Mentoring Teachers: There's an App for That!

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Abstract

Faithful implementation of the Common Core State Standards for Mathematics requires states, districts, and teachers to not only design instruction that meets the new content standards, but also pay close attention to the eight Standards for Mathematical Practice that are interwoven within these Standards. The Ohio Resident Educator Program partners beginning teachers with experienced mentors, each of whom might be struggling to conceptualize how the practice standards "look" during instruction. We examine a technological application (app) that mentor teachers can use to collaborate with their resident educators. ***Common Core Look-fors*** can be used by mentor teachers to collect data on how their mentee provides students with opportunities to engage in the mathematical practices. In addition, the app promotes collaboration by providing a means for mentors and their mentees to articulate their strategies for increasing student engagement in practices.

The Ohio Department of Education (ODE) provides early career educators, also known as beginning or novice teachers, with a provisional Resident Educator license for their first four years of teaching. These teachers are eligible to participate in the Ohio Resident Educator Program, which supports novice teachers by pairing them with an experienced and ODE-trained mentor. The goal of this program is to help novice teachers develop additional skills, collaborate with colleagues, analyze and reflect on their teaching practice, receive job-embedded professional development, reduce stress, and ensure their teaching practices are grounded in the Ohio Standards for the Teaching Profession (ODE, 2014).

According to Andrews and Quinn (2005), research has shown that having an effective mentor is highly important and directly impacts a first year teacher's experiences. In addition, more early-career teachers would likely remain in the field of education if they were to experience a successful residency period; that is, if they were provided with a productive and sustained mentor assignment (Andrews & Quinn, 2005). Gourneau (2009) states, "The mentor teacher is hired to offer consultation, give support, answer questions, model effective teaching, and support the first year teacher in their classrooms" (p. 61). Furthermore, the support provided by a mentor can help a beginning teacher avoid feelings of isolation (Fluckiger, McGlamery, & Edick, 2006, p. 9).

In addition to highlighting the benefits of a productive mentor-mentee relationship, research has demonstrated the positive impact that reflection can play throughout a novice teachers' introductory (i.e., residency) period, particularly self-reflection initiated by their mentor (Gourneau, 2009). It is important for teachers to develop self-reflective practices to manage the challenges that occur within the field of education, such as of keeping up with best practices (Gourneau, 2009). By talking through the reflective process, a mentor can provide the resident educator with a model of what it means to be a reflective practitioner (Schön, 1987). Although the mentor's ultimate goal is to make the resident a more effective teacher, the mentor-resident relationship should also support the transition from a teacher that not only produces high levels of student performance, but has also moved toward independent student practice instead of teacher-led direct instruction (Leinhardt & Smith, 1985).

Despite such research, ***there exists a lack of depth of research regarding effective mentor teachers and the techniques they utilize.*** *Moreover, there are no techniques or tools designed specifically for mentor teachers.*

Research on mentor teaching suggests strategies such as providing support and encouragement can help the novice teacher become more successful (Fluckiger et al., 2006). Despite such research, there exists a lack of depth of research regarding effective mentor teachers and the techniques they utilize. Moreover, there are no techniques or tools designed specifically for mentor teachers. A longitudinal study by Fluckiger et al. (2006) indicated, "There is a lack of information on how mentors make a difference in novices' staying in teaching and becoming [more] effective" (p. 8).

In this article, we highlight a data collection tool that mentor mathematics teachers can use when observing their resident educators (i.e., mentees). More specifically, when used by a skilled mentor, the tool helps resident educators reflect on their own incorporation of the Common Core's Standards for Mathematical Practice (NGA Center & CCSSO, 2010) during instruction.

Mentoring with Technology

As indicated in the Common Core State Standards for Mathematics (CCSSM), the eight Standards for Mathematical Practice embody and connect the National Council of Teachers of Mathematics' Process Standards (NCTM, 2000) and the National Research Council's Strands of Mathematical Proficiency (NRC, 2001). The peer-observation tool (i.e., app) discussed here is available to teachers at all levels and designed to "assess the extent to which students are engaged in particular elements of the mathematical practices" (Splaysoft, 2014).

