

Running head: SCIENTIFIC METHOD UNIT PLAN

Understanding Scientific Inquiry Unit Plan

Tenth Grade Biology

Lorraine L. Jordan

800689309

Special Education: General Curriculum

Special Education Instructional Unit Plan

SPED 5279: Content Area Instruction for Students with Special Needs

Spring 2012

Table of Contents

Introductory Information

General Information	3
Student Population Table.....	3-4

Broad Goals and Rationale

Summary and Narrative Information.....	4-5
Rationale Statement.....	5
SMARTER Planning Summary.....	5-6
Unit Organizer Routine.....	7-9

Content Analysis

Content Standards Table.....	10-11
Summary of the Scope of the Unit Content.....	11
Summary of Cultural Responsiveness.....	12
Content Integration.....	12-13

Assessment Methods.....14-17

Instructional Strategies and Activities

Overview of Instructional Strategies and Routines.....	17-18
Universal Design for Learning.....	18-21
Collaborative Instruction.....	21-22
Co-Teaching Lesson Plan Book.....	23-27

Technology Integration.....28-29

Daily Lesson Plans

3/12/12.....	30-32
3/13/12.....	33-35
3/14/12.....	36-39
3/15/12.....	40-43
3/16/12.....	44-47

Unit Reflection and Evaluation.....48-50

References.....51

Introduction and Overview

General Information

1. Unit Title: Understanding Scientific Inquiry
2. Subject/Unit Topic: Scientific Method
3. Course Content: Biology
4. Grade Level(s): Tenth Grade
5. Type of Placement and Length of Class Time: Clinical Placement; 90-minute class
6. Length of Time to complete the Unit Plan: The unit on the Scientific Method began on March 5, 2012 and ended on March 13, 2012.

Student Population Table

Contextual/Environmental Factors	Information Source	Implications for Instruction and Assessment
Suburban school; 1557 students; 27% minority; 40% free or reduced lunch; students all have MacBook Air computers issued through the school	School Principal; NCWise Data Manager	Be conscientious of homework assignments that require the use of internet because students may not have access at home; Be aware of access and availability of materials that I ask students to provide
Two students have 504 plans for Attention Deficit Hyperactivity Disorder	Classroom Teacher	Use appropriate classroom management procedures; provide differentiation of instruction and appropriate accommodations
One student in Special Education designated with SLD in reading	Classroom Teacher and Special Education Teacher	Ensure that necessary accommodations and differentiation of instruction are in place

One student who is ELL from Denmark	Classroom Teacher and ESL Teacher	Consult with ESL teacher for any materials that may require translation or special accommodations
Two students identified as At-Risk	Classroom Teacher	Use appropriate classroom management procedures; provide differentiation of instruction; provide access to learning enhancements

Broad Goals and Rationale

Summary and Narrative Statement

The overarching understanding, or big idea, of this unit is for students to understand that science is a process. As a result of instruction in this unit, students will understand that the scientific method is the foundation for problem solving and that most scientific developments occur in response to problems or conflicts.

The essential questions that will guide instruction in this unit are:

1. How do you solve a problem?
2. What is the scientific method?
3. What are the essential components in designing a scientific experiment?

The learner objectives for this unit are:

1. Students will identify biological problems and questions that can be answered through scientific investigation.
2. Students will design and conduct scientific investigations to answer biological questions using hypotheses, variables, measurement, data, charts, graphs, interpretation, and communication.
3. Students will formulate and revise scientific explanations and models using logic and evidence.

4. Students will analyze reports of scientific investigations from an informed and scientifically knowledgeable viewpoint.

Rationale Statement

Instruction in this unit is being provided because it is part of the North Carolina Standard Course of Study (NCSCOS) for Biology. This unit aligns directly with Competency Goal 1, which states that learners will develop the ability to do and understand scientific inquiry. The students will identify biological problems and questions that can be answered using scientific investigation. In addition, students will design and implement scientific investigations that answer biological questions. They will be able to analyze and report the results of their scientific investigations.

SMARTER Planning Summary

The SMARTER planning process facilitates teachers in selecting critical information from the content and presenting it to students in ways that enable all students to understand, organize, remember, and respond to the information. It enables teachers to shape critical questions about the content to be taught, it analyzes the content for learning difficulties that may be present, makes decisions regarding the enhancement of instruction, teaches strategies to help students learn, and finally it evaluates the students mastery of the content (Lenz, Deshler, & Kissam, 2004). The steps in the SMARTER planning process are:

1. S – Shape the Critical Questions
2. M – Map the Critical Questions
3. A- Analyze for Learning Difficulties
4. R- Reach Enhancement Decisions
5. T- Teach Strategically

6. E- Evaluate Mastery

7. R- Revisit Outcomes

The Unit Organizer and the Lesson Plan organizer on the next three pages demonstrate the implementation of the first two steps in the SMARTER planning process. It is important to begin with planning the course and subsequent lessons by asking what the critical information is for all students to learn and how you are going to present this information to students.

The Unit Organizer

④ BIGGER PICTURE

NAME Lorraine Jordan
DATE 2/27/12

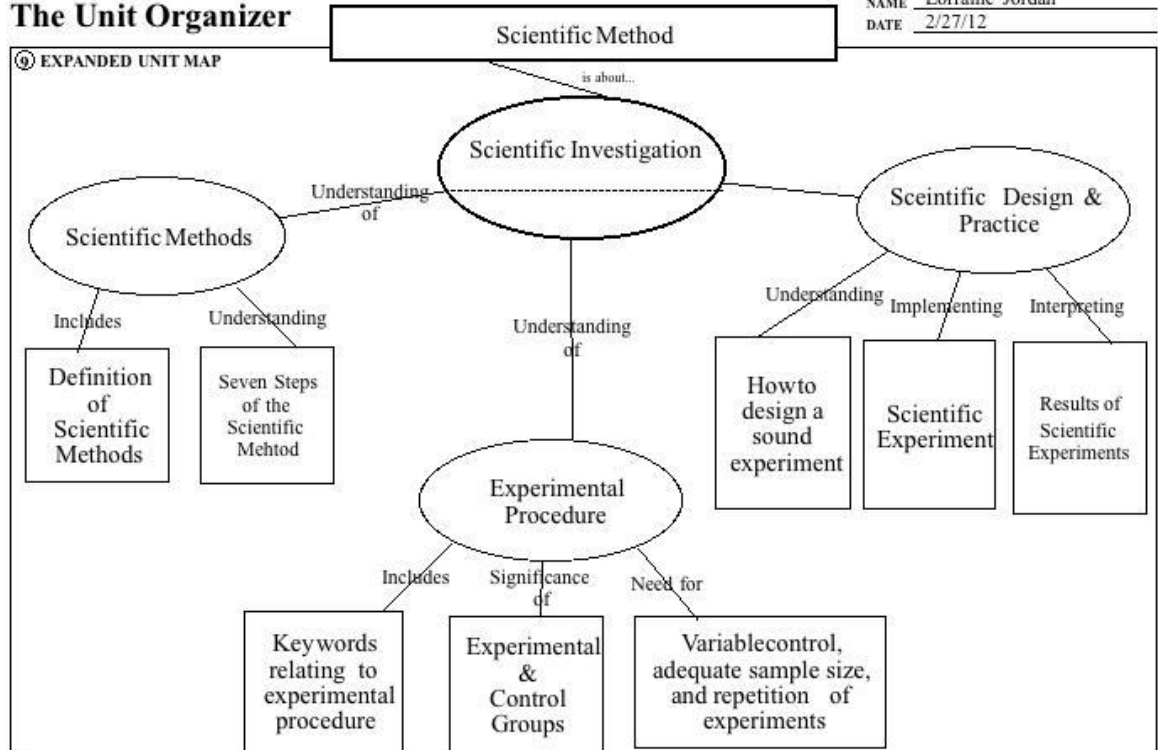
UNDERSTANDING SCIENTIFIC INQUIRY																											
② LAST UNIT/Experience Lab Safety	① CURRENT UNIT SCIENTIFIC METHOD																										
③ NEXT UNIT/Experience Ecology																											
<p>⑧ UNIT SCHEDULE</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 10%;">3/5</td><td>Scientific Method Podcast</td></tr> <tr><td>3/6</td><td>Review of Scientific Method & Vocabulary</td></tr> <tr><td>3/7</td><td>Scientific Method Quiz</td></tr> <tr><td>3/8</td><td>Experimental Procedure vocabulary</td></tr> <tr><td>3/9</td><td>Experimental Procedure Keynote</td></tr> <tr><td>3/12</td><td>Scientific Design Vocabulary</td></tr> <tr><td>3/13</td><td>Scientific Design Vocabulary Quiz</td></tr> <tr><td>3/13</td><td>Scientific Design Keynote</td></tr> <tr><td>3/13</td><td>Scientific Design Practice</td></tr> <tr><td>3/14</td><td>Alka Seltzer Lab Design</td></tr> <tr><td>3/15</td><td>Alka Seltzer Lab Implementation</td></tr> <tr><td>3/16</td><td>Alka Seltzer Lab Report</td></tr> <tr><td>3/19</td><td>Unit Test</td></tr> </table>	3/5	Scientific Method Podcast	3/6	Review of Scientific Method & Vocabulary	3/7	Scientific Method Quiz	3/8	Experimental Procedure vocabulary	3/9	Experimental Procedure Keynote	3/12	Scientific Design Vocabulary	3/13	Scientific Design Vocabulary Quiz	3/13	Scientific Design Keynote	3/13	Scientific Design Practice	3/14	Alka Seltzer Lab Design	3/15	Alka Seltzer Lab Implementation	3/16	Alka Seltzer Lab Report	3/19	Unit Test	<p>⑤ UNIT MAP</p>
3/5	Scientific Method Podcast																										
3/6	Review of Scientific Method & Vocabulary																										
3/7	Scientific Method Quiz																										
3/8	Experimental Procedure vocabulary																										
3/9	Experimental Procedure Keynote																										
3/12	Scientific Design Vocabulary																										
3/13	Scientific Design Vocabulary Quiz																										
3/13	Scientific Design Keynote																										
3/13	Scientific Design Practice																										
3/14	Alka Seltzer Lab Design																										
3/15	Alka Seltzer Lab Implementation																										
3/16	Alka Seltzer Lab Report																										
3/19	Unit Test																										
<p>⑦ UNIT SELF-TEST QUESTIONS</p> <ol style="list-style-type: none"> 1. How do you solve a problem? 2. What is the scientific method? 3. What are the essential components in designing a scientific experiment? 	<p>⑥ UNIT RELATIONSHIPS</p> <p>Explanation</p> <p>Cause/Effect</p> <p>Analyze</p>																										

