A comparison of methods for team determination on the success of team based learning of biotechnology related material across multiple courses.

By

Charles Krininger

M.S. Reproductive and Environmental Physiology

B.S. Animal Science and Technology

Certified in Biology and Chemistry

From

Satellite High School

300 Scorpion Ct.

Satellite Beach, FL 32935

321-779-2000

A comparison of methods for team determination on the success of team based learning of biotechnology related material across multiple courses.

Abstract

Working in groups has shown to provide higher levels of learning, and the ability to function successfully in groups is in high demand in the work place. Team Based Learning (TBL) is a method used to facilitate group learning at all levels of education and in the work place. One TBL tenements is diversity of individuals with in groups, other research has shown homogeneity may also allow for success. Moreover, methods used to "select" individuals within groups has been examined, with mixed results based on selection criteria. The goal of this experiment is test which group selection method, hetero verses homogenous group selection using Reading Level, Grade Point Average, and basic personality test for classification. A triphasic method, using Chemistry and Anatomy and Physiology classes with biotechnology based TBL will be used to determine the cross-curricular success of grouping methodology.

Rational

Potosky and Duck (2007) reported that the ability to work in teams was an important characteristic that companies were looking for in potential hires. Moreover, team based experiences and teaching methods has been reported to improve the learning potential and satisfaction (Matta et al., 2011; Barron and Darling-Hammond, 2008). One current method to facilitate enhanced student and trainee learning is the Team Based Learning (TBL) Model. According to Michaelsen and Sweet (2008) , TBL is "an approach first developed to facilitate active learning in large undergraduate classes, but which has subsequently proven to be effective in a wide range of instructional settings."

Normally, TBL teams are selected by the instructor and has diversity as a bench mark. Research generally supports that heterogeneity in groups is advantageous (Nilson, 2010). Furthermore, McKeachie (2011) advocates teacher selection of groups to insure diversity because of advantages observed. However, some researchers have pointed out that there are advantages to Homogenous grouping, often the converse of the disadvantages of heterogeneous grouping (Hess, 2007). Powell (1990) stated "The more homogeneous the group, the greater the trust, hence the easier it is to sustain network-like arrangements." This is supported by findings that cooperation can be reduced in heterogeneous groups, (Brewer, 1996) and rivalry is also increased by demographic homogeneity (Ancona and Caldwell, 1992). Current demographic information used to develop groups includes student ability (reading level, Yee, 2013), student performance (GPA, Richards and Thompson, 2012), and personality test results (Krininger, unpublished). Prior observations (Krininger, unpublished) showed that heterogeneous grouping using personality type was successful in upper level elective science classes (Anatomy and Physiology), this method proved problematic in non-elective classes (Chemistry, Regular level). Issues with personal dominance and lack of performance was most commonly noted. The goal of this research is to compare methods for team determination in a TBL setting. To institute cross-curricular interest and provide real world application of knowledge, biotechnology themed lessons will be used for the topics of the TBLs. The application of the most effective use for team determination across classes will allow more rapid grouping of students and higher overall student performance based in higher learning gains in cooperative education events.

Action Research Intervention

The inclusion of TBL and team/ group learning as previously stated have shown to improve student learning gains. A large debate is still brewing on what is the best method for determination of teams to provide for optimum group learning and experience. In previous experience with the use of group learning, issues group dynamics has been one of the major problems that has lowered the success such learning events. An interaction in differences in selection for success group dynamics has been observed (Krininger, unpublished) in elective science classes (Anatomy and Physiology, A and P) versus core classes (Chemistry, Chem.). In this experiment, three regular Chemistry class will be used in Phase 1; Two Anatomy and Physiology classes used in Phase 2; and all 5 classes (3 Chem. And 2 A and P) will be used in Phase 3. Lessons used in all phases will be different, based in Biotechnology, however the same lesson will be used in phase 3 for all classes (cross-curricular in nature). TBL lesson topics are as Follows:

Phase 1. Pharmacogenomics, a model for biological interaction with chemical compounds.

Phase 2. Glycogen Storage Diseases as an application of cellular energy and metabolism.

Phase 3. Decellurization as a model for the interaction solubility and cell dynamics.

Phase 1 and Phase 2 will be done in the 1st 9 weeks, with students exposed to at least 1 TBL, in their groups prior to testing. Phase 3 will be completed during 2nd 9 weeks, with at least 1 group activity prior to test. The splitting of phases across 9 weeks is done to follow tenement of TBL to use long term grouping.

