Counting in Kindergarten

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Children often have problems developing their early number sense. Rote counting appears to be a particular problem for a lot of students. In the classroom, we have seen a large majority of our students continuously not able to rote count to reach their quarterly goals. A big hindrance for our students has been counting in the teens. By observing our students, we noticed that they can successfully count from one to ten, but from eleven to nineteen they often get stuck on thirteen or fifteen or omit these numbers altogether. Once the students continue counting after nineteen, they often continue to skip numbers when counting in the twenties. When we further assessed our students, we found that several of our students who were unable to count to one hundred by ones were able to count to one hundred by tens. The intent of our research is now to find ways to help our students overcome these problems with rote counting by understanding why some of these problems are occurring and looking to develop activities that can help to further our students’ progress.

With the growing amount of research in children’s understanding of mathematical concepts, it is important to look at students’ basic number sense skills, including rote counting. By focusing on fundamental skills, we are able to understand some of the difficulties students might be having with concepts that build upon previous number sense knowledge. According to Baroody and Wilkins (1999), “The construction of counting concepts and skills is the single most important element in preschoolers’ mathematical development…a basis for the development of number and arithmetic concepts and skills” (51). Early counting skills are widely recognized as building blocks for future mathematical understanding (Aunio, P. & Niemivirta, M., 2010; Threfall, J. & Bruce, B., 2005). Without a solid foundation of basic number skill knowledge, students are more likely to encounter difficulties in the mathematical subject area (Aunio, P. & Niemivirta, M., 2010). During our work with our kindergarten students we have found similar results. All of our students that are unable to successfully rote count past eleven or twelve appear to also have problems completing other math-based tasks. Based on the idea that counting is a building block for later concepts, we believe that our students may be struggling with other math concepts because they do not have knowledge of the count sequence.

We initially thought that counting ability might have some correlation with gender. However, we were confused as to how that could be. Of our eight students who are able to successfully count to one hundred without skipping numbers or going out of sequence, six have been boys. But of the five students, who are still skipping numbers and stopping their counts before thirty, three are boys and two are girls. It is odd for there to be more boys who are able to count to one hundred, but also more boys who have problems before thirty. The literature shows that there is not a significant difference in gender when it comes to counting skills (Callahan, L. G. & Clements, D. H., 1984; Fischer, F. E. & Beckey, R. D., 1990). Callahan and Clements (1984) note that boys typically reach the milestone of counting to one hundred before girls, but that boys are more likely to get stuck when counting in the lower decade numbers than girls. Our observations of our students thus far support this claim. There is no evidence to support the controversial claim that students should receive different educational supports based solely on their gender, any additional support should be given on a case-by-case basis (Callahan, L. G. & Clements, D. H., 1984).

Before a child can count to one hundred, there are several things that they need to be able to do. They first need to know the count sequence from one to nine, that transitions are signaled by a nine, the new decade term that follows the transition, the rule that each decade follows the pattern of repeated one through nine and finally any exceptions to the rules (Baroody, A.J. & Wilkins, J.L.M., 1999). There is so much to counting to one hundred that there is no
wonder students have so many difficulties with it. Once a student understands the sequence from one to nine, that student has acquired an understanding of the basic counting pattern. However, they then reach a large string of exceptions in rote counting, the teens. These numbers don’t follow the same pattern as the rest of the count sequence. Even if they have acquired the other five rules necessary for counting to 100, figuring out the exceptions seems to be the hardest part for most students (Baroody, A.J. & Wilkins, J.L.M., 1999; Threfall, J. & Bruce, B., 2005). This is where our students have the most problems. Once they glaze over counting through the teens, skipping numbers and going out of order, they are often able to count until at least until the next decade number (and if given the decades they can easily count to one hundred).

Other than not having an understanding of the “rules” to counting there are several reasons why a child may not be able to accurately complete the number sequence. Among these possibilities, Baroody and Wilkins (1999) state that children may comprehend a number sequencing pattern, but apply it in an area where it is not needed (50). For instance, a child may know that the number sequence follows a pattern of one through nine in the decades (twenty-one, twenty-two...twenty-eight, twenty-nine), but may not be able to recognize the stopping point of twenty-nine and instead apply the pattern to the next number, therefore saying twenty-ten instead of thirty (Baroody, A.J. & Wilkins, J.L.M., 1999). Additionally, students may struggle with the number sequence, particularly in the teens because many of the numbers do not linguistically help to represent the number quantity. For instance, the number eleven does not help to convey the number quantity it represents (ten and one) in English, whereas the “teens” in other languages do have this linguistic aid (Ho, C. S. & Fuson, K. C., 1998). We have found that many of our students struggle with oral counting difficulties in the teens, especially when first learning the number sequence. A large majority of our students would struggle with teens and would typically stop at either thirteen or fifteen. These are relatively common stopping points for students because both of these numbers are exceptions to the “rule” of the English teens, which tends to follow the pattern of number from one to nine plus –teen (such as “four-teen” and “six-teen”) (Baroody, A.J. & Wilkins, J.L.M., 1999; Threfall, J. & Bruce, B., 2005). This may be an indication of the influence that the English language has on the numeral names, but also on student ability to grasp the number sequence.

