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Designing and teaching an elementary school enrichment program: What the students were taught and what I learned

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Abstract: This article is a reflection on the experiences I had designing and teaching an elementary school enrichment program to gifted students in mathematics. In particular, I consider not just what I taught the students in the program but what I learned throughout the entire process. This article first focuses on a description of the program and my role within the program. I then describe in detail four of the lessons I designed and taught for the program. Central to the description of the lessons are my observations of the students' reactions to the lessons and my own growth as the instructor. The article concludes with a reflection on my pedagogic practices, the gifted students in the program, what I learned during the experience and what I learned after the experience.

Key words: mathematics enrichment, gifted students, elementary, constructivism

Introduction

In this article, I discuss my experience as a developer and instructor of a program for mathematically gifted elementary school students, entitled the Mathematics Enrichment Program. This program was intended to provide mathematically gifted students the opportunity to experience mathematics that goes beyond the regular curriculum. I begin with a brief description of the program, the school, and the students involved. I then describe my role in contributing to the design of the program and being the first instructor for the program. I outline four of the lessons I developed and taught for the program as well as some of my observations of the lessons. By providing rich details of the program, I offer information for others interested in developing a similar program. Lastly, this article includes a personal reflection on the development of my own mathematical knowledge and understanding as I worked with the program and afterwards as my own education provided more insight into the experience.

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Program Description

The Mathematics Enrichment Program (MEP) took place at Roslyn Elementary School, a public elementary school located near the centre of Montreal. Approximately 530 students attend Roslyn from Kindergarten to Grade 6 (Roslyn School). Roslyn offers both an English stream as well as a French Immersion stream to its students, and is a member of an English school board.

The MEP was first piloted at Roslyn in autumn of 2007. Through a relationship with one of the local universities, Roslyn sought out a graduate student in Mathematics to work as a facilitator and instructor for the program. One of the local universities offers a graduate program in mathematics that focuses on mathematics education. Roslyn sought out a facilitator from this university program in hopes to hire someone with the expertise to teach within the MEP as well as someone who would have the availability part time, as this was not a full time position. I was the graduate student that was hired. During my first visit to the school, I met with the principal and vice principal to discuss the school's goals and intentions for the MEP. The school wanted to offer different and more creative mathematical opportunities, beyond the standard curriculum, for, as the school website states, students who showed "great talent in mathematics", or the mathematically gifted students (Roslyn School). The school decided who was considered to have great talent or was mathematically gifted under their own criteria. Specifically, the criteria for attending the MEP consisted of the classroom teacher's observations and assessment that the student was working two grade levels ahead in mathematics, that the student showed great talent and interest in mathematics, and parental permission. The school anticipated that the MEP, a program that was voluntary for these selected students to attend, would provide an opportunity for students gifted in mathematics to enhance their mathematical talents beyond the curriculum. The school also intended that while these students were attending the MEP, teachers would have the opportunity to focus more time on students in their classrooms who needed extra mathematical support.

It was planned that the MEP would take place during the regular school day. The students who attended were released from their regular classrooms during the time of the

program. The only expectations of these students were that they treat the program as though it was still normal class time and not a release time. The 25 students who attended the program were divided into three groups according to their current grade level: Grade 1 and 2 (five students), Grade 3 and 4 (11 students), and Grade 5 and 6 (nine students). The gender distribution was approximately equal. Each group of students separately attended hour-long lessons, which initially occurred once a week, and later up to twice a week once the program was fully organized. The students were only expected to attend the program and were never given any assignments or homework from the MEP. However, I did place great emphasis on encouraging the students to explore what they had learned from the activities on their own time at home.

