Project-Based Instruction: A UTeach Course Overview

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What is Project-Based Instruction?
Many people think of projects as fun activities that are related to a topic in the formal curriculum.
Math About Me

My Birthday
4-9-60

5 people in my family

3 sports in Triathlon

19 is the number of books I read over the summer

I ran 10 marathons

26.2 miles

Mrs. Huebner

I love my third graders

Figure Me Out

I have? Pigs

1 x 1 =

9 x 2 =

6 ÷ 2 =

16 ÷ 2 =

9 ÷ 9 =

What is my shoe size?

What is my father’s number of years?

What was I born in?

What month was I born in?
“Project-based [instruction] allows students to learn by doing and applying ideas. Students engage in real world activities that are similar to the activities that adult professionals engage in” (p. 317).

“Project-based [instruction] is an overall approach to the design of learning environments. Learning environments that are project based have five key features” (p. 318).

Projects start with a **driving question** or problem to be solved

Dear Ride Engineers and Designers,

Schlitterbahn New Braunfels Waterpark has been the #1 Waterpark in the World for 15 Consecutive Years. Not only is Schlitterbahn New Braunfels Waterpark the most popular summertime waterpark in the United States, but it is also ranked as the #1 kid-friendly destination in the state of Texas. The park is located on the banks of the spring-fed Comal River in New Braunfels, between San Antonio and Austin, in south-central Texas.

We are currently in the early stages of planning a new ride for the park. We are soliciting designs for the new ride from multiple teams of engineers.

Based upon surveys and comments from our valued customers the ride needs to be either a pendulum-type ride or a bungee/mass-on-a-spring type ride. Both of which rely, as you well know, on the mathematics of radical functions and the physics of harmonic motion, in order to predict and change the speed and duration of the ride.

Our minimum requirements for any ride are to accommodate 50 riders/hour. No ride can be shorter than 1 minute but not longer than 1 minute 30 seconds. The ride must fit within a space at the park of one acre, which includes the ride structure and a waiting area for at least 100 riders. It must also incorporate water in some meaningful way.

Each design will be evaluated based upon the minimum requirements outlined above along with its aesthetics, potential to generate excitement and safety. The winning design will be built and become a permanent part of Schlitterbahn for generations to come.

Designs are due on 9/14/2015. Good luck.

Gordon Sumner
Vice President of Ride Design
Schlitterbahn Waterpark,
New Braunfels, Tx.

Students participate in **authentic, sustained, and situated inquiry**

Students **collaborate** to develop, refine, and critique ideas

Students use **technology** to gather, analyze, and communicate information

Students create an **artifact** to demonstrate what they have learned

Why do we have a course about Project-Based Instruction?
To provide our students with a framework for designing a curriculum that is more than a traditional scope and sequence.

First Six Weeks (29 days)
1. Biochemistry: 9A, 9C, 9D (10 days)
2. Cells: 4A, 4B, 4C, 5B, 7G (15 days)
3. Cell Energy- Photosynthesis and Respiration: 4B, 9B (4 days)

Second Six Weeks (24 days)
Con’t Cell Energy (3 days)
5. Protein Synthesis: 4B, 5C, 6C, 6D, 6E (10 days)

Third Six Weeks (27 days)
7. Applications of Genetics: 6D, 6E, 6F, 6H (10 days)

Fourth Six Weeks (33 days)
8. Evolution: 6B, 7A, 7B, 7C, 7D, 7E, 7F (12 days)
9. Classification/Taxonomy: 4C, 8A, 8B, 8C, 11C (11 days)
10. Interaction of Animal Systems: 5B, 10A, 10C, 11A (10 days)

Fifth Six Weeks (34 days)
Con’t Interaction of Animal Systems: 5B, 10A, 10C, 11A (11 days)
11. Plant Systems and Responses: 10B, 10C, 11A, 5B, 9B, 12B (11 days)

Sixth Six Weeks (31 days)
Biology EOC Review (5-10 days)
Dissections, Performance Tasks, Careers in Biology, Project/Problem Based Learning, etc.

District Adopted Resource
- Biology Texas by Houghton Mifflin Harcourt (Holt McDougal), August 2014
- Online access for every student, class set of textbooks.

Note
- Number of days per unit includes assessment days
- Number of days in six weeks is the number of instructional days on the calendar.
- Process Skills TEKS are embedded within content units- reference the unit plans.
To encourage students to incorporate and synthesize ideas from previous courses.
To encourage the use of culturally relevant pedagogy and to confront deficit views of students

My honors kids can do that but my level 1s and 2s, no way...

