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Review Article

Reaching precocious students in math

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Abstract

This compilation study aims to evaluate the classroom experiences of students with advanced mathematical competence (precocious) through teacher observations. The researcher revealed the differences in practice and educational approaches regarding these students through unstructured interviews with eight mathematics teachers with various levels of experience. Some teachers do not evaluate these students as a separate group and even think that focusing on them may hinder the development of other students. On the other hand, some teachers exhibit positive approaches towards these students with differentiated teaching methods, enriched content and individualized learning opportunities. Observations show that students can remain in the background in the system under the name of "safe learning" without being able to use their potential. The study emphasizes that high-performing students should be included in teaching processes, assume leadership roles and be supported with individual projects, not only with their academic success. In addition, cooperation between teachers, resource sharing and harmony of teaching strategies also stand out as important needs. In this context, the article provides both a situation assessment and suggestions. It seems that more holistic and flexible approaches are needed to support students' academic potential and increase their motivation.

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Introduction

In my recent informal research on precocious math students, I interviewed some of my fellow educators to explore their approaches and insights. The feedback from these instructors reveals a diverse understanding of how to engage and support advanced learners. As such, some approach it as they would any other student. They see it as if they take more time with a student; it would take time away from those who may often struggle, something we see frequently in our schools and schools nationwide. Many teachers emphasized the importance of fostering a growth mindset (Dweck, 2006; Veronikas & Shaughnessy2004), providing differentiated instruction (Wells & Shaughnessy, 2009), and creating a collaborative environment that challenges these students while nurturing their innate curiosity. That's a fantastic way of approaching a classroom, especially when prepping for life post-secondary.

Still, I observed a way of those who stayed away from this practice, the practice of reaching/promoting intellectual growth in those found as precocious. What some deem as "safe learning" could ultimately lead to a lack of development in some mathematically gifted students. This insight highlights key observations from educators, shedding light on effective practices and what can be seen as weaknesses in maximizing the potential of mathematically gifted individuals. What follows are summary comments and discussions from a variety of my peers in a variety of math courses. Each course, however, has its own challenges and difficulties and each teacher approaches the instruction of their subject differently

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Geometry (Teacher with 30+ years of experience)

This instructor has spent most of his years out of state and came in last year, very surprised with how the instruction is done. Many instructors do not share lessons or their approach with their students. He would love to work side-by-side with his peers in the Geometry department to get lessons together, assignments, and assessments; this would make each year so much easier.

He had multiple approaches when asked about students that stood out, which we would call precocious. First, he only grades some assignments for some students the same way. He bases most Geometry assignments on effort. If the student shows that they are progressing with their work, they will get a passing grade. The students who are performing well they are held to a higher standard. That said, if they get the problem wrong, it is marked as incorrect. Now, he gives credit for showing their work but would only receive partial credit if the answers are wrong. Depending on how his students are doing–they are currently going over 30-60-90-degree triangles–he will add 2-5 extra problems on an assignment/assessment for those students as well. He states that he has never had any complaints just yet, and last year, he had such a high-performing student that they took Geometry and Algebra II simultaneously.

Algebra II/ELL (Teacher with 10+ years of experience)

I have worked with said instructor when he first became a teacher, and I have just reunited with him this past year—a positive instructor to work with, and great with the Spanish-speaking students. He spent time at the junior high school level before we started working together again at the high school. He was very simplistic with his approach. He pushes for those students, whom we would classify as precocious, to be moved into a higher-performing class. The instructor is set on his approach and sees no sense in focusing on a student with such strengths. That would pull away from their time with those who struggle, and it would only benefit the student(s) moved from his classroom.

Algebra II (Teacher with 15+ years' experience)

I've had the wonderful experience of working with this instructor since my first day in education. I went to her daily for a few years of mentoring. I had no experience in education or student teaching, so she was one of the few I could trust with a specific approach when I needed guidance. She has some experience as an administrator as well. I am thrilled she is back in the classroom, and I trust her technique when given that "student." We had a deep conversation about the fact that a "GT" (Gifted and Talented) student is not high performing just due to their classification, which other instructors are having a hard time understanding, of course, with no disrespect. She stated she has a handful of high performers that she would classify as performers and would not be in basic Algebra II, but has asked not to be moved out of her classroom. Now, she stresses that they should go above and beyond the abilities of others, and she does so positively. I appreciated that she allowed one of them to teach a lesson! I remember doing that in Advanced Placement Physics during my senior year, covering rotational motion in 1994! This will identify a student not just as precocious, but just as an unconventional learner.

Geometry/Pre-Calculus (Teacher with 10 years' experience)

I have had a wonderful experience working with this young instructor. She is a military spouse, originally from the South, who has also worked as an adjunct at a smaller university back home. Over the past four years, she and I have usually been exchanging students. Those who struggle with her are coming to my class, and those who are higher performers and looking to achieve athletic scholarships are generally moved to her class. She was excited about sharing her thoughts and ideas and was disappointed with how others approached that class of students in our department.

Math is a class that our students struggle with, and actually, in most of the country, students struggle with math. I love pre-calculus and would love students to take this before graduating rather than taking Statistics/Calculus. Some are being placed in her class because they are getting Bs/and Cs in Algebra II. That is a great setup for the math course in the coming year, but she would like higher-performing students who are prepared for a college prep course, not just an introductory high school math course. Students with pre-calculus status fall into two categories: "leave me alone" and "give me work." With that being said, she does just that; she allows some distance for those asking for it. Now, of course, she does hold them to a higher standard, and with those needing to be pushed a little further, she does just that; they see more added and, at times, given the opportunity to work ahead.

