SeeMeTeach ®

Teacher Observation Reimagined! ©

Teacher Challenges

A Web-based Teacher & Classroom Observation App

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SMT Teacher Challenges

1. What are Teacher Challenges: *Teacher Challenges* are mini action-research investigations that focus on a strategy, a teaching model, or teacher-student interactions that are important to your teaching. *Teacher Challenges* are meant to be personal explorations of teaching that serve to gather and analyze data on some aspect of teaching that allows the teacher to determine ways to improve teaching and increase the positive effect on the learner. While there are many *Teacher Challenges*, there is no prescribed pathway to follow or any specific endpoint in mind, except improving one's teaching. Growth, change, fine-tuning one's teaching for the sake of improving student engagement and learning is the target of *Teacher Challenges*. While it is a personal exploration, the explorer quickly engages in a study of educational research to increase awareness and understanding of the existing research and guiding conclusions and learn more about the various factors linked together that form the complex act of teaching. Action research and a study of one's teaching can be an integral part of a teacher's professional life. It should begin during the teacher preparation phase, becoming an expected component of a teacher's role throughout their teaching career.

2. Teacher Challenges vs. the Typical Teacher Observation - Teacher observation, followed by feedback and coaching, can be transformative for teachers and ultimately for students. But is this the typical impact of teacher observations? There are five major issues at play that weaken teachers' confidence and most likely reduce the potential benefits of teacher observations. 1) Teachers are observed infrequently. 2) The tools used for teacher observations are often based on subjective impressions and rarely use real data. 3) The teacher observation is a generic one-size-fits-all observation. 4) The teacher observation process affords very little control to the teacher, and as such, the teacher's role is that of recipient vs. collaborator or leader. 5) Teachers do not become better observers and analyzers of their teaching when they receive the observation. They, therefore, remain dependent on the formal once-in-a-while observer.

These hefty issues beg consideration of alternatives. Some key questions that guide a search for elevating teacher observation to a higher level of positive impact are 1) How might we add more data to the process of teacher observations, feedback, and coaching? 2) How can we change the one-and-done observation to an ongoing exploration of teaching that impacts teachers' professional development and growth in more substantive ways? 3) How might teachers have more leverage in determining what gets observed and why? 4) What if the teacher observation process not only measured key aspects of teaching but also contributed to the development of teachers' skills for observing, providing cogent feedback based on data, and coaching themselves and other teachers toward excellence in teaching? And 5) How can the observation process be modified to elevate the satisfaction level of the teaching person and the administrator who serves as co-observer?

Teacher Challenges provides an alternative to current teacher observation and assessment models or might simply serve as a valuable addendum to a school's existing teacher evaluation processes or professional development because engaging in a teacher challenge is both a form of assessment and professional development. *Teacher Challenges* use

data gathered by the *SMT teacher observation tool* to help focus the lens on discrete teacher decisions made during planning, teaching, or assessing learners. Data guides feedback or serves as markers and indicators when coaching teachers to adjust or fine-tune their teaching engine to checkered flag levels of excellence. In this process, teachers search for and dig into sources of innovation and alternatives to identify and employ strategies to elevate student engagement and learning.

Teacher Challenges acknowledges the teacher's central and critical role in improving classroom instruction, increasing teachers' affordance over the process by placing more control and responsibility with the teacher while offering the administrator an equally important role as co-observer. *Teacher Challenges* makes use of the teacher's expertise in their subject matter and PCK that are deeply integrated within lesson success while using a process and a tool that fosters developing teachers who become masters at observing, analyzing, and reflecting on their teaching. A bonus also makes them adept at providing observation and feedback to others, whether a colleague or a student teacher in their classroom.

Teacher Challenges and the *SMT* observation tool directly address these shortcomings of teacher observation and provide a solution in response to the key questions guiding a search for improvement to the current practice of teacher observation. *Teaching Challenges* offer many exploration pathways. Used in conjunction with *TC's* the *SMT PD Modules* and other resources offer opportunities to explore numerous strategies or dig deeply into how to reach better the core goal of elevating student engagement in lessons. Using *SMT Teacher Challenges* teachers learn how to recognize the discrete actions and events existing in sometimes fast-paced lessons, and then examine the collected data for trends, tendencies, and patterns and learn how to recognize the critical indicators of growth. This data and indicators become the new filter and lens for planning lessons, teaching lessons, and analyzing lessons for consistency regarding the goals for instruction. Nobody must tell teachers how the lesson impacted student engagement as the data speak loud and clear. Nobody must interpret the delivery of the lesson for the teacher as the data and analysis indicate the impact on student engagement and student behavior. Using *SMT Teacher Challenges* and the *SMT teacher observation tool,* teachers develop self-analysis, feedback, and coaching skills that rival or surpass anything they have encountered in the typical teacher observation scenario.

It is exciting, encouraging, and motivating to know that even subtle changes to teaching can profoundly affect the learner and lesson. Even if one child benefits from fine-tuning teaching, it is worth much more than the effort it takes to study one's teaching to enact change that will enhance student learning. Improving teaching is a life-long pursuit, and once teachers see the value in engaging in a study of their teaching, the typical teacher observation becomes even more obsolete. It's even more exciting to have data, not impressions, be the foundation of observations and the key to improving teaching and elevating and transforming teaching from an art to more of a science and evidence-based profession. Rich and robust data are present and embedded in teaching, and now we can easily collect, analyze, and use

it for teacher observations. It is time to use tools that allow for data to undergird teacher observation, feedback coaching.

3. The Typical Flow of Activities

The What, Why and How: Situating the Research – The first step is what and why of clearly defined "challenge" that is described in the context of the pre-service or in-service teacher's classroom with a focus on how changing some aspect of teaching results in the intended and hoped for potential impact on the teacher, student engagement or learning. What and why come from personal experience and draws from the literature related directly or indirectly to that topic or issue. *Teacher Challenges* involve action research on a common teaching practice that might benefit from modifications, and the person completing the *Teacher Challenge* delineates what aspect of teaching is being investigated and generates a strong case for why this is an issue for them. When determining an important issue to investigate, the teacher focuses on a strategy, a teaching model, teacher-student interactions, or perhaps student behaviors that are important to their teaching. The goal is to change instruction in a manner that might or will increase student engagement or positively affect student learning.

The Challenge - The general steps that the teacher follows involves teaching a lesson in the normal manner, gathering, and analyzing some data, then looking at key indicators to determine the impact on the learner regarding goals for the lesson. Then the teacher changes their teaching by using a different strategy or altering how they interact with students during the lesson. More data is gathered and analyzed, then compared to the original data set to determine if the changes in pedagogy had the desired effect on student engagement and, ultimately, learning. Keep in mind that "learning" is more complex to measure, but many data and studies link student engagement to learning. The primary indicator of the effect of implementing changes to teaching and from data analysis is student engagement which is easy to document using the SMT observation tool.

The How – The following is the sequence of the components of the mini-action research effort.

Round One – Baseline Data and Indicators

1. Teach: Teach a lesson as usual and capture video
2. Train for Data Capture: Learn how to analyze the lesson and complete the SMT training needed to capture data
3. Capture and Analyze Data: Use SMT to capture and analyze data by linking the questions and corresponding data that serve as best indicators
4. Chart Data: Record data on the *Data Summary Chart* and identify what indicators to use and examine as measures of change
5. Investigate Options and Alternatives: Use *SMT Modules* or online resources to mine for how to change instruction to better target and foster goals for instruction and have a greater positive impact on student engagement and learning

Round Two – Impact of Changes to Instruction

6. Implement Change(s) and Determine Impact: Modify instruction, teach, video the lesson, then again use SMT to collect data followed by comparing data that indicates change, growth, or impact when comparing the initial lesson to the second lesson.

7. Revise and Compare: After viewing the impact from Step 6, the teacher determines if further modifications to the strategy or teacher actions will likely impact student engagement and the goals for instruction, and whether to repeat Step 6 or not.

3. Structuring Your Teacher Challenge – The author suggests that the SMT user complete at least one of the existing Teacher Challenges before structuring their own. This next section provides a template for the SMT user to craft their *Teacher Challenge* tailored to the user's skills, students, or classroom.

SMT Teacher Challenges Template

Title: The title speaks to the pedagogy being examined and what changes might occur

Example: Increasing Student Engagement Obtaining Greater Insights into Student Thinking

The What and Why: Describes a common teaching practice that might benefit from modifications and generates a strong case for why it is an issue. What aspect of teaching is being investigated? Focus on a strategy, a teaching model, or teacher-student interactions that are important to your teaching. Focus on something that might increase student engagement or positively affect student learning.

Example: When teachers lecture and students take notes, it is often a one-way flow of information with the assumption that the information is clear and that students understand what is being said or shown to them. But without periodic checks for understanding, teachers have no feedback whether students are learning or even if students are listening or mentally engaged in the lesson. Lecturing is a perfect place for students to look busy and remain comfortably non-contributing or mentally daydreaming as they take notes. Students sitting politely at desks and writing down notes is the feedback of engagement at some level, but not understanding or learning. During the lecture, a question posed and answered by one student is a sample size of 1/30th of the class – a drop in the bucket leaving 29/30ths of students thinking unknown. Waiting until a worksheet, quiz, or test to find out the impact of the lecture on student understanding is too late. However, there is a fix for this problem. It simply takes a few changes to "lecturing" to elevate levels of student engagement and obtain vital feedback on what students are or are not comprehending.

The Challenge: The general steps that the teacher will follow usually involves teaching a lesson in the normal manner, gathering, and analyzing some data, then looking at key indicators to determine impact consistent with goals for the lesson. Then the teacher changes their lesson plan and how they plan to teach the lesson by using a different strategy or altering how they interact with students during the lesson. More data is gathered and analyzed, then compared to the original data set to determine if the changes in pedagogy had the desired effect or not.

Example: In this action research "challenge," the teacher first teaches a lesson (the teacher is lecturing, and students are taking notes), and this lesson is videotaped. Next, they use SMT to gather baseline data on the current level of student engagement and feedback in that lesson. Then, the teacher plans a lesson and implements some changes specifically to increase student engagement and obtain feedback about what students know or do not know and the source of their confusion. This lesson is also videotaped, and the teacher again uses SMT for data collection to look for growth and positive change in levels of student engagement that result in robust feedback to the teacher.

In this action research “challenge,” the teacher first teaches a lesson (in which there are many opportunities for [_____], and this lesson is videotaped. Next, they use SMT to gather baseline data on [_____] is used in the lesson. Then, the teacher digs into some strategies for [_____], then plans and then teaches a second lesson with the purpose of using [greater wait-time], videotapes the lesson, and again uses SMT to gather data and analyze the data looking for gains in use of [_____], or of the effects of [_____] on student engagement or learning. This cycle may continue until the teacher is satisfied with their implementation of [_____].

The How – Round One

1. Teach a Lesson: First, teach a lesson in the manner you normally would; capture video and high-quality audio of the lesson. Then after reading the section at the end of this document on the data collection and analysis possibilities, decide what data you wish to collect and what level(s) of SMT training to go through.

2. SMT Training Suggestions for Data Collection: In this section, the user lists the training needed to gather the data that provides the best indicators of growth and change for this topic. The user would choose from the following:

Level 1 – General Overview – Basic information and how to use SMT to set up a lesson observation
Level 2 – Qualitative Mode – This mode is used if one is doing a comments-based observation
Level 3 – Basic Quantitative Mode – The training needed to do any level of data collection in Levels 4 and higher
Level 4 – M Codes and use of the Seating Chart – Learning data collection on student misbehaviors, the teacher's reaction to misbehaviors and use of the seating chart when collecting data.
Level 5 – S Codes – Learning data collection on student actions in the lesson
Level 6 – T Codes – Learning data collection on teacher actions in the lesson
Level 7 – Black Belt – Practice using all the codes and the seating chart while developing more speed and accuracy of coding.
Level 8 – Wait-time – Learning to use wait-time, then practice using all the T, M, and S codes with the seating chart while also collecting data on the use of wait-time.
Level 9 – Small Groups – Learning to collect data on behaviors and student engagement within small groups.

