

Math Fair: Meeting the Challenge of Meaningful Summer Field Experiences for Elementary Mathematics Methodology Students

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Abstract

The Math Fair was an event developed by this researcher for teacher candidates in the summer session of the elementary/middle grade mathematics methods course to gain practical experience with students in grades K through sixth grade by teaching mini-lessons to the participants. A qualitative analysis of the teacher candidates' professional reflection comments is included in the article. Analysis of reoccurring themes will be used to understand the challenges and insights into the experience. These data will be helpful in developing future experiences for teacher candidates.

1. Introduction

Historically, the justification for field experiences in teacher preparation programs is attributed to John Dewey and the progressivist movement of the 1930s [5]. He saw the teacher as learner and as that, there was a need for opportunities to construct abilities of excellence in teaching by having appropriate experiences in the field. Despite this futuristic viewpoint, the prevalent mode of teacher preparation in the United States before the 1980s consisted of coursework at a university and culminating with one semester of student teaching [5]. Since that time, educational reforms have placed greater emphasis on field experiences in teacher preparation programs that encompass a wide variety of settings throughout the teacher education program [1]. Future teachers must experience the complexities and diversity of today's classrooms by participating in rigorous and authentic experiences to prepare them for the challenges of teaching [5].

Field experiences for teacher candidates are an important part of methodology course work in order for them to have realistic opportunities to observe and work with professional teachers in actual settings with

PK-12 students. Research indicates that the effectiveness of education courses is substantially increased when accompanied by field experiences, and that those who studied children's mathematical thinking while learning mathematics developed more sophisticated beliefs about mathematics, teaching, and learning [7]. Experiences in the field improved pre-service teachers' implementation of instructional models and teaching strategies demonstrated in methodology classes. They also gained practical knowledge about working with a diverse range of students in regular classroom settings. Planning and implementing lessons are also key components of the field experience. All of these elements are critical in developing effective future teachers; thus, preservice professional development should be more realistic and relevant [8]. Field experiences become necessary for learning to teach because they provide real-world situations for learning that cannot be duplicated within the context of a methodology course.

Instructors of methods courses offered during the school year may employ field-based experiences at local schools. However, methods classes taken during the summer months pose challenges for these students to find appropriate and meaningful activities to complete for this mandatory course component. Few schools exist that maintain a year-round calendar; most schools are not in session. Given the importance of field experiences to learning to teach, this poses a significant problem [4]. The purpose of this paper is to describe an elementary/middle grades mathematics methods course offered in the summer in which an alternative field experience was created called The Math Fair. This report of the activity can inform mathematics teacher educators, as well as those in other disciplines, that are seeking to provide authentic opportunities for learning to teach mathematics to their students, particularly in cases in which courses offered in the summer or early field experiences during coursework prior to student teaching are not part of the teacher education program. The Math Fair was

developed by this researcher/course instructor as a way for the teacher candidates in the summer session of the elementary and middle grade mathematics methods course to gain practical experience working with elementary age children. In the first year, students in grades Pre-K through sixth grade were invited to attend this event held for one afternoon. The event is now in its fifth year and has been expanded to two days and serves first through sixth grade students. Data analysis and reflection by the teacher candidates and the course instructor will be used to report changes made to the program later in this article.

2. Course design and the practical field experience event

If the current effort to improve mathematical instruction at the elementary level is to succeed, it must be supported by a sound base of effective teacher preparation, which includes methodology courses, mathematics courses, and field experiences for future teachers [3]. Materials and Methods for Elementary/Middle Grades Mathematics (EDCI 422) is a three-credit undergraduate-level course offered in a three-week intensive session each summer by the Department of Curriculum, Instruction, and Leadership at Louisiana Tech University. Students in the course typically include individuals who are junior or seniors working on elementary grades 1-5 certification, as well as grades 4-8 mathematics and science majors and non-degree certification candidates. The course is also offered for graduate credit for those seeking alternative certification, pursuing the Masters of Arts in Teaching, and for experienced teachers seeking advanced degrees. The instructor of the course developed a course calendar to address all strands of elementary/middle grades mathematics instruction, with the Math Fair occurring two days before the course ended.

In designing the Math Fair, this researcher/course instructor was concerned with providing an experience conducive to that of a teacher's future classroom responsibilities. Specifically, she wanted to provide opportunities for the teacher candidates to design and implement their own lessons, provide one-on-one/small group instruction to students of varying ability levels, and develop strategies for managing various ability levels for their chosen activity. In the first year, the Math Fair was developed as a mandatory course requirement. Participants were ascertained by inviting students in grades Pre-K through sixth grade

to attend this event held for three hours during one afternoon in its first year of existence.