AP Stats/Geometry (Teacher with 5+ years' experience)

This instructor came to our department from a smaller school district a few years ago. Not only does she teach math, she also teaches an elective, so she has a full schedule. Before her arrival, Advanced Placement Statistics was a class that would have 90+ students, but yearly, it is decreasing. Of course, students must test at the end of the year to receive college credit. If their grade is intact, they will still pass the class, receiving high school credit. After speaking to her, I was surprised by her approach to her high-performing students! If you are "that" kid, she does have an expectation, but does not seek a different direction. If her AP Statistics students do not keep up, they will end up with this author. She sees no immediate growth or prospective students to that degree in Geometry.

Geometry (Teacher with 10 years' experience)

I have worked with said instructor for less than 10 years. I love her intensity and strength in putting her whole heart into this profession. She also has worked at CCC in another department rather than math education. When speaking to her, she put it quite frankly: She indicates that she simply does not have the time to push the few precocious students she has encountered.

Financial Literacy/Algebra II (15 years' experience)

For me, she has been a blessing in our department. She is my neighbor in the building, and I finally have someone who shares ideas and gives me a different path to go down rather than areas I may have needed to change. Financial Literature is specifically for seniors. Yearly, we get more and more placed in those classes. Most would specify it as primarily for low performers, which is untrue.

Regardless, she does have some, especially in Financial Literacy, that she would consider precocious and who did not want to take a higher-level course, i.e., Calculus or AP Statistics. She will notice that they tend to start a little behind, whereas they will question themselves, mainly due to years past. The instructor is literally one of the most positive people I have ever been around, and she'll push those students in various ways. If she says, "YOU could do better," she may receive as stated. She has some students on the PDA profile (Pathological Demand Avoidance), and with them, she will get exactly that: avoidance of what is requested. These are the ones that work "just to get by." She will then make time for one-on-one interactions to make those connections, figure out what needs to be adjusted, and take those steps to have them go beyond their ability.

Calculus/Pre-AP Algebra II (10 years' experience)

I went into this one discussion highly expecting something "intriguing." She has smaller classes with higher-performing students, who one would perceive as post-secondary-bound. They are held to higher standards and rarely move out of the instructor's class. With much dismay, I realized the expectation was high for the students; they would not go off course, and even if a student was said to be precocious, the lessons were set, and that was it. Yes, it is a challenging course, but that is it. Indeed, there was no disappointment, but I was pretty surprised that a student who was as such would not be pushed further.

Financial Literacy (15+ years' experience, SELF)

Looking at myself, not just in a mirror but professionally, I always question where I stand and where I personally need to grow. Regardless of the time we are here, in education, there is always room to grow, be it amongst our peers/department, and especially in my approach to my students in general. This is nothing like my students when I started teaching in 2009, but I find myself a creature of change and adaptable. My class is a math class with the identity of an elective.

Students need four math credits to graduate and can take my class if they see that the other courses have no benefit. Once I see and get to know the backgrounds of my students, I will pick out the ones who function at that higher level. I generally pull them aside and speak with their parents as well. I identify their child's strengths and where this could be used in another class, not due to my lack of interest, but rather where they could benefit.

I would say 75% of those generally stay in my class, which I am very comfortable with. I do a lot of group-based work with a state-funded program called STUKENT. With this, I have them pay bills, buy a home or car, play the stock market, etc. I can also post and hire for extra "jobs." With those I hold to that higher standard, I place responsibilities

with them that I trust more than I would other students. That may not mean that they are doing the next unit/standard, but they could help me approve a loan, approve an offer on a home, and give input on what stocks people are looking into purchasing. So, with my classroom, I push more into a leadership/time-management look into real life.

Summary and Conclusion

In conclusion, how can we effectively address the needs of our highly advanced students who are near the brink of precocity? While most of our students' progress at a typical pace, those with strong mathematical skills often leave the classroom unchallenged and with little to no support. As educators, we must create a learning environment that enables growth for all students, with a strong focus on those who can achieve more.

In improvement, as a team, we must rethink how to identify and support the students who are classified/identified as precocious. Strategies must include using a differentiated approach to instruction, enrichment through all courses, and advanced problem-solving in the curriculum. This must also push a major collaboration with the department and sharing any resources to get on the same page to help address the needs of said students.

Exploring the personalized options for these students may also be a great route, i.e., independent studies, projects, tutoring, and meetings with local colleges. This would give them the opportunity for deeper learning and the chance to channel their interests. Where I see struggles is speed learning, attempting to cover all units/standards. Of course, an assessment will ultimately be given, but we will be given that opportunity with those students to spark interest and create a hunger for the material. This will establish an environment in a supportive and innovative way, and by doing this, help those only heighten their advanced math skills, feel challenged, and be pushed to continue expanding and progressing in their mathematical journey.

Biodata of Author

Nito Salfran is a dedicated Secondary Education Math instructor with over 15 years of teaching experience. He continually I brings a comprehensive background in mathematical education to his students and classes. He currently teaches at Clovis High School in Clovis, New Mexico, specializing in courses including Geometry, Algebra I and II, College Prep, and currently Financial Literacy. His credentials include a BS in Business Management from Wesley College (with Honors) in Dover, DE (2005) and an MA in Secondary Education from Eastern New Mexico University (2011), where he previously served as a graduate assistant in the mathematics department. He is currently a Level 3 teacher committed to helping students develop strong mathematical skills and explore future career opportunities, especially those who may seek work rather than post-secondary education. His professional journey includes military service with the USAF, during which he completed his education part-time while deployed multiple times to the Middle East post-9/11. As a husband and father of four, with one of my children being an elementary school teacher, he is deeply passionate about education development and career preparation, with constant research on ways students can achieve goals that can promote acceleration and enrichment, set early success and accomplishment during their senior year, and on into college.

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