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Pilot for Teacher Professional Development in the use of Total Participation Techniques

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Pilot for Teacher Professional Development in the use of Total Participation Techniques

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Abstract

The purpose of this action research study was to determine the effects of Total Participation Techniques (TPTs) on student engagement in a 5th grade science class, and to examine the effectiveness of the research methods to determine potential use for future coaching of teachers on the use of Total Participation Techniques as a pedagogical approach. The study took place at a small, independent school in Minneapolis, Minnesota. A single 5th grade science class of twenty-two students participated in the study, as did the 5th grade science teacher. Teaching strategies included use of Total Participation Techniques, specifically turn and talk, white-board hold-ups, and exit slips. Data was collected through the use of observational notes from the researcher, a tally sheet completed by the researcher, pre- and post-lesson forms filled out by the teacher, and exit slips completed by students. The research implies that the class was more engaged when TPTs were being used than when they were not. Modifications to the student exit slips and the teacher pre- and post-lesson forms would be needed to improve effectiveness in future action research studies.

In education, at the classroom level, improvement in student learning can be increased through meaningful student engagement (Marzano & Pickering, 2011). In many classrooms, teachers talk, expecting students to listen, with too much focus on the teacher as a giver of knowledge (Himmele & Himmele, 2017). A 2015 Gallup poll that surveyed about a million students found that "50 percent of 5th through 12th graders reported being 'not engaged' or 'actively disengaged' in school" (Himmele & Himmele, 2017, p.7).

Educators fall into the routine of 'beach ball' or 'stand and deliver teaching,' where the teacher has information that they share, volunteers are asked for a response, and, once given, the teacher repeats this process which leaves most students bored and disinterested (Himmele & Himmele, 2017). Freire (2000) refers to students in this "stand and deliver" learning scenario as "listening objects" (p 71). Teachers argue that due to the emphasis on covering so much curriculum and adhering to strict standards and benchmarks, they are finding fewer opportunities to create lessons that promote high student engagement (Certo, Cauley, Moxley & Chafin, 2008). This may be true, but the importance of meaningful student engagement is real, and the need to find techniques that promote high student engagement and critical thinking are vital to the success of students.

If administrators are going to significantly improve opportunities for exceptional classroom engagement, they must insist that teachers build authentic relationships with students, deeply understand their curriculum, and utilize instructional strategies that provide opportunities for high participation and critical thinking. Himmele & Himmele (2017) state, "Educational quality is highly dependent upon the effectiveness of the teacher and is more influential than socioeconomic status or the size of classes" (p. 8). Engaged students explore ideas and consider

the different perspectives of others, which leads to generating ideas that build on the collective thoughts of the group. This deep learning happens when students can connect new knowledge with prior knowledge, and find new understandings about what they thought, due to new ideas presented to them by others (Himmele & Himmele, 2017; Jackson & Zmuda, 2014). Students who are engaged will find learning more rewarding, have more positive experiences in school, and will be more likely to go on to higher education (Conderman et al., 2012; Marks, 2000).

After two days observing students in a high school setting, teacher Alexis Wiggins identified three keys areas that contribute to diminished student engagement: "a) Students sit all day and that is exhausting; b) Students are sitting passively and listening during approximately 90 percent of their classes; c) You feel a little bit like a nuisance all day long" (Strauss, 2014 pp. 2-4).

David Sousa (2006) learned that there is four to 10 times more retention of information learned when students are engaged in learning visually and verbally than when they are just learning through listening. If students are not engaged, there is little if any chance that they will learn what is being addressed (Marzano & Pickering, 2011). Students who are less engaged meaningfully with teachers and coursework are more likely to drop out (America's Promise Alliance, 2014). Conderman et al. (2012) found that dropouts are more than eight times as likely to go to prison than non-dropouts. Boredom and the irrelevance of school are cited by dropouts as top reasons that they do not finish high school (America's Promise Alliance, 2014).

At the school involved in this study, administration decided that teachers will use Total Participation Techniques (TPTs) in their classrooms to help foster critical thinking opportunities and higher participation for all students to increase the level of student engagement in classes.

Literature Review

The Importance of Student Engagement

Marzano and Pickering assert that you need to establish a trusting learning environment for truly engaging classroom experiences to occur. They identify these four key areas for creating engaging classrooms: "emotions, interest, perceived importance, and perceptions of efficacy" (Marzano & Pickering, 2011, p.3). In terms of emotions, students learn best when they feel good and are enthusiastic about what they are learning. Most importantly, students need to feel that they have a positive relationship with the teacher in the class. Marzano (2007) shares that "If the relationship between the teacher and the students is good, then everything else that occurs in the classroom seems to be enhanced" (p.150).

Building interest is an extension of relationships. If the teacher knows what students care about, then making connections that build context is much easier. Using student experiences as a jumping-off point for research and investigation adds vital meaningfulness to the learning, including any direct instruction that also might be part of the experience (Tschannen-Moran & Clement, 2018). Sparking curiosity and allowing students to explore shifts the onus for becoming the expert to the student, and the teacher becomes the guide rather than the person the students instinctively turn to for information. While this role may make some teachers uncomfortable, it is necessary to help our students grow and learn in ways that promote independent thinking and problem solving (Jackson & Zmuda, 2014).

Perceived importance is also important to engaging classrooms (Marzano & Pickering, 2011). When the teacher listens, (a crucial element in all positive relationships), and uses student interests and comments to drive instruction, it elevates the student's connection to the material.

When this connection relates to the student's short, or even better, long-term or life goals, that perceived importance promotes motivation (Jackson & Zmuda, 2014).

Efficacy, includes a student's sense of, *I can do this* (Marzano & Pickering, 2011). Teachers contribute to this by calibrating the level of challenge so that students learn that mistakes are not only okay, but a necessary part of learning. Enhancing efficacy also includes the teacher's ability to recognize when more time is needed, or that the group is ready to move on.