Adapted from The Unit Organizer Routine. Copyrights for the template are held by the authors of The Unit Organizer Routine.

The Unit Organizer

NAME Lorraine Jordan
 DATE 2/27/12

EXPANDED UNIT MAP



NEW UNIT SELF-TEST QUESTIONS

1. What are the steps of the scientific method?
2. What is an adequate sample size and how do we control samples?
3. Why is it necessary to repeat experiments?

Adapted from The Unit Organizer Routine. Copyrights for the template are held by the authors of The Unit Organizer Routine.

Lesson Organizer

④ **UNIT or BACKGROUND** DATE: 2/27/12 NAME: Lorraine Jordan

<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Scientific Method </div>		
<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> Scientific Method </div>	Understanding of	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> Experimental Procedure </div>
	Understanding of	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> Scientific Design & Practice </div>
Implementation of		
Cause & Effect	LESSON TOPIC Scientific Design & Practice	Task-Related Strategies Explanation/Analysis
⑤ Lesson Map		
<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> Vocabulary relating to experimentation </div>	Knowledge of	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> Designing Sound Experiments </div>
	Understanding	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> Key elements of sound experiments </div>
	Designing of	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> Sound Experiments </div>
	Implementation of	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> Scientific Experiments </div>
	Analyzing	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> Results of scientific experiments </div>
is about		
⑥ Challenge Question: Why is it important to have a well-designed scientific experiment?		
⑦ Self-Test Questions: <ol style="list-style-type: none"> 1. What are the key elements of a well-designed experiment? 2. What are the possible outcomes of poorly designed experiments? 3. Why is the interpretation of results so important? 		⑧ Tasks: <ol style="list-style-type: none"> 1. Working in groups, complete scientific design practice. 2. Working in groups, design and implement scientific experiment 3. Working in groups, complete a formal lab report

Adapted from The Lesson Organizer Routine. Copyrights for the template are held by the authors of The Lesson Organizer Routine.

Content Analysis

Content Standards Table

Project Learning Goals	Corresponding NCSCOS Competency Goals, Objectives, and Thinking Skills
Students will identify biological problems and questions that can be answered through scientific investigation.	Biology Competency Goal 1: The learner will develop the abilities to do and understand scientific inquiry. Objective 1.01: Identify biological questions and problems that can be answered through scientific investigations.
Students will design and conduct scientific investigations to answer biological questions using hypotheses, variables, measurement, data, charts, graphs, interpretation, and communication.	Biology Competency Goal 1: The learner will develop the abilities to do and understand scientific inquiry. Objective 1.02: Design and conduct scientific investigations to answer biological questions: create testable hypotheses, identify variables, use a control or comparison group when appropriate, select and use appropriate measurement tools, collect and record data, organize data into charts and graphs, analyze and interpret data, and communicate findings.
Students will formulate and revise scientific explanations and models using logic and evidence.	Biology Competency Goal 1: The learner will develop the abilities to do and understand scientific inquiry. Objective 1.02: Design and conduct scientific investigations to answer biological questions: create testable hypotheses, identify variables, use a control or comparison group when appropriate, select and use appropriate measurement tools, collect and record data, organize data into charts and graphs, analyze and interpret data, and communicate findings. Objective 1.03: Formulate and revise scientific explanations and models of biological phenomena using logic and evidence to: explain observations, make inferences and predictions, and explain the relationship between evidence and explanation. Objective 1.04: Apply safety procedures in the laboratory and in field studies: recognize and avoid potential hazards and

	safely manipulate materials and equipment needed for scientific investigations.
Students will analyze reports of scientific investigations from an informed and scientifically knowledgeable viewpoint.	Biology Competency Goal 1: The learner will develop the abilities to do and understand scientific inquiry. Objective 1.05: Analyze reports of scientific investigations from an informed, scientifically literate viewpoint including considerations of: appropriate sample, adequacy of experimental controls, replication of findings, and alternative interpretations of the data.

Summary of the Scope of the Unit Content

The topic of this unit is the use of the scientific method in biology. This unit will require students to identify biological problems and questions that can be answered through the use of scientific investigation. Students will learn to design and implement scientific investigations to answer these questions. In addition, the students will both analyze and prepare reports from their scientific investigations. To understand the big ideas of this unit, the students must have an understanding of both the equipment that is used to conduct laboratory experiments and laboratory safety procedures.

Scientific investigation is integral to the nature of science and provides integration with other strands in the Biology curriculum, such as the Nature of Science, Science as a Human Endeavor, Historical Perspectives, Science and Technology, and Personal and Social Perspectives. It requires collaboration among peers and accurate data reporting among peers and with the public. Discoveries, such as the development of immunizations for diseases that once killed people, have changed our life expectancies today. This unit will provide students with the knowledge of how scientific investigation impacts them personally as well as how it can impact society both locally, nationally, and globally.