My students can’t handle that...

They can’t read...

My general kids just don’t care...

My students can’t even speak English...

I need to just focus on the basics, everything else is too hard for them...
What do we expect students to know or be able to do at the end of the course?
Describe the essential features of PBI and the strengths and limitations of it.

Evaluate and critique a unit of instruction in terms of its alignment with the essential elements of PBI.

Design lessons and assessments that are appropriate for use during a PBI unit.

Evaluate and Critique a lesson and then make suggestions about how to improve it.
Ensure that all students have an opportunity to learn by creating an equitable and inclusive learning environment that takes advantage of students’ funds of knowledge and perspectives.

Design and teach a multiple day lesson that incorporates elements of PBI in a high school context.

Design a four- to six-week unit of instruction that is consistent with the essential features of PBI for use in a secondary math and/or science course.
What are the major components of the course?
Promoting equity is a focus throughout the course

<table>
<thead>
<tr>
<th>Component</th>
<th>Goal</th>
<th>Time</th>
<th>Nature of Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to PBI</td>
<td>Give students an opportunity to experience PBI</td>
<td>6 sessions</td>
<td>Modeling, readings, and reflection</td>
</tr>
<tr>
<td>Field Experience</td>
<td>Small groups of students teach a multiple day lesson that incorporates aspects of PBI</td>
<td>6 sessions (+1 week out in the field)</td>
<td>Project-Based</td>
</tr>
<tr>
<td>Design of a PBI Unit</td>
<td>Small groups of students develop a 3-4 week unit that is consistent with PBI</td>
<td>16 sessions</td>
<td>Project-Based</td>
</tr>
</tbody>
</table>
Students are asked to design a ride for a local theme park that uses simple harmonic motion.
An introduction to PBI

Students carry out two investigations related to harmonic motion.
An introduction to PBI
Students then develop and critique a blueprint for a ride.

An introduction to PBI
An introduction to PBI

<table>
<thead>
<tr>
<th>Feature</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you explore solutions to a meaningful problem or question?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you engage in inquiry (conduct investigations)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you collaborate with your classmates to find solutions?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you use technology to gather, analyze, or communicate information?</td>
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</tr>
<tr>
<td>Did you create an artifact to demonstrate what you learned?</td>
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</tbody>
</table>

Students read about the essential elements of PBI and then we reflect on the experience.
Students also identify what could have been done differently to (a) make it more consistent with PBI and (b) better support learning.
Field Experience

Students, in pairs, complete 2 observations and teach 3 – 90 minute lessons on consecutive days. Often times, there exist opportunities for field trips.
# Field Experience – Sequence of Events

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before semester</td>
<td>Mentor recruitment</td>
</tr>
<tr>
<td>First week of class</td>
<td>Gather student info</td>
</tr>
<tr>
<td>Second week of class</td>
<td>Mentor meeting</td>
</tr>
<tr>
<td>5 weeks out</td>
<td>Unpacking standards; DQ Observation 1</td>
</tr>
<tr>
<td>4 weeks out</td>
<td>Multi-Day Sketch (rough)</td>
</tr>
<tr>
<td>3 weeks out</td>
<td>Multi-Day Sketch (resources) Observation 2</td>
</tr>
<tr>
<td>2 weeks out</td>
<td>Peer Review; Materials</td>
</tr>
<tr>
<td>1 week out</td>
<td>Practice Teach; Prep. video</td>
</tr>
<tr>
<td>Go time</td>
<td>Field Experience</td>
</tr>
</tbody>
</table>
How do we handle readings in PBI?
Discussions are lead by students and done in small groups (2-4 discussion happening at the same time).

Readings come from practitioner journals and focus on a specific topic related to PBI includes common reading(s) and math or science specific ones.
Design of a PBI Unit

Students design a 4-6 week PBI unit. We teach this component of the course as PBI (includes all 5 essential elements)
February 2, 2016

PBI students:

More school districts in Texas are adopting project-based instruction each year. There are also a number of teachers at several different schools who are making the transition to PBI on their own. Many of these teachers are finding support through professional learning communities and social networks that take the isolation out of using PBI. These teachers, however, need to have greater access to PBI resources that they can use in their classrooms. Our goal here at UT Austin is to support these teachers. We also want to help you learn how to develop PBI units that integrate mathematics, science, technology, and English-Language Arts.

