

Full Length Research Paper

Comparative investigation of alternative assessment methods used in Turkey and United States elementary 4th grade mathematics curriculum

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This study investigated the applicability of alternative assessment methods used in 4th grade mathematics curriculum in Turkey and the United States with the intent of implementing these methods more effectively in elementary schools. The sampling included six elementary schools with twelve teachers in Adiyaman in Turkey; four elementary schools with twelve teachers in Pittsburgh, PA in the U.S. Qualitative data were gathered through document examination semi-structured observation, and semi-structured interviews; they were analyzed qualitatively. Findings indicated a similarity in the foundational resources used in both mathematics curriculum. The observations revealed that although both groups of teachers professed using the assessment methods, teachers in the U.S. applied the methods in their classrooms, while teachers in Turkey did not. The interviews disclosed factors preventing the application of alternative methods, particularly among Turkish teachers, including time, the availability of other methods, and the enormous pressure to “teach to the test.”

Key words: Alternative assessment, mathematics, curriculum, elementary school.

INTRODUCTION

Learning theories such as constructivism, multiple intelligences and project-based learning have deeply affected traditional teaching, learning and assessment theories as well as their applications (Fourie and Van Nierkerk, 2001). One of the reasons for evaluation and improvement of teaching, and learning theories is that the meaning and the scope of the definition of learning have shifted (Shepard, 2000). This shift involves a different approach to every stage of the learning and teaching

process (Daghan and Akkoyunlu, 2014), including a new approach to assessment (Letina, 2015).

The learning is a life-long process, which in turn makes instruction more student directed. This calls for students who have better problem solving, critical thinking, synthesis, analysis, as well as creativity to be successful (Whiteford, 2014). In addition, students' ability to self-evaluate has increased; this in turn demands alternative forms of assessment to assess both learning process

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and outcomes (Dochy, 2001).

In the recent decades, there has been a significant change in the selection and usage of tools for assessment in learning process. The paradigm of assessment in schools, colleges and universities has been shifted from traditional methods to alternative ways (Kalra et al., 2017) and they are relying less and less on traditional paper-and-pencil tests and developing creative ways to assess the learning of their students (Ling, 2016). Traditional methods merely evaluated students with a teacher-centric approach that was largely opaque to students. Newer approaches to assessment do not simply determine whether a student knows something or not; ideally, assessment reveals much deeper aspects of the learning process, and should enable students to explain, apply, critique and self-monitored (Janesick, 2001).

In response to requirements for reformed assessment, alternative assessment methods have come into play. Thus, alternative assessment methods should be used instead of traditional assessment for providing every student with the best learning opportunity "If we truly believe in inclusion and diversity, which builds on the understanding that everyone is capable of learning and worthy of the best possible investment in his or her education, it becomes unsustainable to continue using an assessment model that has traditionally developed to focus on selection, certification and accountability" (Buhagiar, 2007).

LITERATURE REVIEW

Alternative assessment (AA) is an umbrella term for a variety of nontraditional assessment methods, including classroom-based, informal performance assessment and authentic assessment, portfolio assessment and project-based assignments (Gill and Lucas, 2013; Lee et al., 2012). AA is based on a constructivist view of learning; viewing learners as active constructors of knowledge and supplying responses rather than selecting or choosing (Dogan, 2011).

Therefore, alternative assessment has the potential both to reverse student passivity, replacing it with initiative, self-discipline, and choice, and to promote compassion, vision, trust and spontaneity in students (Janisch et al., 2007). AA was developed "as a result of lacking tools that can show students' real improvement and their strong strides, and the dissatisfaction of implementers about prevalent assessment tests" (Balliro, 1993).

The traditional way of assessment is not really efficient for many reasons and it focuses on students' knowledge and skills (Foufa, 2016), however, AA focuses on students' learning strategies, problem solving, and task completion, using direct and holistic measurements of what students know (Wiggins, 1990). Moreover, alternative assessment uses activities that discover "what

students are able to do with the knowledge and skills obtained through learning", emphasising their abilities and strengths instead of focussing on their weaknesses and what they do not know (Oliver, 2015).

As in other disciplines, assessment in math is the primary factor in determining what students understand, as well as what and how they are learning (Hemje, 2014); whether or not they have accomplished the learning goals (Hanifa, 2017). Moreover, it provides teachers an insight into the success of teaching strategies and students' preference of learning styles (Damon, 2017). This focus on assessment helps educators with the development of mathematics instruction and allows for more holistic measurement. Using alternative assessment methods provides a more comprehensive picture and more authentic information about learners' knowledge, skills, attitudes, and competences which are developed during the teaching process (Letina, 2015).