Cultural Responsiveness

Throughout this unit, students are learning about the use of the scientific method in biology. The purpose of scientific investigation is to provide answers to questions and solutions to problems. During instruction, class discussions will provide both the students and teacher with the opportunity to share information that is relevant to them from a cultural perspective. For example, sickle cell anemia is a disease that affects primarily individuals in the African-American community. Almost half of the students in the class are African-American, so the teacher could use sickle cell anemia to illustrate how the scientific method was used to identify the gene that causes this disease. There will be many opportunities for the students to work in collaborative groups as well. Students will be able to use critical thinking skills to form their own knowledge. The teacher will facilitate the learning process. Class discussions and the use of collaborative groups will allow culturally responsive instruction to take place at the inclusive level. By discussing the worldwide implications and impact of the discovery of the sickle cell anemia gene global awareness will be promoted.

Content Integration

Subject	Connection to other disciplines
Biology	English
Biology	Mathematics
Biology	Information and Technology

This unit plan is well integrated with the high school English, Mathematics, and Information and Technology core content objectives. Throughout all five lessons, technology is utilized for assigned tasks. The students are using their MacBooks to listen to Keynote

presentations, view educational videos, complete assessments, create graphs, and write lab reports. In the lesson for 3/14/12, the students will be able to use their computers to research information with their groups regarding factors that may affect the rate of dissolution of Alka-Seltzer in water. This activity will increase the students' ability to determine reliable online resources.

The unit plan integrates Mathematics core content objectives as well. In the lesson for 3/15/12, the students are collecting and organizing data for the Alka-Seltzer lab. They will be calculating the average time for each Alka-Seltzer tablet to dissolve under specific conditions. Finally in the lesson for 3/16/12, the students will be incorporating the data they recorded in graphic form and will be interpreting the data in the formal lab report. These activities align with the Mathematics Competency Goal of learners being able to collect, organize, and interpret data with matrices and linear models to solve problems.

In the lessons for 3/14 through 3/16/12, students will have the opportunity to evaluate problems and examine cause and effect relationships as they work in their lab groups on designing and implementing their Alka-Seltzer experiment. This relates directly to Competency Goal 2 in the English II Standard Course of Study. In the lesson on 3/16/12, the students will be writing their formal lab reports, which will allow them to work on the competency goal of applying conventions of grammar and language usage.

Assessment Methods, Evaluation and Impact on Student Learning

Assessment Methods Table

Learning Goals Addressed	Assessments for Project	Format of Assessment	Preliminary Assessment Adaptations (subgroup/others as needed)
<p>1. Students will identify biological problems and questions that can be answered through scientific investigation.</p>	Pre-Assessment	<p>Informal observations: class and/or group discussions</p>	<p>Provide prompts, redirection, and repetition and modification of instructions as needed.</p>
	In-Progress and Post-Assessments	<p>Informal observations: class and/or small group discussions</p> <p>Student work sample: completion of LINCing tables and BrainPop graded quiz</p> <p>Unit Test: The vocabulary items will be presented in a matching format on Unit Test. The steps of scientific design will be presented in multiple choice and fill-in-the blank format on the Unit Test</p>	<p>Provide prompts, redirection, and repetition and modification of instructions as needed.</p> <p>Provide read-aloud as needed.</p> <p>Allow ample response time for students during question and answer activities.</p> <p>Allow students who have difficulty with writing the use of their MacBook to complete LINCing Tables.</p> <p>Consult with ESL teacher to have any needed materials prepared for the student who is ELL.</p> <p>Provide testing accommodations as per students' IEPs and 504 plans.</p>
2. Students will	Pre-Assessment	Informal	Provide prompts,

<p>design and conduct scientific investigations to answer biological questions using hypotheses, variables, measurement, data, charts, graphs, interpretation, and communication.</p>	<p>In-Progress and Post-Assessments</p>	<p>observations: class and/or group discussions</p> <p>Informal observations: class and/or small group discussions</p> <p>Performance Task: students will complete the Simpson Scientific Method packet using collaborative learning groups</p> <p>Project: Students will be working in groups to design and complete the Alka-Seltzer lab project</p> <p>Student work sample: Completed Experimental Procedure packet and completed Scientific Method Alka-Seltzer lab.</p> <p>Unit Test: Students will be presented with examples similar to those presented in both the Simpson Scientific Method and Experimental Procedure packet in a multiple-choice format.</p>	<p>redirection, and repetition and modification of instructions as needed.</p> <p>Provide prompts, redirection, and repetition and modification of instructions as needed.</p> <p>Provide read-aloud as needed.</p> <p>Allow ample response time for students during question and answer activities.</p> <p>Provide paper copies of Simpson Scientific Method, Experimental Procedure, and Scientific Method Alka-Seltzer lab for students who do not wish to use their MacBook.</p> <p>Consult with ESL teacher to have any needed materials prepared for the student who is ELL.</p> <p>Provide testing accommodations as per students' IEPs and 504 plans.</p>
<p>3. Students will formulate and revise scientific explanations and models using logic</p>	<p>Pre-Assessment</p>	<p>Informal observations: class and/or group discussions</p>	<p>Provide prompts, redirection, and repetition and modification of instructions as</p>

		activity and completed Scientific Method Alka-Seltzer lab report Unit Test: Students will be required to complete a data table and provide a summary of the results based upon a narrative of an experiment.	as needed. Allow ample response time for students during question and answer activities. Provide paper copies of Redi's Experiment activity for students who do not wish to use their MacBook. Consult with ESL teacher to have any needed materials prepared for the student who is ELL. Provide testing accommodations as per students' IEPs and 504 plans.
--	--	--	---

Instructional Strategies and Activities

Overview of Instructional Strategies and Activities

In order to ensure a well-managed and predictable classroom environment for students, instructional strategies and routines were incorporated. Among these were the use of the Unit and Lesson Organizers, LINCS Vocabulary Strategy, and Active Student Response. These techniques and strategies were chosen because they are research-based practices that have been proven to be effective.

The Unit Organizer and Lesson Organizer Routines are Content Enhancements that have been demonstrated to be successful in improving the performance of low-achieving students, students with disabilities, students whose first language is not English, and average-achieving students (Boudah, Lenz, Bulgren, Schumaker, and Deshler, 2000). The Unit Organizer was used

to introduce the “big ideas” of the unit and to provide the students with an understanding of the structure of the unit. The Unit Organizer visually presents this information to students in the form of a graphic organizer enabling them to connect the current information they are learning with what they have already learned and what they will be learning in the future (Boudah, et al., 2000).

The LINCS Vocabulary Strategy was included and taught to all of the students in the first lesson plan in the unit, which included the introduction of new vocabulary words. The LINCS Vocabulary Strategy helps students memorize vocabulary through the creation of note cards following a series of steps that allow students to make connections in memory. Because so many students struggled with the second step of “identifying a reminding word”, a modification was used to allow the students to “invent a sentence” instead which was based upon information found on modifying learning strategies (O’Brien, 2005). This reduced the frustration level of the students and allowed them to utilize the strategy in a way that was more beneficial to them.

Active Student Response was incorporated in the lesson plans in the focus and review component through the utilization of white boards and dry erase markers. In a study conducted by Armendariz and Umbreit (1999), response cards were demonstrated to both increase student engagement and reduce disruptive behavior in the classroom. Response cards also allow the teacher to quickly assess student learning and provide real time feedback to students. Using the response provided the opportunity to determine what concepts, if any, needed to be retaught before introducing the new lesson.

Universal Design for Learning

Universal Design for Learning (UDL) is instruction that is designed to accommodate and provide equal access to the curriculum for all learners. The three essential components of UDL

are representation, expression, and engagement. The lessons designed for this unit integrated varied presentation, expression, and engagement methods that meet the needs of diverse learners, whether or not they were students designated to receive special education services. For example, some of the instruction is provided in the traditional lecture-style of teaching coupled with the opportunity for student input via class and group discussions. Other lessons used downloadable files with text-to-speech options or Keynotes with embedded podcasts. Students were provided with options of oral, handwritten, or typed responses in many activities. The multiple means of representation, expression, and engagement were embedded to allow the information that was being presented to be accessible to all of the students in the class.

