South Valley Academy: Professional Development Plan – 2011-2012

Name: Andres Plaza
School Year: 2010-2011

Subject and Grade Level: Chemistry - 11
Level of Licensure: Level 1 (of 3)
Principal: Katarina Sandoval

Goal: 80% of students will learn the vocabulary necessary for understanding every content-related targeted skill in Chemistry class. In order to do this, I plan on using a variety of vocabulary learning strategies, study techniques, and games. This will include the use of two-column notes, flashcards, *Power Point* presentations for visual aids, hands-on activities, word walls, art projects, and vocabulary games.

Rationale:

QUALITATIVE REASONS:

Stoichiometry, huh?? Titration, what?? Sodium hypochlorite, who?? Chemistry is more than just learning about the interactions that make up matter. Chemistry is like learning another language; a language that codes for complex interactions and physical phenomenon. And, if Chemistry is studied without an understanding of and use of this other language, it is as if you are speaking Spanish to a Brazilian. It doesn't make much sense. Thus, when I reflect about how I can enhance learning in Chemistry, I remember that I am teaching more than a content area, I am teaching a new language. Stated in other words, "The material students encounter in secondary schools is complicated and not understood by just 'reading the words'" (Tovani 2000, 14). Sharing words and sounds are the first stage of a child's language acquisition. Children don't start by reading and then engage in conversation. Through experimentation in interactions (which for more mature young adults takes the form of group shares and discussions), children begin working with and discovering which words are used how and where, and what the words represent and mean in different contexts.

Chemistry is much the same. Students must begin communicating in a new language if they are to understand it. If I look at the combustion reaction: $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$, do you read it the same as I do? Students might be able to count the number of carbon, hydrogen, and oxygen atoms, but it is difficult for them to articulate what this equation is showing. They don't see what I see: a simpler, lighter butane reacting with oxygen to form a flame that leads to byproducts of carbon dioxide and water. Students must engage in the same type of discussion they practiced as a toddler. They need to practice their new language, giving words to these symbols, words that link the atomic symbols of real compounds to an actual reaction that they can see occurring. Only once students engage in discussion of the meaning of these symbols, cognizant that they are communicating in a new language, can they begin to understand what the words (or in my case) symbols on the page actually represent.

Finally, the last step of creating this meaning is through non-linguistic representations, or labs. Labs serve as real events that demonstrate scientific principles. They allow students to see and touch what they are learning. They show students that reactions don't happen on paper; they actually happen. The written reaction has an entirely different meaning now. It isn't just symbols, but a language describing a unique event that gives shape to the world around us. Like my students, I have needed practice in order to communicate in a new language. I have seen physical phenomena not easily explained. And, at the very foundation, it has been through

sharing language with others that I have gained an understanding of events that often seemed inconceivable.

QUANTITATIVE REASONS:

For each content related targeted skill, vocabulary is evaluated at a level I skill, or a "2" out of 5 on the rubric. Thus, if a student is demonstrating above a "2" in a targeted skill, it is therefore assumed that the student knows the vocabulary that is associated with that skill. For example, if Danny has a 2+ as a grade in the targeted skill "Separating Mixtures," we should assume that Danny has demonstrated via assessments that he is familiar with all of the vocabulary words necessary to demonstrate proficiency in this skill.

During the 2010-2011 school year, 21 out of 50 (42%) Chemistry students did not earn a 2 or better in one or more of the content skills. In other words, ***only 58%*** of students learned all of the content vocabulary necessary for to demonstrate proficiency for every targeted skill in Chemistry class.

Measurable Student Outcome: **80%** of students will score a "2+" or higher for every content-related targeted skill in Chemistry class.

I based this percentage on a comparison of the trends in Stanford 10 language scores between my students last year (Class of 2012) and my students this year (Class of 2013). Since I had to relate grade-level language scores to a quantifiable percentage gain, I decided that since the Class of 2013 is on average testing at about a grade level higher, I would raise my expectations about 20%. Essentially, 3 out of every 5 students learned all of the vocabulary last year, and this year 80% is equivalent to 4 out of every 5 students learning all of the vocabulary.