There are a few questions raised about some of the above practices. In particular, the question of which students are gifted in mathematics is broached. According to the school, students working a two grade levels above are those who are gifted. Yet, according to research and literature on gifted students, this may be too suggestive a method of identification as those who are mathematically gifted may exhibit other features than just scholastic achievement (Bicknell, 2008; Clark, 2002; House, 1987; Rosario, 2008). Other questions that are brought forth in the literature, as well as in these situations, are: what are the needs of gifted students and how are they to be addressed? According to the school, the gifted students needed mathematical enrichment from a specialist, which was provided through special classes. Unfortunately, I did not collect any data other than my own observations so it is hard to judge the impact the program had on the individuals who took part. More research, potentially long term, is needed in this area if we are to be better able to answer whether educators are addressing the needs of gifted students appropriately.

My Role within the MEP

As aforementioned, I was hired as the first facilitator and instructor for the MEP. At the time, I was hired for two purposes, to work with the school to get the program started by taking care of some organizational aspects, and to develop and teach the lessons and activities for the program. The school officially categorized my position as a Math Enrichment Tutor, but it was mutually understood that I did much more than tutor.

My role within the MEP was also not limited to time spent within the school. The majority of the work I did for the MEP was outside the school, as I developed lessons and activities to meet the goals of the program. Once the program was organized to the point that students could start attending, my role within the school became that of strictly teaching the lessons and informally reporting the program's progress to the school administrators. Below I describe in more detail my roles in the MEP, both outside and inside the school.

Outside the school

Upon accepting the challenge to teach for MEP, I initially started looking for resources that could help me develop lesson plans. In particular I was searching for resources that described lessons or activities that I could use to meet the goals of the program. This proved to be a difficult task. Internet and literature searches provided a variety of interesting mathematical problems or games, but hardly anything that could be used as the basis for an entire lesson. For example, I found a lot of example of interesting mathematical number patterns or games that could be played with a deck of cards but I felt that the goals of the program were beyond this. As well, a number of the resources I located were on topics already covered in the curriculum, which was not what the school had in mind for the MEP. As such, I turned to the resource of my own experience to develop lesson plans.

I reflected on my own experiences in mathematics, from elementary school, where I was pulled out of class to attend a mathematics program for gifted students, to my undergraduate and graduate courses in pure mathematics, to generate some initial ideas. I created a list of the topics that stood out in my mind as having an impact on my own mathematical enrichment and organized this list into topics that could potentially be taught to elementary students. The biggest challenge was adapting topics to work within the constraint of the elementary students lacking extensive knowledge of algebra. This first list demonstrated my personal preference towards topics that a) encourage mathematical thinking that focused on purposes to mathematics, not just processes of mathematics, b) placed mathematics in realistic or geometric context situations, and c) demonstrate different representations of mathematics. Interestingly, my preferences align

with some similar recommendations, among many others, from the literature as areas to focus on to enhance mathematical skills (Davis & Maher, 1993; Freeman, 2003; House, 1987; Maccagnano, 2007; Nunes, 1993).

My preference for encouraging mathematical thinking, which focused on the purposes of mathematics, was evident as I developed lessons that required the students to reflect on their experiences, not just standard non-trivial problem solving processes. I wanted to avoid the teaching of mathematical procedures and instead focus on the purpose of the processes in problem solving. My preference for realistic geometric context situations was clearly an example of drawing on my own strengths in mathematics, as I prefer to treat mathematical problems with geometric models wherever possible. As such, a lot of my lesson plans employed realistic geometric context situations. I also wanted students to explore different representations of mathematical concepts and to establish links between these representations. By developing links between multiple representations, the students could potentially build a base for higher levels of abstraction within mathematics. Lastly, I included different cultural or social representations of mathematics, such as ancient alternative number systems, which became a feature of some of the lesson plans I developed for the MEP. Overall, the lesson plans that I designed were greatly influenced by my own experiences and beliefs about mathematics.

