



## What Makes this TEAM Reflection Paper Successful?

**Some specific examples/evidence that contributed to the success of this paper are provided below.**

Module Two: Planning

Grade: 10-12

Subject: Chemistry

**Criteria I: Development of New Learning (*How the teacher developed new learning and what was learned*)**

How the teacher developed new learning:

- Read *Science Formative Assessment* by Page Keeley.
- Read journal article by Maria Araceli Ruiz-Primo and Erin Marie Furtak
- Discussion with teachers at a professional development session

What the teacher learned:

- “What I quickly learned, however, was that my initial focus was too narrow. Formative assessments are much more than a tool to gather information intended as a means of modifying a lesson . . . This idea made me broaden my perspective on formative assessments as instructional tools.”
- “Well-designed and implemented formative assessments will promote student thinking, uncover students’ ideas, and provide information about the students’ progress that I will use to improve instruction and thus student learning.”
- “‘Thumbs Up Thumbs Down’ is a quick way to spontaneously gather information from the students on whether they understand a particular concept.”

**Criteria II: Impact on Practice (*How the teacher’s planning practice is different*)**

- “I have decided that I will use the Frayer Model at the start of my unit. This particular assessment is a graphic organizer that I will use to gather the students’ prior knowledge about an operational definition, characteristics, examples and non-examples. By using this particular technique on the first day of the unit, I will get a sense of what the students have already learned about the topic of electrons and atomic structure.”
- “A second formative assessment that I will incorporate into the unit will be the ‘Muddiest Point’. In this activity, I will ask the students to quickly write down, on a note card, the most difficult part of the previous night’s homework assignment...I can quickly collect these cards, group into common themes, and modify that day’s lesson to address the concepts that were not understood.”

**Criteria III: Impact on students (*How the teacher anticipates student performance/learning will improve as a result of changes in practice*)**

- “This technique will make the students critically think about what they have learned and self-assess what was particularly difficult for them to understand.”
- “By making the responses anonymous, this will encourage the students who may be reluctant to speak out ... “
- “I anticipate that students will effectively use this non-threatening technique to convey their lack of knowledge via a ‘thumbs-down’ motion.”
- “I predict student scores will go up by 10-15%.”

**Indicator 3-** Teachers plan instruction in order to engage students in rigorous and relevant learning and to promote their curiosity about the world at large by: Selecting appropriate assessment strategies to monitor ongoing student progress.

**Goal:**

I will research new formative assessment techniques and integrate them into the planning of the unit on atomic structure, electron configuration and light so that my students will be able to self-assess and reflect on their own progress and knowledge

**Initial Summary:**

Currently, I use mostly summative assessments in class. Occasionally, I will use a formative assessment such as a Do Now at the beginning of a unit, but usually not on an ongoing basis. When I did, it often took the form of students using individual white boards, where I could quickly see what students were able to solve a chemistry problem. This technique worked well for its intended purpose: to identify those students who were having difficulty with that particular type of problem. What I didn't do, however, was use formative assessments in a larger context, where they are intended to drive the progression or modification of individual lessons in my unit plan. Consequently, some students did not learn the concepts well enough to allow them to be successful in chemistry.

**Reflection Paper:**

In this module, I will introduce formative assessments into the unit on light and electron configuration, since this was a historically difficult unit for the students to understand. I intend to use the formative assessments as a means of gathering real-time information on how well the students understand the content, so that I can modify the next day's lesson to concentrate on the misunderstandings.

My first learning activity was to read the text Science Formative Assessment by Page Keeley. This book describes 75 practical techniques for formative assessments, especially tailored for a science classroom. What I quickly learned, however, was that my initial focus was too narrow. Formative assessments are much more than a tool to gather information intended as a means of modifying a lesson. One quote that resonated with me was "often it is hard to tell whether a particular technique or strategy serves as instructional, assessment, or learning purpose since they are so intertwined." This idea made me broaden my perspective on formative assessments as instructional tools. Despite their name, they can be used for much more than assessments. Well-designed and implemented formative assessments will promote student thinking, uncover students' ideas, and provide information about the students' progress that I will use to improve instruction and thus student learning.

A second resource I read was a journal article by Maria Araceli Ruiz-Primo and Erin Marie Furtak from University of Colorado at Boulder and Stanford University (Educational Assessment, 11(3 & 4), 205–235. 2006). In this article, I learned about the two kinds of formative assessments: informal or interactive assessments where information of student learning is obtained as often as possible in any student-teacher interaction, and formal/planned assessments which are designed to gather information about

whole-class, student learning. It is now obvious to me that I had originally envisioned formative assessments only in the latter context, a formal and planned implementation. What I have learned in this module is that the informal or interactive assessments are an equally, if not more, powerful means of gathering information on student learning.

As I was thinking of how to include formative assessments in this unit, I remembered a discussion with another teacher from last year. That teacher had used a quick assessment to gauge the students' prior knowledge. I took that memory, along with what I learned in the "Science Formative Assessment" text, and decided on a formative assessment to be used as a pre-assessment. I have decided that I will use the Frayer Model at the start of my unit. This particular assessment is a graphic organizer that I will use to gather the students' prior knowledge about an operational definition, characteristics, examples, and non-examples. By using this particular technique the first day of the unit, I will get a sense of what the students have already learned about vocabulary words such as atom, atomic number, atomic mass unit wavelength and electron configuration. It will also give the students a chance to communicate what their misunderstandings are. I can then use this information to modify my lesson plans, if necessary, to ensure I spend more time on the concepts that are least understood, and less time on areas that the students already have a good grasp of. One misconception that I had before I started teaching, that I have since gained a better understanding of, is to not assume that students will understand the topics that I find basic or fundamental. The Frayer Model will ensure that I know what the students have already learned or not. Using the data I gather from the students' completed graphic organizers, I will plan lessons that target the areas or concepts that were identified as being deficient in the formative assessment. I will not spend unnecessary time on concepts that the students already have a good grasp on.