This paper focuses on AA in elementary mathematics in the United States and Turkey. Many studies have shown that elementary teachers in Turkey are still using traditional methods in teaching (Köklükaya, 2010; Karakus, 2010) despite the change in public education policy in 2005. These methods demonstrate basic mathematical knowledge but do not assess higher order-thinking (Dandis, 2013). This study compared the use of alternative assessment methods in 4th grade mathematics classes in Turkey and the U.S. The U.S. was chosen as a comparison due to its history and commitment to increasing the use of alternative assessment methods through public education policy. From this study, we draw recommendations for improving the use of AA in mathematics curriculum in Turkey and answer the following research questions:

- (1) What are teachers' opinions about applicability of alternative assessment methods used in 4th grade mathematics curriculum in Turkey and in the U.S?
- (2) What are the alternative assessment practices suggested by curriculum materials used in the 4th grade mathematics curriculum in Turkey and in the U.S?
- (3) What type of alternative assessment methods exist and with what frequency are they being used in the 4th grade mathematics classrooms curriculum in Turkey and in the U.S?

METHODOLOGY

Research design

The case study method was used to broadly determine relevant circumstances and to offer solutions related to those individual cases focusing on a single unit with a restricted milieu and discipline (Merriam, 2013). The case study method employs a descriptive, holistic, exploratory, and inductive research method (Rossman and Rollis, 2017) that helps to produce a highly readable narrative that can be used by decision makers and information users (Patton, 2015). By applying this method in two specific

countries, difficulties and barriers that the schools and teachers confronted were highlighted and the frequency of which alternative assessment methods appeared in the documents used in educational settings was determined. We also collected more detailed information through classroom observations and teacher interviews to describe the relationships between what was being said and what was actually happening in classes and the opinions of teachers about the use of alternative assessment methods.

Setting and participants

Maximum variation sampling was used for this study because it constitutes a relatively small group and reflects the maximum degree of diversity (Patton, 2015). Twenty-four 4th grade teacher participants were included in this study. The sampling consists of six elementary schools with twelve teachers in Adiyaman in the southeast region of Turkey and four elementary schools with twelve teachers in the city of Pittsburgh in the Western region of the state of Pennsylvania, in the U.S. In this context, the Adiyaman schools (two teachers from each level) and Pittsburgh schools (three teachers from each level) were grouped based on their general levels of academic success: successful, average and low. A framework was designed according to the use of internal criteria of three data collection methods: Document examination, semi-structured observation, and semi-structured interview. Experts in educational studies from Turkey and the U.S. were consulted to ensure on the final forms of the data collection methods. Additionally, the interview questions were piloted with volunteer teachers in both countries to improve clarity and usability, and were adjusted accordingly. Finally, University of Pittsburgh Institutional Review Board (IRB) granted certification in order to fulfill the ethics of the research and its methods and to promote fully informed and voluntary participation.

Data collection

Multiple data collection tools provide an opportunity to cross-check the validity of several themes that emerge during the qualitative research approach. As Yin (2014) points out that the case study's unique strength is its ability to deal with a full variety of evidence-documents, artifacts, interviews, and observations beyond what might be available in a conventional historical study. Therefore, document examinations, semi-structured observations, and semi-structured interviews were conducted to determine and compare the level of applicability of alternative assessment methods in 4th grade mathematics courses.

The document examination method provides records of activity that researchers cannot observe directly (Stake, 1995). This study collected and reviewed the 4th grade mathematics curricula teacher guidebooks, mathematics textbooks, student workbooks and other resources in Turkey and the U.S. The study identified which assessment methods were being used and what materials, if any, could guide teachers in terms of their use such as directions for the instructor or rubric samples, etc.

The observation method provides an opportunity to see what is transpiring in the classroom to gather additional information about a phenomena that cannot be achieved in the other methods of data collection (Corbin and Strauss, 2015; Yin, 2014). The researcher conducted the observations in the classes to describe the type and frequency of alternative assessment methods used in mathematics lesson. The researcher also identified difficulties experienced during the implementation of these assessment methods in the mathematics lesson, and if there were difficulties, what measures were taken by the teachers. Over a two-month period, each teacher was observed for 3 weeks. The observations were carried out

unobtrusively in the classroom.

Semi-structured interviews are conducted with participants in order to reveal their ideas, perspectives, beliefs and understandings that complement the document examination and observation methods (Merriam, 2013). The interview defined similarities and differences among alternative assessment methods regarding mathematics curriculum. The researcher created interview questions in advance, and allowed adjustment on the questions during discussion in order to provide flexibility for interviewees. The interviews were implemented by the researcher in two 25 to 30 min sessions, all of which were recorded and later transcribed.