The event was publicized to the surrounding community in several ways. The local radio stations broadcasted public service announcements about the Math Fair, and the local paper received a press release about the event. The University e-mailed all faculty and staff members information about the event and it was posted on the University website. Teacher candidates in the course also brought their family members of the appropriate age level to the event.

The teacher candidates could select any strand of mathematics content and were to write a lesson plan and develop a center activity where they could teach their lessons to the participants in the Math Fair. The activity needed to be designed as such so that it could be taught at a remedial level for younger or lower level students, and also could be modified to be more challenging for those students that were older or advanced in mathematics. The activity also had to be brief in nature, so that the participants could visit all the stations available.

In preparing for the event, discussions were held in class and the instructor pre-approved the activities chosen by the teacher candidates for the Math Fair. Lesson plans were written by the teacher candidates for their chosen activity following the adopted lesson plan format for the College of Education at Louisiana Tech University. One section of the lesson plan format that defines accommodations and modifications to be provided by the teacher for students with exceptionalities was modified for the purpose of the Math Fair. In this section, the students were instructed in class to include how they would differentiate the instruction of their activity by defining the remedial activity, the average ability activity, and the enrichment activity.

During class discussions, the teacher candidates expressed concern over the fact that they would have to adapt an activity that would span eight grade levels (PK-6). In a typical classroom, this would not be the case. In light of this concern, the instructor modified the organization of the Math Fair to reflect lower (PK-grade 2), middle (grades 2-4), and upper (grades 4-6) elementary divisions. Students could then select into which division their activity would most appropriately fit.

The University laboratory school's multipurpose room served as the site for the event. Each teacher candidate had a table and chairs provided to set up as desired for his/her activity. Tables were grouped according to the grade divisions noted above. As

participants arrived, they received the appropriate map of the numbered stations around the room and they visited each station in any order. When a station was completed, the teacher candidate placed a sticker on the participants' maps, marking off each station that they visited. Participants with a completed map received a certificate of participation. In the first year, over 100 students visited the Math Fair with their parents and other adults. These attendance numbers have been consistent over the past five years.

3. Teacher Candidate Reflection

Reflective practice involves thoughtfully taking into account one's own experiences in applying knowledge to practice while being trained by professionals in the discipline. In education, it refers to the process of the educator studying his or her own teaching methods and ultimately improving their effectiveness in instruction [2]. In the learning and understanding of teaching mathematics, students need to practice reflection on their own mental processes and structures, the physical processes used, and the effectiveness of these processes. Reflection is also a metacognitive skill, being aware of what one knows, being able to relate, evaluate, regulate and act upon one's own cognitive processes [6].

The College of Education lesson plan format requires that the teacher candidates write a reflection of the teaching experience for any lessons that they actually teach. Teacher candidates who participated in the Math Fair were required to write a guided summary reflection of their experiences working with the various levels of students during the Math Fair, addressing the following broad topics: a) What did you enjoy or think went well with the Math Fair? b) What was frustrating or that you did not enjoy about the Math Fair? and c) What would you change if you could do your activity again for another Math Fair? While the reflection was a course requirement, teacher candidates in the course were given the option of not having their reflection included as part of the analysis. Reflection pieces of those who chose to participate were read and analyzed for reoccurring themes. The comments reported are from the first four years of the Math Fair.

3.1 Positive aspects of the event

The overall major theme that emerged that the teacher candidates enjoyed about the experience was the eagerness of the participants to learn and that they

appeared to have so much fun doing their math activities. One student wrote, "(The Math Fair) was almost as exciting as an amusement park." Many teacher candidates expressed in their reflections that they were excited about teaching at the Math Fair and that the children were excited to be there. While many mentioned the participants being eager to do their activities, many also mentioned that the children enjoyed the "competitiveness" of their game or activity. "It seems children love competition," one teacher candidate wrote.

The teacher candidates also expressed that they appreciated the opportunity to work with such a diverse group of students in terms of age and ability levels. "It was a good experience to see what the different ages were able to do or not do," noted one teacher candidate. Another theme, slightly related to the diversity of the group was that several teacher candidates mentioned enjoying working with age groups that were different than what they normally worked with in other field experiences. "I had some older students visit my station," stated one teacher candidate. "I never thought I would enjoy working with fifth and sixth grade students, but it was very enjoyable."