3. Capture and Analyze Data - Using Video and SMT To Collect Baseline Data and Growth Data as Indicators of Student Engagement

Example: Collect data with the SMT quantitative mode using T and S codes linked to the seating chart. Doing so allows the observer to collect data on the quantity and quality of student engagement and checks for understanding as evidence for student actions during the lesson. Capturing teacher actions using T Codes also allows for examining how teacher actions significantly affect student actions and student engagement.

■ **Questions and Data to Ponder:** First, questions are posed about factors that indicate the level of success of the lesson, which usually includes levels of student engagement and a profile of teacher actions. This section describes the question(s) being investigated and what specific data is being examined in association with that question. There might be more than one question posed. The indicators that help answer that question may be the same or somewhat different.

Example: What is the level of student engagement in the form of questions students ask, comments they make, or opportunities to show what they understand or have learned exhibited in the lesson? What type and number of student-to-student interactions occur? How did the lesson foster student-student interactions, or what might be changed to foster more? What did the Seating Chart Heat Map show regarding equity of student engagement? Add this data to your table after each step.

1. *The Ratio of Teacher to Student Talk – Use Code Summary to examine total teacher talk vs. student talk. Look at the T code tally percentage of time vs. S code tally percentage of time and consider the ratio of T code time vs. S code time. How is the portion of S code time significant in helping to understand what students learned from the teacher lecture?*

2. *A Breakdown of Student Contributions – Use Code Summary to view the types and quantity of student contributions to the lesson as indicated by S1 – S9 events.*

3. *Student to Student Interactions – Check Student Engagement Summary and the data for S–8 events as S-S interactions would also occur in any S-8 Think-Pair-Share event. These S-S interactions are not counted in the S-S count noted in Interaction Patterns above.*

4. *Student To Student Interactions – Use Interaction Patterns Summary and look for the S-S # representing how many S-S interactions were present in the lesson. These are events in which one student responds to another student. For example, one student says, "I think adding a heavier weight will make the truck go down the hill faster," and another student says, "I disagree. I think a lighter truck will roll down the hill faster, but why do you think more weight will make it faster?" Fostering S-S interactions is another productive way of finding out what students think or know. This interaction can be promoted by teacher actions and setting up expectations for this to occur.*

5. *Student Engagement – Use Student Engagement Summary and look for instances when students answer questions or ask the teacher or other students a question or comment to the teacher or other students about the content. Instances of S1-S5 (black lines) indicate the quantity and type of student engagement in the lesson. Few S codes on the timeline indicate very little student engagement. Also, look for S6-S9 (red lines) instances, which are checkpoints and contributions from the whole class that provides the teacher with great feedback about what was accomplished in the preceding segment of the lecture. S6-S9 events are opportunities for ALL students to contribute or be engaged with the teacher or with each other. Few S1-S9 events indicate sparse opportunities to understand student thinking and a questionable lack of impact of the teacher lecture on the student's learning.*

6. *Equitable Student Engagement: Use the Student Seating Chart Heat Map to consider how many of the students were involved in the interactions and how many were not. It is visually obvious if student actions are limited to a few students. The Demographic toggles on the Heat Map can be used to examine student engagement by gender, minority, ELL, SPED. Think about what the data suggests in terms of equity regarding student engagement.*

Questions and Data to Ponder Teacher Actions: The teacher's role and their actions directly affect student engagement in many ways. More so than others, some specific teacher actions help the teacher realize what students know or are thinking about the material. The types of questions and how teachers respond to student answers affect all the student engagement factors examined above. In turn, it increases the quantity and quality of feedback about student thinking and understanding that are of high value to the teacher. More open-ended questions (T4a and T4b) generally result in greater insights into student thinking. And, how teachers react after a student has given a response makes a big difference in whether the student will continue to share their ideas or if it has a squashing effect. What patterns of teacher-student interaction were predominating, and how were they conducive to fostering student engagement?

11. *Teacher Questions Asked – Use Code Summary for a numerical count and percentage of questions asked; look for types of questions that require students to generate a response that indicates a level of learning more than simply regurgitation of information. (T3a – T4b).*

12. *Teacher Questions Asked – Use Teacher Action Summary to examine questions posed, look at the timeline of the lesson and check to see how questions to check for understanding are infused and distributed into the lecture. (T3a, T3b, T4a, and T4b).*

13. *Teacher Responses Tendencies – Use Code Summary to examine how teachers typically respond to a student's answer and in ways that will keep the student talking and revealing more about their thinking; look for T6, T11, and T12 codes.*

14. *Teacher Question and Response Patterns – Interaction Patterns uncover how teachers respond to a student's answer. Look for patterns that will keep the student talking and revealing more about their thinking, such as T4a and T4b for questions, and perhaps T6, T11, and T12 codes for how teachers react to students' responses part of the predominant interaction pattern.*

4. Chart Data Summary and Change: The user should view the data collection charts for existing *Teacher Challenges* and craft a chart that contains the best indicators related to the challenge. An example is shown below.

Data	1st Observation	2nd Observation	3rd Observation	4th Observation
1 T Codes vs S Codes Time				
Code Summary, S total time %				
Code Summary, T total time %				
Ratio = S/T				
2-3 Total Time for S Codes				
St. Engage Sum, S1-S5 # Events				
St. Engage Sum, S1-S5 Time				
St. Engage Sum, S6-S9 # Events				
St. Engage Sum, *S6-S9 Time*				
St. Engage Sum, S1-S9 Time				
St. Engage Sum, S1-S9 # Events				
4 Distribution of S Codes in Lesson				
Teacher Actions Sum, S1-S9 Distribution				
5 Distribution of S Codes in Lesson				
St. Engage Sum, Distribution				
6 Equitable St. Engagement				
Heat Map				
Demographics				
7 Student Engagement Index				
Calculate				
7 Student Events per Minute				
Calculate				
8 Teacher Action Sum - Response				
T6 - Acknowledge				
T11 – Ask S to clarify				
T12 – S idea to rest of class				
9 St. Engage - Context of Teacher Actions				
Teacher Action Sum – Distribution of S Codes and Gaps				
Teacher Action Sum – S Codes in relation to T6, T11, T12				
10 How Teacher Choices Affect S-S				
Interaction Patterns, S-S #				
Student Engage Sum, S-S #				
Student Engage Sum, S-S Time				
11 Interact Patterns – Freq. Sequence 3				
Most				
2nd				
3rd				
11 Interact Patterns – Freq. Sequence 4				
Most				
2nd				
3rd				

Round 2 - Implementing Change and Growth

Generally, there is one simple driving question when doing action research. For example:

> *Student engagement and what I learned during a teaching session about student thinking is less than expected or desired. What is a reasonable concrete plan for increasing student engagement that would also provide increased insights into student thinking?*

5. Investigate Options and Alternatives: The teacher explores modules and online sources to learn new strategies or techniques that might help elevate the indicators to higher levels of success or locate other sources related to this challenge.

◆ *Modules That Help Modify Instruction and Specific Interventions to Increase Checks for Understanding* **–** Here, the user lists modules that provide guidance when attempting to increase the use of or improve the effectiveness of student engagement.

> *Explore the following modules for teaching tips and strategies that engage more learners during the lesson.*
>
> - *See Module 1 – A Framework for Teacher Decision-making: Understanding the teacher-student synergistic relationship as described in the Teacher Decision-making Framework*
> - *See Module 2 - Identifying Teacher Actions: Asking questions that dig into student thinking; Asking questions and responding in ways that result in more student-student interactions*
> - *See Module 3: Maximizing Student Engagement in the Classroom: Using whole-group response tools and strategies to provide maximum feedback*
> - *See Module XXX: Technology that Increases Student Engagement*

◆ *Online Sources:* There are many sources of information and suggestions that reside online. The teacher investigates this topic, searches for information, and locates the material on how improving this aspect of teaching would improve student engagement or learning in the classroom. The primary sources located and used in this exploration are listed.

> Chin, C. (2007). Teacher questioning in science classrooms: Approaches that stimulate productive thinking. Journal of Research in Science Teaching. 44,6, pp. 815-843.
>
> California State Polytechnic University, Pomona and BSCS (2017). Strategies for Effective Science Teaching: The Student Thinking and Science Content Storyline Lenses Grade K-3 STeLLA Conceptual Frameworkhttps://www.cpp.edu/respect/resources/documents/grade-k-3-strategy.pdf
>
> Reboot Foundation. Elevating Critical Thinking, Teachers' Guide. 3. Critical Thinking in Science: How to Foster Scientific Reasoning Skills. https://reboot-foundation.org/critical-thinking-in-science/

6. Implement Change and Determine Impact: Based on the investigation of options, write a plan for modifying instruction, teach, video the lesson, then again use SMT to collect data followed by comparing the initial baseline data to the data gathered from the modified lesson looking for change, growth, or impact when on critical indicators of effective instruction, teacher actions, and student engagement.

◆ After exploring teaching resources, the teacher poses suggestions for pedagogical changes that might lead to improvement or increases in the indicators of the level of success in a lesson.

Guiding Thoughts: One way to increase student engagement is to orchestrate an interactive lecture that adds teacher-student interactions or student-to-student interactions that produce student responses in between short cycles of teacher talk. Incorporating questions into the lesson informs the teacher of what students are learning at that moment and informs the teacher of how to proceed. This feedback from students might come from individuals who wish to volunteer a response, yet this only taps into a sample or two from the 25-45 students in the classroom. Instead, or in addition, how about vastly increasing the teacher's understanding of student thinking by using tools such as dry-erase boards that provide the teacher with feedback from the whole class of learners? Doing so elevates student engagement, increases feedback to the teacher on the learner's understanding, misunderstanding, or complete absence of understanding, and generally helps to produce outcomes that are very different from the traditional, low-student-engaging lecture.

This is followed by:

◆ 1) Writing a short plan for suggested changes to the lesson and your teaching that clearly states the specific modifications to the lesson, the justification for why those modifications are expected to have an impact, and what indicators are best to examine to determine the impact of the changes made to the lesson. 2) Teaching a lesson and capturing data that offers the best indicators of the target of your actions. 3) Comparing the data alongside the baseline data and looking for indicators of growth or change.

My Plan and Suggested Changes to My Teaching Based on the Data and Professional Resources – First Cycle

- *The modification(s) to my teaching or lesson are:*
  - *Obtain individual dry-erase response boards, markers, and wipes.*
  - *Ahead of the lesson, generate some questions that require students to speculate and to provide justifications for their thinking or responses.*
  - *Use the strategy of first getting individual student responses and have them hold the boards up so I can get more feedback on individual student thinking, then use Think-Pair-Share with a partner to exchange ideas and give each other feedback.*
- *Why I am making this change:*
  - *To increase student engagement and provide me with more insight into individual student thinking*
- *What indicators/data I think will show a response or will change accordingly:*
  - *Student engagement events, both individual and in pairs as measure by quantity and total time will increase. The number of S-S events will increase. I will learn much more about student thinking and whether it is accurate or contains misconceptions.*
- *Ideally or optimally, what do I think is possible?*
  - *I expect all students to write on the dry-erase boards and to engage with their partner in exchanging ideas.*

7. Revise and Compare: One cycle through this process might achieve the desired results or take more than one to reach the desired state. Teaching is complex, with many variables in play, but sometimes a very small change can have a noticeable and sometimes very large effect on the learner or the learning environment. After viewing the impact from Step 6, the teacher determines if further modifications to the strategy or teacher actions will likely impact student engagement and the goals for instruction, and whether to repeat Step 6 or not. For the second cycle, the teacher might simply keep everything the same and see if the results are the same. Or the teacher might tweak something to determine how that change affects the outcome.

◆ Second Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

◆ Third Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

5. Teacher Challenges to Choose From – Some existing *Teacher Challenges* that target common teacher or classroom situations are presented for consideration, but they are not presented in any order of preference or necessity.