The app, *Common Core Look-fors* (CCL4s), written by Richard de los Santos, can be easily and inexpensively ($2.99) downloaded by a mentor on their tablet or smartphone and functions as a non-evaluative tool for observing and providing feedback to mentee teachers (see Figure 1). The app allows mentors to (a) gather data related to student engagements in the mathematical practices, (b) collect data on multiple teachers, and (c) store data in one easily accessible space. Furthermore, the app allows for observations to be made regarding Mathematics, English/Language Arts, or Technology.

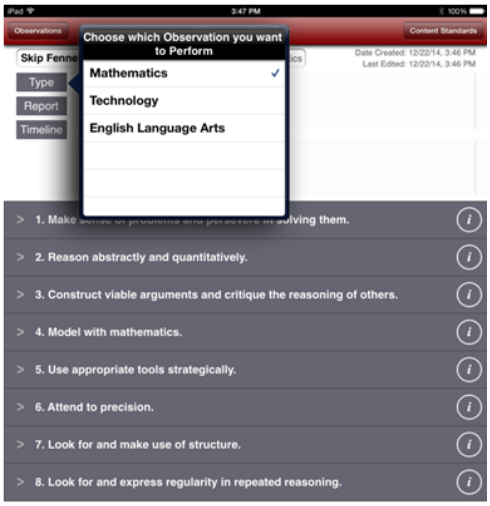

Figure 1. CCL4s App Data Collection.

The mentor has the options of clicking the different mathematical practices button as many times as observed, and ,additionally, can provide written or visual proof of student engagement, using with the camera and video tools. The video tool is particularly helpful for providing specific feedback and suggestions to a novice teacher, in terms of the lesson's strengths and weaknesses with regard to student engagement in the mathematical practices. Figure 2 illustrates the subcategories listed by student and teacher under each of the eight mathematical practices and the available evidence tools