Teacher candidates also wrote that they enjoyed the opportunity to learn from their peers by watching and listening to others in the class teaching their lessons. "I was able to get some neat teaching ideas from other 'teachers' and make notes of things I want to incorporate in my classroom as activities," stated one teacher candidate. Others expressed this as noting the broad array of activities for the participants, learning practical teaching techniques, and being able to apply course content. Many noted the importance of using manipulatives to teach their lesson and/or basing the activity situation on a real-world application of mathematics, which are both concepts that are stressed throughout the entire course. A patterning activity was designed by one teacher candidate, where the participants would be able to manipulate beads to create a pattern bracelet. "The students seemed to like this hands-on activity," she wrote. "This was something they could make and keep. It was also not the standard worksheet activity." One teacher candidate designed an activity where the participants had a budget in which to purchase school supplies. The children had 3 sales flyers to use to find the best prices available for the items they were required to buy for school. "I enjoyed doing this activity because it gave the children something they could relate to when they had to shop for school supplies," she noted

in her reflection. “Some were familiar with looking through sales ads and others were not but were surprised to see the cost of different school supplies at different stores....some even said that they were going to tell their parents to go to the store to buy certain things they like for a reasonable price.”

Other areas mentioned as positive aspects of the Math Fair were the opportunity to work one-on-one with students and noted multiple strategies that participants possessed to solve problems. One teacher candidate had a store activity where participants would be challenged to come up with different coin combinations to equal various amounts up to a dollar. “I love how the students responded to my questions,” the teacher candidate wrote. “They tried to add different amounts of money to make a quarter or even a dollar. This was amazing to me how their minds responded. Some students, when given 75 cents, would purchase items worth 50 cents and 25 cents. Some would purchase only items worth 25 cents. What surprised me was when the students would try to see how many 10 cent items they could purchase with their 75 cents. Most of the students had no clue where to start when it came to counting out enough items to spend their money.”

3.2 Negative aspects of the event

Frustrations were few, but space limitations were the most noted problem with the Math Fair. The instructor did not know how many participants would attend the event, and when over 100 people came the first year, it became crowded quickly. One student said it “seemed to be a chaotic atmosphere.” This contributed to other problems, such as noise and distractions and too many children at a station at one time. “Since the lesson was taught in the multipurpose room, it was hard to keep the children focused on the activity being taught,” one teacher candidate explained. “There were other lessons going on while I was teaching which was somewhat distracting.” This also created a fast pace, and some teacher candidates felt their activity took too long for the time allotted. “I had not anticipated how long my activity would last. If I only had two to three students, the game went fairly quickly. However, when I had four students, the game lasted much longer,” one teacher candidate shared in her reflection.

Another major theme that was frustrating was teacher preparedness. Some teacher candidates noted that they became frustrated when students did not

understand their activities or they felt their activity may be too hard or too easy for the grade level they chose. A teacher candidate that taught a lesson using a hundreds chart wrote that students were not familiar with the chart and had difficulties moving the game tokens. “One student when asked to take away 20, moved the marker down the hundreds chart instead of going up.” This teacher candidate also noted that a first grader that visited her station was not equipped at all to do the activity. “She was lost because she wasn’t familiar with the different mathematical terms like take away and minus.” Some teacher candidates expressed that they felt nervous, were not very organized, and unprepared. “I practiced last night on my family, but this in no way prepared me for the real thing,” one teacher candidate wrote in her reflection. “The first couple of times I stuttered through my words and could tell that the students and their families noticed.” A teacher candidate began her reflection with the day the Math Fair was introduced in class. “I did not know what to think. When I arrived at the....multipurpose room I was a little nervous. When the children started to arrive, I became more nervous.” While some noted that parent involvement was a positive aspect, others saw the parents as a distraction. “The parents would give the kids the answers. That was frustrating because I wanted the students to come up with the answers,” noted one teacher candidate. “Then the parent finally said to his child, ‘I guess I should let you do that.’ The child doesn’t learn anything if the parents are telling them the answers all the time.”

3.3 Conclusions about the event

The teacher candidates noted several things they would do differently if the opportunity existed. Most expressed that they would modify their activities by shortening the length of the activity, or adding or deleting skills. One student, for example, conducted a measurement activity. “I should have them estimate their answers first,” she stated. “Then we could do the actual measurement and compare. I could also have the students convert inches to centimeters next time.” Several teacher candidates wrote about differentiating their problems more. “I would definitely scale down the questions,” one wrote. “Maybe not remove them, but separate them, and use one problem to build on the next one.” Another noted, “I would add more enrichment opportunities...Although it challenged

most of the students, some had an easy time accomplishing the goals.”

Other teacher candidates noted that they would use other materials, such as the addition of a calculator being available, or make their materials more colorful and attractive to the students. “I should have had more of an activity approach, or game approach,” one teacher candidate wrote about his chosen activity. “The students really seemed to like activities that were more activity or game oriented.” One student noted the “professional look” of their peer’s activities. “The tables that were decorated got a lot of the students’ attention,” he wrote.