- **SMT Teacher Challenge 2.0 - Elevating Student Engagement and Obtaining Feedback While Lecturing and Taking Notes**: A common classroom scenario has teachers in front of the whole class providing information to students or demonstrating how to solve a problem or a phenomenon. In short, during this part of the lesson, there is often a lot of teacher talk, with learners playing a passive role. If there are any teacher-student interactions, they tend to be the typical classroom scenario where the teacher asks a question, obtains one student response, then adds more information layered on top of the short student response, or returns to more teacher talk. During this process, student thinking remains ensconced in their brains because of low to no student engagement – feedback is absent to the teacher regarding what students are thinking or how their thinking is in line with the intended outcomes of the lesson. This is a challenge to modify instruction to increase student engagement during "lecture and notes" and bring student thinking to the surface. Hence, the impact of instruction, or lack thereof, is apparent during that moment of instruction.
- **SMT Teacher Challenge 3.0** - **Increasing Student Engagement**: Data collection and analysis can be applied to any lesson to determine the level of and changes to student engagement in the lesson.
- **SMT Teacher Challenge 4.0** - **Small Group Productivity and Equitable Contributions**: Small groups are often inefficient with inequitable contributions from small group members. In this challenge, teachers collect data on misbehavior and student engagement from participants in small groups and how teachers interact with small groups and individuals.
- **SMT Teacher Challenge 5.0** - **The Wait-Time Challenge**: The sole purpose of this challenge is to obtain a benchmark of how the teacher uses Wait-time 1 and Wait-time 2, and then to work to incorporate using more wait-time within a lesson as measured by average wait times and by wait-times associated with specific question and response types.

SMT Teacher Challenge 2.0 - Elevating Student Engagement and Feedback While Lecturing

The What and Why: When teachers lecture and students take notes, it is often a one-way flow of information assuming that the information is clear and that students understand what is being said or shown to them. But without periodic checks for understanding, teachers have no feedback whether students are learning or even if students are listening or mentally engaged in the lesson. Lecturing is a perfect place for students to look busy and remain comfortably non-contributing or mentally daydreaming as they take notes. Students sitting politely at desks and writing down notes is the feedback of engagement at some level, but not understanding or learning. During the lecture, a question posed and answered by one student is a sample size of $1/30^{th}$ of the class – a drop in the bucket leaving 29/30ths of students thinking unknown. In fact, when teachers pose questions, one survey indicates that about 60% of students were not even thinking of an answer as they simply remain passive, knowing that one of the typical few students will respond. Therefore, they can simply listen and remain non-involved. Waiting until a worksheet, quiz, or test to find out the impact of the lecture on student understanding is too late. However, there is a fix for this problem. It simply takes a few changes to "lecturing" to elevate levels of student engagement and obtain vital feedback on what students are or are not comprehending.

The Challenge: In this action research "challenge," the teacher first teaches a lesson (the teacher is lecturing, and students are taking notes), which is videotaped. Next, they use SMT to gather baseline data on the current level of student engagement and feedback in that lesson. Then, the teacher plans a lesson and implements some changes specifically to increase student engagement and obtain feedback about what students know or do not know and the source of their confusion. This lesson is also videotaped, and the teacher again uses SMT for data collection to look for growth and positive change in levels of student engagement that result in robust feedback to the teacher.

Teach A Lesson: First, teach a lesson in the manner you normally would approach lecturing and note-taking and capture video and high-quality audio of the lesson.

SMT Training Suggestions for Data Collection: After recording your first lesson, decide what data you wish to use as indicators. Then complete the related training module (if not yet completed) to prepare you to gather the data for this challenge.
Level 1 – General Overview – Basic information and how to use SMT to set up a lesson observation
Level 2 – Qualitative Mode – This mode is used if one is doing a comments-based observation
Level 3 – Basic Quantitative Mode – The training needed to do any level of data collection in Levels 4 and higher
Level 4 – Seating Chart – Just the section on how to set up a seating chart
Level 5 – S Codes – Data collection on student actions in the lesson
Level 6 – T Codes – Data collection on teacher actions in the lesson

Round 1 - Using Video and SMT To Collect Baseline Data and Growth Data as Indicators of Student Engagement: Collect data with the SMT quantitative mode using T and S codes linked to the seating chart. Doing so allows the observer to collect data on the quantity and quality of student engagement and checks for understanding as evidence for student actions during the lesson. Capturing teacher actions using T Codes also allows for examining how teacher actions significantly affect student actions and student engagement.

■ **Questions and Data To Ponder Regarding Student Actions:** What is the level of student engagement in the form of questions students ask, comments they make, or opportunities to show what they understand, learned, and exhibited in the lesson? What type and number of student-to-student interactions occur? How did the lesson foster student-student interactions, or what might be changed to foster more? What did the Seating Chart Heat Map show regarding equity of student engagement? Add this data to your table after each step.

1. The Ratio of Teacher to Student Talk – Use *Code Summary* to examine total teacher talk vs. student talk look at the T code tally percentage of time vs. S code tally percentage of time and consider the ratio of T code time vs. S code time. How is the portion of S code time significant in helping to understand what students learned from the teacher lecture?

2. A Breakdown of Student Contributions – Use Code Summary to view the types and quantity of student contributions to the lesson as indicated by S1 – S9 events.
3. Student To Student Interactions – Use *Interaction Patterns Summary* and look for the S-S # representing how many S-S interactions were present in the lesson. These are events in which one student responds to another student. For example, one student says, "I think adding a heavier weight will make the truck go down the hill faster," and another student says, "I disagree. I think a lighter truck will roll down the hill faster, but why do you think more weight will make it faster?" Fostering S-S interactions is another productive way of finding out what students think or know. This interaction can be promoted by teacher actions and setting up expectations for this to occur.

4. Student to Student Interactions – Check *Student Engagement Summary* and the data for S–8 events as S-S interactions would also occur in any S-8 Think-Pair-Share event. These S-S interactions are not counted in the S-S count noted in *Interaction Patterns* above.

5. Student Engagement – Use *Student Engagement Summary* and look for instances when students answer questions or ask the teacher or other students a question or comment to the teacher or other students about the content. Instances of S1-S5 (black lines) indicate the quantity and type of student engagement in the lesson. Few S codes on the timeline indicate very little student engagement. Also, look for S6-S9 (red lines) instances, which are checkpoints and contributions from the whole class that provides the teacher with great feedback about what was accomplished in the preceding segment of the lecture. S6-S9 events are opportunities for ALL students to contribute or be engaged with the teacher or with each other. Few S1-S9 events indicate sparse opportunities to understand student thinking and a questionable lack of impact of the teacher lecture on the student's learning.

6. Equitable Student Engagement: Use the *Student Seating Chart Heat Map* to consider how many of the students were involved in the interactions and how many students were not. It is visually obvious if student actions are limited to a few students. The *Demographic* toggles on the *Heat Map* can be used to examine student engagement by gender, minority, ELL, SPED. Think about what the data suggests in terms of equity regarding student engagement.

■ **Questions and Data to Ponder Teacher Actions:** The teacher's role and their actions directly affect student engagement in many ways. More so than others, some specific teacher actions help the teacher realize what students know or are thinking about the material. The types of questions and how teachers respond to student answers affect all the student engagement factors examined above. In turn, it increases the quantity and quality of feedback about student thinking and understanding that are of high value to the teacher. More open-ended questions (T4a and T4b) generally result in greater insights into student thinking. And, how teachers react after a student has given a response makes a big difference in whether the student will continue to share their ideas or if it has a squashing effect. What patterns of teacher-student interaction were predominating, and how were they conducive to fostering student engagement?

7. Teacher Questions Asked – Use *Code Summary* for a numerical count and percentage of questions asked; look for types of questions that require students to generate a response that indicates a level of learning more than simply regurgitation of information. (T3a – T4b).

8. Teacher Questions Asked – Use *Teacher Action Summary* to examine questions posed, look at the timeline of the lesson and check to see how questions to check for understanding are infused and distributed into the lecture. (T3a, T3b, T4a, and T4b).

9. Teacher Responses Tendencies – Use *Code Summary* to examine how teachers typically respond to a student's answer and in ways that will keep the student talking and revealing more about their thinking; look for T6, T11, and T12 codes.

10. Teacher Question and Response Patterns – *Interaction Patterns* uncover how teachers tend to respond to a student's answer. Look for patterns that will keep the student talking and revealing more about their thinking, such as T4a and T4b for questions, and perhaps T6, T11, and T12 codes for how teachers react to students' responses part of the predominant interaction pattern.

Data Summary and Change Chart

Data	1st Observation	2nd Observation	3rd Observation	4th Observation
1 Code Summary - T vs S Time				
S total time %				
T total time %				
Ratio of S/T				
2 Code Summary - Student Actions #'s				
S1: S asks T?				
S2: S asks S?				
S3: S comnt 2 T				
S4: S comnt 2 S				
S5: S answrs?				
Total S1-5				
S6: SS dry erase rsp				
S7: SS digital rsp				
S8: SS Thk Pair Shr				
S9: SS Choral rsp				
Total S6-S9				
3 – 4 Interaction Between Students				
Interaction Patterns Summary - S-S #				
Student Engagement Sum S-S # of events				
Student Engagement Sum S-S Total Time				
5 Student Engagement Summary				
S1-S5 Individual Responses Distribution				
S6-S9 Whole Group Responses				
6 Equitable Student Engagement				
Equitable Contributions-Seating Chart Heat Map				
7 Code Summary - Question Types #'s				
3a – yes/no				
3b – short answer				
4a - speculate				
4b - justify				
Total 3a-4b				
8 Teacher Actions Summary				
Questions Infused & Distributed				
9 Code Summary – Teacher Resp Tendencies				
T6 – Acknowledge				
T11 – Asking student to clarify				
T12 – Using student idea w/rest of class				
10 Interaction Patterns – Freq. Sequence 3				
Most				
2nd				
3rd				
10 Interaction Patterns – Freq. Sequence 4				
Most				
2nd				
3rd				

Round 2 - Implementing Change and Growth

◆The Driving Question

How might I increase student engagement and find out more about student thinking?

◆ *Modules that help modify instruction and specific interventions to increase student engagement and checks for understanding* **-** See the following modules for teaching tips and strategies that engage more learners during the lesson.

- Module 1: Teacher Decision-making Framework - Understanding the teacher-student synergistic relationship as described in the Teacher Decision-making Framework.
- Module 2: Identifying Teacher Actions - Asking questions that dig into student thinking; Asking questions and responding in ways that result in more student-student interactions.
- Module 3: Maximizing Student Engagement in the Classroom - Using whole-group response tools and strategies to provide maximum feedback.
- Technology that Increases Student Engagement – Module xxx

◆ After an exploration into teaching resources, the teacher poses suggestions for pedagogical changes that might lead to improvement or increases in the indicators of the level of success in a lesson.

Guiding Thoughts: One way to increase student engagement is to orchestrate an interactive lecture that consists of adding teacher-student interactions or student-to-student interactions that produce student responses in between short cycles of teacher talk. Incorporating questions into the lesson informs the teacher of what students are learning at that moment and informs the teacher of how to proceed. This feedback from students might come from individuals who wish to volunteer a response, yet this only taps into a sample or two from the 25-45 students in the classroom. Instead, or in addition, how about vastly increasing the teacher's understanding of student thinking by using tools that provide feedback from the whole class of learners? Doing so elevates student engagement, increases feedback to the teacher on the learner's understanding, misunderstanding, or complete absence of understanding, and generally helps to produce outcomes that are very different from the traditional, low-student-engaging lecture.

Follow the three-part cycle below to test out how changes to instruction affect the targeted outcome.

◆ What To Do Now: 1) Write a short plan for suggested changes to your teaching. 2) Then, teach a lesson and capture data that offers the best indicators of the target of your actions. 3) Compare the data alongside the baseline data and look for indicators of growth or change.