Research procedure and data analysis

The qualitative data collected through document examination, semi-structured observations and semi-structured interviews were analyzed and coded for recurring themes. The researcher used a grounded theory model, allowing the codes to emerge through the data analysis (Rubin and Rubin, 2012). The grounded theory approach assumes that coding, recognizing concepts and themes, and theory development are parts of one integrated process (Rubin and Rubin, 2012). Content analysis was conducted to describe further themes and subthemes that emerged from the interviews, observations, and document notes. A codebook was developed, revised and refined accordingly. The researcher manually coded the categorization process by transferring the emergent themes and organizing them according to the research questions and major themes. The analysis was conducted on twelve participants for Turkey and the U.S., but the frequency is greater than twelve in some because some participants provided more than one reason. The observations and interview data were represented using narrative descriptions which involved a 'detailed discussion of several themes (complete with subthemes, specific illustrations, multiple perspectives from individuals, and quotations) all of which provided a more profound understanding of the previously collected inquiry data (Creswell 2014, p. 189). To distinguish among quotations from teachers in the two countries we used the label 'T' and 'U' to refer to Turkey (T) and the U.S. (U).

RESULTS

Semi-structured interviews data

The first research question addressed in this study is:

'What are teachers' opinions about the applicability of alternative assessment methods used in 4th grade mathematics curriculum in Turkey and in the U.S.?'

The participants of the semi-structured interviews were asked several questions relating to practices of alternative assessment methods currently being used in their classrooms. They were also asked additional questions probing more deeply into the current use of these methods. Data were coded into multiple themes falling under the general heading of teacher opinions about the applicability of assessment methods. From here, multiple themes emerged, including information resource, teachers' proficiency, applicability, difficulties experienced, modifications, obstacles, advantages, recommendations, frequency and familiarity.

Information resources

The participants were asked what sources of information about alternative assessment methods they used in their teaching. Information resources were grouped into three subthemes: curricular materials, internet and friends. According to Turkish participants' responses regarding basic sources, the participants used teacher guidebook (n=11), textbook (n=8), private resources (n=6) and the curriculum (n=1). Internet resources included general education websites (n=9), such as 'egitimhane' (n=4), 'vitamin' (n=2), 'sinifogretmenibiz' (n=2) and 'morfakampus' (n=2). With regard to friends, the participants consulted their coterie of friends (n=6) and colleagues (n=2). One of the interviewees said that he examined the curriculum to find ways to apply the methods better, and he utilized the basic resources like the teacher guidebook, textbook, etc. The interviewee pointed out that he initially tried to use these resources, but could not find what he was looking for, so he turned to other resources because:

"The guidebook and the other basic resource are insufficient in terms of examples and information, so I turned to using the internet and additional resources. I googled the related topic on the internet regarding assessment examples. I also used the other resources because they enabled us to find some examples of assessment (T1)."

In regard to the U.S. participants' responses on basic sources, the participants used the curriculum (n=12), teacher guidebook (n=12), textbook (n=12), everyday mathematics student math journal (n=5) and articles (n=1). With regard to the internet, the participants used google (n=11) and online teacher group (n=1). As to the subtheme of friends the participants consulted their mathematics colleagues (n=1). One of the participants who used these resources said the following:

"We use Everyday Mathematics, a primary resource from Chicago University. In that curriculum there are alternative ways of assessing student work: Books, portfolio, rubric, problem solving. Davin Williams, the book's author, has a lot of practical ways there as well. So I would not say I use [only] primary resources, but other things online, different blogs. But I have not used additional resources on alternative assessment. A lot of things come from the curriculum and also some were created from the district. We have Everyday Math, and Envision. We put those together to manage the curriculum. From those resources the important thing is, I am researching, looking, and creating on my own (U10)."

Teachers' proficiency

The participants were asked whether they had enough

information about alternative assessment methods or not. Among the Turkish participants, five stated that they had enough information, four had partial information, and three participants stated that they did not have enough information about the methods. As for the U.S. participants, six stated that they had enough information, three had partial information, and three had no information about the assessment methods. Some of the Turkish participants who answered 'enough information' explained that they had done research on the assessment methods, and they had in-service courses and experiences with the methods. Others answered 'enough information' because their interest in math motivated them to search for more materials. Still others answered 'enough information' because, as those who were responsible for applying the alternative methods, and they were naturally more aware of the methods, and could make important inferences about implementing them. For example, one participant commented:

"Yes, I think I have enough information because it is based on my being a researcher and having more responsibility. No seminar or course were offered on these assessment methods, and I was asking the inspectors when I was doing research on the methods, but they did not know about them, either. Therefore, I realized that if I wanted to know about the assessment methods, I would have to find out by myself (T9)."