Table 1. Stanford 10 Language Scores

	Freshman Language Equivalent	Sophomore Language Equivalent	Junior Language Equivalent
Class of 2012	6.9	8.0	10.0
Class of 2013	7.6	9.2	Not yet assessed

Competency to be Addressed **(**Provisional Teacher – LEVEL I)**:**

Strand A: Instruction (Competencies 1 2, and 5)

2. The teacher appropriately utilizes a variety of teaching methods and resources for each area taught.

B. Uses a variety of methods, including demonstrations, lectures, student initiated work, group work, questioning, and independent practice

5. The teacher effectively utilizes student assessment techniques and procedures.

C. Maintains documentation of student progress.

Strand B: Student Learning (Competencies 3, 4, 6, and 7)

4. The teacher comprehends the principles of student growth, development and learning, and applies them appropriately.

B. Uses teaching techniques that address student learning levels, rates, and styles.

Key Actions to Meet Goal/Timeline:

Key Actions to Meet Goal	*Timeline*
(1) Assure that vocabulary for targeted skills is included as a Level I skill on every content-related targeted skill rubric.	To be completed by Oct. 3, 2011
(2) Make flashcards of new vocabulary words any time new content is presented during the class.	Continuous
(3) Create images/visual representations for new vocabulary being learned (*Power Point* presentations, a word wall, art/poster projects).	Continuous
(4) Employ the use of various note-taking forms (two-column notes), handouts, and techniques so that students are using multiple learning styles to learn vocabulary.	2nd quarter
(5) Try out vocabulary games the day after new vocabulary is learned so that students are practicing using the new vocabulary (*Mile a Minute, Around the World*).	2nd quarter
(6) Student survey for feedback on best note-taking style, games, etc. for learning new vocabulary.	Last week of the second quarter
(7) Identify "most effective" note-taking techniques and games as identified by students and compare to performance data from assessments.	Winter Break
(8) I want to continue using the most effective vocabulary learning strategies as identified through data analysis. My goal would be to stay within 5% of the most effective vocabulary strategies identified for the rest of the year.	2nd semester

Head Teacher	Department Chair	Colleague
(4) and (5) - I want to be observed over the course of three day implementing vocabulary strategies: - Explaining/defining new vocabulary words during lecture; - Live view of students using note-taking handouts to evaluate whether forms are employing multiple learning styles and making connections with new words; - During vocabulary games/activities – to ensure they are forcing students to practice using the new vocabulary.		

Resources Needed/Being Used:

9/15/2011 – Attended collaboration meeting with other staff to brainstorm ideas for developing vocabulary in the classroom. In attendance, Carli Maldonado (Spanish), David Bryant (English), Christina Herrera-Furst (Social Studies), Annette Sanchez (Social Studies), Stewart Paley (Reading).

Classroom observations – I would prefer to visit David Bryant and a math department teacher (I want to see how students learn technical terms in their classes and how they practice using that language.)

Books:

- Carleton, Lindsay, and Robert J. Marzano. *Vocabulary Games for the Classroom*. Bloomington: Marzano Research Laboratory, 2010.
- Marzano, Robert J., and Debra J. Pickering. *Building Academic Vocabulary: Teacher's Manual*. Alexandria, VA: Association for Supervision and Curriculum Development, 2007.
- Marzano, Robert J. *Teaching Basic and Advanced Vocabulary: a Framework for Direct Instruction*. Boston: Heinle, 2010.
- Short, Deborah J., MaryEllen Vogt, and Jana Echavarría. *The SIOP Model for Teaching Science to English Learners*. Boston: Pearson Education, 2011.

Artifacts:

- Rubrics for Content Skills
- Student grades for content related targeted skills. (Comparison of Class of 2012 to Class of 2013)
- Assessments used in the course (I am not going to include every assessment. One skill that I will focus on in particular is Types of Reactions, since students struggled most with this skill during the 2010-2011 school year)
- A form/handout that I will create that encourages students to link vocabulary words to multiple learning styles, sample student word walls (art/poster projects)
- Lab reports where students are using the content-related vocabulary.

Final Reflection:

My PDP for the 2011-2012 school year was the most challenging in my three years at SVA. During the past two years, I have selected topics that I was an expert in and focused on effective instruction of those topics. In my first year, I focused on how to communicate and use data in scientific writing, and last year on how to use technology tools to improve the depth of data analysis. However, this year I focused on vocabulary instruction, something I never really had to worry about in my own education as well as a topic I have little formal training on how to instruct. At the end of this year of experimentation, I may not have skillfully executed the instructional techniques I was trying to learn, but I learned some big lessons about effective

teaching strategies and even bigger global lessons about how students learn and acquire vocabulary.

Measurable Student Outcome

The data represented in Table 2 show the distribution of targeted skill scores for each content area on a scale of 1+ to 5 and the percentage of students who mastered the targeted vocabulary skills with a score of 2+ or higher. Some of the skills have significantly more difficult vocabulary than others, so comparing skill scores can be like comparing applies and oranges. However, the data suggest that next year I continue to perform the activities/strategies related to those skills with a high success rate and that I focus on improving instruction for those skills that students struggled with this year.