Connection to Bench to Bedside summer institute

The TBL process was first introduced at the introduction of the summer program. Each topic for the TBL's have been modified from topics that were presented at Bench to Bedside. Finally, follow up activates that are not included directly in the study

Procedure

<u>Methodology for Selection of Groups</u>

1. All students will take "True Colors" personality test adapted from http://campusrec.unc.edu/sites/campusrec.unc.edu/files/Personality%20Test.pdf
2. Students' primary and secondary color type will be recorded.
3. Students score on standardized Reading test will be recorded.
4. Students Grade Point Average (GPA, unweighted) will be recorded as of Day 1 of Semester or Enrollment in class.
   Math scores will not be considered due to the differences in Level of Math students are enrolled in.
5. Phase 1. General Selection.
    a. Three Chemistry classes will be randomly assigned to selection methodology
        i. Personality type
        ii. Reading score
        iii. GPA
    b. Classes will be divided in half, students will be randomly assigned to heterogeneous or homogenous category. With-in category assignment to groups will be completed by:

i. Heterogeneous groups will consist of at least 3 different colors; homogenous groups will have 1 color. Primary color will be first considered, however the use secondary color may be used to balance group numbers
ii. Homogenous grouping will occur by ranking students from highest to lowest score and blocking 4 students at time; Heterogeneous assigned students will be again ranked but highest to lowest, and then assigned to group by application of 1,2,3,3,2,1, 1,2,3,3,2,1 (group number).
iii. Homogenous grouping will occur by ranking students from highest to lowest GPA and blocking 4 students at time; Heterogeneous assigned students will be again ranked but highest to lowest, and then assigned to group by application of 1,2,3,3,2,1, 1,2,3,3,2,1 (group number).

c. Scores on Pre versus Post-test will be compare, only over-all performance of grouping will be examined (not hetero versus homo), and 2 highest preforming methods will advance to phase 2.

6. Phase 2. Compare Hetero versus Homogenous grouping
   a. Two Anatomy and Physiology classes will be assigned to one of two methods from phase 1 that showed greatest increase in student knowledge regardless of hetero/homogenous designation.
   b. Students will be assigned to groups using same methods as phase 1.
   c. Scores on Pre versus Post-test will be compared focusing only in heterogeneous versus homogenous.
7. Phase 3. Overall Comparison
   a. All classes will be divided randomly in half and assigned to 1 or 2 groups as determined by the results of phase two. Both groups being either Heterogeneous or Homogenous grouping, and same 2 methodologies tested in phase 2.
   b. Scores on Pre versus Post-test will be compared.

<u>Overview of Classroom Procedure</u>

Day O. Students will placed in groups prior to start of TBL procedure

Day 1. Pretest (10 multiple choice questions)

Students are assigned reading/ preparatory activities (homework)

Day 2. TBL lesson:

A. Readiness Assurance Process
   i. iRAT- individual readiness assessment test (5 question quiz, 25 points towards grade)
   ii. tRAT- team readiness assessment test (same 5 question quiz, will count as bonus points up to 5 pts)
   iii. Appeals- must be written and provide to teacher by end of class period
   iv. Mini-lecture (10 to 15 minute lecture/discussion)
B. Application activity (all groups given same problem)
   i. Presentation of Problem
   ii. General discussion of Problem in group

Day 3. TBL lesson:

iii. Presentation of Specific choices for problems
iv. Groups decide on solutions
v. Simultaneously Report of answer for each question
vi. Discussion of each answer, focusing on why
vii. Repeat v. and vi. or each question
viii. Wrap up of what was learned

Day 4. Post-Test (10 multiple choice questions, same as pre-test, will count as 50pts on student grade)

*Note

Pre and Posttests are not part of standard TBL cycle, but are used to measure learning gains.

Testing on day 4 (post-test) would normally be done after series of TBLs (unit) but for action plan will be tested after 1 TBL lesson. Pretest would cover same material as post-test, therefore day one activities could be accomplished at the end of day 3 make this a standard 3 day cycle, with pre and posttest given at ends of "unit" if TBL is used for whole unit.

Data Collection and Analysis

Student's primary and secondary colors will be collected from True colors test. A demographical analysis for reading score, GPA, and Personality type will be conducted to comparing classes for differences and correlations. Individual scores on pre-tests, post-tests, and iRATs and group scores on the tRATS will be collected. Pre versus posttest scores will be analyzed using pairwise t-test for change in knowledge (gain). Change in student score pre versus posttest for each TBL will be calculated and differences determined using Anova or t-tests depending on the phase of experiment. Scores on iRATs and tRATs will be analyzed for differences, trends and correlations. However, final determination on success of selection methodology will be solely on pre versus posttest score change.

Budget and Budget Justification.

2 packs of 36 AA batteries (http://www.staples.com/Duracell-Alkaline-AA-Batteries-36-Pack/product_464050) for CPS response system which will be used for testing purposes

AMScope (http://www.amscope.com/accessories/camera/480p-wi-fi-microscope-digital-camera-software.html) Digital wireless camera for use in mini lecture presentations of microscopic examples onto overhead projector.