Inside the school

My role inside the school was that of a facilitator and the instructor. In the facilitator role, I ensured that the school was aware when I was coming, when I would be teaching each group, and what supplies I would need. The school provided me an empty classroom with a storeroom for supplies, which was essentially mine during the MEP. As the instructor my primary job was to conduct the lessons. I was very fortunate to be working with smaller groups of students than in most classrooms, which was advantageous as I was able to conduct lessons in a more informal round-table or seminar like scenario. I also provided the students with workbooks/journals to record their work, what they had learned, and make journal entries that reflected what they had learned and what they enjoyed. There has been some research that suggests that gifted students may

need extra emotional and social support from teachers (Clark, 2002). I aimed to address this dimension within my practice by being providing a classroom atmosphere that was very inclusive and positive. I encouraged the students from the beginning to talk about how they felt about the work, and whether they were comfortable with the subject matter and the classroom environment. After the first few weeks of the program I had one young boy ask if he could leave the group. Although he was doing very well with the subject matter, he stated that he was not interested in the program since all of his friends were still in the regular class. This aligns with what some of the literature says about gifted students and their self-concept image (Clark; Davis & Rimm, 1994).

Lessons

In the next section I describe some of the lessons I developed and taught for the MEP. The process of selecting topics for the lessons I developed for the MEP was made from a survey of my own mathematical experience and knowledge. The topics were then simplified to what I felt I could develop into interesting lessons that met the goals of the MEP and that aligned with the students' prior knowledge. Along with a portrayal of the lessons, I provided a brief account of my observations of the students' reactions to each lesson. As will be described, not all of the lessons I planned were responded to in a positive manner, and I speculate as to why this might have been. Although, these lessons were designed with the goals of the MEP in mind, and thus are beyond what the standard curriculum in this region required, I believe they could also be incorporated into a regular classroom setting for mathematical enrichment with some minor adjustments.

Cryptology

The cryptology lesson plan involved a) a description of what cryptology is and where it is used in our daily lives, b) an introduction to the concept of modular arithmetic, c) instructions on the different rules of a shift cipher, d) a demonstration of shift cipher using a Caesar Cipher, and e) an activity where the students encrypted and decrypted messages to each other. With only a few minor adjustments for the age groups, each group received relatively the same lesson. My purpose behind wanting to teach

cryptology was that it could be placed in a realistic context and allowed for an activity using the alternative representation of modular arithmetic.

I started by introducing the uses of cryptology within our daily lives, such as computer passwords, in order to demonstrate to the students a realistic context of mathematics. Teaching the students modular arithmetic took up the majority of the lesson and encompassed most of the mathematical concepts used. First, we discussed twelve-hour and twenty four-hour clocks and what is meant by modular arithmetic. We then moved onto some other modular bases and attempted a few practice samples of simple modular addition and subtraction problems, which were worked on in pairs until I felt comfortable that the students understood the concept. I then led from modular arithmetic into the idea of numbering the letters of the alphabet in order to represent them by numbers and eventually encrypt them. As a group, we numbered the alphabet from 0 to 25 and called this our plaintext code, recognizing that it was mod26. Once we had the basis of our plaintext and an understanding of modular arithmetic, I was able to demonstrate a simple Caesar shift cipher of key = 3, for the students. During the time remaining I encouraged the students to encrypt their own message using a key they had chosen and to switch with a friend and try to decrypt each other's messages.

For all three age groups, I introduced the idea of representing a number by a letter. I consciously refrained from using the word algebra when I introduced the symbols in the encryption formula. I had at first considered leaving blank spaces in the encryption formula. However, during the lesson I spontaneously drew a picture of a key in the formula to represent the number that was the key. The students did not voice any concern with this idea and so in an impromptu manner I wrote a P in the formula for the plaintext and C in the formula for the ciphertext (or the 'code', as we called it), leaving us with the formula $C = P + k \pmod{26}$ (for encryption), where k was the picture of a key. For example, if the key = 12 and the plaintext was 18 the students would have the formula $C = 18 + 12 \pmod{26}$ and assuming they did their modular arithmetic correctly, they would end up with C = 4. I do not recall any of the students struggling with the abstraction process of imagining P, C and k as numbers. Alternatively, they were able to rapidly abstract and accept the use of letters and pictures as representing different numbers.