Another possible approach to bettering student engagement is the inquiry approach. In inquiry, learners pose questions then experiment and develop ideas, rather than simply being fed information and knowledge (MakerEd, 2015). Banchi and Bell (2008) outline the National Science Teacher Association's four levels of Inquiry as, "confirmational, structured, guided and open" (p.25). Varying levels of student-driven engagement, depending on the type of inquiry and goal of the learning experience, can be achieved (Figure 1).

Figure 1
Levels of Inquiry (from Banchi & Bell, 2008, p. 28)

Figure 1.

The four levels of inquiry and the information given to the student in each one.

Inquiry Level	Question	Procedure	Solution
1—Confirmation Inquiry *Students confirm a principle through an activity when the results are known in advance.*	✔	✔	✔
2—Structured Inquiry *Students investigate a teacher-presented question through a prescribed procedure.*	✔	✔	
3—Guided Inquiry *Students investigate a teacher-presented question using student designed/selected procedures.*	✔		
4—Open Inquiry *Students investigate questions that are student formulated through student designed/selected procedures.*			

At the Confirmation Inquiry level, there is greater teacher involvement (indicated by the three checkmarks). In Open Inquiry, students have more agency in the questions, procedures and

solutions. This scaffolded approach promotes a balance of direct instruction with instruction that allows students to determine questions, research and problem solve.

Another teaching approach that can elevate student engagement is project-based learning (PBL). Project-based learning encourages both teachers and students to plan projects around their own experiences and apply it to real-world problems while still connecting to curriculum and standards (Martinez and Stager, 2019). According to the nonprofit organization Edutopia (2015), the five keys to PBL are:

1. Establish real-world connections in projects.
2. Build projects that are core to learning (standards and benchmarks are applied).
3. Structure collaboration for student success.
4. Facilitate learning in a student-driven environment.
5. Embed assessment throughout the project - build in target learning goals.

Total Participation Techniques to Enhance Engagement

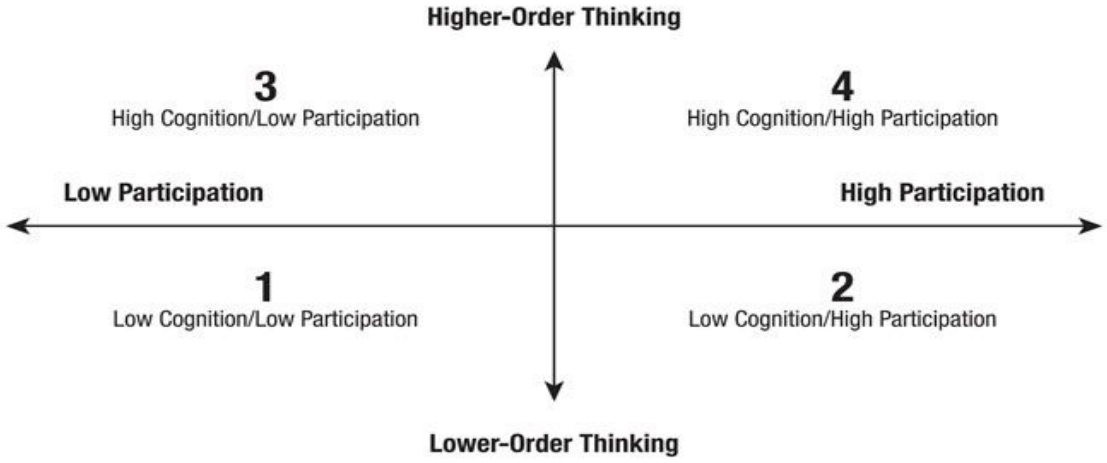
Another tool that can be utilized to enhance student engagement are Total Participation Techniques (TPTs). "Total Participation Techniques are teaching techniques that allow for all students to demonstrate at the same time, active participation and cognitive engagement in the topic being studied" (Himmele & Himmele, 2017, p. 4). Total Participation Techniques can be used by teachers to enhance opportunities for active participation and critical thinking. They allow teachers to get feedback from their students in ways that show they are not only participating in class but that they are also engaged in higher-level thinking. For this to happen, teachers need to offer students questions or prompts that are: meaningful, require the formation

of connections to other concepts studied, and allow time to process before being asked to share with the larger group (Seitz, 2014).

Using TPTs also allows for ongoing formative assessments by the teacher, opportunities for feedback, and conversations with students which all help the teacher make adjustments in their instruction to ensure that they are meeting the needs of each of their students (de la Isla et al., 2015). The TPT Cognitive Engagement Model (Figure 2) presents a way to assess the type of learning and level of participation that is happening within classrooms. The model shows quadrants indicating where active participation and/or high cognition opportunities are happening as a result of the use of TPTs. When students are highly engaged in participation while also utilizing higher-order thinking skills, they have the best opportunity for deep learning. When lessons fall into quadrant four of the grid, meaningful learning is happening for all students. In establishing a highly engaging learning environment, students are challenged to use higher-order thinking skills which in turn help them become the "critical thinkers, problem solvers, innovators and change-makers upon which society thrives" (Himmele & Himmele, 2017, p 15).