The American's teachers, on the other hand, while giving similar answers in same ways, differed in other important ways. American teachers who answered 'enough information' was similar to the Turkish teachers: some of them did their own research; gained knowledge from experience/applying the methods; had in-service and course; and some had sufficient resources about the assessment methods as well as they were educated at the university about the methods. One participant added,

"I feel like I learn in my course work at University of Pittsburgh about all of these assessment ways to check to see if the students learn math. My information is probably from my course work, and I also have been teaching for six years. We are doing assessment in class modeled after assessment that we did at the university. The instructor told us how we should do the assessment (U11)."

Regarding the subtheme 'partial information', the participants from Turkey stated that they had partial information because they were in the dark; they could not follow the improvements; had inadequate experts, lack of personal endeavour, and practice; and they wanted to stick to traditional assessment methods. As distinct from Turkish participants, the U.S. participants stated that they have 'partial information' because they did not feel the need for all of the alternative assessment methods, and they were intimidated by their complexity. Corresponding

to 'lack of information', the Turkish participants complained about the lack of university training on the alternative methods as well as the lack of in-service seminars and courses, equipment, and professional support. In regard to the U.S. participants' responses on 'lack of information', the participants stated that they did not have enough information because of lack of knowledge, inability to practice the methods, and they were accustomed to traditional methods.

The applicability

Each semi-structured interview participant was asked to reveal information about the applicability of alternative assessment methods. According to two Turkish interviewees, the methods were 'applicable', while four interviewees said that the methods are 'partially applicable', and six interviewees stated that they were 'not applicable'. As for the U.S. interviewees, eleven expressed that the methods were applicable and only one of the interviewees reported that he had no idea about the methods. Regarding the subtheme 'applicable', the Turkish participants stated that the assessment methods were applicable providing that certain conditions were met. One of the interviewees explained:

"I think all of these methods are applicable in case of number of students, level of the students, and enough equipment. If the teacher is a little eager, willing to make sacrifice, preparing the forms for assessment before class, these methods can be applicable very easily and so they are beneficial (T11)."

As for the U.S. participants, they stated that the assessment methods were applicable because the methods enabled teachers to learn more about the students, allowed students to use their knowledge, increase their confidence in math, and motivate them in the course. These methods are also applicable for students of different levels, and accurately measure students' knowledge. Furthermore, teachers feel capable of carrying out the methods. One of the interviewees explained why the assessment methods are applicable in the following way:

"I think that you need to find out what the students know. If you are giving the test, and they are failing it, but everyday they are right with you in class, raising their hand and getting everything right, you need to find another way to assess them. When you are saying alternative assessment, so I should use them, absolutely. When we are working together, I see what they are doing and they can tell me what is the community property, and I said, 'Ok, you know what you are talking about' because they show it. They are intelligent kids that are failing the paper and pencil test (U5)."

Corresponding to the subtheme 'partially applicable', the Turkish participants pointed out that the assessment methods were partially applicable owing to time and cost constraints, too many methods, lack of expert support and detailed information, crowded classes, teacher workload, and differences in students' levels. The Turkish participants gave diverse reasons for why alternative assessment methods were 'not applicable' including similar reasons to those expressed earlier, as well as traditional parental expectations, lack of equipment and physical conditions, and the curriculum intensity

Difficulties experienced

Participants' responses about difficulties they encountered in the implementation of the alternative assessment methods in their classrooms were categorized as environmental difficulties, difficulties regarding teacher, student, and parents, and curricular difficulties. Regarding environmental difficulties, the majority of participants indicated that crowded classes, insufficient time, and the exam system hindered the implementation of assessment methods. With regard to teacher difficulties, some participants complained that the methods were not found in the curriculum; their workload was too high; they had insufficient support and information; and they were reluctant to change. Student difficulties included level differences, lack of information, and indifference. Curricular difficulties included the intensive curriculum and methods pertaining to the math curriculum; parent difficulties included cost, parental pressure on doing test instead of doing alternative assessment, and lack of knowledge, as well as bias about their children's level:

"The number of students in the classroom makes it difficult to implement the methods. The resources also did not include enough information, or you could find only one or two examples, so they were certainly insufficient. The methods are costly, and the parents rejected them because there were too many assessment methods (T8)."

According to the U.S. participants' data, within the theme 'difficulties', specific subthemes emerged including environmental and student difficulties. Each subtheme was categorized into the following dimensions: the environmental difficulties were coded into time factors, testing and subjectivity; the student difficulties were coded into level differences among students, collaboration, insufficient information and attitude:

"Some of the alternative assessments are subjective. What I think as a math teacher may be different than another teacher even if we use the same rubric. I can think one way and the other teacher could think another

way, so just having different teachers, with different points of view on implementing the alternative methods that we use, that may be a difficulty (U4).”