My Plan and Suggested Changes to My Teaching Based on the Data and Professional Resources

First Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

One cycle through this process might achieve the desired results, or it might take more than one cycle to reach the desired results. Teaching is complex, with many variables in play, but know that sometimes a very small change can have a noticeable and sometimes very large effect on the learner or the learning environment.

Second Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

Third Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

SMT Teacher Challenge 3.0 - Increasing Student Engagement

The What and Why: There would be no instruction or learning without students in the classroom. With students present in the classroom, the teacher can teach, but students may not be physically or mentally engaged, and therefore learning still may not occur. Some of the observable indicators of students who are engaged include students who respond to questions, ask the teacher or other students questions, make comments to the teacher or other students, or engage in physical manipulation of objects or creating products.

Consider the typical classroom where a select few students exhibit student engagement, such as those who enjoy answering questions or contributing to class. While optimism might cause one to conclude that students who are present and awake are engaged, studies have shown that they are not engaged, and there is a low risk of needing to do so. In a normal setting, 30% of people daydream, and surveys of students indicate that when teachers ask questions, many students (60%) are not even thinking of an answer. Are they engaged or not? One does not know unless there is direct evidence. Unfortunately, a teacher's default stance assumes student engagement and learning. When a classroom is more teacher-centered, students realize they will not likely get called on and will not have to respond; they learn to passively tread water and become one of the many quiet, non-contributing, and probably non-engaged students in the class. However, there is a fix for this problem.

The Challenge: This action research challenges one to gather direct evidence to form a baseline indicator of student engagement and then change the lesson strategy or teaching model to foster increased opportunities for student engagement or change teacher actions to elevate student engagement.

Teach A Lesson: First, teach a "normal" lesson and capture your teaching using video with high-quality audio. Then, complete the training related to the data you wish to use as indicators (if not already done) for this challenge.

SMT Training Suggestions for Data Collection:

Level 1 – General Overview – Basic information and how to use SMT to set up a lesson observation
Level 2 – Qualitative Mode – This mode is used if one is doing a comments-based observation
Level 3 – Basic Quantitative Mode – The training needed to do any level of data collection in Levels 4 and higher
Level 4 – Seating Chart – Just the section on how to set up a seating chart
Level 5 – S Codes – Data collection on student actions in the lesson
Level 6 – T Codes – Data collection on teacher actions in the lesson

Round 1 - Using Video and SMT To Collect Baseline Data and Growth Data As Indicators of Student Engagement: Now you know the rudiments of using SMT and have developed the skills associated with collecting T and S code data. With a video of your teaching loaded into a New Observation in SMT, use the quantitative mode to collect data using the S codes with Seating Chart to capture data on quantity and quality of student engagement in the context of teacher actions. Also, collect data on teacher actions (T codes).

■ Questions and Data to Ponder Regarding Student Actions: What is the quantity and type of student engagement in the lesson, and what level are students engaged as discernable by the observer beyond the passive participant? Describe and report student engagement in the form of questions asked, answered, comments made, or the number of opportunities provided to show what they understand, learned, and exhibited during the lesson. How did the lesson foster student-student interactions, or what might be changed to foster more? What did the Seating Chart Heat Map show regarding equity of student engagement? Note – after each step, add the data to your data table.

Examine Teacher Talk vs. Student Talk

1. Use *Code Summary* to compare the amount of time for teacher actions vs. student actions. Check the Total Time for S codes vs. Total Time for T Codes. S codes at 30% are more of an indicator of student engagement than at 5%. Note that it is possible to introduce small changes to a lesson to alter the S code time from 5% to 45%. After gathering the baseline data, think of how the lesson might be restructured or teacher actions altered to produce greater student engagement?

2. Using data from *Code Summary* or the Student Engagement Summary, examine the events and time related to S codes S1-S5 (students' individual actions).

3. Using data from *Code Summary* or from the *Student Engagement Summary*, examine the events and time related to S codes S6-S9 (whole group actions).

Examine Distribution of Student Actions

4. Use *Teacher Action Summary* to look at the timeline for S1-S9 events that would also indicate student engagement of some sort. Are the S code events equally distributed along the timeline, or are they clumped at the end of the notes? Somewhat equally dispersed S codes indicate many checks for understanding. Look for instances of students responding to questions (providing feedback to the teacher) or when the teacher realizes student confusion and attempts to clarify student misunderstanding. Are students asking questions or making comments indicating they are on track, confused, or maybe not engaged in the lesson?

5. Use *Student Engagement Summary* to consider the distribution across the lesson. Look at the various parts of the class or type of lesson segment and determine if or how students were engaged, as evidenced by vertical bars. Think about parts of the lesson absent of student contributions and engagement and how your lesson might be altered to produce more student engagement.

Examine Equitable Student Engagement

6. Use the *Seating Chart Heat Map* to consider how many students responded to at least one question and how many students were not part of the conversation. Use the *Demographic* toggles on the Heat Map to examine student engagement by demographics such as gender, minority, ELL, Sped. Think about what the data suggests in terms of equity regarding student engagement.

Calculate Engagement Indexes

7. Student Engagement Indexes

   Calculate Engagements Per Student: To determine the average number of engagement events per student, use *Code Summary* for the numbers. Calculate the index by using (1 point for each of S1-S5 events) plus (1 point for each of the S6-S9 events x the number of students in the total class).

   Example. Since S1-S5 represent only one student contribution, tally up all the S1-S5 events noted during the observation. Let us say there were 15 such events. Since S6-S9 represents whole group responses, then each S6-S9 event is multiplied by the number of students in class. Let's say there are 30 students in class, and there was one S6 event, one S7, and two S9 events, so there were four events x 30 students = 120.

   - S1-S5 = 15 individual events
   - S6-S9 - 4 events x 30 students = 120 individuals within group

   _____

   Total events/# of students = 135/30
   Average per student = **4.5 Engagements Per Student Index**

Calculate Student Events Per Minute of Class: This calculation indicates the frequency of student actions and whether they are close or spread apart. To calculate use data in *Code Summary* and add the number of S1-S5 events to the number of S6-S9 events and divide by the number of minutes in class.

Example: Each number next to S1-S9 represents the number of events for each type of S code. Simply tallying these numbers and dividing by the number of minutes in the lesson will result in the average number of S events per minute of class.

• S1-S5	= 15 individual events
• S6-S9	= 4 events
	_____
Total Events	= 19 events
# of events/ # of minutes of class	= 19/40
Average	**= .475 S Events Per Minute Index**

■ Questions and Data to Ponder Regarding Teacher Actions: The teacher's role and their actions directly affect student engagement in many ways. The types of questions asked and how teachers respond to student answers affect all of the student engagement factors examined above. In turn, it increases the quantity and quality of feedback about student thinking and understanding that are of high value to the teacher. More open-ended questions (T4a and T4b) generally result in greater insights into student thinking. And how teachers react after a student has given a response makes a big difference as to whether the student will continue to share their ideas or if it has a squashing effect.

Examine How Teachers Dig Deeper Into Student Responses

8. Use *Teacher Action Summary* to examine questions posed by the teacher, student responses, and the teacher's reaction that follows. Look for evidence on the timeline that consists of teacher responses T6, T11, and T12, which generally help uncover more student thinking and dig deeper into what they know or do not know.

Examine Student Engagement in the Context of Teacher Actions and Lesson Timeline

9. Using the *Teacher Actions Summary* timeline, look for the distribution of S codes in the context of the whole lesson, or within various lesson segments, and in relationship to the T codes such as question types and response types. Using T6 (acknowledging student response), T11 (asking a student to clarify), and T12 (asking other students to react to a student answer) often produces more student responses, more student-to-student interactions, and generally provide the teacher with a more in-depth understanding of student thinking. Look for gaps when S codes are absent and speculate how to modify the lesson to produce more student engagement. Look for more opportunities to insert S6-S8 actions so that the whole group is overtly engaged in responding or interacting with the teacher or other students in the class.

Examine How Teacher Choices Affect Student to Student Interactions:

10. Use *Interaction Patterns* and the S-S # to check how many of the students responded to each other at least once and what you might change to produce more student-to-student interactions.

Examine the Teacher Question and Response Patterns

11. *Interaction Patterns* uncover how teachers tend to respond to a student's answer. Look for patterns that will keep the student talking and revealing more about their thinking, such as T4a and T4b for questions, and perhaps T6, T11, and T12 codes for how teachers react to students' responses as part of the predominant interaction pattern.

Data Summary and Change Chart

Data	1st Observation	2nd Observation	3rd Observation	4th Observation
1 T Codes vs S Codes Time				
Code Summary, S total time %				
Code Summary, T total time %				
Ratio = S/T				
2-3 Total Time for S Codes				
St. Engage Sum, S1-S5 # Events				
St. Engage Sum, S1-S5 Time				
St. Engage Sum, S6-S9 # Events				
St. Engage Sum, *S6-S9 Time*				
St. Engage Sum, S1-S9 Time				
St. Engage Sum, S1-S9 # Events				
4 Distribution of S Codes in Lesson				
Teacher Actions Sum, S1-S9 Distribution				
5 Distribution of S Codes in Lesson				
St. Engage Sum, Distribution				
6 Equitable St. Engagement				
Heat Map				
Demographics				
7 Student Engagement Index				
Calculate				
7 Student Events per Minute				
Calculate				
8 Teacher Action Sum - Response				
T6 - Acknowledge				
T11 – Ask S to clarify				
T12 – S idea to rest of class				
9 St. Engage - Context of Teacher Actions				
Teacher Action Sum – Distribution of S Codes and Gaps				
Teacher Action Sum – S Codes in relation to T6, T11, T12				
10 How Teacher Choices Affect S-S				
Interaction Patterns, S-S #				
Student Engage Sum, S-S #				
Student Engage Sum, S-S Time				
11 Interact Patterns – Freq. Sequence 3				
Most				
2nd				
3rd				
11 Interact Patterns – Freq. Sequence 4				
Most				
2nd				
3rd				

Round 2 - Implementing Change and Growth

◆ The Driving Question

What strategies can I employ or how can I alter my teacher behaviors in order to increase student engagement?

◆ **Modules That May Help Modify Instruction and Specific Interventions to Increase Checks for Understanding -** See the following modules on the SMT website for teaching tips and strategies that may engage more learners during the lesson.

- Module 1: The Teacher Decision-making Framework - Understanding the teacher-student synergistic relationship and how the critical decisions work together for the targeted outcomes of instruction.
- Module 2: Identifying Teacher Actions: Asking questions that dig into student thinking; Asking questions and responding in ways that result in more student-student interactions – see
- Module x: Asking questions and responding in ways that result in more student-student interactions –
- Module 3: Maximizing Student Engagement in the Classroom - Using whole-group response tools and strategies to learn about students' understanding and provide maximum feedback to the teacher.
- Module xxx: Technology that Increases Student Engagement –

Guiding Thoughts: Lessons vary, and therefore so do the possibilities for optimizing student engagement. However, there are three things to consider when modifying the learning environment to allow for the potential to increase student engagement.

1. The strategy that is the core of the lesson can provide numerous opportunities for all students to be engaged. For example, the 5 E's strategy in science has student engagement built right into the model in all five phases. The model is framed around expectations for student actions that contribute to a powerful learning environment for students. Choosing a particular strategy or model that fosters student engagement is an important first step for constructing a lesson. For teaching science, any of the many other strategies or models that have proven effective at helping students engage with science concepts include The Learning Cycle (a forerunner to the 5 E's), Structured Controversy, Issues Analysis, Dialogues, or Problem-Based Learning. What are the expectations for the strategy being used regarding student engagement? Can student engagement be elevated by tweaking the strategy or by altering teacher actions as suggested in #2 below. Or will choosing to use a different strategy result in greater student engagement?

2. Teacher actions and choosing to use those that are compatible with the strategy or model chosen are crucial to optimizing teaching and learning. For example, a teacher-centered or teacher-directed approach to interacting with students is contrary to the purpose of the 5 E's model, reduces the model's power, reduces student engagement, and lessens the effect on learning concepts.