In the months that followed the cryptology lessons, I would constantly get requests to do cryptology again. At Christmas time, we all wrote Christmas cards for our families in shift cipher codes. I heard reports from parents that the students were coming home from school and trying to teach the other members of their families how to encrypt messages. Cryptology turned out to be one of my most successful and talked about lessons.

Symmetry and the Art of Escher

The idea for a lesson on symmetry and the art of Escher came from a university geometry textbook entitled *Experiencing Geometry: Euclidean and Non-Euclidean with History* (Henderson & Taimina, 2005), where the authors of this text outline the seven different types of symmetry of line. The authors described symmetry using a definition of isometry, stating that, "an isometry is a transformation that preserves distance and angle measures" (Henderson & Taimina, p. 15).

For the lesson, I began by asking the students what they knew about symmetry and how they understood symmetry. I provided pictures and asked the students to tell me which were examples of symmetry. Through this discussion we started to agree as a group on what constituted symmetry and what did not. Initially, the students were limiting symmetry to only reflections. But as I offered more pictures and the students discussed the examples as a group, they were able to informally agree on a definition for symmetry that was similar, albeit simplified, to the definition of isometry offered by Henderson and Taimina (2005). In particular, the students agreed that they needed to look at the length and distances between the lines and the angles of the pictures. For the youngest group who had not been introduced formally to angles, we talked about paying attention to the corners of the pictures.

With this agreement on what to look for when searching for symmetry, I then demonstrated for the classes the seven different types of symmetry of a line on the overhead (Henderson & Taimina, 2005), using simple geometric shapes like triangles. Referring to the properties from the definition, we talked about each of the different symmetries, how they held these properties (with the exception of quasi-symmetry), and worked together to brainstorm other examples of these types of symmetry. Lastly, as a

class we went through examples of M.C. Escher's symmetry drawings. With these drawings, I asked the students to explore and identify the different types of symmetry they saw. Initially, I always asked the students to 'prove' to me that they had found some symmetry by showing me that the properties in the definition were there. After requesting this type of explanation a few times, the students started providing it without being asked and 'proving' or justifying solutions became a socio-mathematical norm in the MEP.

This lesson was the first time that I introduced the idea of formal definitions and properties to the students. The students were able to accept quite quickly the need to maintain properties. The few times that I provided contradicting examples to test the students' understanding, I was corrected and referred to the properties in the definition of isometry for clarification.

This lesson also provided me with my first, but not last, experience of being corrected by the students. I had chosen pictures from Escher that were bright and showed clear examples of symmetry to represent what I was introducing. For one picture I had not looked closely enough at all of the details and had decided that it was an example of reflection-symmetry, not half-turn symmetry that it actually was. More than one student noticed my mistake and referred me to the properties in the definition to demonstrate that they were right and I was wrong. This incident brought to my attention the confidence these students held in their own understanding. My experience as an instructor at university was in a different pedagogical setting where the teacher was perceived as 'all-knowing' and students were constantly looking for reassurance. This was never the case with the students in the MEP, which I feel is a reflection of the students' individual mathematic abilities as well as the opportunities that an exploratory mathematics atmosphere offers.

Roman Numeral Arithmetic

My goal when designing this lesson was to introduce the students to a representation of a number system different than the base-ten or Arabic numerals system. In the base-ten system we have ten symbols, 0-9, which can be used to represent any number. In particular, the base-ten system changes in symbolization with each increase of one unit. On the other hand, Roman numerals have symbols representing one and five

and any 10^n multiple of one or five up to n=3. As such, a change in symbols does not occur with each unit increase. I had hoped that the students would gain from this lesson an understanding of how the mathematics we use is socially constructed and how different societies have constructed alternative number system. I also wanted the students to start thinking flexibly about numbers as sums of their parts, which Roman numerals demonstrate quite nicely.