Modifications

To ‘what kinds of modifications would you make on how to assess learning in 4th grade math classes?’ A majority of both Turkish and American interviewees wished for changes in alternative assessment methods. However, one distinct difference in two groups was that while the Turkish participants focused on changing actual assessment methods, such as constructed grid, diagnostic tree, and portfolio. One of the interviewees pointed out that he would like to discard these assessment methods because

“I do not know them, so I have no information about them. Therefore, I would like to extract them. I tired to use portfolio, but I could not adopt it because the kids put everything into the portfolio (T10).” Presumably, the portfolio was too messy to find what the teacher was looking for.

Curiously the American participants’ answers seemed to have little to do with actual assessment methods. Rather, answers focused more on teaching strategies, such as problem solving instruction, an increase in growth assessment, and end the standardized testing. One of the interviewees said:

“I would like to try to teach more problem solving, not say here learn this, this and this. Our curriculum does not give them problems. Ask them to understand something. I would really like that, maybe it should be more like that (U3).”

Obstacles

From the semi-structured interviews, the following subthemes emerged as obstacles in both Turkey and the U.S.: environmental factors, application difficulties, and challenges arising among both students and teachers. In addition, Turkish teachers also identified insufficient support as an obstacle. This difference stemmed from Turkish teachers’ cultural reticence to make use of online resources. One of the Turkish interviewees commented on insufficient support as an obstacle in implementing alternative assessment methods:

“Despite profuse compliments, like “Good job!”, we cannot get enough support from the experts, inspectors, and counselors. We have no expectations for support, but I think it is one of the most discouraging points (T1).”

Other obstacles included environmental factors, such as

insufficient time, differences in learning levels and crowded classes; assessment difficulty, overwhelming variety of methods, insufficient information on those methods, meager equipment, and a scarcity of examples in the teacher guidebook. The U.S. interviewees reported obstacles such as insufficient amounts of time, high costs, unclear curriculum, the pressure to teach to the test, difficulty of data collection, inadequate knowledge of assessment, and the variety of student behaviors and performance levels. One of the interviewees called teachers themselves as an obstacle. This is because many teachers are accustomed to traditional summative assessment tools such as quizzes and tests. One teacher explained this by saying:

“They [teachers] do not have much background with alternative assessment. They often try to document grades they can easily record in their grade books rather than perform alternative assessments on a regular basis where new forms of assessment help to guide classroom instruction. Many worry about assessment but do not apply the results of that assessment to shape future work. They don’t consider the results of the assessment as a template necessary for structuring where the students need to go next (U10).”

Advantages

Considering the advantages of alternative assessment methods, according to Turkish data, the majority of participants indicated that the methods increased interest and motivation towards the course, improved self-confidence, and enhanced a sense of responsibility and a feeling of success. Some of them stated that the methods developed higher-order thinking skills, enriched creativity, improved students’ research skills, as well as provide objective evaluation. A minority of participants specified that the assessment methods reduced exam anxiety, provided permanent learning and critical thinking, and improved democratic skills. According to the U.S. data, majority of the participants explained that the methods revealed the level of knowledge, provided real evaluation data, improved self-confidence, and reduced anxiety; some of the participants stated that the methods enhanced their feeling of success, provided multi-dimensional thinking, developed life skills, and increased students’ awareness. A few of them said that the assessment methods provided an opportunity to recognize students, showed creative skills, and saved independent learning skills.

Recommendations

The participants were asked their recommendations for implementing alternative assessment methods in math,

and responses were categorized as recommendations with specific subthemes, including environmental focus and education focus. For Turkish data, each subtheme was categorized into the following dimensions: the environmental focus was coded into reducing class size (n=2), providing equipment (n=1), arranging the methods according to class size (n=1) and positive attitudes towards teachers (n=1). The education focus was coded into an imperative for practical training for faculty (n=11); inspectors having sufficient knowledge (n=10), teachers attending seminars or courses (n=10), information and rubrics in the resources regarding the methods (n=7), paper instruction on using alternative assessment during teacher training at universities (n=1), and parents buy-in. In explaining the situation, one of the participants recommended:

“More information and forms should be provided in the resources regarding the methods. They [educators] should be given courses and seminars to fill the information gap. Both people who give the course or seminars and the inspector should have more information (T4).”

For the U.S. data, the recommendations for the environmental focus were that the district should adopt alternative assessment methods (n=1), and a certain portion of the budget should be allocated to alternative assessment methods (n=1). The education recommendations included providing information on using the methods (n=3), increasing teachers experience with the methods (n=2), demonstrating applications of the methods (n=2), giving more space to information and forms in the resources (n=1), including teachers in the development phase (n=1), and using the methods more (n=1). One of the participants who was adept at implementing the methods remarked:

“I think showing people how you use the methods, where they can reach information about the methods and how do you put them in action in the classroom, is probably the best way to have them used in their classroom purposely. Because I think some people use the methods for training, but they do not necessarily know how to use them or some people could benefit from using strategy. I think getting information out to people with concrete examples, teaching how do you use them. I can see people jumping on that (U1).”