An investigation by Mastropieri, Scruggs, Norland, Berkeley, McDuffie, Tornquist, and Connors (2006) found that secondary students with disabilities benefitted from instruction that included classwide peer tutoring (CWPT) and cooperative learning. CWPT and cooperative learning opportunities were incorporated in the lesson plans for this unit plan for this reason. CWPT is implemented in the lessons on 3/12 /12 and 3/13/12. Using the method of CWPT described by Mastropieri and Scruggs (2000), students were put in assigned pairs and alternated in the role of tutor and tutee in order to learn the new vocabulary terms. Student engagement was high during this activity and all students passed the vocabulary assessment that was given.

Cooperative learning is a research-based practice that has proven to be effective for students with disabilities in improving access to the curriculum. Because there are discrepancies in the reading level in textbooks and the reading levels of many students with disabilities, cooperative learning enables students to acquire knowledge that they may not be able to obtain through reading alone (Kinder, Bursuck, & Epstein, 1992). The lesson plans in this unit are designed to promote collaborative learning through the completion of group work in science

labs. Students were strategically placed to complete the Alka-Seltzer lab assignment. The activities were designed to foster cooperation and collaboration and to ensure that all students understood the relevance of the steps involved in scientific design.

Along with fostering cooperation and collaboration among students, the activities in this unit plan were designed to promote 21st century skills: critical thinking and problem solving. The scientific design practice and Alka-Seltzer lab activity require students to work collaboratively to research, record, interpret, record, and report data in accordance with the scientific method. Classroom discussions will highlight the global impact of scientific investigations. These activities provide students with multiple opportunities to develop their critical thinking and problem solving skills, which are skills that are needed for success in both the secondary and post-secondary settings.

All students in the classroom have their own MacBooks that are provided through the school, thus providing access to technological enhancements and multimedia that promote access for students experiencing limitations in sensory abilities. All of the computers have a text-to-speech option allowing materials provided to be read aloud. The teacher has created Keynotes with podcasts embedded as well to deliver instruction for some lessons. Once students download these Keynotes, they can be reviewed and listened to at anytime, thereby allowing students the opportunity to pick up any information they may have missed during the class instructional time. Using built-in word processing software that is installed on the MacBooks assists students who have difficulty with handwriting and spelling. The lessons also include multimedia enhancements, such as BrainPop, to aid in building background knowledge of the content being presented.

The Unit Organizer Routine and the Lesson Organizer Routine are Content Enhancement techniques that were incorporated in this instructional unit plan. The Unit Organizer was used to introduce the “big ideas” of the unit and to provide the students with an understanding of the structure of the unit. It visually presents that information to the students in the form of a graphic organizer highlighting for the students the important questions they need to focus on during the unit. Similarly, the Lesson Organizer Routine was used to introduce the individual lessons within the unit. The lesson organizers were used to review lesson material at the conclusion of the lessons, and the unit organizer was reviewed prior to the unit test.

The LINC'S Vocabulary Strategy was embedded in the content instruction and was taught to the entire class. A modification was made allowing students to “invent a sentence” in place of “inventing a reminding word” for those students who were having difficulty with this step of the strategy. This modification made the strategy accessible to all learners and significantly reduced student frustration levels.

Collaborative Instruction

In order to promote the highest level of student achievement and create an inclusive learning environment, the knowledge and skills of both the general education teacher and the special education teacher need to be used effectively. The general education teacher is the content expert while the special education teacher has knowledge relating to accommodations, UDL, learning strategies, and content enhancements. After the initial observations of the classroom and some time spent consulting, it was determined that the general education teacher would determine concepts that needed to be taught throughout. The special education teacher provided information regarding learning strategies, UDL, and content enhancements that would be beneficial for students who are at-risk or receiving special education services.

The general education teacher and special education teacher planned for co-teaching using the Co-Teaching Lesson Plan (Dieker, 2009) and its suggested guidelines. Workload assignments were determined based upon our areas of expertise. The general educator was responsible for planning and leading the instruction and for determining assignments and test content. The special educator created the Unit Organizer, Lesson Organizer, and provided instruction in the LINCS Vocabulary Strategy and CWPT. The lesson plan assignments and assessments were reviewed together in order to determine appropriate accommodations and modifications for the students who are at-risk or receiving special education services.

The primary co-teaching model that was used was Alternative Teaching because the general education teacher is the content expert, while the special education teacher is knowledgeable in providing access to the content for students who are at-risk or receiving special education services. The general education teacher led the instruction, allowing the special educator to observe and make note of students who were struggling with the content. Every lesson provided the opportunity for the special educator to work with both the students who were at-risk or receiving special education services in order to ensure that all students were able to be successful in accessing the content of this unit.

Co-Teaching Lesson Plan Book

General Educator Co-Teaching Lesson Plan

Day/Date	Big Ideas/Goals	Lesson Activities	Assessment
Monday 3/12/12	Students will identify biological problems and questions that can be answered through scientific investigation.	Introduction of new vocabulary terms relating to scientific design Keynote with podcast on steps in scientific design Scientific Inquiry BrainPop video	Completion of LINCing Tables Question and answer; class and/or group discussion BrainPop graded quiz on Scientific Inquiry
Tuesday 3/13/12	Students will design and conduct scientific investigations to answer biological questions using hypotheses, variables, measurement, data, charts, graphs, interpretation, and communication.	CWPT review of vocabulary terms Discussion of experimental procedure file Completion of Simpson Scientific Method activity in collaborative groups Independent completion of Experimental Design Practice activity	Vocabulary quiz Question and answer; class and/or group discussion Question and answer; class discussion and review of Simpson Scientific Method activity Question and answer; class discussion and review of Experimental Design Practice activity
Wednesday 3/14/12	Students will design and conduct scientific investigations to answer biological questions using hypotheses, variables,	Review of experimental procedure Discussion and	Question and answer; class and/or group discussion Question and

	measurement, data, charts, graphs, interpretation, and communication.	research relating to the Alka-Seltzer Lab Completion of the Scientific Method Alka-Seltzer lab through Step 4: Design and Conduct a Scientific Experiment	answer; class and/or group discussion Question and answer; class and/or group discussion
Thursday 3/15/12	1. Students will design and conduct scientific investigations to answer biological questions using hypotheses, variables, measurement, data, charts, graphs, interpretation, and communication. 2. Students will formulate and revise scientific explanations and models using logic and evidence.	Review of the steps of experimental procedure Keynote with podcast on steps five and six in the experimental procedure Completion of Graphing Practice activity Completion of the Alka-Seltzer lab	Question and answer; class and/or group discussion Question and answer; class and/or group discussion Question and answer; class and/or group discussion
Friday 3/16/12	Students will analyze reports of scientific investigations from an informed and scientifically knowledgeable viewpoint.	Review of methods of recording and analyzing data using graphs. Discussion of formal lab reports Completion of Redi's Experiment activity Completion of formal lab report for the Alka-Seltzer lab	Question and answer, class and/or group discussion Question and answer; class and/or group discussion Question and answer; class and/or group discussion Completion of formal lab report

Special Educator Co-Teaching Lesson Plan

Co-Teaching Structure	Behavioral & Academic Adaptations	Materials/Support Needed	Team Notes
Alternative Teaching (Monday 3/12/12)	<ol style="list-style-type: none"> 1. Provide prompts, redirection, and repetition and modification of instructions as needed. 2. Provide read-aloud as needed. 3. Allow ample response time for students during question and answer activities. 4. Allow students who have difficulty with writing the use of their MacBook to complete LINCing Tables. 5. Consult with ESL teacher to have any needed materials prepared for the student who is ELL. 	<ol style="list-style-type: none"> 1. Small group work for reinforcement and reteaching of key concepts 2. Availability of internet access for BrainPop activity 3. Blank LINCing tables and LINCing table formatted in pages 	Several of the students struggled with the “invent a reminding word” step of LINCS. A modification was implemented allowing them to “invent a sentence” instead which reduced the students’ frustration levels.
Alternative Teaching (Tuesday 3/13/12)	<ol style="list-style-type: none"> 1. Provide prompts, redirection, and repetition and modification of instructions as needed. 2. Provide read-aloud as needed. 3. Allow ample response time for students during question and answer activities. 4. Provide paper copies of the Simpson Scientific Method and Experimental Procedure activities for students who do not wish to use their MacBook. 5. Allow students who have difficulty with writing the use of their MacBook to complete the Simpson Scientific 	<ol style="list-style-type: none"> 1. Small group work for reinforcement and reteaching of key concepts. 2. Availability of Simpson Scientific Method and Experimental Procedure activities both on the MacBooks and on paper. 3. Teacher input and reminders to students as needed. 	Student groupings needed to be rearranged to separate Andrew and Rod. They were engaged in too much side conversation and were off-task too often. The switch in groupings allowed both students to be more focused and participate in the activities.

