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Equity in Mathematics Assessment

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We, as teachers and educators, believe that every student has their own learning style. NCTM (2000) states, “Equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students” (p. 12). Teachers often prepare differentiated instruction, but do not prepare differentiated assessment. Not all students show their understanding of mathematics in the same way. This paper discusses equity in mathematics assessment, which means how teachers promote equity in classrooms with various assessments. This paper also provides ideas and examples for assessments in mathematics.

Keywords: equity, assessment, differentiated instruction

Introduction

As mathematics teachers and educators, we should believe that *all* students have the capacity to learn mathematics. We know that students are not born with a mathematics gene, and each of our students has the potential to develop mathematical reasoning skills. These skills can be developed at home and in schools, and predominately in mathematics classrooms. The idea that all students have a right to equal access to the study of mathematics is referred to as equity. According to Croom (1997), “Equity in mathematics education implies fairness, justice, and equality for all students so that they may

achieve their full potential, regardless of race, ethnicity, gender, or socioeconomic status” (p. 2). A position of the National Council of Teachers of Mathematics [NCTM] notes that teachers should encourage students to share different solutions, interpretations, and approaches and should find multiple ways to assess students' mathematical understanding (NCTM, 2008).

However, not all students show their mathematical understanding in the same way. Some students prefer to make presentations, whereas others may prefer to write a paper or explain their solutions in print. Some students are better at taking written tests while others perform better in teams or by completing individual projects. Achieving equity

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in assessment implies that students have an opportunity to demonstrate an understanding of mathematical concepts in a way that is consistent with their learning styles. According to NCTM (1995), "...because different students show what they know and can do in different ways, assessments should allow for multiple approaches" (p. 24). Furthermore, the Assessment Principle notes that a "teacher must ensure that all students have an opportunity to demonstrate clearly and completely what they know and can do" (NCTM, 2000, p. 24).

Equity in Mathematics Assessments

In order to achieve equity in mathematics assessments, specific strategies have to be employed within schools and classrooms, especially when larger assessment issues are still in play at the district, state, and national levels. Five suggestions for teachers to consider in their own personal promotion of equity through assessment practices were outlined by Belcher et al (1997) as follows:

1. Assessment goals need to be made clear to students.
2. Students should be assessed on the same principles that guide classroom instruction.
3. Equitable assessment tools should be used in terms of their format and design.
4. Instruction should be connected to assessment.
5. Self-assessment should be a part of the information-gathering process.

A teacher who uses a variety of assessment strategies can begin to see how well each student progresses. If teachers give students the opportunity to demonstrate their mathematical understanding in multiple ways, teachers open new doors to students who might have been unsuccessful in a more traditional classroom and, thereby, naturally promote equity.

In practice, addressing equity might mean that a teacher includes several assessment strategies, which should not be confined to only traditional assessment strategies, but also alternative strategies for assessment. By making use of a variety of assessment methods, we gain a more complete picture of students' learning and achievement. Some types of assessment tasks focus more on students' abilities to perform mathematical procedures while others emphasize more high-level thinking and problem-solving skills. Stenmark (1991) describes, in the list below, some of the changes in mathematics learning that result from using alternative assessment strategies in the classroom.

Results from Using Alternative Assessment Strategies (Stenmark, 1991)

Students:

- Think more deeply about problems
- Feel free to do their best thinking because their ideas are valued

- Ask deeper and more frequent questions of themselves, their classmates, and their teachers
- Improve their listening skills and gain an appreciation for the role of listening in cooperative work
- Feel responsibility for their thoughts and ownership of their methods
- Observe that there are many right ways to solve a problem
- Experience the value of verbalization as a means of clarifying one's thinking
- Form new insights into mathematical concepts
- Learn ways to identify the places they need help
- Increase their self-confidence and self-esteem as a result of genuine interest shown by a teacher or classmate
- Feel more tolerance and respect for other people's ideas
- Focus their energy on exploring and communicating ideas about mathematical relationships rather than simply finding answers
- Develop strategies for conducting self-interviews while solving problems in other settings
- Find satisfaction and confidence in their ability to solve problems
- Look less to the teacher for clues about the correctness of their methods and focus less on imitating the "right" way

