

# Action Research Project:



## Ways of effective participation and Students' perceptions on the role of participation in the Mathematics Classroom

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## **Part I: Forming the Plan**

Student participation takes into account a variety of forms, and serves as an important way for teachers to receive feedback about student learning as well as the effectiveness of their instruction. According to Ewing (2007) , “Participation is a complex process but one that is critical to successful learning in classrooms” (p. 181). However, the effectiveness of student participation varies based on its implementation and the classroom environment. As a result, the question in this research project that I will be tackling is: In what ways can a teacher increase effective participation in the mathematics classroom?

An interesting generalization made in most math classrooms today is that “the most common form of student participation during whole-class instruction is the one-student-participating-at-a-time method” (Christle & Schuster, 2003). Most often, this type of participation is the result of a class structured when the teacher lectures in front of the class and calls on students one at a time so that they can answer a question. Usually students who do participate and answer in this type of situation are high achieving students whereas low achieving students do not raise their hands as often and have fewer opportunities to participate (Christle & Schuster, 2003). To increase opportunities for all students to participate in class, strategies such as choral responding, timed trials, and response cards will allow students a greater opportunity to participate in order to give teachers important feedback in their instruction and also the learning of their students (Christle & Schuster, 2003). This article raises the notion concerning how all students can have a voice in the classroom provided different opportunities of classroom participation. In particular, this notion coincides with my question about how teachers can focus on effective participation in the mathematics classroom by providing students with multiple ways to participate. One technique that really stood out to me was the response card

technique that was a highlighted form of classroom participation because it accounted for the participation of all students.

Examining the effectiveness of different forms of participation, Christle and Schuster's study revealed the positive effects of using response cards versus hand-raising. From their study, they concluded that “student participation was higher when using response cards than when hand-raising was in effect” (Christle & Schuster, 2003). Using response cards in the classroom served as a way for the teacher to conduct a formative evaluation on student performance (Christle & Schuster, 2003). As opposed to only assessing a few students during a lesson with the hand-raising technique, the response card technique allowed the teacher to quickly see all of the students' responses and to assess their understanding. This particular way of classroom participation seems to be beneficial for students, especially for those who do not like to voice their thoughts and opinions during class since they are shy or do not like public speaking. Although students' dispositions in the classroom are influenced by the norms and classroom environment established by the teacher, this method of participation—using response cards for students to easily provide a solution to a problem during class—can potentially help create a classroom environment in which students feel comfortable sharing their ideas. I plan to implement this technique of using response cards in a lesson to assess its effectiveness.

One of my biggest concerns as a pre-service teacher is how can I best assess the learning of students who do not participate in class vocally and who quietly listen and observe. Calling on these students may put them out of their comfort zone as they may not want to speak in front of the class or perhaps they learn better by observing and listening. The article, “Is Silence Golden? What Silent Participants Might Be Learning in Discourse-Rich Classrooms,” addresses the importance of teachers considering what might be learned from students who are silent in a discourse-rich classroom. It is easy to assume that students who are silent are not participating, but in actuality, research has shown that silent students are actively participating in discussions without speaking but through observing and

listening carefully (Hillen & Smith, 2007, p. 307). Taking this idea that silent students are active participants into consideration, there are a multitude of ways for teachers to provide opportunities of participation among students who are silent which include, “giving learners multiple ways to demonstrate their understanding by working in small groups, writing about their thinking, and discussing tasks in a one-on-one-setting (Hillen & Smith, 2007, p. 310).

Although there are many ways to participate in a classroom, I will focus on the use of the response card technique in a lecture-based classroom. In addition, I will take into account students' perceptions on classroom participation and how that might impact their learning. For my action research plan, I will survey two geometry classes on students' perceptions about participation and implement the response card technique in a lesson that I will teach. The survey is comprised of six questions for students to complete individually and anonymously. I will implement my plan at Oakwood High School in a geometry class with permission from my cooperating teacher, using the response card technique in part of the lesson when students are asked to work on an example on their own, and surveying students from two geometry classrooms about classroom participation. I hope to gain a better picture about how can teachers increase effective participation in the classroom from this action plan by taking into consideration the viewpoints of the students as well as determine and reflect on whether or not the use of response cards can be beneficial. The survey will provide data that will be helpful in evaluating how students feel about classroom participation and how that may correspond to their performance in the classroom.