Number	Description	Unit cost	Total cost
2	**36 pack AA Batteries**	**22.99**	**45.98**
1	**Digital wireless camera**	**119.98**	**119.98**
Total			**165.96**

Permissions

The researcher will be requesting permission to do this experiment form the Science Department Chair, Head of Guidance, and the Principal. This will ensure each level of school hierarchy is aware of the experiment. Also parents will be informed of child's participation, however since this is not beyond the realm of normal classroom practice, informed consent will should not be needed.

Literature Cited

ANCONA D. and CALDWELL D. (1992) Demography and design: Predictors of new product team performance. Organization Science, Vol. 3, p. 321-341.

Barron B. and Darling-Hammond L. (2008) Powerful Learning: Studies Show Deep Understanding Derives from Collaborative Methods. http://www.edutopia.org/inquiry-project-learning-research. Accessed 6-24-15.

BREWER M. (1996): Managing Diversity: the role of social identity. In: Susan Jackson / Marian Ruderman Diversity in workteams: Research paradigms for a changing workplace. Washington, DC: American Psychological Association, p. 47-68.

Hess D. (2007) Heterogeneous and homogeneous groups in the innovation process. http://www.cetro.uni-oldenburg.de/download/Nr._16_jm.pdf. Accessed 6-24-15.

Krininger C.E. (unpublished) Use of True Colors personality tests to determine group make ups in the 2014-2015 school year.

Matta, V., Luce T., and Ciavarro G. (2011) Exploring Impact of Self-selected Student Teams and Academic Potential on Satisfaction. Information Systems Education Journal. Pg. 14-23.

McKeachie, W. J. and Svinicki M. 2011. Teaching Tips: Strategies, Research, and Theory for College and University Teachers. Wadsworth Cengage Learning.

Michaelsen L. and Sweet M. (2008) Team Based Learning. The Advocate, 6-14-08. http://www.nea.org/home/34362.htm. Accessed 6-24-15.

Nilson, L. B. (2010) Teaching At Its Best: A Research-Based Resource for College Instructors. Third. San Francisco, CA: Jossey-Bass. http://www.pharmacy.cmu.ac.th/unit/unit_files/files_download/2014-05-02Teaching-at-its-best.pdf. Accessed 6-24-15

Potosky, D. and Duck J. (2007) Forming Teams for Classroom Projects. Developments in Business Simulation and Experiential Learning. Pg. 144-148.

POWELL, W. (1990): Neither Market nor Hierarchy - Network Forms of Organization. In: Research in Organizational Behavior. http://www.uvm.edu/~pdodds/files/papers/others/1990/powell1990a.pdf. Accessed 6-24-15.

Richards J.E. and Thompson B.S. (2012) Group Member Selection Techniques for Capstone Projects. http://www.usma.edu/cfe/Literature/Thompson_12.pdf. Accessed 6-24-15.

Yee V. (2013). Grouping Students by Ability Regains Favor in Classroom. New York Times, 6-9-13. http://www.nytimes.com/2013/06/10/education/grouping-students-by-ability-regains-favor-with-educators.html?_r=0. Accessed 6-24-15

SINGLE LESSON PLAN

Teacher: Charles Krininger	Content Area/Grade: Chem gd: 10	Date:

Unit Name:	Pharmacogenomics, a model for biological interaction with chemical compounds

Unit Goal What unit goal does this daily lesson address?	**Standard(s)/Benchmark(s)** What standard(s)/benchmark(s) does this daily lesson address?
Understanding the interaction between shape and arrangement of atoms on chemical structure. Understand role shape plays in enzyme and catalyst function.	**SC912.N1.1** **SC912.N1.4** **SC912.N1.6** **SC912.N2.4** **SC912.N4.1** **SC912.P.8.7**
Students will understand that… What should the students understand by the end of today's lesson?	**Essential Questions** What essential question(s) does this lesson address?
Understanding the interaction between shape and arrangement of atoms on chemical structure. Understand role shape plays in enzyme and catalyst function. How genetic testing can help detect issue and help determine which chemicals would work to treat person best before administration.	What is the model for enzyme / catalyst specificity? What is its role in life?
Connecting Concepts How will you review yesterday's content and connect today's lesson to it?	**Organizing Students for Learning** How will students be organized today for the lessons activities?
Seeing how atom arrangement in a compound cane effect enzyme function and how that relates to disease. How genetic test can help us predict drug preformace.	They will be arranged in teams as defined by methods in A comparison of methods for team determination on the success of team based learning of biotechnology related material across multiple courses .action plan protocol.