Frequency

Participants were asked about the frequency with which alternative assessment methods were used. According to Turkish participants' opinions, it was concluded that teachers generally used performance task, portfolio, observation, presentation, concept map, self assessment; sometimes they used peer assessment, rubrics, attitude

scales, but they rarely or never used diagnostic tree, and structured grid. According to the U.S. participants, teachers often used performance task, rubrics, observations; teachers sometimes use portfolio, project, presentation, self and peer assessment. However, they rarely or never used attitude scale, concept map, diagnostic tree and structured grid.

Familiarity

The interviewees were asked 'how familiar are you with these assessment practices?' Turkish were familiar with observation, presentation, portfolio, rubric, peer assessment, project assignment, performance task, interview, self assessment, and concept map. The American participants were familiar with observation, presentation, portfolio, rubric, peer assessment, project assignment, performance task, interview and self assessment; However, one difference was that Turkish participants were somewhat familiar with attitude scale, while the Americans were unfamiliar with the attitude scale. In addition, both countries were unfamiliar with diagnostic tree and structured grid.

Document examination data

The second research question addressed in this study was 'What are the alternative assessment practices suggested by curriculum materials used in 4th grade mathematics curriculum in Turkey and in the U.S.?' Two main themes emerged from the findings to this material resources and frequency of methods appearing in those materials.

Material resources

We found that the main material resources in the mathematics classes in the Turkish classrooms are the curriculum, teachers' guidebooks, main mathematics textbooks, student workbooks, internet, colleagues' opinions and private publications. As for the U.S., teachers used the Envision math curriculum, teachers' guidebooks, everyday mathematics textbooks and student workbooks, including home connections, number corner, practice book, copied resources for common core standards, district lesson plans, and online materials.

The frequency of methods appearing in the resources

We found evidence of alternative assessment methods in only three of the materials we investigated: the curriculum, teachers' guidebook and textbook in both countries. According to our investigation results in the

Turkish mathematics curriculum, instructions for all alternative assessment methods were found except the diagnostic tree and the structured grid. Instructions found in the curriculum, there were examples in the curriculum such as project, assignment, portfolio, observation, attitude scale, rubric, self and peer assessment. While in the U.S. curriculum, we found the instructions based on the following alternative assessment methods rubric, interview, observation and presentation. Teacher's guidebook results showed that there were informative instructions concerning portfolio, project, observation and self assessment. Whereas both the Turkish and U.S. teacher's guidebook forms includes project assignment, portfolio, performance task, self and peer assessment; the Turkish teacher's guidebook includes attitude scale and interview missing in the U.S. guidebook, and the U.S. teacher guidebook includes rubric and presentation, which were missing in the Turkish teacher's guidebook. The Turkish student textbooks had no information and forms on assessment methods. The U.S. student textbooks did include instructions and information regarding performance task, portfolio, presentation, project assignment, and self assessment.

Semi-structured observations data

The third research question addressed is *'How frequently and what type of alternative assessment methods are used in the learning process in the classroom in 4th grade mathematics curriculum in Turkey and in the U.S?'* To study this, observations were performed in both Turkey and U.S' classes to describe which and how frequently alternative assessment methods are used; what are the difficulties/problems experienced during the implementation of the methods used. The observation themes that emerged included classroom observation and difficulties encountered.

Classroom observation

During Turkish school observations, there was evidence of alternative assessment methods such as performance task, project assignment and other forms that teachers had posted on the walls and the activity corners. However, there were no direct observations of those assessment methods being implemented in the classrooms. One of the observation notes indicated:

"Two cupboards were available in the class. Additionally, classroom computers, printers, speakers, projection, banners with the seasons, pictures and other completed tasks such as performance tasks and project assignments were exhibited in the activity corner (T6)."

The observations conducted in the U.S. schools demonstrated that almost all the teachers used

performance tasks, observations, portfolios, presentations, projects, rubrics, and peer and self assessments in the learning process, for example:

"Students brought their performance tasks, nature house made from bark and numbers and they exhibited them on the window sill. The students gave individual presentations of their tasks in turn, and their teacher examined the performance tasks individually. The teacher and the student peers asked questions. The teacher took brief notes both during and at the end of the presentation. After the presentation, the teacher and students commented on the performance task (U1)."

According to observation notes, the American teachers used most of the assessment methods mentioned earlier, but they did not apply a concept map, constructed grid, diagnostic tree or attitude scale due to lack of familiarity with these methods. Although the Turkish teachers cited their familiarity with the methods and that they found them worthwhile, but they did not apply them in their classroom during the observations.