Table 2. Student Scores on Content-Related Targeted Skills—Semester 1.
A 2+ or higher indicates proficient knowledge of the content-related vocabulary terms.

	States of Matter	**Separation of Mixtures**	**Atomic Theory**	**Periodic Table**
1+	6	5	5	8
2	8	8	3	10
2+	18	19	16	15
3	10	7	11	5
3+	6	8	7	3
4	5	4	8	9
4+	0	1	2	3
5	0	1	1	0
2+ or better	**73.6%**	**75.5%**	**84.9%**	**66.0%**

In the end, it is somewhat difficult to evaluate the overall effectiveness of my PDP this year. I was aware that my students this year were coming in with higher reading and language ability, and I pushed myself to have a significantly higher percentage of students learn the requisite vocabulary for thoroughly understanding the targeted skills in the course. I adapted all of my rubrics so that a student must have mastered all content related vocabulary to receive a 2+ rather than just a 2. Last year, only 58% students earned at least a 2 for every targeted skill area. This year 74% of students earned at least a 2 for every targeted skill area. However, since I revised my rubric to require a 2+ to indicate mastery of vocabulary, only **66%** of students earned a 2+ or better for every targeted skill.

I didn't reach my goal of 80% of my students earning a 2+ or better for every targeted skill, but I feel confident in continuing to use and improve upon strategies that I learned this year. I think the lessons learned will make me a far more effective teacher in the future. I look

forward to next year when I can continue to focus on vocabulary instruction and a data-based approached to improve those skills with which students struggled.

Analysis of Vocabulary Instruction Strategies:

Without a doubt, the most significant lesson that I learned this year is that there is a big difference between teaching students strategies to be successful and getting the students to actually use them. In other words, just because students know strategies to better learn vocabulary doesn't mean they are actually going to do it. I am still learning how to balance the appropriate amount of class time to spend practicing the vocabulary and how to get students to actually take the initiative to learn it on their own. Undoubtedly, this is a growth area for me. How do I get students to actually use the strategies and learn the vocabulary on their own?

I opted to use flashcards as an instructional technique, because these are something that is heavily used by college science students. Some students get through General Chemistry without them, but as soon as you hit Organic Chemistry, it's clear that in the Chemistry world, flashcards are imperative. This past summer in my Biochemistry course, the vast majority of students could be seen using hundreds of flashcards they created in preparation for exams. The reason flashcards are useful in Chemistry is because they can be used to represent vocabulary words that represent more complex ideas such as atomic structures, chemical structures, or reaction mechanisms. For example, the general structure for a carboxylic acid is a carbon double bonded to oxygen with an alcohol (OH) bonded to the end; much easier seen than explained (can't you tell?). Flashcards allow students to represent these structures through pictures and diagrams that make far more sense than an explanation.

I offered students time to make flashcards for all of the new vocabulary terms that we covered this semester. However, there were some major challenges with the use of flashcards for the students. Number one, just because they made them didn't mean they would actually use them. Throughout the year, I observed firsthand how vital repetition was in learning the vocabulary, and I will cover some good activities that use repetition later. However, students often defeated the purpose of making the flashcards, because they wouldn't use them. They often felt that as soon as they were done making the flashcards, the task was completed. Unfortunately, the creation is only the beginning of the task, and the real challenge is to use the flashcards and hold oneself accountable for the information on them. Another challenge with flashcards is high school students' organization skills. Frequently, it takes them 3 or more minutes to find the homework they did the previous evening. Now, introduced to a large number of small pieces of paper, the flashcards serve more as backpack confetti than they do as study tools. I plan on continuing using flashcards next year and will purchase them rings and a couple of hole punches so they have a place for them. I offered them rubber bands, and some of them simply clipped their flashcards into their binders; however, many students lost them in their backpack oblivion.

Heading into next year, I am also going to reorganize the way that I use flashcards, because I think the practice making and using them is so important. That is the real studying, which something our students could use some help on how to do. This year, I had them make the

flashcards during class so that they could use them to study in the evening. In other words, there was no way for me to assess whether or not they were actually using the flashcards. Next year, I will have them make the flashcards for homework and use the class time for studying the flashcards. In this way, I can hold students accountable for putting in the work and study time necessary to learn the vocabulary.