LEARNING EXPERIENCES, INSTRUCTION AND RESOURCES

What activities or experiences (from your Unit Plan) will students engage in today?

Lesson Sequence

Activating Prior Knowledge	After completing **Homework** **Complete web quest for** http://gslc.genetics.utah.edu/units/pharma **Visit:** http://learn.genetics.utah.edu/content/pharma/ Students will relate enzyme/catalyst shape and function to specific chemical reactions. They will understand the differences in shape of atom arrangement to shape of molecule.	☐ ABC Brainstorming ☐ KWL ☐ Anticipation Guide ☐ Card Sort ☐ Think-Pair-Share
Explicit Instruction	Teacher will present mini-lecture Phase1.ppt	☐ Motivational Hook ☒ Lecture ☐ Demonstration ☐ Note-taking Guide

Lesson Sequence				Resources and Materials
Group Processing of New Information	Students will work as a group to answer question and share with class using TBL model.	☐ Jigsaw ☐ Reciprocal Teaching ☐ Concept Attainment ☐ Think-Pair-Share	☒ Lab / Inquiry Activity	☒ Computer ☒ LCD Projector ☒ Paper ☐ Pencils ☐ Whiteboards ☐ Markers ☐ Butcher Paper ☐ Response Cards ☐ Post-it Notes ☐ Video Clip(s): ☒ Website(s): ☐ Lab Materials:
Elaborative Questioning	See TBL model phase 1 problem and questions: Phase1questions.ppt	☒ Inferential Questions ☒ Analytic Questions ☐ Philosophical Chairs		
Demonstrating Understanding	Pre versus posttest, scores on iRAT and tRAT	☐ Graphic Organizers ☐ Picture Notes ☐ Flow Charts ☐ Concept Maps ☐ Mnemonics ☐ Graffiti		
Reflection	Students will do personal reflection	☐ Reflective Journals ☐ Think Logs ☐ Exit Ticket (Student Learning)		
Daily Progress Monitoring Assessment	Pre versus posttest, scores on iRAT and tRAT	☒ Quiz ☐ Journal ☐ Exit Ticket (for Content) ☐ Response Cards		
Based in the results from your Daily Progress Monitoring Assessment, what concepts need to be revisited in the next lesson?				**Homework** **Complete web quest for** http://gslc.genetics.utah.edu/units/pharma **Visit:** http://learn.genetics.utah.edu/content/pharma/

SINGLE LESSON PLAN

Teacher: Charles Krininger	Content Area/Grade: A and P G11/12	Date:

Unit Name:	Unit: Energy and Metabolism Lsn: Glycogen Storage Diseases as an application of cellular energy and metabolism.

Unit Goal What unit goal does this daily lesson address?	**Standard(s)/Benchmark(s)** What standard(s)/benchmark(s) does this daily lesson address?
To have real world knowledge of how issues in the metabolic process results in biological issue. To gain appreciation of advancements in Biotechnology and impact on medicine	MAFS.K12.MP.3.1 SC.912.N.1.1:1-11 SC.912.L.18.11: LACC.1112.WHST.3.9 SC.912.N.1.2: SC.912.L.16.10: SC.912.L.18.2: SC.912.L.18.6: SC.912.L.18.8: SC.912.L.18.11:
Students will understand that… What should the students understand by the end of today's lesson?	**Essential Questions** What essential question(s) does this lesson address?
What is Glycogen Storage Diseases, what is biological causes and effects, what are current treatments and what is biotechnologies role in future treatments.	How is biotechnology changing the model for Glycogen Storage Diseases and their relationship to metabolism?
Connecting Concepts How will you review yesterday's content and connect today's lesson to it?	**Organizing Students for Learning** How will students be organized today for the lessons activities?
Will take basic understand of cellular metabolism and energy and apply it body wide effects and disease state.	They will be arranged in teams as defined by methods in A comparison of methods for team determination on the success of team based learning of biotechnology related material across multiple courses .action plan protocol.

LEARNING EXPERIENCES, INSTRUCTION AND RESOURCES

What activities or experiences (from your Unit Plan) will students engage in today?

