphis.
Ok A, Erdogan M (2010). Prospective teachers' perceptions on different aspects of portfolio. Asia Pac. Educ. Rev., 11(3): 301-310.
Otis-Wilborn A, Winn J (2000). The process and impact of standards-based teacher education reform. Teach. Educ. Spec. Educ., 23(2): 78-92.
Ozen R (2006). Perceptions of primary school teachers about the effects of inservice training (INSET) programs (a case study: Duzce). Abant Izzet Baysal Univ. J Fac. Educ., 6(2): 141-160.
Paulson LF, Paulson PR, Meyer C (1991). What makes a portfolio a portfolio? Educ. Leadersh., 48(5): 60-63.
Ryan JM, Kuhs TM (1993). Assessment of preservice teachers and the use of portfolios. Theor. Pract., 32(2): 75-81.
Saglam Arslan A, Avcı N, Iyibil U (2008). Physics prospective teachers' perception levels concerning alternative evaluations methods. J. Ziya Gokalp Fac. Educ., 11: 115-128.
Shepard LA (2000). The role of assessment in a learning culture. Educ. Res., 29(7): 4-14.
Simon M, Forgette-Giroux R (2000). Impact of a content selection framework on portfolio assessment at the classroom level. Assess. Educ., 7: 84-101.
Slater TF (1996). Portfolio assessment strategies for grading first-year university physics student in the USA. Phys. Educ., 31: 82-86.
Smith K, Tillema H (2003). Clarifying different types of portfolio use. Assess. Eval. High. Educ., 28(6): 625-648.
Stecher B (1998). The local benefits and burdens of large-scale portfolio assessment. Assess. Educ., 5(3): 335-351.
Stiggins RJ (2002). Assessment crisis: The absence of assessment for

learning. Phi Delta Kappan, 83(10): 758-765.
Tillema H, Smith K (2000). Learning from portfolios: Differential use of feedback in portfolio construction. Stud. Educ. Eval., 26(3): 193-210.
Wade RC, Yarbrough DB (1996). Portfolios: A tool for reflective thinking in teacher education? Teach. Teach. Educ., 12(1): 63-79.
Winsor P, Ellefson B (1995). Professional portfolios in teacher education: An exploration of their value and potential. Teach. Educ., 31(1): 68-91.
Wolf K (1991). The school teachers' portfolio: Issue in design, implementations, and evaluation. Phi Delta Kappa, 73: 126-136.
Wolfe EW, Miller TR (1997). Barriers to the implementation of portfolio assessment in secondary education. Appl. Mea. Educ., 10: 235-251.
Woodward H (1998). Reflective journals and portfolios: Learning through assessment. Assess. Eval. High. Educ., 23(4): 415-423.
Zeichner K, Wray S (2001). The teaching portfolio in US teacher education programs: What we know and what we need to know. Teach. Teach. Educ., 17: 613-621.

Appendix 1a. Rubric for overall pre-service mathematics teachers' portfolio.

Level	Required items	Students works/Items	Reflection/Critique	Overall presentation
Very excellent	All required items are included, with a significant number of additions.	Items clearly demonstrate that the desired learning outcomes for the term have been achieved. The student has gained a significant understanding of the concepts and applications.	Reflections illustrate the ability to effectively critique work, and to suggest constructive practical alternatives.	Items are clearly introduced, well organized, and creatively displayed.
Good	All required items are included, with a few additions.	Items clearly demonstrate most of the desired learning outcomes for the term. The student has gained a general understanding of the concepts and applications.	Reflections illustrate the ability to critique work, and to suggest constructive practical alternatives.	Items are introduced and well organized, and displayed.
Moderate	Somewhat required items are included.	Items demonstrate some of the desired learning outcomes for the term. The student has gained some understanding of the concepts and attempts to apply them.	Reflections illustrate an attempt to critique work, and to suggest alternatives.	Items are somewhat introduced and organized.
Poor	A significant number of required items are missing.	Items do not demonstrate basic learning outcomes for the term. The student has limited understanding of the concepts.	Reflections illustrate a minimal ability to critique work.	Items are not introduced and lack organization.
---	No work submitted			

Appendix 1b. Rubrics for each item/work on portfolio.

Level	Students Item/Work	Overall presentation
Very excellent	Item clearly demonstrates that the desired learning outcomes have been achieved. The student has gained a significant understanding of the concepts and applications.	Item is clearly introduced, well organized, and creatively displayed.
Good	Item clearly demonstrates most of the desired learning outcomes. The student has gained a general understanding of the concepts and applications.	Item is introduced and organized, and displayed.
Moderate	Item demonstrates some of the desired learning outcomes. The student has gained some understanding of the concepts and attempts to apply them.	Item is somewhat introduced, organized, and displayed.
Poor	Item does not demonstrate basic learning outcomes. The student has limited understanding of the concepts.	Item is not introduced and lack organization.
---	No work/item submitted	

To be completed by evaluator(s)
Areas of strength: …….
Standard to met: …….
Areas for improvement: ……..