

Using Mathematics Conferences in the Classroom

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Abstract: There has been abundant research demonstrating the benefits of using reading conferences in the English Language Arts classroom and describes how to make such reading conferences as effective as possible. However, little research has been conducted exploring how teachers can transfer or adapt such practices for the mathematics classroom. This paper examines specific, research-based strategies for conducting effective reading conferences in English language arts and proposes ways to transfer those techniques to support successful mathematics conferences. It presents an argument for using mathematics conferences to address current difficulties in mathematics instruction and offers specific advice on incorporating mathematics conferences into the classroom.

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Picture an English language arts classroom where the teacher is using a Reader's Workshop approach (Hudson & Williams, 2015). The teacher sits with one student for the conference and listens as they discuss their understanding of a text. The rest of the class is using the time to engage in a range of activities: reading books of their own choosing, responding to those texts in their journals, or having small-group discussions of texts they have read. While the teacher is conferring with their student, the teacher is also making assessments that drive instruction, demonstrating strategies when needed, and providing successful reading experiences (Gill, 2000). In these ways, the teacher applies research-supported strategies to maximize the benefits from these conferences.

Now visualize this same teacher using teacher-student conferences in the mathematics classroom. The teacher is again conferring with their student; however, the rest of the class is using the time to collaborate together, to solve teacher-given problems using a flipped classroom approach, or to work with mathematics software (Zengin, 2017). Using the same research-supported strategies from the ELA conferences, while working with individual students the teacher can assess learning, provide instruction, demonstrate mathematical strategies, and provide successful mathematics experiences. Mathematics teachers may also find that the evidence suggests that using these types of conferences in the mathematics classroom can help resolve issues in mathematics instruction.

The Need for Mathematics Conferences in the Classroom

According to Polikoff (2012), there is redundancy in mathematics instruction in the U.S. The mathematics curriculum for each grade level is broad and shallow. Teachers are required to cover many topics at each grade level, but they only cover these topics at superficial levels of detail, which results in students receiving instruction on the same topics again and again without ever developing a deeper understanding

of those topics. For example, in Ohio, the same state standard repeats in first and second grade: to represent and interpret data under the Measurement and Data category (Ohio Department of Education, 2017). In third grade, the same standard reappears; students are asked to “represent and interpret data,” although the standard has now moved to the Geometry category. This is just one sample standard among many other similarly repeated standards. Because of this repetition and because of how many standards there are at every level, teachers deliver instruction on a wide range of topics but quickly move from one to the next in order to hit all of the standards each year. As a result, according to Schmidt (as cited in Polikoff, 2012), American students have limited conceptual understandings of mathematics which represents a major deficit in mathematics instruction.

Mathematics conferences can help solve the difficulties that we are seeing in the current mathematics instruction in the United States. First, by using mathematics conferences in the classroom, teachers can guide students to a deeper level of understanding by assessing on an individual basis. Once a teacher sees the degree of understanding a student has of a certain topic or concept, they can pose higher-level questions that will challenge the student to think further and arrive at a deeper conceptual understanding. Without mathematics conferences, in which teachers really get to see their students’ understanding on an individual basis, this can be difficult to achieve.

Second, once this deeper level of understanding on a specific topic or concept is achieved, teachers can extend and expand student learning, rather than repeating topics. They can build on their students’ current knowledge and scaffold within the students’ zones of proximal development (the difference between what a student can achieve alone and what a student can achieve with assistance) (Polikoff, 2012). For example, through conferencing, a teacher might observe that a student is able to sort a group of objects and count how many objects are in each category. Since the student is already able to meet this kindergarten standard, the teacher takes the opportunity to show the student how to compare the total of each category to determine which has more or less, which is the first-grade standard. Once the student can meet this standard with help, the teacher can support this student as they work to meet this standard independently by helping them less and less every time until the student learns to do the task independently. Now the student has a deeper level of understanding of this concept, so the student’s first-grade teacher the following year will not have to revisit this same topic again. In place of that topic being taught again, the teacher can spend time on a new topic or concept.

Teacher-student conferences can also give teachers the opportunity to support discourse in mathematics education and make formative assessments. The research that supports the implementation of conferences in Reader’s Workshop also supports the application of conferences in mathematics to ensure that these conferences address the challenges facing mathematics education.

Effective Reading Conferences

For any approach to be effective in the classroom, such as individual teacher-student conferences, teachers must understand how to successfully implement it in the

classroom. The studies cited below on how to make reading conferences effective offer useful guidelines for implementing effective mathematics conferences.