Figure 2

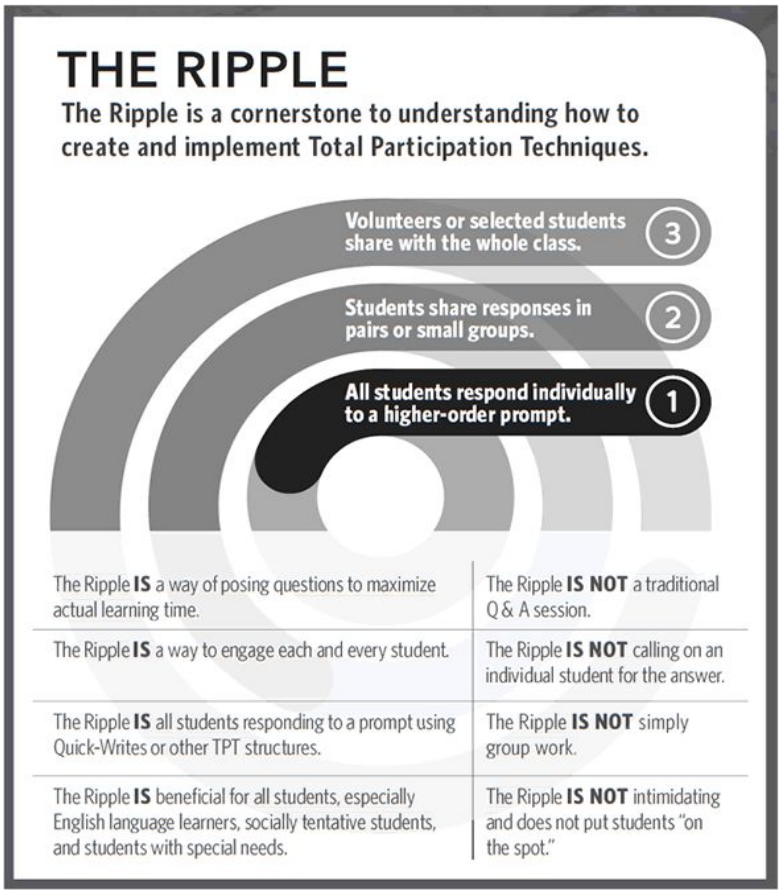
TPT Cognitive Engagement Model (Himmele & Himmele, 2017, p17)



Himmele & Himmele (2012) also encourage teachers to create what they call a rippling effect (Figure 3). Rippling has to do with all students responding to a prompt individually and then sharing either in pairs or in small groups before a whole-class discussion. This ensures high participation from all, not just the kids who typically answer, and it gives reluctant participants time to process their thoughts and ideas individually first. This allows for students to build confidence around sharing their ideas.

Figure 3

The "Ripple Effect" (Himmele & Himmele, 2017, p.21)



Utilizing the ripple effect ensures that teachers do not fall into a question and answer session where the teacher asks a question to the group and just a few students answer. In this sort of question and answer session, teachers only know what those students who volunteered understand or have synthesized, but they have no idea where the rest of the group is in their understanding. Also, in this scenario only a few students are called upon and those who are not can easily check out of the lesson.

Four Categories of Total Participation Techniques

Himmele & Himmele (2017) advocate specifically these four categories of TPTs: On-the-Spot, Hold Ups, Movement, and Note Taking & Concept Analysis. Like any tool, knowing how to use the TPTs effectively contributes to successful implementation. These four categories are described below.

"On-the-Spot" TPTs require little to no preparation and provide a quick way for the teacher to gauge the depth of understanding that students have about the concept being taught (Seitz, 2014). For instance, one On the Spot strategy is a quick-write. In this TPT students spend up to several minutes reflecting and writing about an idea. This is considered a first-tier ripple that engages a student to individually think deeply about and respond to what is being covered in class. Moving from quick-write to the strategy of think-pair-share allows students to then contemplate their thoughts and ideas with a partner and to give feedback to one another. This second-level ripple now has students thinking critically by discussing with another person. Finally, the teacher can bring the class together to share thoughts and ideas about the topic. This is the third ripple that allows students to discuss their ideas publicly after having time to prepare

for this kind of sharing. This also allows students to hear other students' thoughts and build on ideas that are shared by classmates. This potentially deepens their level of thinking and creates opportunities for making greater connections to the content through shared learning experiences (Seitz, 2014).

Hold-Ups are the second category of TPTs. These are activities that engage students by having them hold up a card, paper or whiteboard in response to a question or prompt. Hold-Ups have been shown to increase participation, improve achievement on quizzes and tests, and decrease disruptive behavior (Seitz, 2014). Hold-Ups promote interaction through the use of response cards that challenge students to determine their own opinions followed by justifying their answers and thoughts. Maheady et al., (2002) found in their research that rather than hand-raising techniques, "the classroom teacher could get almost six times as many students to respond to each question simply by using response cards" (p. 66) and that there was an increase in scores on summative assessments.

The third category of TPTs is Movement. For these, students get out of their seats, move around the room, and use items to contribute to their learning all while participating in interactions related to the lesson or prompt. Researcher, David Sousa (2006) posited that oxygen is fuel for the brain. It is not surprising then that his findings indicate that more oxygen in the blood means stronger cognitive abilities for students. He goes on to share that when students move around during a lesson and talk about the topic, they consume more oxygen, resulting in greater learning. Movement TPTs do just that, they help to increase students' blood flow, oxygen levels and therefore learning.

TPTs implemented to Guide Note Taking and aid in Concept Analysis are the fourth strategy category. “Educational studies have long documented the crucial role of note-taking in facilitating academic success” (Yang et al., 2018, p.12). Lacking effective note-taking skills very often means that students will miss important lecture content and may negatively affect grades. For many students, it is difficult for them to know where to start with note taking and they often either write everything down or not enough (Boyle, 2013). Himmele and Himmele (2017) state that "effective note-taking is a learned skill and it's important enough that we ought to take time to support students in developing it" (p. 92). In this category of TPTs, the emphasis is on helping students learn how to summarize information that is presented by the teacher through direct instruction. The theme within each of the note taking strategies is to pause and think about what was shared, analyze what is thought to be the most important ideas or information and finally, respond to what has been learned by synthesizing the information and sharing it in a written response and/or by sharing with a partner or group.