Lesson Sequence

Activating Prior Knowledge	Work through GSD.ppt Visit and note following web sites: http://www.agsdus.org/, https://ufhealth.org/glycogen-storage-disease-program/overview, https://ufhealth.org/glycogen-storage-disease-program/links-resources	☐ ABC Brainstorming ☐ KWL ☐ Anticipation Guide ☐ Card Sort ☐ Think-Pair-Share
Explicit Instruction	Teacher will present mini-lecture Phase2.ppt	☐ Motivational Hook ☒ Lecture ☐ Demonstration ☐ Note-taking Guide

Lesson Sequence				Resources and Materials
Group Processing of New Information	Students will work as a group to answer question and share with class using TBL model.	☐ Jigsaw ☐ Reciprocal Teaching ☐ Concept Attainment ☐ Think-Pair-Share	☒ Lab / Inquiry Activity	☒ Computer ☒ LCD Projector ☒ Paper ☐ Pencils ☐ Whiteboards ☐ Markers ☐ Butcher Paper ☐ Response Cards ☐ Post-it Notes ☐ Video Clip(s):
Elaborative Questioning	See TBL model phase 2 problem and questions: Phase2questions.ppt	☒ Inferential Questions ☒ Analytic Questions ☐ Philosophical Chairs		
Demonstrating Understanding	Pre versus posttest, scores on iRAT and tRAT	☐ Graphic Organizers ☐ Picture Notes ☐ Flow Charts ☐ Concept Maps ☐ Mnemonics ☐ Graffiti		☒ Website(s): ☐ Lab Materials:
Reflection	Students will do personal reflection	☐ Reflective Journals ☐ Think Logs ☐ Exit Ticket (Student Learning)		
Daily Progress Monitoring Assessment	Pre versus posttest, scores on iRAT and tRAT	☒ Quiz ☐ Journal ☐ Exit Ticket (for Content) ☐ Response Cards		

Based in the results from your Daily Progress Monitoring Assessment, what concepts need to be revisited in the next lesson?

Homework

Work through GSD.ppt

Visit and note following web sites:

http://www.agsdus.org/, https://ufhealth.org/glycogen-storage-disease-program/overview, https://ufhealth.org/glycogen-storage-disease-program/links-resources

SINGLE LESSON PLAN

Teacher: Charles Krininger	Content Area/Grade: A&P, Chem./10-12	Date:

Unit Name:	Decellurization as a model for the interaction solubility and cell dynamics

Unit Goal What unit goal does this daily lesson address?	**Standard(s)/Benchmark(s)** What standard(s)/benchmark(s) does this daily lesson address?
Understanding the chemistry behind cellular attachment. Understanding the practical applications of basic biochemistry. Understand basic process of decellurization.	**SC.912.N.1.1** **SC.912.N.1.4** **SC.912.N.1.6** **SC.912.N.2.4** **SC.912.N.4.1**
Students will understand that… What should the students understand by the end of today's lesson?	**Essential Questions** What essential question(s) does this lesson address?
Understand what is decellurization. Understand role of solubility on cell attachment. Understand the application of decellurized tissues.	What types of chemicals and processes would be needed to decellurize tissues?
Connecting Concepts How will you review yesterday's content and connect today's lesson to it?	**Organizing Students for Learning** How will students be organized today for the lessons activities?
Understand of basic cell knowledge and concepts of solubility and how they can be applied to decellurize tissues.	They will be arranged in teams as defined by methods in A comparison of methods for team determination on the success of team based learning of biotechnology related material across multiple courses .action plan protocol.

LEARNING EXPERIENCES, INSTRUCTION AND RESOURCES

What activities or experiences (from your Unit Plan) will students engage in today?

Lesson Sequence

Activating Prior Knowledge	Have students complete **What is Regenerative Medicine? An Introductory WebQuest:** **Talk about relationship of attachment materials to solubility.**	☐ ABC Brainstorming ☐ KWL ☐ Anticipation Guide ☐ Card Sort ☐ Think-Pair-Share
Explicit Instruction	Teacher will present mini-lecture Phase3.ppt	☐ Motivational Hook ☒ Lecture ☐ Demonstration ☐ Note-taking Guide

<table>
<tr><th colspan="3">Lesson Sequence</th><th>Resources and Materials</th></tr>
<tr><td>Group Processing of New Information</td><td>Students will work as a group to answer question and share with class using TBL model.</td><td>☐ Jigsaw
☐ Reciprocal Teaching
☐ Concept Attainment
☐ Think-Pair-Share</td><td rowspan="6">☒ Lab / Inquiry Activity

☒ Computer
☒ LCD Projector
☒ Paper
☒ Pencils
☐ Whiteboards
☐ Markers
☐ Butcher Paper
☐ Response Cards
☐ Post-it Notes
☒ Video Clip(s):

☒ Website(s):

☐ Lab Materials:</td></tr>
<tr><td>Elaborative Questioning</td><td>See TBL model phase 3 problem and questions:

Phase3questions.ppt</td><td>☒ Inferential Questions
☒ Analytic Questions
☐ Philosophical Chairs</td></tr>
<tr><td>Demonstrating Understanding</td><td>Pre versus posttest, scores on iRAT and tRAT</td><td>☐ Graphic Organizers
☐ Picture Notes
☐ Flow Charts
☐ Concept Maps
☐ Mnemonics
☐ Graffiti</td></tr>
<tr><td>Reflection</td><td>Students will do personal reflection</td><td>☐ Reflective Journals
☐ Think Logs
☐ Exit Ticket (Student Learning)</td></tr>
<tr><td>Daily Progress Monitoring Assessment</td><td>Pre versus posttest, scores on iRAT and tRAT</td><td>☒ Quiz
☐ Journal
☐ Exit Ticket (for Content)
☐ Response Cards</td></tr>
<tr><td colspan="3">Based in the results from your Daily Progress Monitoring Assessment, what concepts need to be revisited in the next lesson?</td><td>Homework
Have students complete: What is Regenerative Medicine? An Introductory WebQuest</td></tr>
</table>

UNIT PLAN

Unit Title: Atoms and chemicals	**Content Area/Grade: Chem. Gd 10**
Teacher: Charles Krininger	**Implementation Time Frame: about 10 days**

STAGE 1: THE DESIRED RESULTS
What are my learning goals?

Unit Goal Students will understand that…	**Standard(s)/Benchmark(s)** What standard(s)/benchmark(s) does this daily lesson address?
Understand the arrangement of sub atomic particles in atom. Understand interaction of sub atonic particles from different atoms in a compound. Understand how atomic arrangement effects shape. Understanding the interaction between shape and arrangement of atoms on chemical structure. Understand	SC.912.P.8.3 SC.912.P.8.4 SC.912.P.8.7 SC.912.N.1.1 SC.912.N.1.4 SC.912.N.1.6
Related Misconceptions What misconceptions are predictable?	**Students will know…** Vocabulary, terminology, definitions
Misunderstanding of role of subatomic particles on shape of molecule. Relationship of shape of molecules to action of enzyme. Issues crated when shape of molecule is altered.	Vocabulary Atom Proton Neutron Electron Compound Chemical Bond Molecule Pharmacogenomics
Essential Questions What questions will foster inquiry, understanding and transfer of learning?	
See individual lesson plans	

Students will know…
key facts, formulas, critical details, important events, important people, timelines

Other Essential Knowledge

Basic geometric shapes, idea of 3-d, that enzymes require specific shapes to work, that enzymes are bio catalysts

Students will be able to…
Specific skills students will acquire as a result of this unit

See goals:

STAGE 2: ASSESSMENT EVIDENCE

What evidence will show that my students have achieved the learning goals?

Performance tasks:

Through what specific "real-world" performance task(s) will students demonstrate their understanding of the learning goals?

Though performance on the TBL section at end of unit

Rubric

By what criteria will "performance of understanding" be judged?

Quizzes, iRAT, tRAT, Post-test, unit project

Other Evidence: What other evidence needs to be collected in order to monitor student progress on these concepts and skills along the way?	**Self-Assessment/Reflection** How will students reflect and self-assess their learning?
Performance in class discussions and TBL	They will complete a self-reflection as part of the unit project

STAGE 3: LEARNING EXPERIENCES, INSTRUCTION, AND RESOURCES
What activities will help my students achieve the learning goals?

What **H**ere	**What** is expected? How will you ensure that students are aware of the learning goals? **Where** are your students? How will you establish your students' prior knowledge?
	Students are expected to learn the material that is found under goals. They will be aware of these goals through the uses of essential questions. To determine where students are and prior knowledge a pretest will be given.
Hook **H**old	How will you **hook** students at the beginning of the unit? How will you **hold** their attention throughout the units?
	Show Clip on role of atomic shape and chemistry in medicine, to hold attention I will quiz them on regular basis.
Experience **E**xplore **E**quip	What critical input **experience** will help students **explore** the key ideas and essential questions? How will you **equip** your students with needed skills and knowledge?
	TBL, and use of multiple methods to provide knowledge
Reflect **R**ethink **R**ehearsing **R**evising **R**efining	How will you encourage students to **reflect** and **rethink**? How will you guide students in the process of **rehearsing**, **revising**, and **refining** their work?
	Reflection will be required part of unit project, the TBL has built in methods for **rehearsing**, **revising**, and **refining.**
Exhibit **E**valuate	How will you help students to **exhibit** and **self-evaluate** their developing skills, knowledge and understanding throughout the unit?
	Will encourage them to reflect on quiz scores as measure of where they are.
Tailor	How will you **tailor** your instruction to meet the different needs, interests and abilities of all learners in your classroom?
	I will used multiple methods to provide student instruction.
Organize	How will you **organize** and sequence the learning activities to maximize the engagement and achievement of all students?
	Basic material first, then more complex information, TBL and then unit project to summarize.