Another notable adaptation that I made for many reasons was to use Power Point presentations as a method for disseminating information **(Artifacts #7, #9, #11, #13)**. Given that this is the primary method for instruction in college, it is imperative that students get used to this model for them to be successful in college. Nevertheless, Power Points can also be very useful when it comes to vocabulary instruction. Students this year were exposed to vastly more images and models of content than they were in previous years. It also enhances understanding, because videos and other sorts of multimedia can be linked to provide various sources of input using similar language that often sounds different since someone else is saying it.

One project that I found to be particularly successful for having the students learn the vocabulary was a timeline they constructed reflecting the development of different theories of the atom, including both important models and experiments. Two examples of the timelines they created are provided as **Artifact #4** and **Artifact #5.** The timelines were associated with the Atomic Theory skill that had the highest rate of student success. This project was effective in helping them learn the vocabulary for a number of reasons. First, students were engaged in an authentic task, without being totally cognizant that it was a vocabulary learning exercise. They were engaged in higher level thinking about drawing and modeling the experiments/new atomic structures, and explaining how experiments and new understandings lead to new models. But, at the same time, they were drawing and explaining the models and experiments they needed to understand, therefore simultaneously modeling and describing the vocabulary ideas they were supposed to know. Another reason this project seemed to work is because I had some amazing artists in class this year, and this gave them an opportunity to take pride in and share their talents in a class where these talents aren't usually recognized. The artists really invested in this task, and their focus on the detail in their drawings provided deep connections between the words describing the models and the models themselves. The students who invested in this project had no problems passing the vocabulary sections of the Atomic Theory test **(Artifact #12)**. I will definitely do this project next year and would be interested in integrating more of these types of projects where students are not overtly focused on vocabulary acquisition.

Hands-on activities can also be a great way to reinforce students' vocabulary understanding, albeit in Chemistry this can often be difficult. It is not easy to represent microscopic ideas that are impossible to directly observe. Nevertheless, one hands-on activity that has to be used when teaching wave mechanics is slinky play. This allows students to directly observe wave properties like frequency, wavelength, and amplitude, which not only can be observed but manipulated. Instead of asking them to measure the frequency, they can change the frequency. When asked to increase the frequency, they not only learn what the word means, but they gain an understanding of how to do it and what it looks like. This can be easily applied to amplitude and wavelength. Not only that, they can start to observe the relationships between vocabulary terms. If I increase the wavelength, what does that do to the frequency, or vice versa.

Thus, the activity not only informed them about the definitions, but the relationships between the definitions. On the test covering this topic, students had clear and accurate understandings of these topics. These scores are represented in the Atomic Theory exam **(Artifact #12)**, which has the highest success rate of any of the Semester 1 Exams.

I make sure I do at least one lab activity with each targeted skill in the class **(Artifacts #3, #6)**. Primarily, it is to engage students in the applications of what they are learning but perhaps more importantly, labs are what make Chemistry a fun class. In terms of application, use, and comfort with Chemistry vocabulary, labs and lab reports are really the ultimate test. When reading through the background information, students often have to decode concepts that they are familiar with and haveheard before but are presented in a different way, the real and practical applications of the concept. Just figuring out what to do in a lab or the purpose of performing the lab can often be difficult for some students to figure out. Also, when reading through the lab procedure, students must be familiar with the equipment and techniques used in order to execute the lab. Both of these things tend to depend on a unique vocabulary set. In order to make sure students understand the vocabulary, I have them complete lab notebooks so that I can be confident that they know what they are doing in the lab and how to perform it. Throughout the lab and ultimately in the lab report, students are required to make observations using vocabulary. They must use much of the vocabulary they have learned in order to explain how they performed the lab and what they discovered doing it.

One game that I wasn't very effective implementing was the *Mile a Minute* activity, which just happened to be observed by the institution's Head Teacher. This game is probably more appropriate for general vocabulary instruction in an English class than it was for a Chemistry class. Students could correctly identify vocabulary words, but it didn't necessarily correlate with a correct understanding of the particular words definition and usage in Chemistry. In this game, students had 60 seconds to get their team to guess as many words as appeared on a notecard they randomly selected. Students used very good interpretive strategies in order for their teammates to guess the correct words, but their descriptions frequently did not correlate with an increased understanding of the vocabulary term. For example, when describing a polar bond, "the bottom of the earth where penguins live," did not exactly lead to understanding a bond where electrons are shared unequally. In other words, Chemistry has distinct definitions for words that are vital to understanding a certain topic, but an interpretive activity like this might not have led to a better understanding of that word. At the very least, I had them take two-column notes during the game that they could use as a study guide to identify words they did and did not know to focus on while they studied. But, because of the interpretive nature of the game, I don't think it was that appropriate for Chemistry. I will continue to use the two-column note structure I employed to other games we play, but I will probably leave this one behind in the future.