	<p>Method and Experimental Procedure activities.</p> <p>6. Consult with ESL teacher to have any needed materials prepared for the student who is ELL.</p>		
<p>Alternative Teaching (Wednesday 3/14/12)</p>	<ol style="list-style-type: none"> 1. Provide prompts, redirection, and repetition and modification of instructions as needed. 2. Provide read-aloud as needed. 3. Allow ample response time for students during question and answer activities. 4. Provide paper copy of Scientific Method Alka-Seltzer lab for students who do not wish to use their MacBooks. 5. Allow students who have difficulty with writing the use of their MacBook to complete the Scientific Method Alka-Seltzer lab. 6. Consult with ESL teacher to have any needed materials prepared for the student who is ELL. 	<ol style="list-style-type: none"> 1. Small group work for reinforcement and reteaching of key concepts. 2. Availability of the Scientific Method Alka-Seltzer lab activity both on the MacBooks and on paper. 3. Teacher input and reminders to students as needed 	<p>The two lab groups I was working with struggled with developing a testable hypothesis and in creating experimental and control groups. Additional review with these groups of these concepts will be necessary.</p>
<p>Alternative Teaching (Thursday 3/15/12)</p>	<ol style="list-style-type: none"> 1. Provide prompts, redirection, and repetition and modification of instructions as needed. 2. Provide read-aloud as needed. 3. Allow ample response time for students during question and answer activities. 4. Provide paper copy of Scientific Method Alka- 	<ol style="list-style-type: none"> 1. Small group work for reinforcement and reteaching of key concepts. Focus review of the concepts of hypothesis, control group, and experimental group. 2. Availability of the Scientific Method Alka- 	<p>Isaiah and Chris were having difficulty with understanding why certain graphs were better to use represent various data. They may require additional instruction during Curriculum Assistance in order</p>

	<p>Seltzer lab and Graphing Practice activity for students who do not wish to use their MacBooks.</p> <p>5. Allow students who have difficulty with writing the use of their MacBook to complete the Scientific Method Alka-Seltzer lab and Graphing Practice activity.</p> <p>6. Consult with ESL teacher to have any needed materials prepared for the student who is ELL.</p>	<p>Seltzer lab and Graphing Practice activity both on the MacBooks and on paper.</p> <p>3. Teacher input and reminders to students as needed</p>	<p>to fully grasp this content.</p>
<p>Alternative Teaching (Friday 3/16/12)</p>	<p>1. Provide prompts, redirection, and repetition and modification of instructions as needed.</p> <p>2. Provide read-aloud as needed.</p> <p>3. Allow ample response time for students during question and answer activities.</p> <p>4. Provide paper copies of Redi's Experiment for students who do not wish to use their MacBooks.</p> <p>5. Allow students who have difficulty with writing the use of their MacBook to complete the Redi's experiment activity.</p> <p>6. Consult with ESL teacher to have any needed materials prepared for the student who is ELL.</p>	<p>1. Small group work for reinforcement and reteaching of key concepts.</p> <p>2. Availability of the Redi's Experiment activity both on the MacBooks and on paper.</p> <p>3. Teacher input and reminders to students as needed</p>	<p>Several students are having difficulty with organizing and drafting their formal lab reports. Additional assistance may be required during Curriculum Assistance.</p>

Technology Integration

The use of various forms of technology are integrated throughout this unit plan both to enhance learning and to provide equal access to the curriculum for all students. All of the students and teachers in the school district have their own MacBook laptops, which facilitated the process of incorporating the use of technology in every lesson. Keynotes with podcasts embedded in them were used to provide instruction for some lessons, lesson activities were provided in an electronic format, and students used videos on BrainPop to enhance the content and reinforce key concepts. This unit plan is about the use of the scientific method in Biology. The purpose of scientific investigation is to provide answers to questions and solutions to problems. The students will use the World Wide Web to research information during the Alka-Seltzer lab working in collaborative groups. Individual students will also utilize the World Wide Web to research information being shared by other students during class discussions. Class discussions enable students not only to share information that is relevant to them from a cultural perspective, but also to highlight the global connections of scientific investigations. These activities incorporate technology and help to promote 21st century skills of critical thinking and problem solving.

Technological enhancements and multimedia promoting access for students experiencing limitations in sensory abilities or lacking background information will be provided through the use of the students' MacBooks. The computers have a text-to-speech option allowing all of the materials provided to be read aloud. The teacher has created Keynotes with podcasts embedded as well to deliver instruction for some lessons. Once students download these Keynotes, they can be reviewed and listened to at any time, thereby allowing students the opportunity to pick up any information they may have missed during the class instructional time. Using built-in word

processing software that is installed on the MacBooks assists students who have difficulty with handwriting and spelling. The lessons also include multimedia enhancements, such as BrainPop, to aid in building background knowledge of the content being presented. With the exception of WorldLingo, translation software for the student who is ELL, all students in the classroom can use the assistive technology that is available for students who are receiving special education services. All instruction in this unit was designed to accommodate and provide equal access to the curriculum for all learners in accordance with the principles of UDL. The three essential components of UDL are representation, expression, and engagement. The lessons designed for this unit integrated varied presentation, expression, and engagement methods that met the needs of diverse learners, whether or not they were students designated to receive special education services.

LESSON PLAN: 3/12/12

SUBJECT: Biology

TOPIC: Scientific Design and Practice

Rationale: In order for students to understand biological questions and problems that can be answered through scientific investigation, they must gain knowledge of the key elements of well-designed scientific experiments. Students need to be able to design and implement scientific experiments and analyze the results in order to make inferences and predictions regarding biological questions. In addition, students need to be able to explain the relationships between the hypothesis and the resulting data from the scientific experiment.

Objective: Students will be able to define key vocabulary terms relating to scientific design, identify the key components of well-designed scientific experiments, design and implement a sound scientific experiment, understand the possible outcomes of poorly designed scientific experiments, and analyze the results of scientific experiments.

NCSCOS Objective Reference:

Biology Grades 9-12 Competency Goal 1: The learner will develop the abilities necessary to do and understand scientific inquiry.

Objective 1.01: Identify biological questions and problems that can be answered through scientific investigation.

Objective 1.02: Design and conduct scientific investigations to answer biological questions: create testable hypotheses, identify variables, use a control or comparison group when appropriate, select and use appropriate measurement tools, collect and record data, organize data into charts and graphs, analyze and interpret data, and communicate findings.

CONTENT AND STRATEGIES

Focus/Review: “Yesterday, we watched and listened to a Keynote presentation discussing the essential components in an experimental procedure.” The teacher will ask students to write all the components they can think of on their whiteboards at their lab tables. She will check responses and provide positive feedback for the correct responses and corrective feedback for incorrect responses.

Objective Stated in Student Terms: “Today, we are going to discuss these components in greater detail. We are going to concentrate on understanding what each of these components is. By the end of this lesson, you should be able to define each of the components of an experimental procedure.”

Teacher Input: The teacher will write the key vocabulary terms (hypothesis, experiment, control, independent variable, dependent variable, data, and theory) on the white board in the front of the classroom. The teacher will present a Keynote to the class that provides detailed information and definitions of each of the steps in scientific design. The students will be reminded that the Keynote with podcast is available for them to download and use for review.