Marzano and Pickering laid out their four keys to successful student engagement: emotions, interest, perceived importance and efficacy. Not surprisingly, Himmele and Himmele (2017) echo these ideas when describing the intentionality needed to create a "TPT-conducive classroom" (p.146). They point out that students need to feel safe in sharing their ideas and that their differences are accepted and appreciated. Teachers need to be intentional in structuring lessons so that the expectations are clear and achievable by the students. Students need to be able to understand the purpose of what they are learning and have opportunities to find connections

between what they are learning and what they know or where they have an interest. When students can engage this way, it challenges them to think critically about content.

Creating an environment that promotes optimal student engagement takes an investment on the teacher's part. The result, however, can be a classroom where students not only come to enjoy interactions, but they also look forward to being in class and learning (Duncan, 2015). The shift may be a challenge, as teachers come out of college very focused on getting the information right for their students, and perhaps are not yet ready to trust an environment where they are not 'controlling' the process. This mindset focuses on the idea of the teacher as the dispenser of knowledge; however, critical thinking does not happen if students are just being talked at. Freire (2000) said, "Knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry human beings pursue in the world, with the world, and with each other" (p. 72). Helping teachers implement strategies that increase opportunities for students to develop critical, creative, and collaborative thinking skills will allow students to become the capable, successful adults we all hope for them to be.

Theoretical Framework

"Critical and higher-order thinking is thought to be essential to learning for all students in the Twenty-First Century" (Darling & Hammond, 2008). As Total Participation Techniques are intended to increase overall student participation and challenge teachers to develop prompts that promote critical thinking, Bloom's taxonomy helps serve as a guide for schools in creating common language for assessing cognition in a way that all teachers can easily understand and

use. Borich & Tombari (2004) found that when teachers use Bloom's taxonomy, it helps them focus on instructional objectives and outcomes they want students to achieve through the lesson.

Bloom's Revised taxonomy, as compiled by Anderson and Kratwohl (2001), provide helpful tools for schools that are looking to adopt language that is usable by their teachers (Himmele & Himmele, 2017). This revised taxonomy focuses on four knowledge areas including: factual, conceptual, procedural and metacognitive (Anderson and Kratwohl, 2001) (Figure 4). Factual knowledge includes "basic elements students must know to be acquainted with a discipline or solve a problem in it" (Anderson and Kratwohl, p. 29). Conceptual knowledge is the "interrelationships among the basic elements within a larger structure that enable them to function together" (Anderson and Kratwohl, p. 29). Procedural knowledge involves "how to do something, methods of inquiry, and criteria for using skills, algorithms, techniques and methods" (Anderson and Kratwohl, p.29). Metacognitive knowledge involves knowledge of cognition in general as well as awareness and knowledge of one's own cognition" (Anderson and Kratwohl, p.29). The six categories in Anderson and Kratwohl's (2001) revised taxonomy, as well as the progression of lower order thinking to higher-order thinking, are outlined in Figure 5.

Figure 4

Four Key Knowledge Dimensions (Iowa State University Center for Excellence in Learning and Teaching, 2012)

Table 1. The Knowledge Dimension – major types and subtypes

concrete knowledge → abstract knowledge			
factual	**conceptual**	**procedural**	**metacognitive***
knowledge of terminology knowledge of specific details and elements	knowledge of classifications and categories knowledge of principles and generalizations knowledge of theories, models, and structures	knowledge of subject-specific skills and algorithms knowledge of subject-specific techniques and methods knowledge of criteria for determining when to use appropriate procedures	strategic knowledge knowledge about cognitive tasks, including appropriate contextual and conditional knowledge self-knowledge

(Table 1 adapted from Anderson and Krathwohl, 2001, p. 46.)

*Metacognitive knowledge is a special case. In this model, "metacognitive knowledge is knowledge of [one's own] cognition and about oneself in relation to various subject matters . . ." (Anderson and Krathwohl, 2001, p. 44).

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Figure 5

Cognitive Process Dimension (Iowa State University Center for Excellence in Learning and Teaching, 2012).

Table 2. The Cognitive Processes dimension — categories & cognitive processes and alternative names

lower order thinking skills → higher order thinking skills					
remember	**understand**	**apply**	**analyze**	**evaluate**	**create**
recognizing • identifying recalling • retrieving	interpreting • clarifying • paraphrasing • representing • translating exemplifying • illustrating • instantiating classifying • categorizing • subsuming summarizing • abstracting • generalizing inferring • concluding • extrapolating • interpolating • predicting comparing • contrasting • mapping • matching explaining • constructing models	executing • carrying out implementing • using	differentiating • discriminating • distinguishing • focusing • selecting organizing • finding coherence • integrating • outlining • parsing • structuring attributing • deconstructing	checking • coordinating • detecting • monitoring • testing critiquing • judging	generating • hypothesizing planning • designing producing • constructing

(Table 2 adapted from Anderson and Krathwohl, 2001, pp. 67–68.)

Using the TPT Cognitive Engagement Model (Figure 2) and the Cognitive Process Dimension (Figure 5) as guides, teachers assess how often they are engaging students in these cognitive processes throughout a class. Questions and prompts should require students to analyze, evaluate, and create or synthesize content that has been learned during the class, lesson or unit using a TPT that requires a short period of time to complete (Himmele & Himmele, 2017). When teachers are in quadrant 1 of the TPT Cognitive Engagement Model (Figure 2), there is low participation and low cognition which leads to student boredom and lack of investment in the importance of learning about the material. Teaching in this quadrant does not challenge students to think critically. Conversely, in quadrant 4, all students are actively engaged and thinking critically (using analysis, evaluation, synthesis or creation). This research seeks to establish the impact that the use of TPTs has on overall student participation, as well as classwide critical thinking opportunities as outlined in Bloom's revised taxonomy, in a 5th grade science class.