For the lesson, I introduced the Roman numerals to the students by displaying the Roman symbols and the corresponding base-ten numbers they represent. We spent a considerable amount of time talking about the rules for using Roman numerals and how to read Roman numerals. Once the symbols and rules were outlined, I explored briefly with the class some conversions of numbers back and forth from a base-ten system to Roman numerals.

The last activity the class investigated was addition and subtraction arithmetic with the Roman numerals. When the students first encountered the arithmetic problems in Roman numerals, they quickly converted then to base-ten numbers, conducted the arithmetic operation, and then converted the numbers back to Roman numerals. I took the time to point out to the students that the Romans did not convert their numbers to base-ten because they did not have base-ten. At this point, the students started exploring the arithmetic strictly within the Roman numeral system. For the youngest age group, I did not provide them arithmetic problems with sums larger than 20, but for the two older age groups, I utilized the entire range of Roman numeral symbols for the arithmetic problems.

The students quickly responded to the idea of using alternative symbols and rules to create numbers. No student questioned the logic of using Roman numerals. One student even mentioned that it reminded him of cryptology because he was just writing a new code for each number. As a follow up at the end of the lesson, I asked the students how many different types of number systems they thought we could have. After some discussion, the classes agreed that we could make as many number systems for which we could think of symbols and rules. Some students even mentioned that they might try making their own number system. Thus, for these young gifted students in mathematics, the idea of mathematics as being a social construction instead of absolute was a very easy

philosophy for them to accept. This was also an opportunity to introduce the students to other alternative number systems, such as base-two (binary) or base-three systems, which were explored in later sessions for the older two age groups.

Euclidean Straightedge and Compass Constructions

This lesson plan is the example of a lesson that did not work as I anticipated. Using a straightedge and compass, I had hoped to teach the students how to cut a line perfectly in half and how to draw an equilateral triangle, a square, and a hexagon. The goal of this lesson was to encourage the students to look at geometry figures in terms of their properties and particularly, the parts that make up the figures. I tried throughout the lesson to focus on the idea of the radius of the circle being the same distance from every point on the circle. This lesson was only attempted with the Grade 5/6 group, and after 20 minutes of little progress and much noise and confusion from the students, I decided to move onto a different lesson I had planned for the next MEP session. One of the reasons I speculate why this lesson did not work is because not all of the students arrived with a compass. I then suggested that everyone share with a partner and try the construction together. This also did not prove to be successful because as the students tried to share the compasses, they tended to not follow the instructions well.

I cannot predict whether this lesson would have worked if all of the students had brought compasses. It might have been that the topic was too advanced, or that my instructions were inappropriate to be incorporated into their prior knowledge. There could be other causes as well. One thing that the difficulty with this lesson did demonstrate to me is that at the time that I was working with the MEP, the program and myself as an instructor were both still in a developmental stage.

As was also mentioned previously, other lessons were also less than successful in how they were planned. In these situations, I found myself either having to adapt the original plan or in some cases, move onto a different lesson altogether. It was imperative that I be prepared for such circumstances inside the classroom. Since the lesson plans were all of my own design and not previously tested, situations where they needed adjustment or failed altogether were to be expected. Thus, while teaching I was also consciously and constantly evaluating the strengths and weaknesses of the lesson plan and adapting as I went along.

Reflection

My time as the instructor for the MEP lasted only six months, as I finished my graduate degree in Mathematics and moved to a different city. I am currently completing a graduate degree in Mathematics Education and I am able to reflect back on the MEP experience with some new perspectives based on focused studies on education. In particular, I have new theoretical and pedagogical perspectives, which cause me to rethink the teaching approaches I used in the MEP project. I also have a better understanding about the characteristics of gifted students and a familiarity with research on teaching mathematically gifted children of this age.