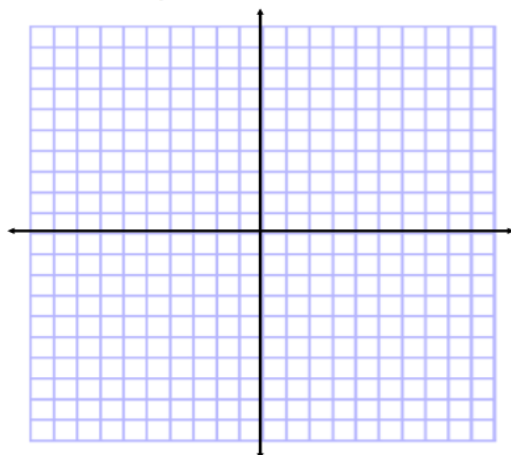
## **Part II: Taking Action**

I taught a lesson on slope in a geometry class. In the lesson, I introduced the problem: Given two set of points, determine if the two lines formed by the sets of points are parallel, perpendicular, or

neither. I used this example as an opportunity to incorporate more classroom participation by implementing the use of response cards for all of the students. In addition, I allowed students to come up to the SMART Board to show and explain their work to the class on example problems. Finally the week after I taught the lesson, I came up with a six question survey about classroom participation and distributed the survey to two geometry classes.

One particular example when I asked for student participation was when we reviewed different types of slopes. I asked students to volunteer to come up to the SMART Board to draw lines with different slopes with the particular directions shown in the picture below.

Draw a line in black that has positive slope  
Draw a line in blue that has negative slope  
Draw a line in red that has zero slope  
Draw a line in green that has an undefined slope



When I implemented the response cards, I first told students that I will be passing out a half sheet of note cards and will give them a few minutes to work on the problem. I told them that after they work through the problem in their notes, they are to write down their final answer on the half sheet of note card—parallel, perpendicular, or neither—and to raise that note card up so that I can see that they are done and have a solution. After a few minutes, one by one, students started to hold their note cards up, and I walked down the rows to check their answers. I was able to see the responses of all the students, a mixed array of solutions of parallel, perpendicular, and neither. The correct solution for the

particular example was neither.

We gathered as a class to discuss about the particular example that the students wrote on their note cards, and how students came about with their solutions. I started off by debriefing with the students and telling them about my observations using the note cards saying , “as I was walking around, I saw a lot of different responses, some people said perpendicular, others said parallel, and then some people said neither...so which response is the correct solution?” We then used this as a starting point to work through the problem as a class, and students concluded that the points (5,6) and (8,7) as well as (8,2) and (9,5) were neither parallel nor perpendicular because they have different slopes and one slope was not the opposite reciprocal of the other slope. I nearly ran out of class time, so I did not use the response card technique for the second example, which was very similar to the first example problem but had different points, and quickly went through that problem with the class and assigned students homework.

### **Part III:** Analyzing the data

The implementation of the response cards in the lesson intended to increase classroom participation among all students in the classroom, even students who tended to be silent and did not respond to classroom discourse. Having the mixed array of solutions and being able to see such solutions allowed me to consider whether or not the students grasped the problem and to determine if I should follow up with another similar example. Although I was running out of class time, the response cards helped me to consider that it might be best to have students do another similar example and to test whether or not I have more correct responses the second time around. If I were to do the lesson again or use the response cards again, I would definitely consider doing another example and test to see whether or not more students were able to get to the correct solution, which will serve as important feedback for me on assessing the progress of the students.



I surveyed a total of 32 students. The students providing the answers remained anonymous so this allowed the entire class to participate with out any hesitance. For students who answered 'no' to the question: Do you like participating in class? their responses to the followup question (5), explaining why they do not like participating class were as follows:

- *“I do not like being wrong”*
- *“I would rather listen”*
- *“I do not like talking in class; I learn better by listening to others”*
- *“I am shy”*
- *“I don't like being wrong so I just don't try to be part of the group”*
- *“I am not a fan of public speaking”*

Two students misinterpreted question (5) and explained why they liked participating in class saying the following:

- *“Helps give ideas and explain things differently from other people”*
- *“Because it helps me learn better”*

