



AGGIE STEM

T E X A S A & M U N I V E R S I T Y

PBL Refresher

~Quick Quiz~

Project-based learning.

The Project solving approach is incredibly important. Mathematics and physics are the two key aspects of engineering projects. In general, PBL is the creation of complex settings and environments where students develop important skill sets and apply prior knowledge in the creation of new flexible knowledge.

1. Data collection *is* important.
True False
2. Numerical accuracy is an *essential* skill for a *successful* final product.
True False (it is not always important to have numerical accuracy sometimes the problem solving or estimation are the outcomes that are being assessed)
3. Statistics is not *important* for making use of PBL.
True False (it is FRUE—Just checking to see if you were paying attention.)
If your PBL deals with probability and statistics learning outcomes then of course it is but if it does not - - every PBL does not need to include statistics.
4. Ethics and education in ethics are *NOT* key components of project-based learning.
True False (Ethics are a vital component of our educational philosophy Group Responsibility and Individual Accountability. They are also evident in how we treat kids, establish groups, and expect students to each be responsible for making sure everyone in the group understands the project.)
5. Peer assessment is an *important* and *essential* aspect of PBL.
True False

Aspects of PBL:

Please check all that apply to the *key* aspects of a *well-developed* PBL. If you do not place a check in the box, cross out or write in the word or phrase that would allow you to place a check in the box.

➤ Structure of PBL (Choose All that Apply to STEM PBL)

- Problem solving is emphasized.
- Projects should be irrelevant to students but closely address learning objectives.
- Teaching should be innovative with active learning.



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- Learning objectives have no place in the design of PBL.
- Rigorous mathematics and science are integrated. (Mathematics can only be integrated within a real world setting because mathematics is description of the real or natural world.)
- Students work in groups.
- Team building is a secondary skill that should be addressed if everything else is working well. (No!! Team building is an essential component, kids need to learn to be a good team member and teachers need to learn how to use teams to accomplish learning outcomes)
- Exclusion from participation is a first line of behavior management. (Nope the teacher and how groups are developed and supported are the first line)
- One group member selected at random presents the group's project.

➤ Planning PBL (Choose All that Apply to STEM PBL)

- ONLY one project per semester will result in the learning outcomes I expect and the district will be satisfied. (Highly unlikely that this model will result in a teacher perfecting her or his techniques or be able to learn from mistakes and be able to improve the next attempt because so much time has passed.)
- All the interpersonal, behavioral, and metacognitive skills students will need should be present before I try a PBL or they should have them all when they



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finish the first PBL. (Nope this evolves and continues to evolve with every engagement and guided interactions.)

- Projects are planned well in advance and all the teachers and administrators are stakeholders in making this a success.

- Training is ***not*** important to planning and conducting a meaningful PBL.
(Training and support are essential to making EVERY educational innovation successful. School support structures are also important. Having a peer or group of peers engaging in the same thing strengthens implementations and build skills more quickly.)

- Administrators have a very important role in a successful PBL, but they only need to give permission and provide supplies. They have no other role. (Nope! They need training in how to observe, provide feedback during classroom observations, and ensure teachers have opportunities to hone skills through professional development. They also are responsible for taking any and all heat from parents and the community so the teacher can feel supported and protected.)

- Teachers should develop a set of common resources used for the PBL. (Very important. Given the poor funding of our schools. If teachers can agree on some materials that can cut across subjects or grades these materials will maximize dollars and ensure money is available to one-off things that fit only one subject well.)



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- On-going collaborative meetings across and among all teachers involved is necessary for a PBL success.
- **Assessment in PBL (Choose All that Apply to STEM PBL)**
- Group work but individual accountability
- Individual accountability for all summative assessments
- On-going peer review only works when the teacher is completely in charge. (Peer assessment requires students to have assumed and the teacher to give educational accountability to the children.)

- Peer assessment is an essential component.

- The use of culminating events like developing a marketing plan, conducting a trial, or developing a persuasive exposé can be used to explain, justify, or sell the PBL to investors, argue evidence, or prepare a news article is important to the integration of writing and expressing ideas logically.

- Summative PBL reporting should be **only** in writing or **only** orally but ***NEVER*** both. (The more modalities that are incorporated, the greater the learning potential)

- **Student/Group Responsibility (Choose All that Apply to STEM PBL)**

- Students should develop a design notebook that details what they did and how what they did crosses curriculum boundaries.



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- Group members need to learn to engage in conflict

- Conflict resolution is idiosyncratic and does not need to be taught or modeled.

(Students know how to fight and argue they do not understand that engaging in conflict is civilized, respectful, yet passionate, logical, and scholarly. It should result in better understanding and open communication.)

- Individuals are responsible for their behavior.

- **Implications of Teams and Team Building for PBL: Choose all that Apply**

- Improved attendance (Research has shown that kids who are engaged in hands on learning every 9 weeks, tend to have better attendance, more positive attitudes, and less disciplinary referrals than before the activities were implemented.)

- More confusion for parents (While this is not a positive outcome it is possible unless the teacher, administration, curriculum coaches, and department chairs have clearly communicated the new instructional strategies to parents. They need to engaged and involved when feasible and when they won't create new distractions.)

- Improved engagement for teachers (In a Study in Colorado when new mathematics curricula were implemented that involved more hands on activities, teachers improved their attendance rates from on average 11 days absent the previous year to less than 4 days. The most common explanation for



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why it improved was because the substitute could not do what they did. The teachers felt needed and important and that they could not be replaced by just another person in the classroom.)

- More community concerns (same as above. This is more of a warning. Make sure stakeholders are informed and involved when possible.)

➤ Questions that Remain

How do we make the PBL rigorous?

ANSWERS MAY VARY

In general plan in advance for students to be more successful than you imagined so have challenge questions that require deeper thinking and or more research ready. Expect students to be able to show you they understand what you taught and can give it back to you in applied rigorous ways.

Is PBL aligned with effort-based intelligence?

ANSWERS MAY VARY

Effort based intelligence is the idea the a person is only as smart as the effort he or she allocates to learning the material. Therefore, students who tend to persist at a task, regardless of their level of success “A” versus “B or C” tend to have greater self-worth, greater intrinsic motivation, and tend to treat minor setbacks without taking it personally and without giving up on the subject matter.