Difficulties encountered

The teachers were observed with special attention paid both to the difficulties they encountered during the implementation phase of alternative assessment methods, as well as to the adjustment phase, in which their alterations to those methods were also reported. A close look at the gathered observation data from Turkish schools indicates that the difficulties encountered and the alterations made were not reported because the alternative assessment methods were not implemented. Turkish teachers were not observed using AA methods; however, they did provide evidence of the difficulties of implementation in their interviews. The collected observation data from the U.S. regarding difficulties the teachers experienced during the implementation of AA methods revealed that the majority of teachers reported time as the main factor; some of them occasionally experienced classroom management and the level difference among students as an issue, while two of them reported having difficulties organizing their students. A minority of teachers reported difficulties encountered in informing students about the alternative assessment methods, controlling the students under the new methods, developing new assessment forms aligned with the methods, and lacking experience using the methods. In the context of making their own measures for the new assessment methods, teachers benefited from other schema, collaboration with their colleagues, opportunities to give one-on-one attention to individual students, practices of supplying students with additional information on assessment procedures before applying those procedures, and prior preparation of forms for assessment before class.

DISCUSSION AND CONCLUSION

This study analyzed the applicability of alternative assessment methods (AA) used in 4th grade mathematics courses in Turkey and the U.S. in order to implement them more effectively. Document examinations, semi-structured observations and semi-structured interviews were conducted to determine and compare the level of applicability of alternative assessment methods in 4th grade mathematics courses. In this way, the similarities and differences were manifested.

Results showed that both countries used the curricula, teachers' guidebook, textbook, student workbook, online resources materials, private publications and colleagues' opinions as resources for implementing AA methods. In addition to these materials, the U.S. teachers also utilized home connections, number corner, practice book, copied resources for common core standards, and district lesson plans regarding mathematics instruction. Concerning the frequency of assessment methods in Turkish and U.S. math curricula, teachers' guidebook and textbook results indicated that the Turkish curriculum included explanatory and informative instructions and forms for all alternative assessment methods except for diagnostic tree and structured grid. In contrast, results showed that the U.S. curriculum had fewer AA methods only including concept map rubric, interview, observation and presentation.

In comparison, teacher's guidebooks in both countries included informative instructions on portfolios, projects, observations and self-assessments. However, differences emerged on some items. For example, Turkish teacher guidebooks also included forms on performance task, attitude scale, interview, and peer assessment. The U.S. teacher guidebooks included instructions and forms on performance task, presentation, rubric, and peer assessment in. Textbook investigation revealed that while there was not any information or forms regarding the assessment methods in the Turkish textbook, there was information and forms regarding the performance task, portfolio, presentation, project assignment, and self assessment in the US textbook.

A close look at the observational data from the U.S. schools showed that almost all teachers used performance task, observation, portfolio, presentation, project, rubric, and self and peer assessment. Similarly, Bol (2002) found that the observation method was widely used as an alternative assessment method in the U.S. classrooms. The majority of the U.S. teachers reported time as the main obstacle to using alternative assessment methods, and the rest reported that difficulty in teaching students about the methods was the main problem. This corroborated finding by Letina (2015) that found that time consuming is one of the main difficulties for alternative assessment efficient and effective implementation. However, the Turkish schools' observation data indicated that the assessment methods were not implemented directly in the classrooms, so the difficulties encountered were not observed. Köklükaya

(2010) in her research, emphasized that teachers knew how to apply the alternative assessment; however, they did not implement the methods in their classrooms.

Based on the responses provided, most of the Turkish participants stated that they did not have enough information about the application of AA methods because of lack of education from the university, seminar or course, and inadequate expert support. This is consistent with findings of Buyuktokatli and Bayraktar (2014) and Anil and Acar (2008) that found that teachers did not have enough information due to the lack of education, and insufficient professional support. On the other hand, U.S. participants stated that they had enough information because they had sufficient resources, and were educated about the methods. Regarding applicability of AA methods, while many Turkish interviewees expressed that the methods were not applicable, all of the U.S. interviewees expressed that they were.

Participants' opinion were collected regarding difficulties encountered in the implementation of the AA methods. It was notable that Turkish respondents asserted numerous difficulties, including environmental, difficulties regarding teachers, students, and parents, and the curriculum. The U.S. participants propounded a few difficulties including environmental and student difficulties. Both of these countries' participants emphasized the difficulties of insufficient time, testing, lack of information and level differences among students. These findings are corroborated by various researchers (Karakus, 2010; Acat and Uzunkol, 2010; Birgin, 2010). Oliver (2015) also point out that implementing alternative assessment is labour intensive and time consuming. It requires a continuous training and development opportunities for educators, which could be costly.