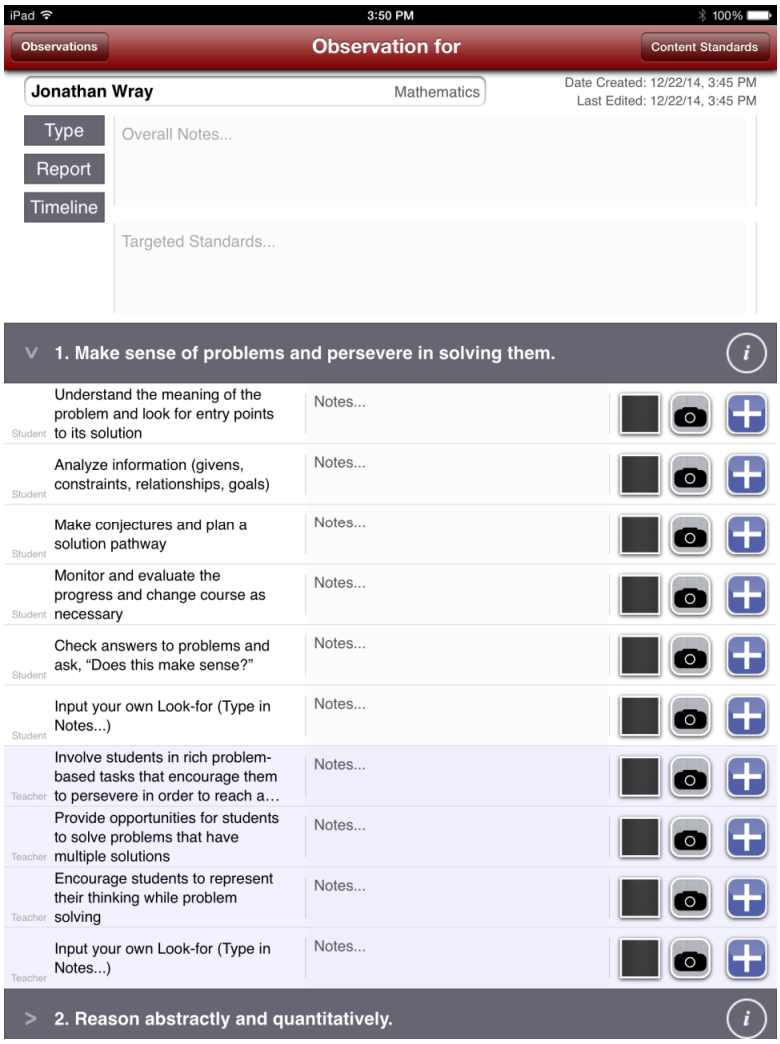

Figure 2. CCL4s subcategories and data collection tools

Once the lesson observation has been completed, the mentor and mentee can review the overall data report as a bar chart broken down by mathematical practice and number of occurrences observed. The tool also allows the mentor and mentee to see a timeline for each observation, which displays the number of times the teacher and student look-fors occurred during the lesson. The horizontal axis of the chart shows the time (in minutes) for the look-fors and the vertical axis shows the number of occurrences (frequency) met by the students and teacher throughout the lesson. Figure 3 illustrates the number of occurrences of a particular practice by instructional minute for teacher and students.

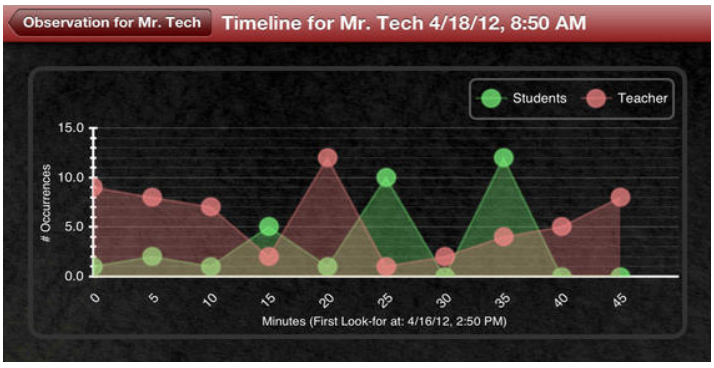

Figure 3. Sample mathematical practice observation timeline.

Data and Analysis

One seventh and one eighth grade mathematics teacher agreed to allow the first author (Michelle) to use the CCL4s app to collect data regarding their implementation of the Common Core's mathematical practices as she observed their instruction. Michelle explained the data collection process to both teachers and then observed one blocked mathematics class period (88 minutes) for each teacher. After the observation, each teacher used the app to individually identify the mathematical practices they believed students engaged during their lesson. After the two teachers completed their separate evaluations using the CCL4s application, the three collaborators compared each teacher's self-evaluation with those Michelle completed during her observations.

The app includes a total of 56 separate observational areas as "look-fors" within a particular lesson. These areas are categorized separately under student and teacher expectations. Look-fors in this particular case included the sub-categories (i.e., detailed descriptions) for each of the eight mathematical practices. These descriptions help teachers develop a better understanding of what each practice means or "looks like" during instruction. Table 1 shows an example of the look-fors, or sub-categories, that are listed under the first mathematical practice (MP1) in the CCL4s app.

Table 1
CCL4s Mathematical Practice 1 Look-fors

MP1: Make sense of problems and persevere in solving them.
Student Look-fors • Understand the meaning of the problem and look for entry points to its solution • Analyze given information (givens, constraints, relationships, goals) • Make conjectures and plan a solution pathway • Monitor and evaluate the process and change course as necessary • Check answers to problems and ask "Does this make sense?"
Teacher Look-fors • Involve students in rich problem based tasks that encourage them to persevere in order to reach a solution • Provide opportunities for students to solve problems that have multiple solutions • Encourage students to represent their thinking while problem solving

In both observed lessons, the mathematical practices each teacher indicated as being addressed did not match Michelle's observations in any of the eight categories. Table 2 displays data for each teacher based on the percentage of student and teacher look-fors that correlated with Michelle's observations. More specifically, Table 2 illustrates the percent agreement for each of the eight practices when comparing each individual teacher's data to that collected during Michelle's observation using the app. The percentages do not include the number of times each practice was observed, but whether the teacher and Michelle both identified that practice as being addressed in the lesson.