From the following responses that the students provided, it is interesting to note students' dispositions towards participating in class. Some students admit that they do not like being wrong in class and do not participate. One question as a pre-service teacher that I would ask myself is, how can I create a classroom environment in which students are comfortable in sharing their mathematical ideas and solutions without the fear of being wrong? Teachers can promote more participation among their students by simply communicating with students that part of learning mathematics is encountering and overcoming mistakes. Moreover, when the teacher makes mistakes in front of his or her students, showing that they too can be vulnerable, may help create a class environment in which students feel comfortable participating in the classroom without any fear of making mistakes in front of others. In



order to create such an environment, a teacher must establish norms in their class, communicating to students about their expectations on how they expect students to behave or interact when other students are sharing their ideas. For instance, if one student in the class shares his or her ideas, the rest of the students should be listening and considering how they can explain the same idea to others.

Establishing norms that promote a classroom environment that welcomes student thinking and incorporating multiple ways to receive student feedback, will help allow all students in the classroom to benefit in classroom participation.

Furthermore, some students do not like to speak up during class, and that by no means indicate that they are not learning as much as students who do talk during class. As indicated in the article, “Is Silence Golden?” silent students in fact learn just as much as students who speak up during class and can be active participants as they are more observant and listen carefully during class discussions.

When considering how to implement more participation opportunities for silent students, teachers can incorporate more group work so that students can talk amongst one another, and the response card technique in which students share their solutions on a note card instead of shouting it out to the entire class.

From the collected surveys, these were the following grade distribution of the two Geometry classes:

- 20 Students have a B or Higher.
- 7 Students have a C
- 4 Students have a D
- 1 Student did not know his/her grade

The following results show the proportion of students who liked participating or did not like participating in relation to their grades:

- 18 out of 20, **90%** of students with a grade B or Higher *liked* participating
- 2 out of 20, **10%** of students with a grade B or Higher *did not like* participating
- 4 out of 7, **57%** of students with a C *liked* participating
- 3 out of 7 **43%** of students with a C *did not like* participating
- 1 out of 4, **25%** of students with a D *liked* participating
- 3 out of 4 **75%** of students with a D *did not like* participating

From the results, it appears that the majority of students with a high grade liked to participate in class while students with a D did not like participating. However, it does not necessarily mean that students with a lower grade did not participate frequently during class. Originally, I believed that there was only a strong correlation between high grades and students participating in class and a weak correlation between low grades and the number of students participating in class. Based on the surveys I collected from students in geometry, I received mixed results on students' feelings toward classroom participation, their current grades, and how often they participate. Students who did not perform as high still participated in class.

Table 1

Current Grade	Frequency of Participation: 1-Seldom 5- Frequently
B or Higher:	3, 4, 5, 4, 2, 3, 3, 4, 3, 3, 3, 3, 4, 3, 3, 2, 5, 3, 3, 3
C:	3, 3, 3, 4, 3, 3, 4
D:	2, 4, 4, 3

Surprisingly, Table 1 shows that students with a C or D in the class said that they participate just as frequently as students who have a B or Higher. None of the students said they seldom participated in class. Although these results only reflect one class and do not speak for all classes and students, it does provide information on how teachers can account for different forms of participation

the classroom and to reflect on what strategies might be useful in receiving student feedback. It is important to note that the two geometry classes I surveyed is a lecture-based classroom and students often participate by taking notes, paying attention quietly, asking relevant questions, and raising their hands when the teacher asks questions to the class.

In analyzing the relationship between the frequency of students participating and their grades, I believe it is important for teachers to consider whether or not the grades of students who do participate frequently strongly correlate with their grade. In other words, does the students' effort and amount of participation reflect his or her grade? Moreover, what forms of participation does the teacher usually incorporate in class and how might that impact the learning of all students in the classroom? For instance, if teachers only allow students to participate by answering yes or no questions, they might not have valuable feedback to assess the learning of their students. As a result, providing multiple ways and opportunities for students to participate in class will help promote a rich learning environment.