Guided Practice: Upon completion of the Keynote presentation, the teacher will provide the students with blank LINCing tables and have the students complete them. According to the primary co-teaching model for this unit, Alternative Teaching, the general education teacher and the special education teacher will divide the class into two groups. The special education teacher will work with the students receiving special education services, the at-risk students, and any other students who are struggling with the content presented in this lesson. The general education teacher will work with the larger group. Both teachers will model and lead students in the completion of the vocabulary words on the LINCing Table.

Independent Practice: The teacher will direct the students to open up their laptops and log into BrainPop. The students will view the video “ Scientific Inquiry”. After viewing the video, the students will take the graded quiz. The general education teacher and special education teacher will each monitor the progress of their groups and provide assistance and feedback as needed. When they have completed the quiz, they are to raise their hand and show the teacher their quiz results.

Closure: The teacher will close the lesson by reviewing the concepts of the day’s lesson with the students. She will remind the students that they can review today’s Keynote in Angel. The teacher will then review all of the vocabulary words taught in the lesson. She will remind the students that there will be a vocabulary quiz tomorrow. Students will review their vocabulary words using classwide peer tutoring. The teacher will conclude the lesson by asking the students if they have any questions and will praise them for their hard work and attention.

Evaluation/Assessment: Question and answer, class discussions, completion of LINCing Tables, and completion of BrainPop graded quiz.

Materials/Technology: White boards, markers and erasers for sixteen students, eighteen blank copies of the LINCing tables (sixteen for the students and two for the general education and special education teacher), scientific design Keynote with podcast and teacher laptop and projector, sixteen student laptops

Plans for individual differences: Follow student behavior plans for redirection and positive behavioral support, provide read-aloud as needed, allow students use of MacBooks to complete LINCing Tables upon request, and consult with ESL teacher and have any necessary materials prepared for the ELL student.

LESSON PLAN: 3/13/12

SUBJECT: Biology

TOPIC: Scientific Design and Practice

Rationale: In order for students to understand biological questions and problems that can be answered through scientific investigations, they must gain knowledge of the key elements of well-designed scientific experiments. Students need to be able to design and implement scientific experiments and analyze the results in order to make inferences and predictions regarding biological questions. In addition, students need to be able to explain the relationships between the hypothesis and the resulting data from the scientific experiment.

Objective: Students will be able to define key vocabulary terms relating to scientific design, identify the key components of well-designed scientific experiments, design and implement a sound scientific experiment, understand the possible outcomes of poorly designed scientific experiments, and analyze the results of scientific experiments.

NCSCOS Objective Reference: Biology Grades 9-12 Competency Goal 1: The learner will develop the abilities necessary to do and understand scientific inquiry.

Objective 1.02: Design and conduct scientific investigations to answer biological questions: create testable hypotheses, identify variables, use a control or comparison group when appropriate, select and use appropriate measurement tools, collect and record data, organize data into charts and graphs, analyze and interpret data, and communicate findings.

CONTENT AND STRATEGIES

Focus/Review: “Yesterday, we discussed the key components in experimental procedure. We also learned the vocabulary terms associated with experimental procedure. Today, we are going to take a vocabulary quiz on these terms. Before the quiz, I am going to give you ten minutes to

review your terms with a partner.” Teacher will allow students ten minutes to study and review words with a partner using classwide peer tutoring and then have students take the vocabulary quiz on Angel.

Objective Stated in Student Terms: “Today, we are going to discuss experimental procedure. An experimental procedure is the step-by-step directions for your scientific experiment. Good experimental procedures should be very detailed and allow for someone else to duplicate your experiment exactly. We will also talk about some very critical components in experimental procedures: adequate sample size, the use of experimental and control groups, and the use of repetition.”

Teacher Input: The teacher will direct the students to log into their Angel accounts and open the file titled “Experimental Procedure”. Students will be instructed to either read the file or use to the text-to-speech option with their ear buds.

Guided Practice: When the students have finished reading the Experimental Procedure file, the teacher will instruct the students to open the file titled “Simpson Scientific Method”. The teacher will read aloud and complete the first example with the class. The students will then be divided into groups to complete the remaining six examples. According to the primary co-teaching model for this unit, Alternative Teaching, the special education teacher will work with the students receiving special education services, at-risk students, and other students who are struggling with the content presented in the lesson. The general education teacher will circulate and work with the remaining groups. Both teachers will provide assistance and feedback to the students in the completion of the remaining examples.

Independent Practice: Students will return to their seats and the teacher will instruct them to open the file “Experimental Design Practice”. The teacher will tell the students to complete

these examples independently. The special education teacher will monitor the progress of and provide feedback to students receiving special education services, at-risk students, and other students who are struggling with the content presented in the lesson. The general education teacher will monitor the progress of and provide feedback to the remaining students in the classroom.

Closure: The teachers will close the lesson by reviewing the answers to the “Experimental Design Practice” file. The elements of proper experimental procedure will be reviewed with the students. The teacher will remind the students that they can review the Experimental Procedure file in Angel.

Evaluation/Assessment: Question and answer, class discussions, completion of group and independent work on experimental design practice.

Materials/Technology: Upload the Experimental Procedure file, Simpson Scientific Method file, and Experimental Design file to Angel for students; six paper copies of the Experimental Procedure file, Simpson Scientific Method file, and Experimental Design file; two answer keys for both the Simpson Scientific Method and Experimental Design file for the general education and special education teacher, two teacher laptops, and sixteen student laptops

Plans for individual differences: Follow student behavior plans for redirection and positive behavioral support, provide read-aloud as needed, provide paper copies of the Simpson Scientific Design and Experimental Design files upon student request, and consult with ESL teacher and have any necessary materials prepared for the ELL student.

LESSON PLAN: 3/14/12

SUBJECT: Biology

TOPIC: Scientific Design and Practice

Rationale: In order for students to understand biological questions and problems that can be answered through scientific investigations, they must gain knowledge of the key elements of well-designed scientific experiments. Students need to be able to design and implement scientific experiments and analyze the results in order to make inferences and predictions regarding biological questions. In addition, students need to be able to explain the relationships between the hypothesis and the resulting data from the scientific experiment.

Objective: Students will be able to define key vocabulary terms relating to scientific design, identify the key components of well-designed scientific experiments, design and implement a sound scientific experiment, understand the possible outcomes of poorly designed scientific experiments, and analyze the results of scientific experiments.

NCSCOS Objective Reference: Biology Grades 9-12 Competency Goal 1: The learner will develop the abilities necessary to do and understand scientific inquiry.

Objective 1.02: Design and conduct scientific investigations to answer biological questions: create testable hypotheses, identify variables, use a control or comparison group when appropriate, select and use appropriate measurement tools, collect and record data, organize data into charts and graphs, analyze and interpret data, and communicate findings.

CONTENT AND STRATEGIES

Focus/Review: “Yesterday, we discussed experimental procedure. We talked about how good experimental procedures should be very detailed. We also talked about some very critical

components in experimental procedures.” The teacher will ask the students to answer the following questions using the whiteboards at their lab tables:

1. Write the three critical components in an experimental procedure.
2. List the steps in an experimental procedure.

The teacher will check responses and provide positive feedback for correct responses and corrective feedback for incorrect responses.

Objective Stated in Student Terms: “Today, you are going to have the opportunity to work in your lab groups. You will be writing your own experimental procedures for a lab you will complete tomorrow.”

Teacher Input: The teacher will direct the students to log into their Angel accounts and open the file titled “Scientific Method Alka-Seltzer Lab”. She will tell the students that they will be writing an experimental procedure to test their hypothesis of what factors influence how quickly Alka-Seltzer dissolves in water. Before the class divides into lab groups, the teacher will talk to the students about what Alka-Seltzer is and will demonstrate what it does when placed in water. She will have a class discussion and list the factors on the whiteboard that the students think may contribute to how quickly Alka-Seltzer dissolves.

