Using Games to Improve Student’s

Problem Solving Skills in Mathematics

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**Abstract**

 This paper will look into three articles that address the use of games in the math classroom to further student’s problem solving skills. The rationale for using games in the classroom as well as the benefits that the students will receive are addressed in this paper as well as some problems that could be seen in the use of these games. There are a number of studies that show how the use of games in the math classroom can be beneficial and show to improve the problem solving skills of students. The different types of games and different deliveries of such games will also be addressed such as in groups, online, and competitive games as well. Many students have many different learning styles and can benefit from this method of teaching problem solving.

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One of the key concepts teachers of mathematics struggle to convey to their students is the essential skill of problem solving. Problem solving is critical in all areas of mathematics as well as in other academic subjects and in day-to-day life. Many teachers find it difficult to draw their student’s interests towards mathematics, which can make it difficult to further students in this critical subject area. There are a significant number of students in many different grade levels that show a deficit in their problem solving skills as well as a bounty of research regarding different methods teachers are using to improve on these students skills. Some of these studies are showing that using mathematically based games in the classroom can help these students improve on their problem solving. Teachers who engage their students and draw their interest towards mathematics using games are seeing their student’s problem solving skills improve.

 Problem solving is a critical aspect of mathematics and one that students will use throughout their entire lives not only in their educational career but also in other areas of their lives. Individuals in various life situations including in social settings use the problem solving that they learn while in school. While problem solving is critical in learning mathematics, the instruction of problem solving is a relatively new addition to the mathematic curriculum. Students in the past who are now our school’s math teachers learned the subject in a time where the material was taught based on drills and exercises alone. These teachers should be looking toward different methods of teaching mathematics and problem solving in their classrooms than what they experience as students themselves. Studies continue to show that the use of games in mathematic instruction are improving students problem solving skills.

 In an article by Marylyn Burns she explains her rationale for using games in the classroom claiming that it provides students with practice skills, allows students strategic thinking development, engaging them in enjoyable activities, and showing that learning is fun (Burns, 2003, 1). In regards to the idea that games could be considered a distraction to the students Burns states, “…I remind students regularly that the reason I’m having them play a particular game is for the learning that I’m promoting, and I’m explicit about what the learning is.” (Burns, 2003, 2). By being clear to the students what they are learning and why they are playing a game they will intake what outcome they should receive from participating in the activity. Students should be engaged and interested in the material they are learning or they could fall into a habit of not paying attention in class and not internalizing the material. By playing games and putting the students in situations where problem solving is explicitly used then the students will not only receive practice for the problem solving skills learned in class but also will see where problem solving applies in their lives. Adding a level of cooperation and competition between students also gives the students an added incentive to “figure it out” and want to progress their skills. Students show to be much more eager to get the correct answer and solve the problem when they could win a game compared to doing it just because they are told to.

 One study looked at the use of an online tutoring program that utilized games along with the online tutoring. While the tutoring program itself focused on breaking down and understanding the different aspects of math problems, it was paired with different sites that utilized games for math problem solving (Molloy, 2010, 86). “These sites offer engaging online math practice in game-like formats. Each game allows students to select the level of difficulty they want to try.” (Molloy, 2010, 86). Using games can keep students interested in the subject matter while the usual handouts and lecturing can seem boring to many students. By allowing students to choose the difficulty of the games they play, the students bored by the easier games are then challenging themselves with the more difficult games. Students who aren’t as confident in their math skills may choose games that are below level. The students who choose games that are below level can gain confidence by succeeding and practice the problem solving in progression of difficulty rather than “drowning” in the more difficult problems. “Math board games offered another way to engage students in problem solving “(Molloy, 2010, 86). Board games create an environment where students work together to solve problems. Students who are below level benefit by learning from the more advanced students while the advanced students benefit from teaching and explaining concepts to their classmates. In the five classes participating in the tutoring program they all showed significant improvement in the scores of their post-test compared to the study’s pre-test (Molloy, 2010, 87). “We found a mean gain of 25.51% in test scores from pre-test to post-test among all student participants, while 36 student participants registered gains of 40% or more from pre-test to post-test.” (Molloy, 2010, 88).

 Another study took observations of students before the implementation of collaborative games and observed that, “Based on the observations in the classroom it was evident that pupils varied in their approaches to learning mathematics. Some engaged much more readily than others who were observed to become bored and to work slowly. Some children clearly lacked confidence as was evidenced by their unwillingness to answer questions in class even when they knew the right answer.” (Al-Washmi, 2013, 619). These students showed that the games interested them as well as helped them in their problem solving skills. Students were shown to enjoy the games though were more inclined to select games that weren’t specifically educational when given the option (Al-Washmi, 2014, 623). Al-Washmi also states that, “It was also observed that the act of one child explaining a solution to another enabled them to vocalize their reasoning and helped their problem solving.” (Al-Washmi, 2013, 622). Students who are able to explain their reasoning to other students show a deeper understanding of the material that they are teaching to their fellow students. The students who are having the solutions explained to them are also benefiting from the cooperative game.

 While it’s pretty well known that mathematics, as a subject, is not typically a student’s favorite class, that doesn’t mean it has to remain that way forever. In school students may not see the importance of problem solving in their lives. Math teachers need to set their students up with the problem solving skills that they will need to use in other academic subjects and in real life situations. By introducing games into the classroom students are allowed an activity that they could perceive as entertaining and not see it directly as practice. Games cover a wide range of different learning styles that cater to all students. Games would benefit students who are visual learners, spatial learners, competitive individuals, etc. Though these games can’t be used for every lesson every day, they can prove to be an essential tool in improving students problem solving skills when used at home, during tutoring, free time and occasionally during lessons. Interesting students in what they are learning is key to having them internalize the information provided to them by their teachers. Teachers need to stray from the way that they learned in the classroom and teach less drilling methods and more methods that would not only interest the students but also prove to be more effective as well.

**Conclusion**

From what the studies discussed show it can easily be seen that by implementing games into the classroom students show documented improvement in their problem solving and general math skills. Further studies should be done with larger groups of students from varying grades and backgrounds to bring more into light about the use of these games. Studies should be completed with control groups and regarding the different types of games that can be played, the effectiveness of using games with ELL students or special education students as well. More research should be done in the area to further prove effectiveness in the use of games as well as other “unconventional” teaching methods. Further investigation needs to go into the use of collaborative games and games that are not specifically educational. Games that are not specifically educational do show the use of problem solving to be necessary in completing the game, the nature of these games may not be what is needed in the classroom. Games that are collaborative should be studied further in regards to students “carrying” their classmates through the game and therefor having the game not benefit those weaker students.

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