Talk Less, Listen More

Porath (2014) analyzed two teacher-student reading conferences that were part of a nine-month case study. During these reading conferences, Porath helped the teacher, June, realize that she was dominating the conference by doing most of the talking. Instead of posing thought-provoking questions and listening to what her students were saying to her, she was making assumptions and giving her personal opinions. When June's student chose a book about poetry, June assumed that her student loved poetry, so June spent the conference talking to her student about how much she loved poetry as a child. If June had asked her student why she had chosen the poetry book and listened to her student's response, she would have discovered that her student liked that the poetry book because it included poems about animals and her student liked animals. After receiving support from Porvath and instruction in listening strategies, June began her next conference with the same student, with a question about why the student chose the book. It opened up the opportunity for Jane's student to explain her own reasons and motivation for choosing and liking a particular book. When June chose to spend the conference listening to the student, she discovered that her student could support her ideas with examples from the text and she was able to see her student's ability to infer.

This approach of talking less and listening more can also be applied in the mathematics conference, as shown in Table 1. For example, when conferring with an individual student in a conference, the teacher could ask the student to clarify their thinking, or to explain the specific strategy used to solve a problem, why they choose this strategy, and how they arrived at a particular answer. The teacher would then be able to use the student's answer to help assess current learning of the individual student.

Conference Focal Points

Pletcher and Christensen (2017) found that during their reading conferences ELA teachers focused heavily on accuracy instead of other aspects of the reading process such as comprehension, expansion of vocabulary, or fluency. Pletcher and Christensen saw this as problematic since the meaning of text is the most important part of reading, rather than simply reading accuracy. They suggested that teachers keep careful records regarding what focal points (the teaching point that the teacher decided to focus on) were used during the conference. For instance, with accurate records of the teacher's past focal points, a teacher may notice that he/she is never spending time on expanding a student's vocabulary. Instead, he/she is focusing on the accuracy of the student's reading every time they confer. Accurate records will ensure that each student is getting instruction related to all areas of the reading process.

Additionally, they argue that teachers should narrow their focus to one or two focal points per conference that stem from each student's text or from the teacher's observation of the student's reading skills. This approach will help them focus on

the student's need at the time, so they can identify the student's zone of proximal development and provide the appropriate scaffolding (Pletcher & Christensen, 2017). This also helps teachers use their time effectively, so they will have time to reach more students.

In mathematics, it can be easy for teachers to narrow their focus to number sense or computation without even realizing that they are missing other areas of mathematics (see Table 1). Keeping careful records of conversation focal points can help mathematics teachers ensure that they are reaching all areas of mathematics even while only focusing on one or two points per conference.

Types of Questioning

Once teachers determine their focal points for the student conference, the types of questions they ask can determine how much information the teacher collects about the student's learning. Nystrand (as cited in McElhorne, 2013) says that even though talk has been suggested as an important learning tool, most talk occurring in classrooms limits opportunities for learning and closes dialogue down because students do not have opportunities to engage in elaborated talk. Instead, teachers frequently use the initiate-respond-evaluate (IRE) pattern in teacher-student talk (Cazden, as cited in McElhorne, 2013). Teachers ask a question that has a correct answer they expect to receive from a student. Once the student responds to the question, the teacher evaluates whether the student has answered correctly or not. McElhorne considered how instead of evaluating feedback in the "E" section of the IRE, teachers can use non-evaluative feedback that can lead to more elaborated talk. She describes two categories of such non-evaluative feedback: high press and reducing press talk moves. Examples of high press talk moves would be (a) "Say more about that;" (b) "What evidence supports that?" or (c) "How did you figure that out?" Examples of reducing press talk moves would be giving the students multiple-choice answers or asking yes/no questions.

Using high press talk moves can lead to conferences that are more effective because pressing individual students to think in depth about their own ideas pushes them to refine their reasoning and sets up for future challenges. This can increase student learning and enable in-depth teacher assessment. Supporting this, McElhorne (2013) found that when teachers used more high press talk moves in their classroom, reading achievement and teacher-student engagement increased.

This study (McElhorne, 2013) may be even more relevant when applied to mathematics (see Table 1). In mathematics, teachers tend to look for correct computation instead of asking these types of high press questions that can open pathways into assessing students' learning and challenging their students' thinking. In mathematics instruction, there is conceptual and procedural knowledge. Procedural knowledge means recognizing the symbols and procedures/rules used to solve mathematical tasks. Conceptual knowledge means understanding the underlying mathematical concepts, which allows students to link all the pieces of information together. The use of high press talk moves during mathematics conferences can help students link information together to form deeper conceptual understanding.

Table 1

Purpose of strategies in reading and mathematics conferences.