3. The learner is an individual, and while learning within a social environment is influenced by others, each learner must build ideas, work with the pieces, and construct concepts to make sense of them. If engaged, the learner will build their understanding at different speeds and may mis build at times which is to be expected but overall, hopefully making progress toward the endpoint. If the individual learner is engaged, they will show and tell the teacher via actions, statements, and responses to questions, thereby providing hints and clues about how and what they are building and their state of progress in the building process. If they are not physically and mentally engaged, it is like sitting on a pile of concepts hoping that comprehension occurs.

◆ After an exploration into teaching resources, the teacher poses suggestions for pedagogical changes that might lead to improvement or increases in the indicators of the level of success in a lesson.
Follow the three-part cycle to test out how the changes to instruction affected the targeted outcome.

◆ What To Do Now: 1) Write a short plan for suggested changes to your teaching. 2) Then, teach a lesson and capture data that offers the best indicators of the target of your actions. 3) Compare the data alongside the baseline data and look for indicators of growth or change.

◆ **My Plan For Changes to My Teaching Based on the Data**

First Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

One cycle through this process might achieve the desired results, or it might take more than one cycle to reach the desired results. Teaching is complex, with many variables in play, but know that sometimes a very small change can have a noticeable and sometimes very large effect on the learner or the learning environment.

Second Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

Third Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

SMT Teacher Challenge 4.0 - Small Group Productivity and Equitable Contributions

Introduction - A common pedagogical strategy used in classrooms is to group students for labs, discussions, working problem sets, or a variety of other reasons. What constitutes small group work and how small groups are structured varies considerably from simply working together in a loosely formed group to groups formed and functioning using cooperative learning parameters. Structuring lessons using small group work can be a potent learning tool. Educators hope that rich and equitable interactions occur between small group members and that all small group members are involved in the work and conversation.

Yet, small groups can be notoriously inefficient and inequitable regarding who is engaged, doing the work, and who is along for the ride. It is not unusual for small groups to have a subset of the group doing most of the work. One or two group members might dominate discussions while the others remain silent, resulting in inequitable contributions within the group. One of two group members might engage in and complete the work while other group members get carried along with the current and play a passive role as their involvement diverts to non-lesson-related topics. Passive players within small groups benefit no more or no less than passive players within the whole class setting.

If done the right way, structuring small group lessons can foster high student physical and mental engagement and be a great tool for learning and development. Like any other learning experience, choices made by the teacher before and during the lesson, and the teacher-student interactions with the small group, are critical to the success of the lesson. Student performance and outcomes vary greatly depending on teachers' choices when structuring and facilitating small group work and their actions when interacting with small groups. Data collecting on the quantity of student-student conversations and what type of interactions were present can offer up indicators of whether the lesson fostered the type of equitable interactions and work contributions desired within the small group.

The Challenge
Teach a lesson in which small groups are working to complete a task. The task should not be something they can complete in a short amount of time but should be a task that involves considerable group member interactions. Teach this lesson in a manner that you normally would teach a small group lesson. The lesson is videotaped (see guidelines below). Then you use SMT to gather and analyze the data that provides indicators of the small group members' interactions and the interactions between the teacher and the small group. SMT data collected includes S codes using the seating chart that show both the group number and individual student numbers. Teacher action data are also collected to determine prominent teacher behaviors. Observing and collecting this data can be useful when examining or analyzing individual or group dynamics and engagement and individual student or group misbehaviors. The data are recorded on the Data Summary and Change Chart.

Next, the teacher modifies the lesson to get ALL students involved equitably and productively related to the goals and objectives for that lesson. The lesson is taught, videotaped, and then analyzed again using SMT and recorded on the *Data Summary and Change Chart*, followed by comparing the initial data with the modified lesson data to determine the impact of the modifications.

In short, this challenge is about optimizing the impact on student learning and students' contributions to the small group by using powerful small group structures, lesson design, and teacher-student interactions that optimize engagement and contributions from all students. This challenge is broken down into three related segments:

☐ **Small-Group Work: Designing Lessons to Foster Student Engagement**
☐ **Small-Group Work: Teacher Interactions and Facilitation**
☐ **Small-Group Work: Fostering Equitable Interactions Between Group Members**

While one can examine all three components simultaneously, the three have been separated here to highlight the importance of each component. To derive maximum impact of interventions and witness significant outcomes associated with small group work, the teacher should understand, tweak and advance changes to all three sections of this challenge.

Teaching Segments and Capturing Ideal Audio and Video Needed to Maximize Data Collection
It is best to capture the SMT data from video simply because the person teaching can view the video, see, and hear their teaching in action. Having someone else observe and simply tell the story loses much of the meaning and most of the data embedded in the act of teaching. The video captured depends on the focus of the action research. Here are some options for gathering data:

1. Using Small Group Summary

Focus 1: The focus is on how the teacher interacts with each small group and the whole class. Therefore, the teacher wears a microphone, so the audio captures the teacher's voice and the voices of any small group members the teacher is visiting at that time. The other small group discussions would not be on video until the teacher approaches and interact with the small group. Keep in mind that when the teacher monitors or observes the small groups at work, none of the small group interactions would be captured on the audio.

■ **Focus 1A:** The SMT Small Group Data Gathered, Analyzed, and Displayed - Note that the downside of only having a microphone on the teacher is that the rich interactions that occur within a small group are not captured when the teacher is not next to the small group. This loss of student-to-student interaction data is significant, but since the focus is on how the teacher interacts with the small group, it is Ok
Data Summary Chart

Groups	Misbehavior	Teacher Interaction			Student Engagement			St Answering ?'s	Total
	M10 or M12	S1	S3	S1+S3	S2	S4	S2+S4	S5	S1-S5
All	2	33	26	59	23	18	41	62	162

Analysis of the Data **-** *Student Engagement With the Teacher and Some of What Occurs Within the Group (using S5 for all student answers to questions)*

- Teacher interaction with all groups (S1-S3, plus some of S5) = 162?
- Student to Student Interactions Within a Small Group (S2+S4 plus some of S5) = 103?
- Number of M10 or M12 misbehavior events in all groups = 2

.

Focus2: The focus is on the interactions between students within the small group. There are two possibilities to consider.

a. Do you want a sampling of the interactions from all small groups? This is only possible using a microphone for each small group that feeds into a box with a selector that allows the person recording the lesson to choose which small group's audio to feed into the recording. This setup would also capture the teacher's interaction with the small group.
Or

b. Do you want just the audio and video coming from a single small group representative of what is happening in other small groups? If so, then place one microphone on the center of the table in one of the small groups and orient the camera to capture the whole class, but ideally closest to one small group so the observer can see who is talking and contributing. When the teacher interacts with the small group, the teacher and student vocals will be captured. When the teacher is away from that small group, the video and audio capture all the student interactions from only that table of students.

■ **Focus 2A:** The SMT Small Group Data Gathered, Analyzed, and Displayed **-** If using focus 2A and the teacher is studying the actions of a typical small group, this chart provides a summary of the sampling from all groups regarding the type of interactions between small group members within specific small groups.

Focus 2A: Not Differentiating between S5 and U2 For Student's Answering Questions

Data Summary Chart

Group	Misbehavior	Teacher Interaction			Student Engagement			St Answering ?'s	Total
	M10	S1	S3	S1+S3	S2	S4	S2+S4	S5	S1-S5
G1	0	2	3	5	10	18	28	21	54
G2	1	1	0	1	22	7	29	14	44
G3	0	5	1	6	17	14	31	17	54
G4	0	1	0	1	12	21	33	34	68
G5	2	3	1	4	11	17	28	28	60
Total	3	12	5	17	72	77	149	114	282

Analysis of the Data **-** *Student Engagement Within Group (using S5 for all student answers to questions)*

- Range of S2 plus S4 Totals (smallest # to largest #) = 28-33
- Average Number of Interactions Within a Small Group (S2+S4/# of groups) = 149/5 = 29.8
- Number of M10 or M12 misbehavior events in all groups = 3

☐ = Note the somewhat similar total events per small group. If a small group had 15 events, or if the total per small group was quite small in a 45-minute work period, it would indicate minimal exchanges between small group members.

☐ = seems like healthy sums per S2 (S asks S?) and S4 (S comnt 2 S), which originate from small group member interchanges

☐ = seems like healthy sums per S5 (S answers ?) which largely should come from small group member interchanges, but also part of that number might come from students answering questions posed by the teacher when visiting and interacting with the small group. If the user wanted to differentiate between students answering a question posed by the teacher vs. answering a question posed by small group members, the observer would utilize data collection and analysis in 2B below.

Focus 2A: Differentiating between S5 and U2 For Student's Answering Questions

Suppose the user wanted to differentiate between students answering a question posed by the teacher vs. answering a question posed by small group members. In that case, the observer could code answering a teacher's question as an S5 and answering a small group member's question as a U2 code. Then S2 plus S4 plus U2 would be a more accurate representation of the interactions within a small group, as well as S1 plus S3 plus S5 would be an accurate representation of the teacher with the small group.

Data Summary Chart

Group	Misbehavior		Teacher Interaction			Student Engagement			
	M10	S1	S3	S5	S1+S3+S5	S2	S4	U2	S2+S4+U2
G1	0	2	3	5	10	10	18	16	44
G2	1	1	0	3	4	22	7	11	40
G3	0	5	1	4	12	17	14	13	44
G4	0	1	0	8	9	12	21	26	61
G5	2	3	1	6	10	11	17	22	50
Total	3	12	5	26	45	72	77	88	239

Analysis of the Data **-** *Student Engagement Within Group (using U2 for students answering questions from other small group members, using S5 when answering questions from the teacher)*

- Range of S2 plus S4 plus U2 Totals (smallest # to largest #) = 40-61
- Average Number of Interactions Within a Small Group (S2+S4/# of groups) = 239/5 = 47.8
- Number of M10 or M12 misbehavior events in all groups = 3

Focus 2B: Using One Small Group as Representative Sample and Not Differentiating between S5 and U2 For Student's Answering Questions

If collecting data using focus 2B this chart will summarize the type of student contributions when students in that one group are interacting with the teacher, with each other, and misbehaviors or off-task events associated with the members within that group. Off-task behaviors or comments could be coded as M10 events while observing.

Data Summary Chart 2B.1

Group	Misbehavior	Engagement with teacher			Engagement with other students				
	M10	S1	S3	S1+S3	S2	S4	S2+S4	S5	Total
G1	3	14	12	26	18	16	34	75	135

☐ = Note the number of interactions from one student to another within the small group = 34 (S2 + S4)

☐ = Interactions the small group members had with the teacher = 26 (S1 + S3)

Analysis of the Data - Compare the number of interactions within the small group vs. how many they had with the teacher. The small group, if functioning largely under their own power they should have many more interactions within the small group than the number of interactions with the teacher.

Sample from One Small Group, S5 Not Delineated

- Total number of interactions between small group member - S2 plus S4 = 34
- Total number of interactions between teacher and small group – S1 plus S3 = 26
- Number of M10 or M12 misbehavior events = 3

Focus 2B: Using One Small Group as Representative Sample and Differentiating between S5 and U2 For Student's Answering Questions

Data Summary Chart 2B.2

Group	Misbehavior	Engagement with teacher				Engagement with other students				
	M10	S1	S3	S5	S1+S3+S5	S2	S4	U2	S2+S4+U2	Total
G1	3	14	12	23	49	18	16	52	86	135

Analysis of the Data – Compare the number of interactions within the small group vs. how many they had with the teacher. The small group, if functioning largely under their own power they should have many more interactions within the small group than the number of interactions with the teacher, including the number of questions answered within the small group should be much higher than the number of questions answered when posed by the teacher.