Methodology

This research project took place at a small independent school in Minneapolis, Minnesota. The sample in this research study was a 5th grade science class. This is a required course for all 5th grade students in the school and the 5th grade consisted of twenty-two students, five boys and sixteen girls. The 5th grade science teacher was a collaborator on this project.

Multiple forms of data were collected in order to gather information about the research question. Qualitative methods included a pre-lesson form (Appendix A) and a post-lesson form (Appendix B) that were filled out by the collaborating teacher. Field notes gathered by the researcher were also collected. Quantitative research included a tally sheet filled out by the

researcher (Figure 2). Students filled out an exit slip (Appendix C) which gathered both qualitative (anecdotes about the lesson) and quantitative (Likert scale) data.

Prior to each lesson, the teacher completed the pre-lesson form in which the teacher identified the learning goals, how it was determined whether or not students met those goals, and potential challenges in the lesson. During the classroom lesson, the researcher used the TPT Cognitive Engagement Model (see Figure 2) to gather observational data about student participation and opportunities for students to engage in critical thinking. Use of the model was intended to help visually see the relationship between total participation and higher-order thinking in the classroom (Himmele and Himmele, 2017). Observations of the students were recorded every five minutes and a tally mark was made in a quadrant indicative of the overall level of participation and critical thinking opportunities at that time in class. Anecdotal notes were taken describing student engagement during those five minute increments of time. After the lesson, the teacher filled out a post-lesson form to share reflections about how the lesson went, whether students met the learning goal(s), their perspective on the level of student engagement, and their thoughts on the positive or negative impacts of the TPT used with regard to overall class participation and engagement in critical thinking. At the end of the lesson, students filled out an exit slip that gathered information indicating whether students met the learning goals of the lesson, as well as their opinion about the effects of the TPT being used in class that day.

Prior to each lesson in the study, the collaborating teacher determined whether or not they would be using Total Participation Techniques in a given class. During the lessons, the teacher delivered the lesson as planned as the researcher observed and collected data related to the level of student participation and opportunities for students to think critically. On days when TPTs

were not being used, the lesson delivery was primarily frontal, with the teacher lecturing and students responding to questions that were asked by the teacher. On days when TPTs were used, students used:

Hold ups:

- White boards on which all students provided a written response (Quick Writes) to a prompt.
- Proton, electron and neutron response hold-up cards (Appendix D) which students held up to provide responses to questions about atoms.

On the Spots:

- Turn and Talk-Students were given a prompt and then had an opportunity to turn and talk to a partner about their answers before sharing with the greater group.

Wrap-Ups

- Exit Slips-Students provided information indicating what they had learned during the lesson which showed the teacher and the researcher if they had met the learning goal of the lesson.

The researcher reviewed student exit slips, the researcher's field notes and tally sheets, and the collaborating teacher's pre- and post-lesson forms to determine the positive, negative or neutral effects on higher student participation and critical thinking in lessons when TPTs were used.

Analysis of Data

Pre- and post-lesson forms (Appendix A and Appendix B) were used to collect data before and after each lesson. This information was used by the researcher to track whether a TPT

was being used or not during a lesson and to determine the learning goal of the lesson. Student exit slips (Appendix C) were completed at the end of each lesson. The information gathered from these slips was used by the researcher to learn: a) What students thought was an important takeaway from the lesson; b) How well students thought they participated; and c) What the students liked/disliked about how the lesson was taught. Responses from the exit slips were then compared to the information the teacher provided in pre- and post-lesson forms to determine if there was an increase in student participation and understanding of the material when TPTs were used. Field notes from the researcher were analyzed in conjunction with the tally sheets to determine effects on overall class participation when TPTs were being used and when they were not.

This research project had two goals. One was to collect data to answer the question: How do Total Participation Techniques impact the level of student engagement in a 5th grade science class? The other was to use these tools as a pilot program with a collaborating teacher to determine whether these materials would be effective if used school-wide as coaching tools to help teachers increase student engagement in class. To answer these questions, the collaborating teacher used Total Participation Techniques in three science lessons and no Total Participation Techniques in two science lessons.

Tally Sheet Analysis

When teaching with the TPT grid (Figure 2) in mind, the goal was to be in the 4th quadrant, High Cognition/High Participation as often as possible. Findings indicate that on the days when TPTs were intentionally planned for and used, students were in this fourth quadrant

5-7 times during a 40-minute class period. On days when TPTs were not intentionally planned for and used, this dropped to 1-2 times in a 40-minute class period (Table 1). In both scenarios, with TPTs being used and without, there were still periods of time when students were in the first quadrant, thus experiencing low participation and low-level cognition. In lessons where TPTs were not being used, there was a greater amount of time where students were experiencing low-level participation opportunities. The tally sheets, modeled after the Cognitive Engagement Model (Figure 2), provided data for the collaborating teacher showing where on the TPT quadrant his instruction was in 5 minutes intervals. Field notes collected by the researcher were associated with these time intervals and provided anecdotals on how the students were engaged in class.

Table 1

Amount of times students were in the 4 quadrants of the TPT grid

Date of Response	Low Cognition/Low Participation (Quadrant 1)	Low Cognition/High Participation (Quadrant 2)	High Cognition/Low Participation (Quadrant 3)	High Cognition/High Participation (Quadrant 4)
		When TPTs were used		
12-16-19	1	0	3	5
12-20-19	1	0	2	7
1-27-2020	1	1	1	5
		When TPTs were not used		
12-18-19	1	0	5	1
1-15-2020	2	0	5	2

The goal is to have students in Quadrant 4, High Cognition/High Participation, as often as possible.

Teacher Pre- and Post-Lesson Forms

Teacher pre- and post-lesson forms were filled in by the collaborating teacher on this research project. The goal of the pre-lesson form was to provide the researcher with information about the lesson, specifically if a TPT was intentionally planned for use in the lesson and to help students achieve the learning goal of the lesson. The post-lesson form was a place for the teacher to reflect on the lesson and how the use of (or lack of use of) a TPT impacted student engagement. The findings from these pre- and post-lesson forms indicated that the teacher found the students to be more engaged in the lessons when the TPTs were in use.