Reflection on my Teaching

Although I was not formally educated in educational theory at the time this program took place, I now see that there were instances and situations in my teaching that align with a constructivist view of education. According to Goldin (1990), a constructivist mathematics philosophy believes "mathematics [is] *invented* or *constructed* by human beings, rather than as an independent body of 'truths' or an abstract and necessary set of rules" (p. 31, emphasis in original). Some of the topics of my lesson plans aimed to demonstrate the constructed nature of mathematics. For example, in teaching Roman Numerals in comparison to the base ten number system my goal was to make obvious that mathematics has been socially and culturally constructed throughout history. Another example is when I facilitated the students developing, or constructing, a definition for symmetry on their own. The students also did activities like constructing their own ciphering systems. As well, I always encouraged the students to work in pairs or small groups.

Van de Walle and Folk (2007) provide six features that contribute to a constructivist teaching methods of mathematics. These features are a) children construct their own knowledge and understanding; we cannot transmit ideas to passive learners, b) knowledge and understanding are unique for each learner, c) reflective thinking is the single most important ingredient for effective learning, d) the socio-cultural environment

of a mathematical community of learners interacts with and enhances students' development of mathematics ideas, e) models for mathematical ideas help students explore and talk about mathematical ideas, and f) effective teaching is a student-centered activity (Van de Walle & Folk, p. 34). These features in no way make up an exhaustive list of what exactly a constructivist mathematics classroom should include, but they do provide a basis for features to look for.

On reflections, I did manage to include some of the features of a constructivist mathematics classroom in the MEP. For example, from the first class we used math journals to record any work and to reflect on the class, thus encouraging a reflection of the mathematics that was covered. For the youngest age group they might have drawn faces to describe how they felt about the lesson and were encouraged to write a few words about the class. The two older age groups responded to questions such as "what was math enrichment about today?" and "what did I learn?" After the first few weeks the students would start to answer these questions even before I instructed them to do so. I would read through the journal entries as a way to inform myself about their thinking. Further to this, I encouraged open discussions to allow students to listen to their peers and formulate their own understanding. I often felt it difficult to facilitate open class discussions and keep students on track and sometimes fell back to lecturing, but I also recognized that when the open class discussions were successful the level of understanding the students demonstrated was greatly increased.

Although, I now realize that there are many places where I did not honor a constructivist approach. The greatest example being that there were many instances of lecture style teaching where I was trying to transmit ideas to passive learners. In some cases, I did try to encourage some student discovery and always tried to activate the students' prior knowledge, but I was not consistent at this. I believe that my tendency to fall back on a lecture style teaching method was because of my current position at the time teaching introductory university mathematics courses, which were taught in this manner, as well as my own experience of participating in lecture style mathematics classrooms. Thus, I was working from the only example I had ever had.

The Gifted Students

I have also learned more about the characteristics of gifted students and approaches that prove to be beneficial. From numerous literature sources, characteristics of giftedness are described as including curiosity and understanding of qualitative features, thinking logically and symbolically about relationships, the ability to generalize patterns, see relationships, or make connections flexible mental processes, persistence in solving mathematical problems, rapid understanding of mathematical ideas, systematically and accurately working, confident in mathematical or quantitative situations, and creatively approaching problem solving, to name just a few (Applebaum, Freiman, & Leikin, 2008; Bicknell, 2008; House, 1987; Maccagnano, 2007; Pandelieva, 2008; Rosario, 2008).

As I reflect on my experience, I realize that I witnessed the students in the MEP exhibited similar traits. For example, as I mentioned earlier, the students in the MEP held no hesitation in correcting my mistakes, thus demonstrating some of their confidence in mathematics. Similarly, one very interesting observation about my experience in the classroom was that I hardly ever had to repeat instructions to the students. The students understood instructions on the first time or were very quick to work with a partner to ensure they understood the material, thus taking responsibility for their own understanding. I was also able to move through the lessons at a faster pace than I initially anticipated. I believe this is an example of the higher and rapid level of comprehension of the students in the MEP.