On the flip side, I found one game that I thought was awesome. It's not associated with any of the skills presented in this PDP, which is based on first semester data, but I used it in RtI sessions and in class, both with the 9^{th} and 11^{th} graders. I like it because it's competitive, kinesthetic, and repetitive. Almost every student who was in the RtI session came in and passed the vocabulary component of the Chemical Bonds targeted skill the following day. The activity,

Around the World, is quite simple. One student stands up behind another student, and the teacher reads the definition of the word. The first student to say the correct word moves to the next student and tries to make it around the world. If the other person wins, the standing student takes the seat and the game continues. This gets students in a competitive mood, plus up and moving around with something that could be boring. Key rules are that both students are penalized for guessing, and the game restarts with the next two students. Otherwise, they will just rifle off every word they can think of. It's up to the teacher to put the words on the board or not, which should be based on an understanding of students' overall comfort level with the vocabulary. This is a game I plan on using more often next year; kids loved it!

Head Teacher's Feedback to Andres Plaza

Andres, as always, I love reading your PDP learning journey! This year you employed ten different techniques, activities, and games to help students learn Chemistry vocabulary. You devised a well-crafted PDP with a clear outcome measure and presented multiple artifacts to demonstrate the ways in which vocabulary was applied and practiced. You stretched yourself as a teacher, noting "During the past two years, I selected topics that were comfortable for me . . . however, this year, I focused on vocabulary instruction, which was always something that I recognized as very important to science but never felt particularly skilled or comfortable instructing." Andres, I like the risk you took in pursuing this PDP. Your thoughtful reflection and clearly marked artifacts aided my understanding of the student learning outcomes you presented.

Some thoughts: As you reflected upon your PDP journey, I looked for practices that might be used across content areas to increase word knowledge. For instance, you note the use of annotation where students highlight words and in the margin explained what the word meant in relation to what they were going to do in laboratory investigation. You also discussed use of note cards, posters, two-column notes, and experimentation. Your reflection offered significant lessons. You indicated that strategies must be taught, but then students actually have to practice them. You wondered, "How do I force students to actually use the strategies and learn vocabulary on their own?" Sean Ottmer, our school's English 10 teacher, has had a similar question, and ultimately, like you, he concluded that you actually have to teach how to study note cards and allow students to practice in class. You also indicated the importance of repetition. Words are not learned instantaneously. I appreciate your suggestion that images create a better explanation of vocabulary than words, whether through note cards, *Power Point* presentations, or videos. You even managed to "sneak-in" a timeline project in which students engaged in an authentic task in which vocabulary was strengthened. Hands-on activities are also critical as established through your use of *Slinky Play* to demonstrate properties like frequency, wavelength, and amplitude. You did not feel that the *Mile a Minute* activity was as effective, because sometimes student descriptions did not correlate with an increased understanding of the vocabulary term. You loved the game called *Around the World*.

PDP Next steps: Next year you hope to use *Rings* to help students keep their vocabulary cards organized. You also felt that note cards and *Power Points* with images as well as videos aid our students, and you plan to continue their use next year. You found the two-column note structure very useful. You said you loved the *Around the World* game as a vocabulary technique. I hope you will share this particular practice with your colleagues. It sounds like the kids also loved it.

Observations: I conducted both formal and informal observations of your classroom this year. Formal observations were linked directly to your PDP. Jenn Gable, our physical science teacher and Science Department Chair, is now using the *Around the World* with freshmen, because it worked so well with the juniors. She observed you as you experimented with teaching dimensional analysis.

You asked me to observe the class as they practiced the *Mile a Minute* activity. While you ultimately concluded that this was an activity in which students did not learn vocabulary in the way you hoped, in our post-observation, you said this game reinforced for you the importance of incorporating games in both RTI sessions and regular classroom. I always enjoy visiting your classroom Andres. Keep inviting me in!

Andres, you are just a tremendous teacher. It is no wonder the Class of 2012 gave you the "School Genius" award. You create thoughtful and dynamic lessons, and are cognizant to provide timely feedback to students. I am also very appreciative of your work with our school's MESA program. This continued exposure to science through MESA fosters our students' excitement for this field of study. Last but not least, congratulations on the successful completion of the state's Online Portfolio for Alternative Licensure (OPAL). It is clear that you are finding ways to "hook" students in the field of science through exciting and engaging activities that support student learning of complex skills. Quite frankly, this OPAL submission was National Board certified work.

Congratulations on another great year of teaching! Our students are very lucky to have you.