Upon completion of the pre-lesson form, the researcher reviewed the information to learn about the TPT planned for use in the lesson. If the researcher found a TPT was indicated for use that did not fit the goal of having students in quadrant 4 then a discussion took place. For example, when a pre-lesson form indicated the teacher would use an exit slip as the TPT for the class, it invited a discussion about where in the lesson other TPT opportunities could happen instead of waiting for the last moments of class. Other TPTs were then added to make the lesson have more opportunities for high participation and critical thinking opportunities.

The post-lesson form provided feedback from the teacher on how the class went both in instances when a TPT was used and when TPTs were not used. It should be noted that the teacher indicated turn and talks were a good way to get everyone involved, but it was difficult to informally assess everyone's understanding in these instances. Also, in using this strategy, the more assertive kids often talked first or got to say more. A strategy for how to manage this would

be necessary for ensuring effective implementation in the future. With the white board hold-ups, the teacher indicated that whiteboards were a quick assessment and everyone was involved. In using the hold-up cards, the teacher distributed premade proton, electron and neutron cards. When he asked a question such as, "Which particles would you find in the nucleus of an atom?" Students held up the card (proton, neutron, electron) that they thought indicated the answer. This had every student thinking critically and participating. Additionally, it provided the teacher with instant feedback as to whether students were understanding the material or not. While findings indicate there was off task behavior during transitions (e.g., getting white boards out or getting attention back after a turn and talk was used), the teacher found students were still collectively more engaged in discussing the material being learned when these TPTs were used.

Student Exit Slips

The exit slips were intended to gather four key pieces of information:

1. Students' interest in the topic of the lesson (quantitative);
2. Students' self-assessment of their participation in class that day (quantitative);
3. Students' assessment of the most important takeaway from the lesson of the day (qualitative); and
4. Student opinion about how the lesson was taught (qualitative).

In analyzing the quantitative data collected from the student exit slips, findings did not indicate an increase in student participation when TPTs were being used (Table 2). In fact, based on the student interest average score in comparison to student participation score, student self-assessment of participation was actually lower when TPTs were used. Further research would be needed to determine whether this is a direct result of the use of the TPTs or if it is a

result of the students not being familiar with the TPTs and that their uncertainty with the techniques impacted their perception of their participation level.

Table 2

Students' Exit Slip Responses for Self Assessment of Level of Participation in Class

Date of Response	Interest Average Score	Participation Average score
Student Exit Slip Responses for Lessons with TPT being used		
12-16-19	2.3	2
12-20-19	2.44	1.88
1-27-2020	2.29	1.95
Student Exit Slip Responses for Lessons with TPT not being used		
12-18-19	2.44	1.88
1-15-2020	1.95	2

Student exit slip responses were scored using a Likert Scale with a range of 1 indicating "I participated more than usual" and 3 indicating " I participated less than usual. Student average scores are reflected in the table.

One piece of quantitative data gathered from exit slips included responses to student assessment of the most important takeaway from the lesson of the day. When compared to the teacher pre-lesson form which indicated the learning goal for the lesson, student responses were inconclusive in determining whether the learning goal was met or not. For example, a typical

student response for the lesson on 12-16-19 was, “I learned a lot about molecules and atoms.” While not an incorrect statement about content discussed that day, it does not provide conclusive data that would support whether the student met the learning goal of the day: “Understanding that solids, liquids and gases are all different levels of energy of particular substances.” A better assessment of student learning would be to have a more specific query related to the learning goal. The open-endedness of the exit slip was not specific enough to determine the students’ assessment related to the learning goals.

Other qualitative data collected was related to students’ opinions about how the lesson was taught. This data was also inconclusive. Many students gave responses such as, “I really liked learning about matter.” While this indicated that they liked the topic being taught in class, it did not provide information as to whether or not the students actually liked the instructional approach in class that day. While interviews with all students would not be possible, clarifying the question on the exit slip with more specificity related to teaching practices used might provide a better assessment of student response to instructional approach.

Anecdotally, the participating teacher noted that when preparing the lessons in which a new TPT would be introduced, it forced some professional thinking related to both content and pedagogy that might otherwise not have happened. The teacher appreciated this particular challenge. The teacher also noted that although introducing the TPTs added ‘a little clunkiness’ to the lessons, if given more time and practice, the students, (especially those who were more hesitant), would become more comfortable with their use, allowing those students to be even more engaged in the lessons.

The data gathered does indicate that when TPTs are intentionally planned and implemented, opportunities for overall student participation went up as did opportunities for critical thinking. Additionally, the quality of the prompt or question given to students directly impacted the level of critical thinking that took place. If a prompt or question was cursory in nature, then even a well-delivered TPT was not effective. This must be considered when looking at a school-wide implementation of TPTs.

Conclusions and Recommendations

This study had two purposes. One was to determine how the use of Total Participation Techniques impacted the overall classroom participation and depth of thinking in a 5th grade science classroom. The second was to determine whether the data tools and processes used in this research could be used effectively as a school-wide professional development tool to help teachers raise student engagement in their classes.

Conclusions

- Based on tally data collected by the researcher, student participation and opportunity for cognitive engagement increased with the intentional planning and use of Total Participation Techniques (TPTs).
- Students' responses on exit slips did not indicate a preference for lessons that used TPTs over lessons that did not.
- Students' responses on exit slips related to their enjoyment of the lessons were unfinished or had too little information to interpret.

- Prompts that kept in mind focus, purpose, intent and framing were vital to students' opportunity to engage in critical thinking. If prompts were merely yes/no questions, or required only a cursory response, then even with the use of a TPT, critical thinking was challenging to achieve.