Teachers:

- Gain access to student thinking
- Enhance their ability to use non-threatening questions that elicit explanations and reveal misconceptions
- Strengthen their listening skills
- Show respect for students by being non-judgmental
- Use interview results as a source of questions to pose on written assignments for the whole class
- Encourage respect for diversity by modeling appreciation of varied approaches
- Pose questions that encourage students to construct and share their own understandings
- Feel reinforcement for letting go of "teaching as telling."

Additionally, a teacher might use alternative assessment tasks such as journal writing, interviews, individual and group tests, authentic performance tasks, seminars, extended projects, and a portfolio in determining grades along with tests and homework. In this frame, students who have difficulty with written tests might have the opportunity to demonstrate their understanding through writing. Students who have poor writing skills now have an opportunity to show progress through oral interviews, and

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so forth. Moreover, a teacher might attempt to make their classroom more equitable by giving students a choice of assessment type. Suppose a high school mathematics class was completing a unit of exponential function. The teacher might post the following options to assess the students' understanding.

1. Take a traditional 25-item test on Friday.
2. Interview a person who works in bank or financial company and ask that individual how exponential function is used in the profession. Write a 3- to 5-page paper about the interview, including examples of how exponential function is involved in that job.
3. Come in during a study hall, before, or after school for a ten to fifteen minute interview with the teacher. In the interview, you will be asked three questions involving exponential function. Each question will also have a follow-up question, based on your response.

In the assessment examples given above, a student is being asked to demonstrate an understanding of exponential function in each of the choices. The student has three different ways to show their understanding. The student can choose to be assessed in a traditional testing format, by a written paper, or orally through an interview. Some students simply do not want to hassle with interviewing a professional and writing a paper and may feel content with taking a written test. However, if students believe that they can explain their thinking more in an interview than on a 25-item test, they may select the option of an interview. Then, on the day of the written test, the students who chose one of the alternative assessments might spend the test time preparing for their assessment, completing an assignment, or studying for another class.

Conclusion

Is giving a choice of different assessments realistic for the teacher? It depends primarily on the teacher's classroom schedule, the experiences that instructors may have had with various assessment strategies in the past, and the structure of the school and curriculum in providing the autonomy to do so. Therefore, teachers must decide what is workable in their local contexts and remember that any attempt to adjust for various learning styles naturally promotes equity. Additionally, this can serve as a major improvement over what has historically been offered to students in the mathematics classroom.

A typical mathematics classroom is far from being a place where all students are the same and come to school equally excited and prepared to learn. In addition, teacher should understand that students not only learn mathematics through many different methods, but they are also given the opportunity to show that they have learned mathematics using many different types of assessments.

NCTM's equity principle concludes with the following:

Achieving equity requires a significant allocation of human and material resources in schools and classrooms. Instructional tools, curriculum materials, special supplementary programs, and the skillful use of community resources undoubtedly play important roles. An even more important component is the professional development of teachers. Teachers need help to understand the strengths and needs of students who come from diverse linguistic and cultural backgrounds, who have specific disabilities, or who possess a specific talent and interest in mathematics. To accommodate differences among students effectively and sensitively, teachers also need to understand and confront their own beliefs and biases. (NCTM, 2000, p. 14)

Therefore, the challenge of every classroom teacher is to assess the needs of each student and to plan learning activities that address their diverse needs. Teachers also need to research different approaches and strategies for the mathematics classroom—such as cooperative learning and group work, use of multiple representations to illustrate problem-solving, differentiated tasks, and providing extra assistance for students who need help to promote equity in the mathematics classroom.

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