Big Idea:		Standard(s)/Benchmark(s):
Unit:		Sample Activities
Grade:		
Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.**	
Score 3.0	**The student:** **The student exhibits no major errors or omissions**	
Score 2.0	**There are no major errors or omissions regarding the simpler details and processes as the student:** • Recognizes or recalls specific terminology • Performs basic processes, such as: **However, the student exhibits major errors or omissions regarding the more complex ideas and processes**	
Score 1.0	**With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.**	
Score 0.0	**Even with help, no understanding or skills demonstrated.**	

UNIT PLAN

Unit Title: Energy and Metabolism	**Content Area/Grade: A&P Gd 11-12**
Teacher: Charles Krininger	**Implementation Time Frame: 10 days**

STAGE 1: THE DESIRED RESULTS

What are my learning goals?

Unit Goal

Students will understand that…

Understand the processes of aerobic and anaerobic energy formation and how they are related.

Difference between aerobic and anaerobic energy formation

Understand how food is converted to energy.

Standard(s)/Benchmark(s)

What standard(s)/benchmark(s) does this daily lesson address?

MAFS.K12.MP.3.1
SC.912.N.1.1:1-11
SC.912.L.18.11:
LACC.1112.WHST.3.9

SC.912.N.1.2:
SC.912.L.16.10:
SC.912.L.18.2:

Related Misconceptions

What misconceptions are predictable?

Confusions on methods of anaerobic formation

Which type of food produces most energy?

Role of Biotechnology in Energy and Metabolism

Essential Questions

What questions will foster inquiry, understanding and transfer of learning?

See specific lesson plans.

Students will know…

Vocabulary, terminology, definitions

Vocabulary

Aerobic

Anaerobic

Glycolysis

Citric acid cycle

Glycogen storage disease

Electron Transport Chain

ATP Synthase

Substrate Level Phosphorylation

oxidative phosphorylation

Oxidation

Students will know…

key facts, formulas, critical details, important events, important people, timelines

Other Essential Knowledge

Glycolysis, COa, ETC, Lactic acid versus EtOH fermentation,

Students will be able to…

Specific skills students will acquire as a result of this unit

See goals:

STAGE 2: ASSESSMENT EVIDENCE

What evidence will show that my students have achieved the learning goals?

Performance tasks:

Through what specific "real-world" performance task(s) will students demonstrate their understanding of the learning goals?

Though performance on the TBL section at end of unit

Rubric

By what criteria will "performance of understanding" be judged?

Quizzes, iRAT, tRAT, Post-test, unit project

Other Evidence: What other evidence needs to be collected in order to monitor student progress on these concepts and skills along the way?	**Self-Assessment/Reflection** How will students reflect and self-assess their learning?
Performance in class discussions and TBL	They will complete a self-reflection as part of the unit project

STAGE 3: LEARNING EXPERIENCES, INSTRUCTION, AND RESOURCES
What activities will help my students achieve the learning goals?

What **H**ere	**What** is expected? How will you ensure that students are aware of the learning goals? **Where** are your students? How will you establish your students' prior knowledge?
	Understand the processes of aerobic and anaerobic energy formation and how they are related, Difference between aerobic and anaerobic energy formation, understand how food is converted to energy. To have real world knowledge of how issues in the metabolic process results in biological issue. To gain appreciation of advancements in Biotechnology and impact on medicine. I hope my students are in my classroom. I will look at previous test scores to determine where they have knowledge
Hook **H**old	How will you **hook** students at the beginning of the unit? How will you **hold** their attention throughout the units?
	Show Clip of Movie Extraordinary Measures, to hold attention I will quiz them on regular basis.
Experience **E**xplore **E**quip	What critical input **experience** will help students **explore** the key ideas and essential questions? How will you **equip** your students with needed skills and knowledge?
	TBL, and use of multiple methods to provide knowledge
Reflect **R**ethink **R**ehearsing **R**evising **R**efining	How will you encourage students to **reflect** and **rethink**? How will you guide students in the process of **rehearsing**, **revising**, and **refining** their work?
	Reflection will be required part of unit project, the TBL has built in methods for **rehearsing**, **revising**, and **refining.**
Exhibit **E**valuate	How will you help students to **exhibit** and **self-evaluate** their developing skills, knowledge and understanding throughout the unit?
	Will encourage them to reflect on quiz scores as measure of where they are.
Tailor	How will you **tailor** your instruction to meet the different needs, interests and abilities of all learners in your classroom?
	I will used multiple methods to provide student instruction.
Organize	How will you **organize** and sequence the learning activities to maximize the engagement and achievement of all students?
	Basic material first, then more complex information, TBL and then unit project to summarize.

