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Annotated Bibliography

Introduction
This annotated bibliography includes 6 articles about teaching fractions to elementary students. Since fractions are a difficult concept for students to grasp, I wanted to learn how to teach fractions in a way that is relevant and engaging for students.

Goral, M. B., & Wiest, L. R. (September 01, 2007). An Arts-Based Approach to Teaching Fractions. T*eaching Children Mathematics, 14*, 2, 74-80.

This NCTM article by Goral for elementary teachers provides examples and supporting research of the importance of emphasizing sensory learning in elementary classes. Goral presents 3 lessons incorporating poetry, music, and movement for teaching fractions (whole, half, quarter, and eighths) to students. Over three days, students read a poem about fractions, jumped on number lines, and sang a song. In both the song and the number line, students were divided into either taping half notes or quarter notes or having to arrive at equivalent fractions at the same time while jumping on the number lines. This source is a great example of how integration of arts and movement in the class not only engages students and motivates them in learning, but students had a greater and longer lasting comprehension of what they were taught. As a music major and kinaesthetic learner, I would definitely use these engaging activities to teach fractions. I found this source to be extremely relevant because when I taught math in my first internship, students had a difficult time grasping new concepts. I feel like if I would have included more rich activities which require student active participation, students would have understood the material better.

Rowan, T. E., Payne, J. N., & Towsley, A. E. (April 01, 1990). IMPLEMENTING THE "STANDARDS": Implications of NCTM's "Standards" for Teaching Fractions and Decimals. *The Arithmetic Teacher, 37*, 8, 23-26.

Many students demonstrate deficiencies with fractions. Rowan's article addresses this issue and provides teachers with tools for how to teach for success. He emphasizes the importance of students having a strong conceptual foundation in fractions and decimals before computing with them. This can be established by having students compare and estimate with fractions because it requires students to understand the given fractional quantity in relation to wholes or more familiar fractions. I think this article is very practical for math teachers because it provides instructional tips for teaching fractions effectively such as using realistic problems, oral language, and allowing for more time (one week for K-4 and two for 5-8) for students to experiment with manipulatives and concrete materials. In addition, there are many different problems and activities provided at the end of the article that teachers can use to teach specific aspects of fractions such as equivalence, estimation, and operations. I would recommend this article to other teachers because it has activities that are relevant to students.

Steffe, L. P., Battista, M. T., Clements, D. H., & Olive, J. (May 01, 1991). The Problem of Fractions in the Elementary School. *The Arithmetic Teacher, 38,* 9, 22-24.

Steffe begins this article addressing the issue of students' inability to problem solve with fractions because they do not conceptually understand them. Instead, they rely on memorization, rules, and tricks when dealing with fractions. This article was informative for me because it gave examples of students' perceptions, misconceptions, and reasoning for their understanding of fractions. This article encourages student activities that requires students to reason and modify their interpretation of fractions to arrive to the actual concept of fractions. It is evident that this article is backed up by research and is reliable based off of looking at its sources. I would recommend this article to teachers in any subject because it promotes a constructivist teaching approach which is highly engaging and motivating for students. There is an example of how a student discovers that one over two (1/2) and two over one (2/1) are not the same by the teacher probing her with questions and the student using computer software to represent the fractions. This is relevant for all teachers, to be reminded that students learn and remember more when they experience working through a problem and then finally coming to the conclusion rather than having formulas of information spoon-feed to them.

Anderson, C., Anderson, K., Wenzel, E. (2000). Oil and Water don't Mix, but they do Teach Fractions. *Teaching Children Mathematics, 7*(3), 174-178.

In this article, students' experiment with oil and water (with blue food colouring), to understand proportion and find equivalent fractions. This served as a great illustration because students can see the division between the two substances.

After some teacher demonstrations, students were asked to find equivalent fractions by first predicting and then using the cups, pitchers, oil and water to test their answer. I would strongly recommend this article to any math or science teacher. Not only did the students comprehend the concept of fractions, but they enjoyed being actively engaged in math problem solving. This lesson is also very practical because it integrates science into math with the oil and water mixing and the inquiry approach with students making predictions. This article is extremely relevant for me as a teacher because it provides several activities that students can do with oil and water to understand proportions, ordering of fractions, adding and subtracting fractions, equivalence fractions, and mixed numbers.

Ortiz, E. (August 01, 2006). The Roll out Fractions Game: Comparing Fractions. *Teaching Children Mathematics, 13*, 1, 56.

This article presents an engaging and motivating game to help students strategize and analyze fractions of varying sizes. This two person game involves students rolling di, forming fractions from their rolls, and comparing them by using any of the three levels of representation: concrete (fraction tiles), pictorial (charts), and abstract (symbols), which strengthens the connections of student understanding of fractions across contexts. I would recommend Ortiz's fraction game for approximately grades 4-6 because students require understanding of whole numbers and basic understanding of fraction terms such as numerator, denominator. However, this article offers several suggestions for how to adapt

and extend this game to function for older and younger students as well. This article is relevant to me because I believe that students learn more while having fun, which is why I hope to use rich pedagogical interactive games like Ortiz's in the classroom.

Payne, J. N. (January 01, 1980). ONE POINT OF VIEW: Sense and Nonsense about Fractions and Decimals. *The Arithmetic Teacher, 27*, 5, 4-7.

Payne addresses the importance of fractions and how students need a firm foundation in both fractions and decimals in their daily lives. He also addresses the importance of learning fractions in meaningful and concrete ways in all grades before gradually teaching computational algorithms in a way makes sense. I found this article to be relevant to me because in my math class at STU we were discussing whether we should teach fractions or decimals first to students. Payne's view is that the question should be not *what* is taught first but the "*meaning* we want students to have for decimals and fractions (Payne, 1980)." This means that teachers should be mindful of concrete and spatial representations they use, the types of units used, and ensure that verbal names proceed symbols to provide logical and gradual transitions for students. I agree with this article that in order for students to develop thoughtful and reasonable estimation, quantitative thinking, and computational skills, they must experience and investigate mathematics by using concrete and visual representations. Through this process,

students will discover algorithms and understand their meaning and purpose, rather than misusing them due to memorization without comprehension.