Strategy	Reading Conferences	Mathematics Conferences
Teachers talk less and listening more to students	Allows teachers to determine which comprehension skills students are proficient in, what genres students prefer, and text comprehension levels.	Allows teachers to see what strategies their students are using to solve problem and prompts students to clarify their thinking.
Focal points prepared ahead of time; a variety of focal points used	Helps teachers avoid focusing on decoding and engages comprehension, accuracy, and vocabulary expansion, among other skills.	Helps teachers avoid focusing on computation and engages their ability to measure, to work with data, and to support their problem solving.
Teachers use targeted, high-press questions during the conference (versus reduced-press questions)	Offers teachers a better understanding of student knowledge that can be used to deepen current understandings and to construct new ones.	Offers teachers a better understanding of student knowledge that can be used to deepen current understandings and to construct new ones.

The common theme in all of these strategies is that the communication that happens within teacher-student conferences opens the doorway to additional opportunities for increased student learning and teacher assessment. Communication is important in all subject areas including mathematics.

Communication

If communication is pertinent in the mathematics classroom, mathematics conferences are pertinent in the mathematics classroom. Jung and Reifel (2011) investigated the importance of communication in mathematics education, based on Vygotsky's idea of socio-constructivism (as cited in O'Connor, 1998), which argues that children build their understanding of any topic through talk, social interaction, and the construction of shared meaning. Jung and Reifel (2011) observed a teacher who gave her students many opportunities to communicate their learning in mathematics. They found that allowing her students to communicate about their mathematical thinking moved the instruction from the procedural level to the conceptual level of mathematics. If she had only checked to see if her students had the correct or incorrect answer, she would not have given them the opportunity to move to that higher level of mathematical understanding.

Such communication also meets the recommendations of the National Council of Teachers of Mathematics (as cited in Jung and Reifel, 2011), which argues that students must be challenged.

To organize and consolidate their mathematical thinking through communication, to communicate their mathematical thinking coherently and clearly to peers, teachers, and others, to analyze and evaluate the mathematical thinking and strategies of others, and to use the language of mathematics to express mathematical ideas precisely. (p. 60)

Conferences offer one approach to allow such communication to happen. Students sitting at their desks performing computations to get the correct answers in

their workbooks are not communicating with each other or the teacher and are not expressing their mathematical thinking; by engaging students in mathematical conferences, teachers can ensure they are giving their students the opportunity to meet these goals.

How to Incorporate Mathematics Conferences in the Classroom

When introduced to the idea of mathematical conferences, a teacher's first question might be, "What will all the other children be doing while I am conferring with one student?" It is important to note that teachers do not need to meet with each student daily: once every week or two may be enough. That said, in the Readers Workshop approach, students spend their time reading texts of their own choosing while the teacher holds individual reading conferences (Hudson & Williams, 2015). This same idea can be applied in the mathematics classroom. While teachers are conferring with individual students, the other students in the classroom can be strengthening their mathematics skills. That said, there are several options that teachers can choose from to incorporate during conferences. One option would be to take a flipped classroom approach. In this approach, instead of students learning the concepts from their teacher in the classroom and doing their homework at home, students learn the lesson at home by watching a video that has been carefully made by their teacher and then uses class time for active learning in collaboration with their classmates. This approach also supports communication amongst students in the mathematics classroom. Zengin (2017) explored this idea specifically in the mathematics classroom using videos from Khan Academy for the lessons learned at home and using other software programs as well. Mathematics conferences would fit into this type of approach rather easily. While the students are using class time to collaborate with classmates, to solve problems that were given by the teacher, or to work with other supportive software programs, the teacher can be conferring with students individually.

Another option, especially in the primary classrooms, is to have students work on small group activities. The teacher in Jung and Reifel's (2010) study set up challenging tasks that created discussions amongst the students to help foster the communication that is so important in the learning process. These activities focused on the children's learning processes rather than on finding the correct answer. The students would have the opportunity to discuss with their classmates their reasoning and thought processes. At the same time that the students are engaged in these small group activities, the teacher can conduct individual mathematics conferences, thus using class time in an effective manner.

Conclusion

Research suggests that the current mathematics curriculum and instruction is not reaching its potential (Polikoff, 2012). Implementing mathematics conferences may provide many of the same benefits that using reading conferences offers in ELA classrooms. First, mathematics conferences give teachers a chance to challenge students individually with high press talk moves. Second, they open the door to communication about the students' mathematical thinking. Third, they give teachers the

opportunity to assess their students' quality of mathematical thinking, which can help them plan future instruction accordingly.

Research focused on English language arts conferences has many applications for mathematics conferences and can help ensure effective conferences that increase learning. Such mathematics conferences can be organized in a variety of ways depending on the age level of the students. They might require a little extra work on the teachers' part to get the conferences started, but the research suggests that they will have a wide range of long-term benefits.

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