Guided Practice: The students will be divided into four lab groups of four students each. Two groups will have a combination of students receiving special education services and typical performing students in the class. The teacher will direct the students to look at the instructions for the lab while reading aloud the directions. She will tell them that Step 1: Define the Question/Problem, has already been completed. She will tell them to look at Step 2: Observations and Research, and ask the students to discuss as a group for two minutes what they know about how Alka-Seltzer dissolves in water. After two minutes, she will direct the students

to write the information down. Next, the teacher will direct the students to complete the statement in Step 3: Develop Hypothesis, “If the water is _____, then the Alka-Seltzer will dissolve faster” using the information they recorded in the observations. According to the primary co-teaching model for this unit, Alternative Teaching, the special education teacher will work with the two groups of students containing the students receiving EC services. The general education teacher will work with the remaining two groups. Both teachers will provide assistance and feedback to the students in the completion of the first three steps in designing their experimental procedures.

Independent Practice: The teacher will instruct the students to complete their lab design through Step 4: Design and Conduct an Experiment. The special education teacher will monitor the progress of and provide feedback to the groups with the students receiving special education services. The general education teacher will monitor the progress of and provide feedback to the remaining two groups of students.

Closure: The teacher will close the lesson by reviewing the first four steps of the experimental procedure: define the question/problem, observations and research, develop hypothesis, and design and conduct an experiment. The teacher will conclude the lesson by asking the students if they have any questions and will praise them for their hard work and attention.

Evaluation/Assessment: Question and answer, class discussions, completion of group and independent work on the experimental procedure for the Alka-Seltzer lab.

Materials/Technology: White boards, markers, and erasers for sixteen students; beaker, water, and Alka-Seltzer tablet for teacher demonstration; upload Scientific Method Alka-Seltzer Lab to Angel; six paper copies of Scientific Method Alka-Seltzer Lab, laptops for sixteen students

Plans for individual differences: Follow student behavior plans for redirection and positive behavioral support, provide read-aloud as needed, provide paper copies of Scientific Method Alka-Seltzer Lab file upon student request, and consult with ESL teacher and have any necessary materials prepared for the ELL student.

LESSON PLAN: 3/15/12

SUBJECT: Biology

TOPIC: Scientific Design and Practice

Rationale: In order for students to understand biological questions and problems that can be answered through scientific investigations, they must gain knowledge of the key elements of well-designed scientific experiments. Students need to be able to design and implement scientific experiments and analyze the results in order to make inferences and predictions regarding biological questions. In addition, students need to be able to explain the relationships between the hypothesis and the resulting data from the scientific experiment.

Objective: Students will be able to define key vocabulary terms relating to scientific design, identify the key components of well-designed scientific experiments, design and implement a sound scientific experiment, understand the possible outcomes of poorly designed scientific experiments, and analyze the results of scientific experiments.

NCSCOS Objective Reference: Biology Grades 9-12 Competency Goal 1: The learner will develop the abilities necessary to do and understand scientific inquiry.

Objective 1.02: Design and conduct scientific investigations to answer biological questions: create testable hypotheses, identify variables, use a control or comparison group when appropriate, select and use appropriate measurement tools, collect and record data, organize data into charts and graphs, analyze and interpret data, and communicate findings

Objective 1.03: Formulate and revise scientific explanations and models of biological phenomena using logic and evidence to: explain observations, make inferences and predictions, and explain the relationship between evidence and explanation.

Objective 1.04: Apply safety procedures in the laboratory and in field studies: recognize and avoid potential hazards and safely manipulate materials and equipment needed for scientific investigations.

CONTENT AND STRATEGIES

Focus/Review: “Yesterday, you began working in your lab groups on writing your experimental procedure for your Alka-Seltzer lab. Let’s review the four steps of writing an experimental procedure.” The teacher will ask the students to answer the following questions using the whiteboards at their lab tables:

1. What is the first step in the writing an experimental procedure? (Define the question/problem)
2. What is the second step in writing an experimental procedure? (Observations and research)
3. What is the third step in writing an experimental procedure? (Develop a hypothesis)
4. What is the fourth step in writing an experimental procedure? (Design and conduct an experiment)

The teacher will check responses and provide positive feedback for correct responses and corrective feedback for incorrect responses.

Objective Stated in Student Terms: “Today, we will talk about steps five, six, and seven of the experimental procedure. You will be conducting your experiment following the step-by-step procedure you wrote with your lab group.”

Teacher Input: The teacher will direct the students to log into their Angel accounts and download and listen to the Keynote titled “Scientific Method Steps 5 and 6”. The teacher will then discuss with the class the different methods of recording and analyzing their data using graphs. She will ask the students the following questions:

1. What graphs are best for showing the magnitude of data? (Bar graphs)

2. What graphs are best for relating two sets of data or showing how data changes over time?

(Line graphs)

3. What graphs show how parts relate to the whole? (Circle or pie graphs)

4. What graphs show the correlation between two or more sets of data? (Scatter plots)

Guided Practice: The teacher will direct the students log into their Angel account and open the file “Graphing Practice”. According to the primary co-teaching model for this unit, Alternative Teaching, the general education and the special education teacher will divide the class into two groups. The special education teacher will work with the students receiving special education services, at-risk students, and any other students who are struggling with the content presented in this lesson. The general education teacher will work with the remaining students. Both teachers will model and lead the students in the completion of the ten examples in the Graphing Practice lesson.

Independent Practice: The teacher will instruct the students to go their lab groups from yesterday and open the “Scientific Method Alka-Seltzer Lab” from yesterday. The students will be instructed conduct their experiments following the step-by-step procedure they prepared and to complete the remaining three steps of the lab. The special education teacher will monitor the progress of and provide feedback to the groups with the students receiving special education services. The general education teacher will monitor the progress of and provide feedback to the remaining two groups of students.

Closure: The teacher will close the lesson by reviewing the last three steps of the experimental procedure: record and analyze the data, draw conclusions, and repeat the experiment. The teacher will conclude the lesson by asking the students if they have any questions. She will

remind them that the Keynote, “Scientific Method Steps 5 and 6”, is available on Angel for them to review. The teacher will praise the students for their hard work and attention.

Evaluation/Assessment: Question and answer, class discussions, completion of group and independent work on the experimental procedure for the Alka-Seltzer lab.

Materials/Technology: White boards, markers, and erasers for sixteen students; forty Alka-Seltzer tablets, beakers, thermometers, Bunsen burners, goggles for sixteen students to complete the lab; upload “Scientific Method Steps 5 and 6” and “Graphing Practice” files to Angel; six paper copies of “Scientific Method Steps 5 and 6” and “Graphing Practice” files; two answer keys for the “Graphing Practice” file; sixteen student laptops

Plans for individual differences: Follow student behavior plans for redirection and positive behavioral support, provide read-aloud as needed, provide paper copies of “Scientific Method Steps 5 and 6” and “Graphing Practice” files upon student request, and consult with ESL teacher and have any necessary materials prepared for the ELL student.

LESSON PLAN: 3/16/12

SUBJECT: Biology

TOPIC: Scientific Design and Practice

Rationale: In order for students to understand biological questions and problems that can be answered through scientific investigations, they must gain knowledge of the key elements of well-designed scientific experiments. Students need to be able to design and implement scientific experiments and analyze the results in order to make inferences and predictions regarding biological questions. In addition, students need to be able to explain the relationships between the hypothesis and the resulting data from the scientific experiment.

Objective: Students will be able to define key vocabulary terms relating to scientific design, identify the key components of well-designed scientific experiments, design and implement a sound scientific experiment, understand the possible outcomes of poorly designed scientific experiments, and analyze the results of scientific experiments.

NCSCOS Objective Reference: Biology Grades 9-12 Competency Goal 1: The learner will develop the abilities necessary to do and understand scientific inquiry.