Overall, the two participating teachers and Michelle had high agreement (greater than or equal to 50%) for mathematical practices 2 and 4 and a low percentage of agreement (less than 50%) for practices 3 and 5. Practices 1 and 6 varied significantly among the teacher and student percentages for each observation, while practices 7 and 8 varied little. In each case, the mathematical practices observed did not look the same in each classroom. For example, with regard to mathematical practice 6 (MP6), attend to precision, one teacher had students specify units throughout the conversion of unit rates in their class notes and during class discussions while the other teacher's entrance ticket required students to find missing

measurements and units using ratio tables. Each teacher demonstrated their own methods, highlighting their own interpretations, for addressing the individual mathematical practices.

Table 2
Matching observation data based on percentages for student and teacher look-fors

Mathematical Practice	Teacher 1 Matching		Teacher 2 Matching	
	Student	Teacher	Student	Teacher
1. Make sense of problems and persevere in solving them (5 student and 3 teacher look-fors)	40%	0%	40%	66.7%
2. Reason abstractly and quantitatively (5 student and 3 teacher look-fors)	80%	66.7%	80%	66.7%
3. Construct viable arguments and critique the reasoning of others (5 student and 3 teacher look-fors)	20%	33.3%	20%	33.3%
4. Model with mathematics (4 student and 3 teacher look-fors)	50%	66.7%	75%	66.7%
5. Use appropriate tools strategically (4 student and 3 teacher look-fors)	25%	0%	25%	33.3%
6. Attend to precision (5 student and 2 teacher look-fors)	20%	0%	60%	100%
7. Look for and make sure of structure (3 student and 3 teacher look-fors)	33.3%	66.7%	66.7%	66.7%
8. Look for and express regularity in repeated reasoning (2 student and 3 teacher look-fors)	50%	33.3%	50%	33.3%

After comparing the collected data, Michelle had a 15-20 minute debriefing session with each teacher at the end of the day they were observed. These discussions indicated that each teacher viewed practices 2 and 4 as being the most explicit and distinct among the eight practice standards. Conversely, both teachers indicated that practices 3, 5, 7 and 8 were the most confusing to identify and distinguish.

Throughout these discussions, teachers often referred to the look-fors within the app for the descriptions of each mathematical practice. They appeared uncomfortable in describing how the mathematical practices exhibited themselves during their class without referring to the given descriptions. These discussions were lively and often provided an opportunity for teachers to reflect on their own teaching and discuss ways to improve student engagement in the practice standards. In addition, teachers noticed that although some of the look-fors could have occurred during their lesson, they may have offered too much guidance for students and did not leave time for students to argue and discuss as a class or in small groups. Finally, the *Common Core Look-fors* app allowed Michelle to motivate teachers to reflect on their practice and think of ways they could incorporate these mathematical practices in their future classes.

Future Research

Although the *Common Core Look-fors* tool was used with experienced teachers, we feel it could be an excellent collaborative tool for mentors to implement with novice teachers. Furthermore, the *Common Core Look-fors* app was used to identify how and when each of the eight mathematical practices were addressed. We feel that, in our future work with teachers, our observations will focus on only one or two of the practices at a time. Attempting to collect evidence of engagement in all eight mathematical practices during a single class period (even a blocked period) can be overwhelming for both the teacher and observer. Whereas, focusing on only a couple of the practices at a time may produce more thorough and detailed data regarding engagement in the practices within a lesson. This might also lead to more robust lesson reflections and post-lesson interviews between a mentor and her mentees.

Overall, Michelle and her colleagues seemed to have different understandings and interpretations of the practice descriptions and look-fors under each category. Therefore, they came to idiosyncratic

observations using the CCL4s app during the lesson. Future research could focus on how teachers come to develop meaning for the mathematical practices, including how such habits of mind can develop in their students.

The *Common Core Look-fors* app also helps to point out areas for improvement that teachers may not notice on their own. It can help prospective or novice teachers develop deeper understandings of the mathematical practices while planning to support their students' engagements with the rigorous expectations of Common Core-aligned tasks and assessments. Finally, mentor-mentee and teacher-teacher interactions must include discussions that focus on developing aligned interpretations for what each individual practice and practice combinations "look like" during verbal discussions and in written work. Such discussions should also focus on how teachers might support their students' development and demonstration of the practice standards. Faithfully engaging students in the mathematical practice standards throughout a lesson can help students build a deeper understanding of the mathematics and develop the 21st century skills needed for success in college and their future careers.

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