We therefore need you to help us develop PBI units that are aligned with the TEKS. The units need to be between 4 and 6 weeks long. Each unit also needs to include all the instructional materials (handouts, slides for short interactive lectures, etc.) and the assessments (handouts, rubrics, etc.) that a teacher would need to have in order to implement it. You can develop a completely original unit or you can expand your lesson from your field experience into a full unit.

The units will need to be incorporated into a website in order to make them easy for teachers to access. Examples of PBI unit websites created by other students are available on the canvas website for your PBI course. You can develop PBI units that integrate mathematics, science, technology, and English Language Arts.

More school districts in Texas are adopting project-based instruction each year. There are also a number of PBI students: a number of PBI unit websites created by other students are available on the canvas website for your PBI course. You can develop PBI units that integrate mathematics, science, technology, and English Language Arts.

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PBI Unit Project Calendar: Spring 2016 (MW)

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/8</td>
<td>2/9</td>
<td>2/10</td>
<td>2/11</td>
<td>2/12</td>
</tr>
<tr>
<td>Project Launch</td>
<td></td>
<td></td>
<td>Identify Artifact and Objective for Unit</td>
<td></td>
</tr>
<tr>
<td>2/15</td>
<td>2/16</td>
<td>2/17</td>
<td>2/18</td>
<td>2/19</td>
</tr>
<tr>
<td>Create Handout for the Artifact and Scoring Rubric</td>
<td>Prepare for Field Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/22</td>
<td>2/23</td>
<td>2/24</td>
<td>2/25</td>
<td>2/26</td>
</tr>
<tr>
<td>Milestone 1 Due (Objectives and Artifact)</td>
<td>Prepare for Field Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milestone 2 Due (Artifact Handout and Rubric)</td>
<td>Prepare for Field Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/7</td>
<td>3/8</td>
<td>3/9</td>
<td>3/10</td>
<td>3/11</td>
</tr>
<tr>
<td>Work on Investigations</td>
<td>Prepare for Field Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring Break</td>
<td>Spring Break</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milestone 3 Due (Investigation)</td>
<td>Prepare for Field Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/28</td>
<td>3/29</td>
<td>3/30</td>
<td>3/31</td>
<td>4/1</td>
</tr>
<tr>
<td>Field Experience</td>
<td>Field Experience</td>
<td>Field Experience</td>
<td>Field Experience</td>
<td>Field Experience</td>
</tr>
<tr>
<td>4/4</td>
<td>4/5</td>
<td>4/6</td>
<td>4/7</td>
<td>4/8</td>
</tr>
<tr>
<td>Field Experience</td>
<td>Field Experience</td>
<td>Field Experience</td>
<td>Field Experience</td>
<td>Field Experience</td>
</tr>
<tr>
<td>4/11</td>
<td>4/12</td>
<td>4/13</td>
<td>4/14</td>
<td>4/15</td>
</tr>
<tr>
<td>Prepare for Presentations</td>
<td>Presentations</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Disease Project: A Study of Exponential Functions

Overview

This unit project is designed to help students gain an understanding of explicit and recursive exponential functions as well as logarithms. For this project, students will be examining the spread of a transmittable disease that is linked to a drug, Propothazin. The students will act as consultants for the company that manufactures the drug. Propothazin. They will create multiple models to describe how the spread of a disease changes when the company takes different courses of action to deal with the disease. Students will then need to make a recommendation to the company based on these models. Students will create posters that explain their models and their recommendations, and they will create proposals for the company. Finally, students will need to defend their recommendations and prove that their recommendation is the best in a debate against their peers before a panel of experts.

Why is the project meaningful?

This project will be meaningful for students for many reasons. First, this project connects what students could be doing in the future. Specifically, many students will need to create models to fit real-world scenarios in their careers. Also, predictive modeling holds a great deal of importance for business. Furthermore, students will likely need to understand how to explain mathematics and use mathematics to make decisions. While they might be working in a specific area, students will need to collaborate with others who might not understand what they did in their field. This will be something that students will encounter no matter what they will do in the future. This project gives them experience working with this. It also helps students remember that they need to consider ethics in whatever they do. Furthermore, this project teaches students about time management. Lastly, the project relates to concerns students currently face. For example, the spread of a transmittable disease relates to

Presentation

PBI

- What is PBI?
  - Driving Question
  - Inquiry
  - Technology
  - Collaboration
  - Artifact


Website

- Why use PBI?
  - Equity
  - Preparation for the Future
What do the PBI units that students create look like?
Some examples of PBI Units…

<table>
<thead>
<tr>
<th>Fall 2015</th>
<th>Spring 2016</th>
</tr>
</thead>
</table>
Here is an example of a syllabus
Questions?

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