It was also the case that a number of times a student would draw conclusions about the mathematics we were working on that also showed a very strong level of comprehension, and an ability to generalize and see relationships. For example, while covering the ideas of modular arithmetic, the class had begun by looking at addition problems so that I could draw on their prior knowledge of clocks and time. While attempting a few addition modular arithmetic problems, one student took the opportunity to announce to the class that she had figured out the subtraction as well. Without being asked she went to the board and demonstrated it for the entire class. She thus exhibited her ability to rapidly comprehend the information and also to extend her understanding to cover alternative mathematical situations.

The Program

I now recognize that there are many resources available that offer suggestions of how programs like the MEP should be developed. For example, the NCTM emphasizes has a list of essential components of programs for the mathematically gifted, which include such features as teacher competence, high-order thinking skills, applications and problem solving, communication skills, encouragement of creativity, and integration of content (House, 1987). Another guide on developing programs for gifted students states that an enriched mathematics program should attempt such activities as using open-ended questions, avoid repeating the regular curriculum, do not grade, and ensuring topics are mathematically significant (Freeman, 2003). By reflecting on how I interpreted the goals of the program, I believe that I was able to attempt the majority of the NCTM essential components as well as Freeman's list of activities. Thus, the program did include a lot of features that the literature suggests it should.

Nonetheless, there are many areas were I can now say I could have improved the program. For example, although I constantly avoided repeated the regular curriculum, I am not sure if I could justify that all the lessons I planned demonstrated the significance of the mathematics involved. I also could have attempted to use more open-ended programs within the lessons. Similarly, offering more examples of where the content could be integrated with other curricular areas could have enhanced the program. I also would change my pedagogical approach to include more features of a constructivist teaching method to hopefully facilitate more creative activities and personal discovery. Overall, if I were to develop a similar program now, I would attempt to include these components.

Conclusions and Suggestions

Since I have left the MEP, other instructors have taken over. I had the opportunity to share some of my knowledge and experiences with the instructor that initially took my place. Other than that, I do not know what knowledge or wisdom has been passed on since I left. I do know that the program continued to run into a second school year and is planned to continue for a third. I also know that the school has expanded their Enrichment Program to also include literature, art, and engineering (Roslyn School).

From my experience, I have some suggestions for those who try a similar program in the future. First, it was difficult to find resources for lessons that matched the goals of the program. Although there is a lot of literature available on gifted mathematics students and alternative mathematics for the classroom, I could some find, but not a lot that could be incorporated into the lessons for the MEP. A lot of the material I found on non-curriculum mathematics was designed for larger lecture style classroom settings. Since I was aiming for more exploration and personal discovery with the MEP, these lessons were not appropriate. Thus, it would be very valuable for enrichment instructors of similar programs to have a place to share and exchange lesson ideas.

It is also important for an instructor to be very familiar with the material (s)he chooses to teach. As I demonstrated by my experience, not all lessons will be successful how they are planned. For an instructor to be able to flexibly adapt to the needs of the group, the instructor must have a deep conceptual understanding of the material. In some cases, it might even be most prudent to move on and perhaps return to a revised version of the lesson at a later date.

I also suggest that instructors only prepare the lessons to a certain point and then adjust and move with the pace of the class. For example, in the Roman numeral lesson, I had initially planned to take the opportunity to show the students how to read different Roman numeral dates that can be seen on the sides of old buildings. This was to help the students recognize a situation where we use Roman numerals. Right at the beginning of the lesson though, when I mentioned we would be doing Roman numerals, one student quickly stated that he knew how to read them already because he sees them on buildings around the city. Thus, I did not feel like I needed to include it in my lesson plan since the students spoke about it as a group without my initiation of the topic. Although,these suggestions could be relevant to any mathematics classroom.

Overall, I feel that the MEP, even in its infancy, was a very positive opportunity for the students who were deemed gifted in mathematics. The program took minimal effort for the school to run. All that was required was for the co-operation of the teachers to allow the MEP students to be pulled out of class and a room for the lessons to take place. The majority of the work was placed on the instructor, but I found it a very rewarding experience and was also compensated for my work. I would encourage other

schools to look into the possibility of providing a similar program for mathematical gifted students.

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