- The pre-lesson form allowed the researcher to understand in advance what TPT would be used in class and what the learning goal for the lesson was. The learning goal was then to be compared to the student responses on the exit slips. Student responses on the exit slips to the question, "What was the biggest take away from today's lesson," did not consistently indicate that the students were meeting the learning goal of the lesson.

Recommendations:

- The open-endedness of the current exit slip was not specific enough. A better assessment of student learning would be to have a more specific query on the exit slip related to the learning goal. This should be directly connected to the learning goal that the teacher indicates in the pre-lesson form. Creating a multiple choice question for the exit slip would provide the teacher with more accurate data about what students learned.

- Time is needed for students to learn how to use TPTs and any associated materials. This will take a certain level of time commitment on the part of the teacher. Further research would be needed to determine whether students' indifference to TPT use related to their participation levels is a direct result of the use of the TPTs or if it is a result of the students not being familiar with the TPTs and their uncertainty with the techniques impacted their perception of their participation level.

- The teacher pre-lesson form needs to specifically indicate the learning goal for the student and this goal needs to then be added to the student exit slip for that lesson so that the teacher can determine whether the learning goal of each lesson was met.

- Using more Likert scale questions on the exit slip such as, “How much did you like the use of the white board hold-up that was used in your class today?”, with a follow up question of, “Why did you like/not like the use of the white board hold up?”, provide more quantitative data and depend less on students having to articulate in words their thoughts on the use of TPTs.

- Small group meetings with students to discuss how they liked/disliked the way that classes were taught (with or without TPTs) may provide better information about student thoughts. The exit slip would then be kept to just gathering data about what the students learned in order to determine whether or not higher level thinking was achieved during the lesson.

- The post-lesson form was informative. It was intended to be filled out without a meeting between the teacher and the researcher. While the form provided feedback from the teacher, a follow up meeting was added in order to reflect on the lesson. This meeting created an opportunity for coaching between researcher and teacher. It is recommended that an in person follow up meeting take place between teacher and researcher for school wide roll out.

- If time permits, the researcher should have follow-up meetings after lesson implementation with small groups of students to learn whether they liked the teaching

approach or not when TPTs were used or not used. While it is not practical for all students in all classes school-wide to be interviewed, in classes where student engagement was identified as very low in a class, time for these in person meetings with students should be prioritized.

- Prior to teachers using TPTs in their classrooms, the following professional development opportunities should be offered:
    - Building Student Relationships - If teachers have not done this, TPTs may not be successful as students will not feel comfortable with the level of participation
    - Asking Good Questions - The quality and depth of questions or prompts is vital to the opportunity students have to engage in critical thinking
    - TPT Kits - Having time to create the materials needed for the different types of TPTs will help teachers be more successful in implementing as the preliminary prep work will already have been completed.

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Appendix A

Teacher Pre-lesson Data Form

Teacher Pre Lesson Data Form

* Required

1. Email address *

2. Teacher first name *

3. Teacher last name *

4. What is the name of this lesson? *

5. What is the date of this lesson? *

   Example: January 7, 2019

6. What is the time of this lesson? *

   Example: 8:30 AM

7. Will a TPT be used for this lesson? *

Mark only one oval.

- ◯ Yes
- ◯ No

8. If a TPT will be used for this lesson, which one(s) will be used? *

_____
_____
_____
_____
_____

9. What would you like to have happen as a result of this TPT? *

_____
_____
_____
_____
_____

10. Have you taught this lesson before *

Mark only one oval.

- ◯ Yes
- ◯ No

11. What is the learning goal of this lesson? *

12. How will you know what they learned? *

13. What is going well in your class? *

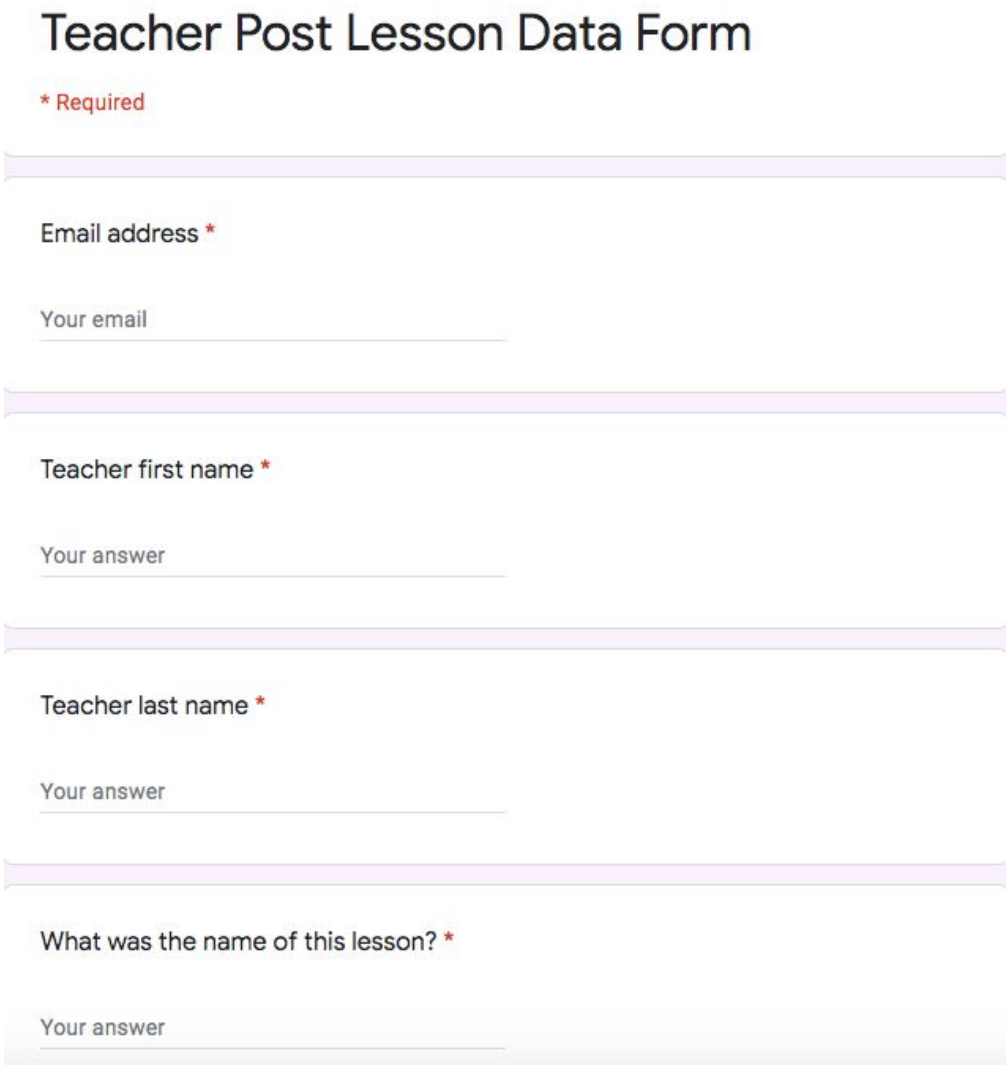
14. What isn't going so well in your class? *