Sample from One Small Group, S5 Delineated

- Total number of interactions between small group members - S2 plus S4 plus U2 = 86
- Total number of interactions between teacher and small group - S1 plus S3 plus S5 = 49
- Number of M10 or M12 misbehavior events = 3

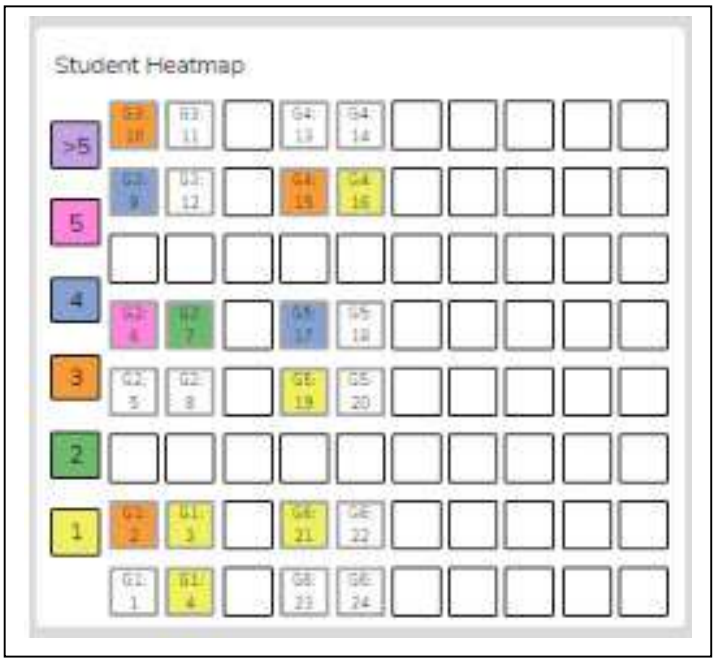
Comparison of data between using (2B.2) or not using U2 (2B.1) to differentiate from S5 - Note the large difference in total student engagement when separating students answering a question from the teacher vs. from other students in their small group. As such, it is recommended to use the extra U2 code.

Small Groups and Student Engagement – What is Possible?

When collecting data on student engagement using SMT, what tallies indicate a rich and robust interchange between small group members? It varies as the number also depends on the amount of time spent in the small group working on the task. An example that should not be considered the standard for all small group sessions, but rather what might be possible, the author has done a particular lesson many times in which the five members of the small group each had a role and were an expert in a certain necessary aspect of the simulation in which the goal was to find oil. After collecting data, the results indicated that four groups of 5 students working for about 50 minutes had upwards of 1300 student-student interactions in the form of questions, suggestions, reactions, comments, decisions, and sharing of information. This is normal for that lesson – it happens every time because of the way the lesson is set up, with each student having a role. The group must work together to achieve success. It always fosters incredible student-to-student communication and exchange. Students are totally engaged from beginning to end, and nobody is left out or can play a passive role. And the teacher's role is largely just monitoring students at work and not interfering with the incredible flow of energy and activity. Again, this shows the potential of a successful small group lesson, but don't use these numbers as a yardstick. Teach a lesson, collect the data, then change things to foster more student engagement and thinking, and then compare with the baseline data.

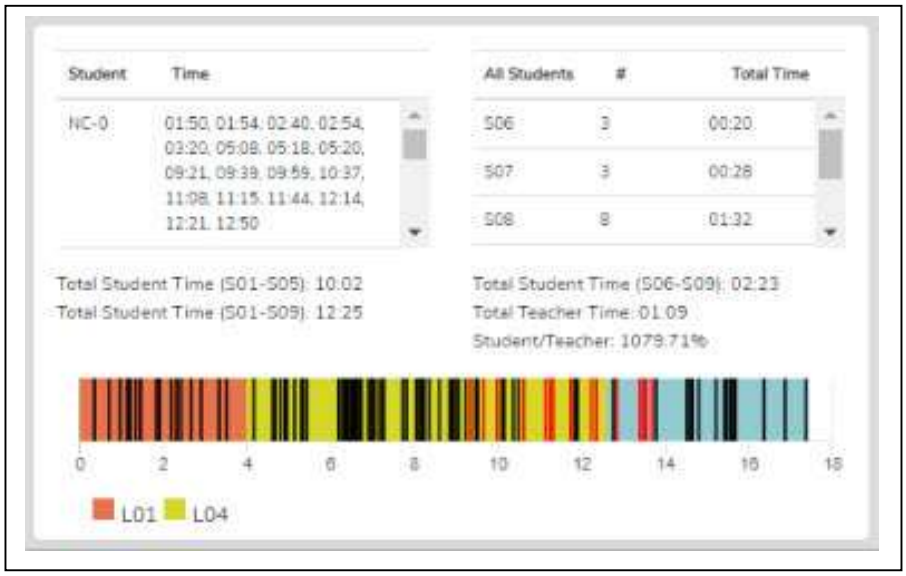
2. Using *Student Heat Map* and *Demographics*

a. This Seating Chart Heat Map presents a visual map of the quantity of S code events within a group and by group members.
b. The *Demographics* toggles can be used to separate out and examine the student contributions regarding balance and equity.



3. Using Student Engagement Summary

a. Shows the S1-S5 (individual) events in black and the S6-S9 (whole class) events in red as distributed across the timeline of the lesson.
b. If coding by student or group number, then single students can be isolated on the timeline.
c. Each data point links to a segment of video
d. Provides a summary of time of S1-S5, S6-S9, S1-S9 (total student time) and Total Teacher Time.

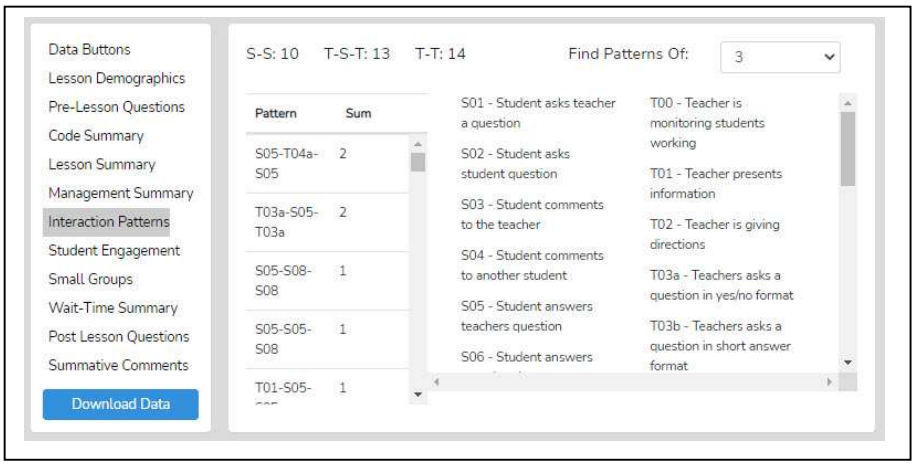


4**. Using Interaction Patterns**

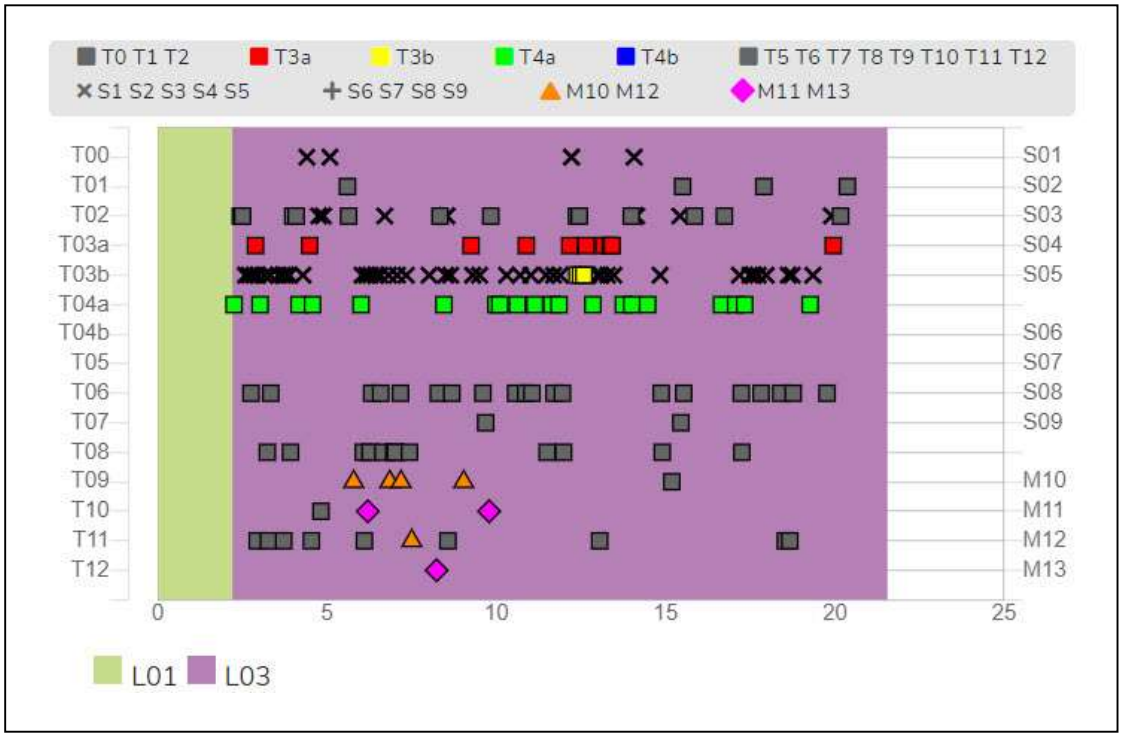
a. The teacher's patterns of interaction(s) with students can be examined from most to least occurrences. Ideally, the predominant patterns should sync with the teacher's goals and intentions for the lesson. A commonly seen teacher behavior when working with small groups is for the teacher to move from group to group, interacting to keep the group moving forward with the main goal of getting to the endpoint. The author calls this type of action "plate spinning," as one sees in a vaudeville act where the person puts the plate on a rod and spins it before moving to the next rod and spinning another plate until they have ten plates spinning on the rods. After spinning the last plate, they quickly move to the first plate because it is slowing down, and it needs a refreshed spin, before moving to plate 2 for a spin, and so on. First, teaching this way is exhausting. Second, being the force that pushes the students to keep moving forward removes this responsibility from the small group members and one of our goals for students is to have them learn to monitor their effort and work, make decisions about their efforts, results, and progress, and learn to be independent thinkers and workers, while learning to work within a team. Teachers can undermine these important outcomes by taking on the plate spinner role.

   When considering the teacher's role when interacting with small groups, is the teacher approaching the group in more of a teacher-directed manner, interacting to keep the group moving forward by directing their activities (plate spinning), or is the teacher's actions indicating more of a curious or wondering approach that keeps them informed of student intentions and progress while fostering more student-to-student interactions and more student thinking? First, look at a sequence of 3 codes (the user sets the sequence # for patterns at the top right) then a sequence of 4 codes. Look for the teacher using open-ended questions, acknowledgments vs. judgmental or directive actions.

b. The data also shows how many S-S interactions were noted during the data collection – if a small group is recorded during the lesson, this number shows the richness of the total interactions within that group during that lesson. Or, if each small group has a microphone on the table and the person running the audio recording cycled through and sampled each small group, the results will indicate the average interactions within small groups during the lesson. A larger number would indicate that the lesson was rich in interchanges between students. The Small Group Summary, Code Summary, and Student Engagement Summary would indicate the type of S code interactions recorded. Teachers can foster more S-S interactions by using wait-time, reflecting questions posed to the teacher back to the small group members, refraining from directive actions, and asking the small group to come up with options and sort out the best option for proceeding.



5. Using Teacher Behavior Summary – The Teacher Action Summary displays a visual flow of teacher actions throughout the lesson associated with student actions within the context of lesson type. The four types of questions are color-coded to make it easy to see if any question types dominate or are missing from the lesson. A glance shows the story of how the teacher interacted with the students and the flow of S codes.