Similarly, English does not use a decade structure that conveys the number quantity (Ho, C. S. & Fuson, K. C., 1998). Instead of having decade names that help to represent the quantity by “saying” two-ten (value of twenty) or three-ten (value of thirty), English decades have an entirely new term for children to remember such as twenty, thirty, and forty. Our kindergarteners have also struggled with decades when counting by ones. The students seem to be able to understand and apply the pattern of one through nine when counting the decades, but when the students reach the end of a decade (like twenty-nine), the students have a difficult time remembering what number follows it (thirty). The issue may have a link to the difficult linguistic structure of English decades, since knowledge of the decade names seems to be primarily placed upon memory. Students easily pick up on the pattern of one through nine occurring in each decade, it is the order that the decades occurs in that seems to be the problem. Threfall and Bruce (2005) state that since the understanding gap is with the decades, emphasis should be placed on the students’ understanding of the “x-ty” (any of the decade numbers other than ten) pattern rather than on the entire count sequence (74-75).

Threfall and Bruce (2005) give ways that students make errors in their counting: “1. The addition of just one further number following a correct string, 2. The continuation of the string in the correct order, but with some numbers omitted, 3. A move into a repeating loop of numbers, 4.
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A return to parts of the string already produced and 5. An idiosyncratic continuation of the number string’ (69). Our students fall into the categories of point number two and point number four. About half of our students that are having counting problems will skip one number in the teens and continue counting up to at least twenty-nine without any other problems. The other half of our students will repeat a decade set that they have already said multiple times if we don’t stop them. Understanding what it is that our students are doing, is one of the first steps in helping them to further their rote counting ability.

The literature gave us insight into the errors and problems that our students are having with counting, but it did not give suggestions for ways to help them. Coupling our understanding of what our students were doing with our knowledge of effective teaching strategies, we were able to start creating some activities that we hope will start to help our students. Our focus is still on getting students to practice the counting sequence correctly and as often as possible, but we have started to alter the way that we work with the students to focus more on the errors that they are making.

The first case is specific to one of our students that has consistently struggled with the number fifteen in the counting sequence. Other than this number, the student is able to count all the way up to nineteen without any problems. We have been stuck on this particular issue for some time because we did not want to have the student move forward without being able to accurately reiterate the numbers prior to twenty. We felt that if we had moved on, it would have encouraged the student to continue his counting by skipping fifteen. Ever since reading the literature that reinforced fifteen as a trouble number, we started to focus on repeating the number along with its surrounding numbers to help the student remember what came before and after. In other words, we have the student listen to us saying “fourteen, fifteen, sixteen” and then we have the student repeat the string back to us. Our hope is that this repetition will help the student to become very familiar with the string so that when he comes to the number fourteen, he will pause and think, “What comes after fourteen? Sixteen doesn’t sound right, so it must be fifteen.” After this, we have the student once again repeat the string and then count starting from one. When the student does this, he is not only able to see what he has to focus on (fourteen, fifteen, sixteen), but also how it fits in the whole scheme of things. Finally, we remind the student every day that he needs to try to remember the number fifteen so that he is able to move on in the counting sequence.

The second case we have implemented with a number of our students that have been struggling with the number sequence. This includes those that have issues in the teens as well as in other places, such as the decades. In this scenario we partner up struggling students with a student of a higher level ability, who acts as an aid or a “helper” for the struggling student. First, we have the struggling student count independently to assess the student on what s/he has retained from previously working with us. Then we have the “helper” student count so that s/he is able to model the correct number sequence. Following this, we have the struggling student repeat the number sequence one more time, hoping that s/he has listened to the other student and learned how to correct her/his mistake. Once this is completed, we have the students orally count with each other so that one student starts the number sequence and the other student follows with the next number in the sequence. We typically have students participate in this “back and forth” partner counting until the students reach the specific trouble area, but the goal is for them to surpass this point. This has now been extremely successful with two of our students. One student continually skipped the number thirteen in his counting. After one session with the “helper” student, he stated that he knew the number thirteen because he had heard her say it. Since then he
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has successfully counted to fifty-nine without skipping any numbers or needing any assistance. The other student would stop counting at nineteen and not go any farther. She was very reluctant to count with us and actually cried on several occasions. Once we started partnering her with another student to count, she was more excited to count and she has made progress. She now counts all the way to thirty-nine which was a surprise to us. We were focusing on twenty and before she had successfully hit that point she was making it there, she was counting to thirty without a problem.

By implementing the partner counting activity, we have learned that students respond in a positive manner. We surmise this is because students are working with other students and are interacting in a game-like manner. This helps to switch up the simple rote counting activity to something more engaging for the students, while still allowing them to focus on counting. Additionally, we have seen improvement in a number of our students, who are now able to surpass most of their trouble points. This being said, however, the activity is not for all students, like those who have problems focusing when paired with other students. In these situations we chose to partner the student with one of the teachers because this helps the student to focus more and it does not distract the other student needlessly. We are still looking for more ways to use our knowledge of what errors our students are making to help them increase their early number sense abilities. We are currently looking at a way to increase students’ success with remembering the decade structure by looking at their ability to count to one hundred by tens and applying that knowledge to counting by ones.
References