Objective 1.05: Analyze reports of scientific investigations from an informed, scientifically literate viewpoint including considerations of: appropriate sample, adequacy of experimental controls, replication of findings, and alternative interpretations of the data.

CONTENT AND STRATEGIES

Focus/Review: “Yesterday, we discussed the last three steps of the experimental procedure. We also talked about different methods of recording and analyzing data using graphs.” The teacher will ask the students to answer the following questions using the whiteboards at their lab tables:

1. Which step involves recording control and experimental results? (Step 5: Record and Analyze Data)
2. Which step involves deciding whether your hypothesis was correct and what can be done to make the results of your experiment more valid? (Step 6: Draw Conclusions)
3. Which step involves reporting your findings? Step 7: (Repeat the Experiment and Report Findings)
4. What graphs are best for showing the magnitude of data? (Bar graphs)
5. What graphs are best for relating two sets of data or showing how data changes over time? (Line graphs)
6. What graphs show how parts relate to the whole? (Circle or pie graphs)
7. What graphs show the correlation between two or more sets of data? (Scatter plots)

The teacher will check responses and provide positive feedback for correct responses and corrective feedback for incorrect responses.

Objective Stated in Student Terms: “Today, we are going to learn about formal lab reports and the information that needs to be included in a scientifically literate lab report. You will have the opportunity to write a formal lab report based on the results of your Alka-Seltzer lab experiment.

Teacher Input: The teacher will direct the students to log into their Angel accounts and download the file “Formal Lab Reports”. The teacher will discuss each part of a formal lab report with the students. She will engage the students in discussion about the importance of each step in writing a lab report.

Guided Practice: The teacher will direct the students to go to their Angel account and open the file “Redi’s Experiment”. According to the primary co-teaching model for this unit, Alternative Teaching, the general education and the special education teacher will divide the class into two

groups. The special education teacher will work with the students receiving special education services, at-risk students, and any other students who are struggling with the content presented in this lesson. The general education teacher will work with the remaining students. Both teachers will model and lead the students in the completion of the questions in “Redi’s Experiment”.

Independent Practice: The teacher will instruct the students to open their “Scientific Method Alka-Seltzer Lab” from yesterday. The students will be instructed to begin working on a formal lab report based upon their lab information. She will inform the students that she knows that they will not complete the entire lab today and will have additional class time to work on it. The special education teacher will monitor the progress of and provide feedback to the students receiving special education services, at-risk students, and any other students who are struggling with the content presented in this lesson. The general education teacher will monitor the progress of and provide feedback to the remaining students in the class.

Closure: The teacher will close the lesson by reviewing the steps in creating a formal lab report. She will remind them that they will be able to continue working on during class tomorrow. The teacher will conclude the lesson by asking the students if they have any questions. She will praise the students for their hard work and attention.

Evaluation/Assessment: Question and answer, class discussions, completion of group and independent work.

Materials/Technology: White boards, markers, and erasers for sixteen students; upload “Formal Lab Reports” and “Redi’s Experiment” files to Angel; six paper copies of “Formal Lab Reports” and “Redi’s Experiment” files; two answer keys for “Redi’s Experiment”; sixteen student laptops

Plans for individual differences: Follow student behavior plans for redirection and positive behavioral support, provide read-aloud as needed, provide paper copies of “Formal Lab

Reports” and “Redi’s Experiment files upon student request, and consult with ESL teacher and have any necessary materials prepared for the ELL student.

Unit Reflection and Evaluation

My co-teaching clinical provided me with a lot of insight into the positive outcomes as well as the potential obstacles involved in co-teaching. At the start of the clinical, I met with both the general education and special education teachers of the classroom. We discussed the material that was currently being taught as well as the demographics and needs of the students in the classroom. Mooresville High School has just begun the practice of supportive inclusive classrooms within the last two school years. Prior to this, students who received special education services were only provided with support in a Curriculum Assistance class. Both teachers stated that the goal was to eventually shift to models such as Team Teaching. The special education teacher stated that until she is more familiar with the curriculum, she would not be comfortable doing the lead teaching. We discussed this and I agreed that since I too was not familiar with the biology curriculum, implementing the strategies and techniques I have learned in this class in conjunction with Alternative Teaching would be most beneficial for the students and myself.

When I met with the general education teacher to plan our co-teaching, it was decided that I would teach the LINCS Vocabulary Strategy and the Unit Organizer Routine to the whole class during the first lesson. The instruction in the Unit Organizer Routine took much more time than I had initially anticipated, so the teacher and I made the decision that I would work on the LINCS Vocabulary Strategy with my group of students when we broke into groups for guided practice. An additional requirement for this class was to teach a learning strategy to a student, or small group of students, for a Learning Strategy Implementation project. Three of the six students in my group had already been instructed in the strategy, so I paired the students together to complete the vocabulary words on the LINCing Tables. These students then paired up later to

review their vocabulary words in a classwide peer tutoring activity. All students in my group scored 71% or higher on the vocabulary quiz the next day. I believe that the group work on the LINCing Tables with the classwide peer tutoring activity was a contributing factor to their success.

One of the things I enjoyed the most and felt benefitted the students the most was the utilization of the cooperative learning groups that we used during the Alternative Teaching. These groups incorporated the use of the technology that the school has available, hands-on experience in conducting scientific investigations, and promoted critical thinking and problem solving skills. The students were actively engaged in learning and they used each other's knowledge, the Keynotes they downloaded, and information they found on the World Wide Web to develop their hypothesis and scientific design during the Alka-Seltzer lab.

While the cooperative learning groups and classwide peer tutoring groups were beneficial for the students, there were some instances of off-task behaviors that occurred. In most instances, a verbal or gestural reminder was all that was needed to get the students focused on the task at hand. In one instance, I needed to change the student groupings to separate two students. Even with reminders, they were engaging in too much side conversation and off-task behavior. Once the groups were changed, both students were able to remain focused and actively participate in the activities.

My experience co-teaching provided me with firsthand knowledge of the benefits and difficulties involved in teaching in an inclusive classroom. I did find it difficult to implement the strategies in the manner I would have liked due to the time constraints involved in completing the assignment. I was also unable to carry through personally on additional instruction that was needed for some of the students in understanding the concepts of developing a testable

hypothesis, experimental groups, controls groups, and the representational information on certain charts and graphs. The special education teacher had to work with these students during their Curriculum Assistance block because I was not available during this time. However, both the general education teacher and special education teacher thought that the Unit Organizer Routine was helpful in highlighting the critical information in the unit for the and they plan to use it in future units.

References

- Armendariz, F., & Umbreit, J. (1999). Using active responding to reduce disruptive behavior in a general education classroom. *Journal of Positive Behavior Interventions*, 1, 152-158.
- Boudah, D. J., Lenz, B. K., Bulgren, J. A., Schumaker, J. B., & Deshler, D. D. (2000). Don't water down! Enhance content learning through the unit organizer routine. *Teaching exceptional children*, 32(3), 48-56.
- Dieker, L. A. (2009). The co-teaching lesson plan book. *Special Education Technology Practice*, 11(1), 5.
- Kinder, D., Bursuck, W., & Epstein, M. (1992). An evaluation of history textbooks. *The Journal of Special Education*, 25, 472-491.
- Lenz, B. K., Deshler, D. D., & Kissam, B. R. (2004). *Teaching content to all: Evidence-based inclusive practices in middle and secondary schools*. Boston: Pearson Education.
- Mastropieri, M., & Scruggs, T. (2000). *The inclusive classroom: Strategies for effective instruction*. Upper Saddle River: Merrill.
- Mastropieri, M. A., Scruggs, T. E., Norland, J. J., Berkeley, S., McDuffie, K., Tornquist, E. H., et al. (2006). Differentiated curriculum enhancement in inclusive middle school science: Effects on classroom and high-stakes tests. *The Journal of Special Education*, 40(3), 130-137.
- O'Brien, C. (2005). Modifying Learning Strategies for Classroom Success. *TEACHING Exceptional Children Plus*, 1(3), 1-9.