Data Summary and Change Chart

Data	1st Observation	2nd Observation	3rd Observation	4th Observation
1 Small Group Summary				
1a Range (small to largest)				
Avg # of Interact S2+S4/# of grps				
# of M10 and M12 events				
# of Interact with the teacher				
1b Range (small to largest)				
Avg # of Interact S2+S4+U2/# of grps				
# of M10 and M12 events				
# of Interact with the teacher				
1c # of Interact in grp S2+S4				
# of Interact wit teacher S1+3				
# of M10 plus M12				
1d # of Interact in grp S2+S4+U2				
# of Interact wit teacher S1+S3+S5				
# of M10 plus M12				
2 Seating Chart Heat Map				
Equitable Contributions Overall				
Equitable Contributions Demographics				
3 Student Engagement Summary				
Contributions by Student Number				
4 Interaction Patterns Summary				
Student to Student Interactions #				
5 Interaction Patterns – Freq. Sequence 3				
Most				
2nd				
3rd				
5 Interaction Patterns – Freq. Sequence 4				
Most				
2nd				
3rd				
6 Code Summary – Teacher Actions				
T0: Monitoring students				
T1: Lecturing or Presenting Info				
T2: Tchr gives directions				
T3a: Tchr asks yes/no question				
T3b: Tchr asks short answer question				
T4a: Tchr asks question – speculation				
T4b: Tchr asks question – justification				
T5: Rejects response				
T6: Acknowledges response				
T7: Confirms response				

T8: Repeats response				
T9: Clarifies for the student				
T10: Answers student's question				
T11: Asks student to clarify				
T12: Uses student response with class				
6 Tchr Behavior Summary – Tchr Actions				
Distribution of Teacher Interactions				

Round 2 - Small-Group Work and Designing Lessons to Foster Student Engagement

◆ The Driving Question(s)

Questions to Ponder Regarding Lesson Design To Foster Student and Group Engagement and Equity Among Group Members

- We know the power of using cooperative learning strategies with small group structures (versus simply students in a group expected to work together). What might the teacher have done differently regarding small group strategies, and what impact might this change have on student engagement, thinking, and learning?

◆ **Modules to Modify Instruction:** See the following modules for teaching tips and strategies that engage more learners during the lesson.

- Cooperative Learning and Teaching Science
- Cooperative Learning and Teaching Mathematics

◆ After an exploration into teaching resources, the teacher poses suggestions for pedagogical changes that might lead to improvement or increases in the indicators of the level of success in a lesson.

Guiding Thoughts: Factors that can be altered that might affect small group interactions and engagement in the lesson include:

- Structuring the lesson so students have roles
- Using counters to help foster equitable student contributions – chits, markers,
- Tools for equitable contributions and lessening power structures
- Altering group size so everyone can feel included
- Monitoring who is off task and who is misbehaving in a group
- Establishing clear social goals for the groups
- Building individual accountability into the lesson
- Building group interdependence into the lesson
- Using group-sized data recording so all members can contribute and comment

Follow the three-part cycle below to test out how changes to instruction affect the targeted outcome.

◆ What To Do Now: 1) Write a short plan for suggested changes to your teaching. 2) Then, teach a lesson and capture data that offers the best indicators of the target of your actions. 3) Compare the data alongside the baseline data and look for indicators of growth or change.

My Plan and Suggested Changes to My Teaching Based on the Data and Professional Resources

First Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

One cycle through this process might achieve the desired results, or it might take more than one cycle to reach the desired results. Teaching is complex, with many variables in play, but know that sometimes a very small change can have a noticeable and sometimes very large effect on the learner or the learning environment.

Second Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

Third Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

Small-Group Work and Teacher Interactions and Facilitation

Data As Indicators: See the data gathered, analyzed, and displayed earlier in this document, and focus on the following suggestions.

- Look at the questions asked by the teacher; notice ones that are yes/no or factual type vs. ones that require students to speculate or supply justification for their ideas (T4a – T4b).
- In what ways are the activity and teacher-student interactions student-centered, where students are asked to think, articulate their ideas, listen carefully and respectfully, consider, and react to each other's thinking?
- Instances where students are generating questions and comments to the teacher and how the teacher reacts to return the thinking and decision-making role back to the students.
- Instances where the teacher fosters students generating questions and comments to each other.

■ Questions to Ponder Regarding Group Engagement and Equity Among Group Members Data

- When the teacher approached the small groups and interacted with them, what was their intention? What did they want to accomplish by doing so versus observing the groups in action?
- What was noticed about the teacher's interactions with the small groups?
- How did the teacher's interactions foster the goals for the small group and the lesson? Conversely, in what ways, if any, did the teacher's interactions lessen the intention of the lesson or weaken the intended purpose of having students work in small groups?
- Small groups are a great place to ask good questions and to foster student-to-student interactions – what did the observer notice regarding such? How might the teacher improve?
- How was the teacher's ability to pace themselves and get around to all small groups without taking too much time with one small group?

◆ **Modules to Modify Instruction:** See the following modules for teaching tips and strategies that engage more learners during the lesson.

- Cooperative Learning for Teaching Science
- Module x – Teacher and Student Interactions: Working With Small Groups

Factors that can be altered that might affect small group interactions and engagement in the lesson include:

- Identifying and noting small group work that occurs by group #
- The teacher's monitoring time vs. interacting time
- How the teacher checks on status and progress
- Questions to the group posed by the teacher that stimulates or encourage action and interaction within the group
- Monitoring participation by group members
- How to nudge small groups and individuals toward greater productivity

◆ **My Plan For Changes to My Teaching Based on the Data**

First Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

Second Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:

- Ideally or optimally, what do I think is possible?

Third Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

Small-Group Work and Equitable Interactions Between Group Members

Data As Indicators: See the data gathered, analyzed, and displayed earlier in this document, but also focus on the following suggestions.

- What are the types of questions asked that are posed between students? Note that if set up ahead of time, there could be one seating chart number designated for each of the four question types (T3a-T4a T4a – T4b) and clicking on the seating chart number for a yes/no question followed by S1 (asking the teacher a question) or S2 (asking a student a question) would provide a count of the number of questions of each type asked during the lesson. At what level are most of the questions posed to the teacher? To each other in the small group?
- How student-centered was the lesson? S Code Total Time/T Code Total Time
- How are students generating questions and comments to the teacher? Look at S1 and S3 counts.
- How are students generating questions, comments and responding to each other? Look at S2, S4, and S5
- Examine the Seating Chart Heat Map for levels of contributions by individuals within groups.
- Examine Interaction Patterns S-S # data for how many times students interacted with other students.

◆ **Modules to Modify Instruction:** See the following modules for teaching tips and strategies that engage more learners during the lesson.

- Module 1 - Asking questions and responding in ways that result in more student-student interactions and dig into student thinking

Factors that can be altered that might affect small group interactions and engagement in the lesson include:

- Building Individual accountability into the lesson, thereby getting all students involved using roles and responsibilities.
- Foster and monitor individual contributions using chits, cards, or colored markers.
- Leave microphone at one table, or place microphones on multiple tables and cycle through tables to achieve a sampling of student-student interactions at each table.
- Look at network dynamics – who is conversing with whom.

◆ **My Plan For Changes to My Teaching Based on the Data**

First Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

Second Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

Third Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

SMT Teacher Challenge 5.0 - The Wait-Time Challenge

What and Why: Knowing about and using wait-time is an important factor in student engagement and learning. Wait-time is one of those "laws" of teaching. Like gravity, it works, but there are very predictable and non-productive results when not in place. Wait-time has been practiced, either knowingly or unknowingly, since "teaching" began – at least by some teachers. It is the same today – wait-time is practiced by some but should be a part of every teacher's repertoire of teacher behaviors. The identified and documented benefits of wait-time are a semi-recent contribution (Rowe, 1963).

What is wait-time? Generally speaking, wait-time is the lapse in time between comments, statements, responses, or questions posed by either the teacher or student(s). If the goal is to get students to think, and teachers ask questions that require thoughtful answers, speculation, and justification for their ideas, then perhaps students need a bit of time to think about the question and construct a response. As such, research indicates that if teachers increase their average wait-time to at least 3.5 seconds, there is an extensive list of positive things that might occur when the average wait-time is 1 second or less. A few of the predictable and positive results of using sufficient wait-time are increases in:

* the length of student's responses increases between 300% and 700%, and in some cases, more depending upon the study
* more inferences are supported by evidence and logical argument
* the number of questions asked by students increases, and the number of experiments they propose increases
* student-student exchanges increase; teacher-centered "show and tell" behavior decreases.
* failures to respond decrease.
* disciplinary moves decrease.
* the number of appropriate responses increases
* the number of low achievers contributing increases
* different students begin contributing

When combined with better questioning, wait-time is a potent package that gives students ample time to think, allows them to keep thinking without being cut off after a second or two, and therefore keeps them engaged in the lesson. When students remain engaged in the lesson, the cycle of learning continues to new heights. When the quickest thinking student is called on right away, the thinking process of the other students is squelched, and given the fastest students (by a few seconds) get the recognition, it creates an impression of not being capable and not up to par regarding expectations. We know that sometimes the "best" answers are those that are allowed to ruminate for a bit, and with average wait-times of less than one second, there is simply not enough rumination time for creative and well-thought-out answers to form and take shape.

In short, knowing the average wait-time can be very helpful. Wait-time 1 is merely giving students a chance to think, so after asking a question, teachers pause and give students the time needed to think about an answer (not the typical few milliseconds, but 3-5 seconds or more). Even if some students raise their hands, the other students can still think for a few seconds. Wait-time 2 is waiting 3-5 seconds or more **after** the student has responded (refraining from reacting to that student's response or restating, repeating, or re-phrasing the response or calling on another student. Beyond the initial wait-time research and only because SMT can measure such, the author has created two more categories of wait-time that may be indicators of rich classroom discussion and engagement. The following are the functional definitions of how SMT captures wait-time data and differentiates between WT 1, 2, 3, and 4.

- Wait-time 1 (defined as WT1) is the lapse in time between a teacher posing a question (T3a, T3b, T4a, or a T4 code) and then following up the question with a statement, response, or another question (coded by another T code).
- Wait-time 2 (defined as WT2) is the lapse in time between a student responding to a question posed by the teacher and the teacher following up the student response with a statement, response, or another question (coded by another T code).

- Wait-time 3 (defined as WT3) is the lapse in time between a teacher posing a question (T3a, T3b, T4a, or a T4 code) and a student action/response occurring (coded by another S code). WT3 is like WT1, but the student action ends the pause, not the teacher's action.
- Wait-time 4 (WT4) is the lapse in time between a student action/response and another student action/response begins. WT4 is like WT2, but ends with a student action, not the teacher's action.

The Challenge: In this action research "challenge," the teacher first teaches a lesson (in which there are many opportunities for teacher-student interactions) and this lesson is videotaped. Next, they use SMT to gather baseline data on the current level of wait-time used in the lesson. Then, the teacher digs into some strategies for increasing wait-time, plans and teaches a second lesson with the purpose of using greater wait-time, videotapes the lesson, and again uses SMT to gather data and analyze wait-time, looking for gains in the use of wait-time. This cycle may continue until the teacher is consistently using sufficient wait-time.

Teach a Lesson: First, teach a lesson in the manner that you normally would approach questioning-responding discourse with students while capturing video and audio of the lesson.

SMT Training Suggestions for Data Collection – Easy Method: Wait-time 1 and 2 can be collected using an easy method that simply provides WT1 and Wt2 averages (not in association with T or S codes).

Level 1 – General Overview – Basic information and how to use SMT to set up a lesson observation
Level 3 – Basic Quantitative Mode – The training needed to do any level of data collection in Levels 4 and higher

General Steps:

- There are a simple sequence of T or S button clicks without knowing any specific T or S codes/buttons. While watching a teaching episode, if the teacher is talking, then click ANY T1-T12 button at the end of any T event, and doing so triggers the wait-time timing bar to activate, and wait-time is now being timed. Then when either a student or teacher begins to vocalize, click the wait-time bar to turn off the timing which triggers the end of wait-time, and then that wait-time is recorded. The cycle begins anew when the teacher or student has finished speaking, the observer immediately clicks ANY T button (if the teacher was talking) or ANY S1-S5 button (if a student was talking), and the wait-time bar says "timing." When the lesson observation is completed, the *Wait-Time Summary* should display WT averages.