In collecting students' responses from the survey about how they view classroom participation and how they participate in the classroom, I translated the data into two sections in Table 2. I tallied the number of responses for each form of participation and divided it among what grades the students received. The first half of the table summarizes Question 1 of the survey while the second half of the table summarizes Question 2 of the survey, (actual ways students participate in the classroom versus how they view what classroom participation is). Table 2 demonstrates the different ways students think reflect classroom participation and the ways they actually participate during class. It appears that although some students believe that explaining ideas to the class is a form of classroom participation, few actually share their ideas and this could partly be because the classroom is structured in such a way that students may not have that opportunity. The majority of the students, regardless of their grade checked that a form of classroom participation is paying attention quietly and taking notes, and almost all of these students say that they participate in class by enacting both ways. Taking into consideration

that many students pay attention quietly, it may be difficult for the teacher to assess the progress of learning from all of the students and can only assess a few students through student-teacher discourse and interactions. As a result, incorporating other ways of classroom participation such as group work and response cards could better equip the teacher in receiving feedback from his or her students.

Table 2:

Ways students think of Classroom Participation	Raising hand	Working in Groups	Explaining ideas to the class	Asking Relevant Questions	Giving Answers	Paying Attention quietly	Taking Notes
A or B	xxxxxxxxxxxx xxxxxxxx	xxxxxxx xxxxx	xxxxxxx xxx	xxxxxxx xxxxxxx x	xxxxxxx xxxxxxx x	xxxxxxx xxxxxxx xx	xxxxxxx xxxxxxx xxx
C	xxxxxx	xxxx	xx	xxxxx	xxx	xxxxx	xxxxxx
D	xxxx	xx	x	x	x	xxx	xxxx
Ways they actually Participate	Raising hand	Working in Groups	Explaining ideas to the class	Asking Relevant Questions	Giving Answers	Paying Attention quietly	Taking Notes
A or B	xxxxxxxxxxxx xxxx	xxxxxxx xxxxx	xxxx	xxxxxxx xxxx	xxxxxxx xxxxxxx	xxxxxxx xxxxxxx xx	xxxxxxx xxxxxxx xxxx
C	xxxx	xxxx		xxx	xx	xxxxxxx	xxxxx
D	xxx	x		x	x	xxxx	xxxx

**Part IV: Reflecting**

From this research project, some highlighting aspects that I can draw for me and my students is the fact that classroom participation comes in a variety of ways and can be effective in varying degrees. In addition, classroom participation serves as important feedback for the teacher to assess the progress on student learning. In regards to what teachers might consider when it comes to classroom

participation, creating a classroom environment in which students feel comfortable sharing and participating is critical. In order for students to feel comfortable sharing their mathematical ideas and solutions, having a multitude of ways for students to participate would be a key starting point. Many students confess that they do not feel comfortable speaking out loud in front of the class. Some questions a teacher may ask himself or herself, is how can I get more students who are shy to participate in my classroom? More specifically, what different ways can I allow students to participate in my classroom? In order for teachers to increase effective participation in the classroom, they must not only provide multiple ways of participating but also multiple opportunities for students to participate. Perhaps the structure of the classroom plays a role on the amount of opportunities students have to participate. For instance, students in a lecture-based classroom may have fewer opportunities and fewer ways to participate than students in a problem-based classroom. In a lecture-based classroom, students may usually participate through taking notes, actively listening, and answering yes or no questions whereas in a problem-based classroom, students may participate through group work, think-pair share activities, and meaningful class discussions. As a result, it is important for teachers to think about what forms of participation might best benefit the learning of all students and how that can be incorporated in each lesson.

Some “next steps” from here would be forming classroom norms that would increase classroom participation behavior and set a positive environment in which students feel comfortable sharing their ideas and participating. Taking into consideration students who do not like speaking in class, a teacher can incorporate a response card technique in their lesson that will allow students to share their ideas on note cards or mini white erase boards so that the teacher can assess the progress of learning of all students in the classroom. Increasing classroom discourse through having students work in groups and communicating to students the benefits of working in groups and having multiple ways of classroom participation may also give students reason in participating in the classroom to increase their learning.

New questions raised from this research include:

- What forms of participation often occur in a lecture-based classroom and how do students benefit? What forms of participation do lecture-based classrooms lack?
- What forms of participation are used frequently in a problem-based classroom and how do students benefit? What forms of participation do problem-based classrooms lack?
- What forms of participation do students prefer in the classroom?
- How can a teacher utilize different forms of classroom participation to assess the performance of all students?
- Should some forms of classroom participation be used more than others?

#### References:

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