Concluding remarks from the teacher candidates were very positive. They felt the event was successful and well attended. They felt the opportunity for the students was good for review and that the students learned some new skills. One teacher candidate noted that she “learned patience” in working with students. One observed, “I got more out of this experience than when I’m just observing.” Another practicing teacher noted that she wanted to integrate a similar activity at her school.

4. Using the data to inform practice

The information provided by the collection and analysis of the teacher candidates’ reflections has informed the practice and subsequent planning of the Math Fair event. The summer of 2010 was the fifth year of the event and it has changed significantly from the first year. One significant change was to break the event into two days, with children completing grades 1-3 invited to the first day of the event and those in grades 4-6 invited to participate on the second day of the event. Teacher candidates were allowed to select which age group they wanted to teach with approximately half of the teacher candidates assigned to each day. On the “non-teaching” day, the teacher candidates acted as assistants. They set up tables and chairs and assisted those teaching prepare for the students. They also helped parents sign in and assisted the children in moving around to the different stations. In initial data analysis from the fifth year, this seemed to ease the stress of attending to many different grade levels and so many participants on one day. This also helped alleviate the noise and congestion problems. This format will continue for the 2011 Math Fair.

After the first two years of the Math Fair, the participant map of the stations was deleted from the event. Many teacher candidates in the fourth and fifth

year of the event stated that they wished there was more organization to the rotation of the students through the various stations. “Maybe it would be beneficial to assign a helper to two or three tables,” one teacher candidate suggested. This researcher/course instructor is looking into including the map back into the event for the 2011 Math Fair. Also, instead of just letting the participants randomly select stations, children would be grouped at the beginning of the Fair and assigned to one of the teacher candidates that was not teaching that day. A timer could be used to give uniform time to each group and rotate through the stations in a more organized fashion.

Another added factor that helped control some of the reported problems was to allow the parents a “drop off” option. In the first years of the Math Fair, parents or guardians were required to stay with the children. It was initially thought that parents could pick up some tips and insight on how to work with their children at home. Overall, this did not prove to be the case, as several teacher candidates alluded to in their comments about parents giving answers. Also, this just seemed to create more noise and congestion in the room. With the “drop off” system, parents were given the option to stay if they wished, or if they completed an emergency contact form, they were free to leave and could pick up their child promptly at the end of the event. This worked well; a majority of parents left, while those that stayed seemed to earnestly want to learn how to help their child in mathematics.

In dividing the event into two days and the teacher candidates having a “non-teaching” day opened up an opportunity for the teacher candidates to observe the others’ activities and reflect on their practice. As noted earlier, the teacher candidates expressed that they enjoyed seeing the other class participants’ activities. This was limited, however, to those classmates that were close by due to the fact that all were teaching on the same day. In the fourth year, each teacher candidate that was not teaching was assigned five classmates that were teaching and were to give a brief reflection of the five activities they observed. This allowed the teacher candidates more opportunities to glean ideas and teaching strategies from each other.

5. Conclusion

Given the importance of field experiences to learning to teach, it is crucial that teacher candidates

enrolled in mathematics methods coursework have an opportunity to implement what they are learning and develop their skills for teaching mathematics to learners in as realistic a setting as possible. As discussed, traditional school-based field experiences may be difficult to implement, especially in the summer months. While some instructors have turned to alternative models, such as videotaped teaching episodes, these alternative models may not provide a context reflective of the classroom settings in which teachers will be expected to teach. This researcher/course instructor believes that the Math Fair approximates a more realistic setting for the teacher candidates to participate in a field experience more conducive to the teachers' future classroom tasks. It allows the teacher candidates to design and implement their own lessons as well as manage materials for hands-on mathematics instruction with individuals and small groups. While teaching lessons in a whole group setting would be an added advantage, with 30-35 teacher candidates in a three-week course, this becomes impossible. However, the teacher candidates experienced a very real and daunting task in today's classrooms; varying and adjusting instruction for the vast array of learning levels in the regular classroom setting. There is reason to believe that this experience can positively impact teachers' future instruction, as is witnessed by the comment at the end of the previous section. The data collected have been helpful to the course instructor in teaching the elementary/middle grades mathematics course again during the summer for subsequent years. The teacher candidate reflections as well as self-reflection and observation of the event by the course instructor has influenced the organization and planning of the event, as well as better preparing the teacher candidates for the experience. These data will also be helpful in developing future experiences for teacher candidates in other methodologies.

6. References

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