A second formative assessment that I will incorporate into the unit will be the "Muddiest Point". In this activity, I will ask the students to quickly write down, on a note card, the most difficult part of the previous night's homework assignment. This technique will make the students critically think about what they have learned and self-assess what was particularly difficult for them to understand. I can quickly collect these cards, group into common themes, and modify that day's lesson to address the concepts that were not understood. By making the responses anonymous, this will encourage the students who may be reluctant to speak out, especially when asked to admit shortcomings, to let me know what they are having trouble with. I especially like this technique because it is quick, and can be used spontaneously to gather and sort responses, enabling me to make immediate decisions about instruction for the class. For instance, it will allow me to place students in small groups based on their understanding of the content.

Another formative assessment technique that I learned about in discussion with other teachers during a professional development session was the "Thumbs Up, Thumbs Down" activity. Like the "Muddiest Point", this is a quick way to spontaneously gather information from the students on whether they understand a particular concept. It is very easy to simply ask, "Do you know how to calculate the energy of light if you have the frequency?" The students simply hold up a thumb if they understand, or a thumbs down if they are having difficulty. One potential pitfall of this technique is that it is not a true assessment of the students' knowledge. It is merely a student's perception of whether or not they "think" they know the material. With this in mind, I will not use this technique in an instance where it is truly imperative to properly assess their grasp of the material (that could be accomplished by a short



quiz, for instance); instead, I will use this technique as it is intended, in an informal, on-the-fly setting to gauge whether or not I need to spend a few more minutes on a particular concept.

I also plan on using the Frayer Model as a post-assessment tool. The class period before my planned review lesson, I will use this technique again, asking the same questions as in the pre-assessment. This information will allow me to quickly determine any gaps in comprehension. I will then construct questions that will address these gaps and use the questions to begin our whole class review lesson. So, for example, if I notice that a student can't describe the electron configuration of a lithium atom, then I will ask the question "What are orbitals and what is the importance of valence electrons in an atom?" That way the struggling students will have another opportunity to draw from the understanding of other classmates or get further clarification from the teacher. Additionally, students will have a very visible indication of how much they learned during the unit, compared to before the unit started.

Designing lesson plans that include formative assessments has made my planning more purposeful and will allow me to better monitor my students' comprehension. Planning this way will help me to reach more students where they are in their learning. The inclusion of the Frayer Model as a pre-assessment will allow me to customize the individual lessons in the unit. Having taught this chemistry curriculum for the second time this year, I have come to realize how much students can differ from one year to the next, in terms of prior knowledge. I want to plan instruction in this unit that is tailored to the specific needs of individual students in this year's class. The Frayer Model will enable me to make those needed adjustments to the lessons. Another related positive impact on my planning practice is a more differentiated lesson on the calculation of the properties of light. Again, students will differ in their prior knowledge and algebra skills. The formative assessment, "The Muddiest Point", will give me the information necessary to fill the holes in that knowledge. I will adjust my instruction to improve students' understanding of all aspects of the unit, including more instruction on basic algebra skills, if necessary, to fill any gaps in student learning that are uncovered through analyzing data from this formative assessment. I predict that this will increase student understanding of the content and will lead to higher scores on tests/quizzes. I hope that scores will increase by at least 10%.

I also anticipate that the use of formative assessments in this unit will yield many positive outcomes for the students. The students will end up with a better understanding of the material which should result in higher assessment scores. Through the use of the "thumbs-up/-down" technique, students will quickly self-assess their understanding of the topic at hand. I anticipate that students will effectively use this non-threatening technique to convey their lack of knowledge via a "thumbs-down" motion. The fast pace of questioning will deter students from thinking about negative consequences to their ego or peer impressions and focus them on what they still need to learn. After I compile the post -assessment data from the Frayer Model, I will design the questions and topics that will be used in this last review lesson. As the students participate in this activity, they will be gathering self-assessment information that will again help guide their test preparation.

Completing this module has certainly helped me refine my planning, and has provided me with a number of techniques that will help me gather data that I will use in planning instruction for my students. I have learned that formative assessments don't have to be difficult to implement, or tedious to design. There are simple techniques that can be used "on-the-fly" to help improve a lesson while it is underway. I also learned that planning to use formative assessment throughout the unit will result in



informing me of how I will need to differentiate instruction to meet the individual student's needs. Based on what I've learned in my readings, discussions with my mentor, and observations of other teachers, I am confident that I will be able to improve my lesson planning to fit my students' documented needs. Self-assessment of the data gathered will provide students with a clear understanding of their progress and what they need to do to improve their performance. Once they become comfortable with this, I predict student scores will go up by 10-15%. I hope my struggling students will benefit the most from all of my changes. Because of the changes to self-assessment, they won't risk embarrassment. I will work on their weaknesses with them as a small group, and as a result, they will take tests/quizzes with more understanding of the content, which will lead to more confidence, which will lead to higher test scores.