SMT Training Suggestions for Data Collection – Regular Method: After recording your first lesson, complete the following training modules (if not yet completed) to prepare you to gather the data for this challenge. Doing so will provide the most robust data that includes the wait-time associated with the specific T and S codes. For example, WT's for each of the question types will be displayed so the user can determine if they are allowing more WT for higher levels of questions that require more think time.

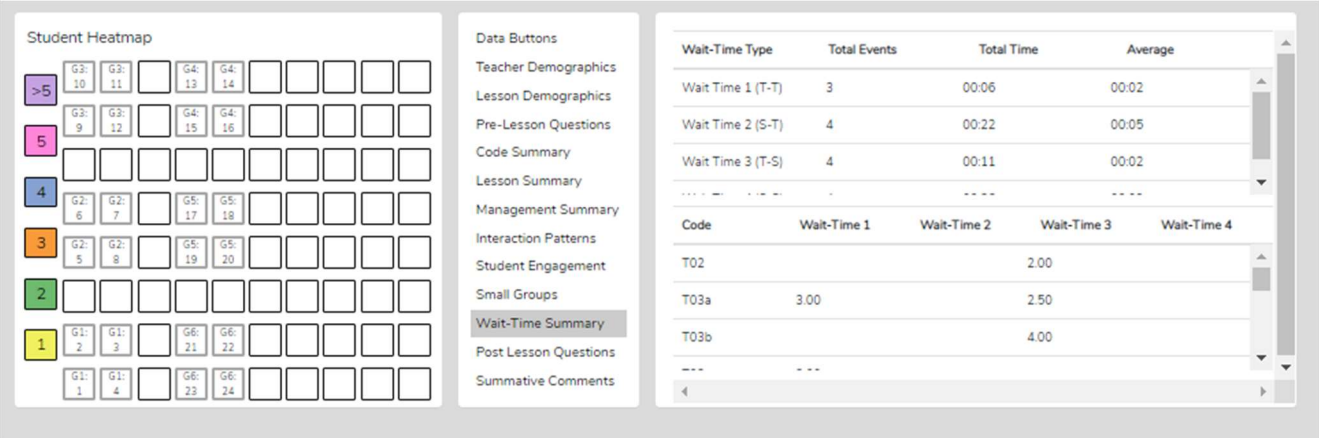
Level 1 – General Overview – Basic information and how to use SMT to set up a lesson observation
Level 2 – Qualitative Mode – This mode is used if one is doing a comments-based observation
Level 3 – Basic Quantitative Mode – The training needed to do any level of data collection in Levels 4 and higher
Level 5 – S Codes – Data collection on student actions in the lesson
Level 6 – T Codes – Data collection on teacher actions in the lesson
Level 8 – Incorporating Wait-Time

Using Video and SMT to Collect Baseline Data and Growth Data As Indicators of Using Wait-time: Collect data with the SMT quantitative mode, gathering data on T codes, S codes, and wait-time. With this data and analysis, view the average WT1 - WT4 times and the WT used in association with any T or S codes.

■ Questions and Data To Ponder Regarding The Level of Wait-time Used in a Lesson: Wait-time is an integral component of teacher-student interactions. First, view Wait-Time Summary and look at the average wait-times. Which wait-times are below or above the time of 3.5 seconds that triggers the positive results of using wait-time? Then, scroll down to view the average wait-times associated with the various T codes and S codes. The data will show wait-times associated with the four question types (T3a, T3b, T4a, and T4b) and whether open-ended questions that require a constructed

response are paired with a greater amount of wait-time to allow students to think vs. factual based or yes/no type of questions.

1. Wait-time Averages - Use Wait-Time Summary to view wait-times 1-4 by wait-time type, by events, by total time, and averages for each wait-time (shown below). How does the WT1 average correspond to the teacher's intention for using wait-time to give students ample opportunity to think about the teacher's question? How does the WT2 average correspond to the teacher's intention to use wait-time to give students ample time to think about a student's response and respond to that student? (Look at the relationship between WT2 average and the S-S count in *Interaction Patterns*.) After a student responds and the teacher pauses and slows to react, other students fill this void and may react by commenting or offering a response. This is especially true if the teacher suggests this is a desired expectation for the class.



2. Wait-time Averages By Specific T and S Code Type – Found on the bottom half of Wait-Time Summary, the average wait-times associated with each T and S code are listed. This type of critical data summary can answer questions and identify tendencies in the classroom, such as how does the average WT for question types differ concerning higher-level questions and needing more think-time to generate an answer?

3. Levels of Student Engagement – At the beginning of this challenge, some of the positive effects of using wait-time were listed. We will list them again with suggestions for SMT captured and analyzed data that might serve as indicators of change for these factors.

The length of student's responses increases between 300% and 700%, and in some cases, more depending upon the study	Code Summary and Student Engagement Summary would show an increase in total time and average time per student response. Total time for S5/# of events of S5
More inferences are supported by evidence and logical argument	Code Summary and Student Engagement Summary would show an increase in average time per student response. Increase in S2, S4, U2
The number of questions asked by students increases, and the number of experiments they propose increases	Code Summary would indicate that the number of S1 or S2 events would increase—possible increase in S1, S2, S3, S4- students asking questions or making comments.
Student-student exchanges increase	Code Summary would indicate that the number of S2 and S4 events would increase. The S-S event count number in Interaction Patterns would increase.
Teacher-centered "show and tell" behavior decreases.	Code Summary would show a decrease in overall T code time. And the S Code/T Code ratio would indicate more time used for S Codes.

Failures to respond decrease.	SMT doesn't have an S Code for failure to respond, but one of the U codes could be designated to record such behavior. U1 might be used to note this student event
Disciplinary moves decrease.	Management Summary would indicate a decrease in M10 and M12 events
The number of appropriate responses increases	SMT doesn't have an S Code for appropriate answers, but the observer might simply make a mental note of the few that exist or not.
The number of low achievers contributing increases	Student Seating Chart Heat Map provides the number of responses per student – a visual sweep of low achievers and contributions would indicate an increase or not.
Different students begin contributing	Student Seating Chart Heat Map provides the number of responses per student – a visual sweep of who contributed would indicate an increase or not.

Data Summary and Change Chart

Data	1st Observation	2nd Observation	3rd Observation	4th Observation
1 Wait-time Summary - Averages				
WT 1				
WT 2				
WT 3				
WT 4				
2 Wait-time Summary – T and S code Avg				
S1: S and T?				
S2: S asks S?				
S3: S comnt 2 T				
S4: S comnt 2 S				
S5: S answrs?				
T2: Tacher gives directions				
T3a: Teacher asks yes/no question				
T3b: Teacher asks short answer question				
T4a: Teacher asks question – speculation				
T4b: Teacher asks question – justification				
T5: Rejects response				
T6: Acknowledges response				
T7: Confirms response				
T8: Repeats response				
T9: Clarifies for the student				
T10: Answers student's question				
T11: Asks student to clarify				
T12: Uses student response with class				
3 Factors Expected to Increase or Decrease				
* Length of student's responses increases (total time for S5/# of S5 events)				
* Inferences supported w/evidence (Code Summary, add S2, S4 and U2)				
* Questions asked by students increases (Code Summary, possibly S1, S2, S3, S4)				
* Experiments they propose increases				
* Student-student exchanges increase (Interaction Pattern, S-S #)				
* Teacher-center "show and tell" decreases (Code Summary, Ratio of T Tot vs. S Tot)				
* Failures to respond decrease				
* Disciplinary moves decrease (Code Summary, add M10 and M12)				
* Appropriate responses increase				
* Low achievers contributing increases (Student Seating Chart Heat Map, visual sweep of student contributions from low achievers)				
* Different students begin contributing (Student Seating Chart Heat Map, visual sweep of contributions from "low-engagement" students)				

Round 2 – Implementing Change and Growth

Increasing Use of Wait-time

◆ The Driving Question(s)

What is the ideal wait-time? If the WT average is lower than expected or desired, what is the teacher's concrete plan for increasing and consistently using enough wait-time?

◆ **Modules to Modify Instruction:** See the following modules for teaching tips and strategies that engage more learners during the lesson.

- Understanding the teacher-student synergistic relationship as described in the Teacher Decision-making Framework – see Module 1.
- Asking questions that dig into student thinking; Asking questions and responding in ways that result in more student-student interactions – see Module 2: Identifying Teacher Actions
- Using dry erase response boards has a built-in wait-time factor. Some students get their ideas down fast, others slow - but they all get much more time to think than the typical 1-2 seconds of wait-time in most classes. See Module 3 - *Maximizing Student Engagement in the Classroom* for the many benefits of using dry erase boards.

◆ **Online Resources:**

[Grab your reader's attention with a great quote from the document or use this space to emphasize a key point. To place this text box anywhere on the page, just drag it.]

◆ After exploring teaching resources, the teacher poses suggestions for pedagogical changes that might lead to improvement or increases in the indicators of the level of success in a lesson.

Guiding Thoughts:

- When combined with better questioning, wait-time is a potent package that gives students ample time to think, allows them to keep thinking without being cut off after a second or two, and therefore keeps them engaged in the lesson. When students remain engaged in the lesson, the cycle of learning continues to new heights. When the quickest thinking student is called on right away, the other students, and this continues to happen, thereby stopping the thinking process of the other students, it creates an impression of not being capable and not up to par regarding expectations. We know that sometimes the "best" answers are those that are allowed to ruminate for a bit, and with average wait-times of less than one second, there is simply not enough rumination time for creative and well-thought-out answers to form and take shape.
- If students aren't used to a teacher using wait-time, then using wait-time may make them uncomfortable. Therefore, tell students what to expect from you. Let them know that this is a part of your normal and expected manner of interacting with them. Perhaps share some of the benefits of using wait-time with them.
- Any question posed should be accompanied by wait-time. Questions that require students to think deeply vs. respond with yes or no (generally speaking), or spout memorized material should be accompanied by longer wait-times. And as the reader works toward using more open-ended questions that require students to think. Ask the question, then allow for ample think-time.
- Put one hand behind your back and begin to count off on your fingers: 1 one-thousand, 2 one-thousand, 3 one-thousand, and so on. Meanwhile, smile and look encouraging. While in many instances, eye contact is positive, in this case, making eye contact can make students nervous, so consider looking around the room but not directly at any student. Note that 2-3 seconds may seem like an eternity to you and your students when first using wait-time. You will get used to it, and so will your students.
- After time elapses, you may see hands going up and, when appropriate, call on a student. Provide an acknowledgment and call on another student.
- If no hands go up, call on someone. Call on another student. An experienced teacher friend of mine used little cards with student's names written on them. When no hands came up, he would pick the top card, and the students knew that it was their time to respond. They could pass just once that quarter, and if they did, he noted it on the card and moved on to the second card/student's name.
- Using dry erase response boards has a built-in wait-time factor. Some students get their ideas down fast, others slow - but they all get much more time to think than the typical 1-2 seconds of wait-time in most classes. See *Maximizing Student Engagement in the Classroom* for the many benefits of using dry erase boards.

Follow the three-part cycle below to test out how changes to instruction affect the targeted outcome.

◆ What To Do Now: 1) Write a short plan for suggested changes to your teaching. 2) Then, teach a lesson and capture data that offers the best indicators of the target of your actions. 3) Compare the data alongside the baseline data and look for indicators of growth or change.

My Plan and Suggested Changes to My Teaching Based on the Data and Professional Resources

First Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

One cycle through this process might achieve the desired results, or it might take more than one cycle to reach the desired results. Teaching is complex, with many variables in play, but know that sometimes a very small change can have a noticeable and sometimes very large effect on the learner or the learning environment.

Second Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?

Third Cycle:

- The modification(s) to my teaching or lesson are:
- Why I am making this change:
- What indicators/data I think will show a response or will change accordingly:
- Ideally or optimally, what do I think is possible?