The participants from two countries gave utterly distinct answers related to what kinds of modifications they would like to make. Most of the Turkish interviewees would like to modify or discard constructed grid, attitude scale, portfolio, rubric, concept map and diagnostic tree because they had no information about them. Consistent with this finding, Buyuktokatli and Bayraktar (2014), Duran et al. (2013), Kolomuç and Açılışlı (2013) and Acat and Uzunkol (2010) pointed out that Turkish teachers had no information about the AA, so they used some of the methods, such as performance task and observation. Some of the Turkish teachers would not like to change anything because they found the methods were applicable and beneficial. A majority of U.S. interviewees requested changes in instructional methods, an increased focus on problem solving instruction, and growth assessment while a minority of interviewees replied that they were satisfied with the assessment methods, and gave "nothing".

In terms of the barriers, the data indicated that almost all the Turkish interviewees identified an insufficient amount of time, overcrowded class size, testing pressure, too many methods, lack of expert support and knowledge, and difference in levels of students as barriers to

implementing the AA methods. Buyuktokatli and Bayraktar (2014) and Yesilyurt (2012) confirmed that teachers had difficulty in practicing the alternative assessment techniques due to time constraints, crowded classrooms, negative effects of parents, and insufficient knowledge on these techniques. Similarly, almost all the U.S. interviewees reported barriers including inadequate time, the pressure to teach to the test, inadequate background knowledge for assessment, and the variety of student behaviors. In line with this finding, Letina (2015), Janisch et al. (2007) and Bol (2002) found that overcrowded classes, not having enough time, preoccupation with test scores, lack of support were barriers to conduct the assessment methods.

In analyzing the advantages of implementing alternative assessment methods for students, Turkish and U.S. participants commonly stated that the methods increased students interest and motivation towards the course, improved self-confidence, and enhanced the feeling of success. This is corroborated by other researchers who found that when students participated in alternative assessment activities, they appeared more eager to complete the activities, felt a greater sense of confident, and accomplishment as they completed the assessments (Brooks and Brooks, 2001; Marzano, 2003; Mintah, 2003; Zimbicki, 2007). The participants also stated that the methods enriched creativity, improved students research skills, reduced exam anxiety, developed higher-order thinking and life skills. These findings endorsed information that had been previously gathered by Bal and Doganay (2010), Aschbacher et al. (1995) and Century (2002).

According to participants who reviewed their recommendations for the implementing of methods, the Turkish participants generally recommended reducing class size, providing equipment, practical training, sophisticated inspectors, and informative seminars or courses. Marzano (2003), Roberts and Trainor (2004) and Zimbicki (2007) particularly emphasized that 'research has proven teachers cannot effectively implement alternative assessment activities without professional development training' (p. 232). Similarly, Letina (2015) confirmed that the application of alternative assessment would be certainly more effective if teachers were provided adequate support. The U.S. participants generally recommended a need for gaining more experience with AA method, adopting AA methods at a district level, supplying necessary financial support for resources and materials, and training in specific applications of AA methods.

In the interviews conducted both Turkey and US teachers reported familiarity and use of AA methods. In both countries, teachers generally used performance task, observation, project, portfolio, self and peer assessment; however, they rarely or never used attitude scale, diagnostic tree, and structured grid. In line with this finding, Daghan and Akkoyunlu (2014) and Buyuktokatli

and Bayraktar (2014) confirmed that the participants were familiar with observation, presentation, portfolio, rubric, project assignment, performance task, interview and self and peer assessment, however, they were unfamiliar with attitude scale, diagnostic tree, and structured grid. In addition, Sandford and Hsu (2013), particularly, emphasized in their study that teachers often used portfolio and its use creates a significant impact on student learning.

The results of this comparative study indicated that positive changes may not occur in Turkey and similar countries up until teachers are given manageable class size, sufficient time, enough training at the university or through inservice courses, adequate equipment, and proficient support to efficiently implement the alternative methods of assessment. The study therefore, recommend that educators and politician should make adjustment to apply the alternative assessment methods for differing classrooms or reduce the class size, teach the future teacher candidates how to use assessment in effective ways, provide enough materials for the teachers, and attend seminars or classes that directly address the assessment methods practices.

STUDY LIMITATIONS

This study has certain limitations. First, the study is a case study research, and the findings in this study should be considered with the limitations inherent in it. Although the generalization of the results may not be possible due to the nature of qualitative case study, the rich set of descriptive information regarding the context and students may enable readers to relate the findings of this research to their specific cases. Nevertheless, if similar studies were repeated at a later time and in different settings, it would be possible to obtain distinct and generalizable results because of changes in conditions and the participants' experience and approaching. Last, the research has limited twenty-four 4th grade teacher participants that were included in the study samples based on a voluntary basis.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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