15. Do you have any concerns or "look-fors" you would like me to pay attention to? *

16. How else can I support you? *

Appendix B

Teacher Post-lesson Data Form



Teacher Post Lesson Data Form

* Required

Email address *

Your email

Teacher first name *

Your answer

Teacher last name *

Your answer

What was the name of this lesson? *

Your answer

What was the date of this lesson? *

Date

mm/dd/yyyy

What was the time of this lesson? *

Time

: AM

Did the lesson go the way you had hoped? *

Your answer

What did you learn from how this lesson went? *

Your answer

Did the students all learn what you wanted them to? *

Your answer

What did you notice about how well students were engaged in class overall? *

Your answer

If you used a TPT, how do you think it impacted student engagement in this lesson? *

If no TPT was used, just write "none"

Your answer

How was the behavior of the students in class? Do you think the TPTs impacted behavior in any way.

Your answer

If you used a TPT, did you find them easy to use? Hard to use?

Your answer

If you used a TPT, would you use it again? Explain why or why not.

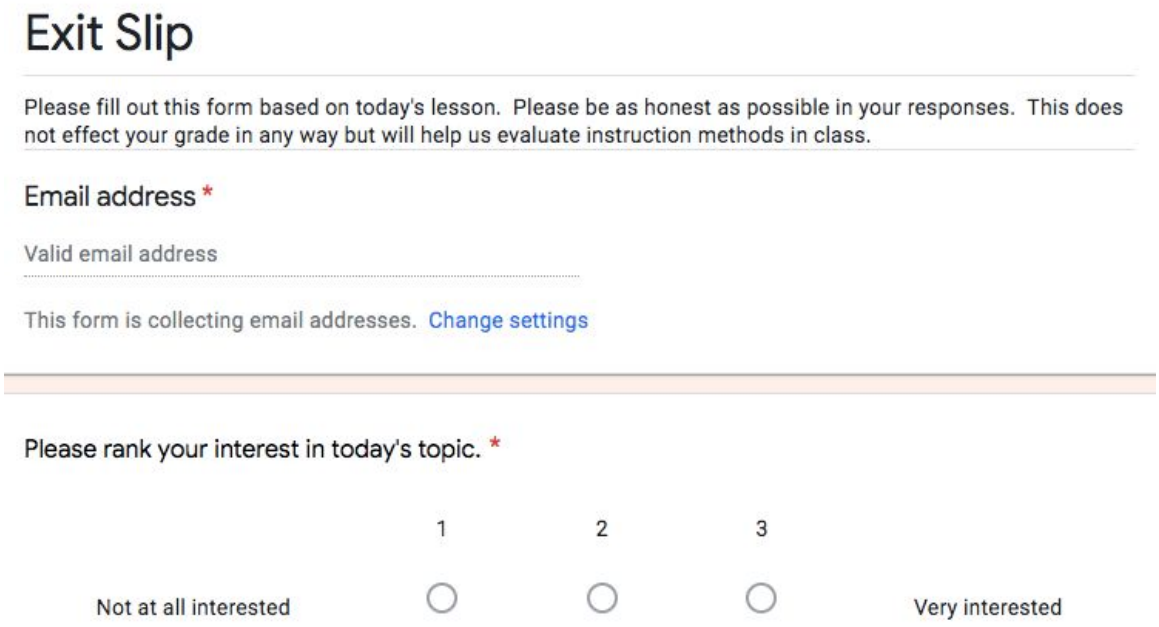
Your answer

Anything else you would like to share? *

Your answer

Appendix C

Student Exit Slip



Exit Slip

Please fill out this form based on today's lesson. Please be as honest as possible in your responses. This does not effect your grade in any way but will help us evaluate instruction methods in class.

Email address *

Valid email address

This form is collecting email addresses. Change settings

Please rank your interest in today's topic. *

	1	2	3	
Not at all interested	○	○	○	Very interested

Please rank your level of participation in class today. *

	1	2	3	
I participated more than usual	○	○	○	I participated less than usual

What is one important take away from today's class (something that you learned)? *

Please answer fully and completely. This will help us know what you may or may not need additional help with in class.

Long answer text

The information learned about in class today was... *

	1	2	3	
Brand new to me	○	○	○	Completely review

Please comment on how today's lesson was delivered. Did you like the strategies used? Did you not like the strategies used? Was there anything in particular that you liked or disliked? *

Long answer text

Appendix D

Proton and Neutron Hold-Up Cards