Big Idea:		Standard(s)/Benchmark(s):
Unit:		Sample Activities
Grade:		
Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.**	
Score 3.0	**The student:** **The student exhibits no major errors or omissions**	
Score 2.0	**There are no major errors or omissions regarding the simpler details and processes as the student:** • Recognizes or recalls specific terminology • Performs basic processes, such as: **However, the student exhibits major errors or omissions regarding the more complex ideas and processes**	
Score 1.0	**With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.**	
Score 0.0	**Even with help, no understanding or skills demonstrated.**	

UNIT PLAN

Unit Title: solubility and cell dynamics	**Content Area/Grade: A&P, Chem./10-12**
Teacher: Charles Krininger	**Implementation Time Frame: 7 + days**

STAGE 1: THE DESIRED RESULTS
What are my learning goals?

Unit Goal Students will understand that…	**Standard(s)/Benchmark(s)** What standard(s)/benchmark(s) does this daily lesson address?
Understand solubility. Understand what the ECM does. Understanding the chemistry behind cellular attachment. Understanding the practical applications of basic biochemistry. Understand basic process of decellurization.	**SC.912.N.1.1** **SC.912.N.1.4** **SC.912.N.1.6** **SC.912.N.2.4** **SC.912.N.4.1**
Related Misconceptions What misconceptions are predictable?	**Students will know…** Vocabulary, terminology, definitions
That removing cells from a tissue would be a simple process. The ECM is of little use to the cell. That there is little role of basic chemistry in applied biotechnology.	**Vocabulary** **ECM** **Solubility** **Decellurization** **Perfusion** **Stem cells** **Connective tissue** **Polar** **Nonpolar** **Solvent**
Essential Questions What questions will foster inquiry, understanding and transfer of learning?	
See specific lesson plans.	

Students will know…
key facts, formulas, critical details, important events, important people, timelines

Other Essential Knowledge:

Materials that make up ECM, rules for solubility, structure of basic molecules.

Students will be able to…
Specific skills students will acquire as a result of this unit

See goals:

STAGE 2: ASSESSMENT EVIDENCE

What evidence will show that my students have achieved the learning goals?

Performance tasks:

Through what specific "real-world" performance task(s) will students demonstrate their understanding of the learning goals?

Though performance on the TBL section at end of unit

Rubric

By what criteria will "performance of understanding" be judged?

Quizzes, iRAT, tRAT, Post-test, unit project

Other Evidence: What other evidence needs to be collected in order to monitor student progress on these concepts and skills along the way?	**Self-Assessment/Reflection** How will students reflect and self-assess their learning?
Performance in class discussions and TBL	They will complete a self-reflection as part of the unit project

STAGE 3: LEARNING EXPERIENCES, INSTRUCTION, AND RESOURCES What activities will help my students achieve the learning goals?	
What **H**ere	**What** is expected? How will you ensure that students are aware of the learning goals? **Where** are your students? How will you establish your students' prior knowledge?
	Students will be expect to know what decullurization is and biochemistry behind the process. Students will be presented the leaning goals as essential questions. I will determine where students are and prior knowledge by pretesting.
Hook **H**old	How will you **hook** students at the beginning of the unit? How will you **hold** their attention throughout the units?
	Show short clip on production of replacement organs, to hold attention I will quiz them on regular basis.
Experience **E**xplore **E**quip	What critical input **experience** will help students **explore** the key ideas and essential questions? How will you **equip** your students with needed skills and knowledge?
	TBL, and use of multiple methods to provide knowledge
Reflect **R**ethink **R**ehearsing **R**evising **R**efining	How will you encourage students to **reflect** and **rethink**? How will you guide students in the process of **rehearsing**, **revising**, and **refining** their work?
	Reflection will be required part of unit project, the TBL has built in methods for **rehearsing**, **revising**, and **refining.**
Exhibit **E**valuate	How will you help students to **exhibit** and **self-evaluate** their developing skills, knowledge and understanding throughout the unit?
	Will encourage them to reflect on quiz scores as measure of where they are.
Tailor	How will you **tailor** your instruction to meet the different needs, interests and abilities of all learners in your classroom?
	I will used multiple methods to provide student instruction.
Organize	How will you **organize** and sequence the learning activities to maximize the engagement and achievement of all students?
	Basic material first, then more complex information, TBL and then unit project to summarize.

Big Idea:		Standard(s)/Benchmark(s):
Unit:		Sample Activities
Grade:		
Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.**	
Score 3.0	**The student:** **The student exhibits no major errors or omissions**	
Score 2.0	**There are no major errors or omissions regarding the simpler details and processes as the student:** • Recognizes or recalls specific terminology • Performs basic processes, such as: **However, the student exhibits major errors or omissions regarding the more complex ideas and processes**	
Score 1.0	**With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.**	
Score 0.0	**Even with help, no understanding or skills demonstrated.**	