Project Based Learning

Handbook for Students & Families

This handbook was developed for Arlington Tech at the Arlington Career Center.

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What is Project Based Learning (PBL)?

"In project based learning (PBL), students work on an extended project that engages them in addressing a real-world problem or answering a complex question. As a result, they develop deep content knowledge as well as 21st century success skills. PBL unleashes a contagious, creative energy among students and teachers." *(Larmer, 2018)*

At Arlington Tech, students engage in PBL in all classes. Projects serve to integrate content across curriculums and provide hands-on, work-based learning opportunities in which students put theory into action and use critical thinking skills to solve relevant local and global problems in real-time. We aim to design our projects collaboratively with a client who will use our students work in meaningful ways.

In a traditional classroom, projects usually come at the end of the unit and act as the culminating experience. At Arlington Tech, our students' learning is embedded within the scope of the project and occurs naturally as part of the process. All projects are planned to align with the Virginia Department of Education standards to ensure that Arlington Tech students master the required curriculum in each course.

What is PBL and what PBL is not?

Many teachers say their students "do projects" (e.g., a poster about a famous scientist, author, or person in history; a model of the pyramids or the solar system; STEM kits; or a presentation about a topic of personal interest). These may be valuable activities and a good way to start students on a path to fully-developed project based learning but "doing projects" and PBL are not the same.

Doing Projects	Project Based Learning
Supplemental to a unit	Project is the unit, or a major vehicle for teaching content standards within a unit
Based on the following directions from the teacher and is repeated year after year	Open ended and involves student voice and choice; often differs from year to year and develops with a client's needs in mind
Typically done individually (often at home)	Done in collaboration with a team (much of it during school hours)
Focused on the product; the product may even be called the project	Includes a learning phase based on inquiry that is distinct from the product creation
Not authentic to the real world or to students' lives	Authentic to the real world, could be a task a professional would complete

Source: Adapted from Larmer, Mergendollar, & Boss, 2015, p.70

Common Types of PBL Projects		
Addressing a Real-World Problem	Develop a solution to a local, national, or global issue (fictitious scenarios that could occur in the future also work).	Example
Meeting a Design Challenge	Create a physical or digital artifact; a piece of writing, multimedia, or a work of art; develop a plan; produce an event; or provide a service.	Example
Exploring an Abstract Question	Explore the answer(s) to an abstract question.	Example
Conducting an Investigation	Investigate a historical event or natural phenomenon.	Example
Taking a Position on an Issue	Defend a position on a present day or historical controversy.	Example

Source: Adapted from Larmer, PBL Starter Kit, 2017, p.38

Students: What Can You Expect in a PBL Classroom?

Project Based Learning will put new demands on you. In a PBL classroom you will need to transition from being a teacher-directed learner to an autonomous, self-directed learner.

To be successful in a PBL classroom you should

- take an active role in your learning
- manage your time efficiently
- articulate your ideas clearly
- demonstrate self-restraint
- collaborate with peers
- maintain a personal calendar
- be inquisitive
- create innovation solutions
- make mistakes (and learn from them)
- reflect
- celebrate accomplishments

Maintaining a Calendar

All graded assignments (formative and summative) and final project deadlines will be placed on the Canvas calendar by your teacher. During the Create phase, teams determine their own benchmarks that meet the time constraint of the client. These benchmarks are placed on the calendar by the group member whose role in the group is “Tech Manager”.

It is important to be specific when adding team benchmarks to a calendar. Look at the calendars below. Which one more clearly articulates the benchmarks due in each class? Explain.

Calendar A

Calendar B

You may want to consider watching the Student Groups Tutorial Video to help you understand how to effectively create a calendar event and use the other tools in the Groups section of Canvas.

Parents: How Can you Support Your Student in PBL?

Project Based Learning will put new demands on your student - below are resources to help you support him or her as they transition from being a teacher-directed learner to an autonomous, self-directed learner.

Questions to Ask Your Student Regularly

Below are several questions that we'd like to encourage you to ask your student regularly. These questions will help PROMPT students in managing their workload, becoming a self-advocate, and reflecting on their learning process. As much as we can, we'd like for students to be making decisions and managing their needs.

- What is your goal for this project? What do you hope to learn? What is your challenge?
- What connections are you hoping to make throughout your research? What learning is your research helping you work towards achieving?
- What is your role in this project? Did you advocate for your role? What strengths do you bring to that role? Do you understand your responsibilities for this role?
- Have you been willing to try different roles in each of your classes? Have you felt comfortable sharing your ideas with your team?
- Did you have a assessment or benchmark today? If so, what was the outcome? Did you feel confident with your responses? If not, what are you needing remediation on? How can you get help?
- How are you continuing to monitor your own learning? Are you self-assessing everyday? Are you using the rubrics provided by your teacher or something else?
- Do you understand the expectations and deadlines for your project? Do you have them noted on a calendar? Can you show me?
- Have you set intermediate deadlines for yourself/group that support your progress toward your teacher's deadlines? Are these noted on a calendar? Can you show me?
- What phase of the project are you in? What's your next step? Is your team on pace to hit benchmarks and deadlines? What questions did you develop to guide your research/work today?

- How is your relationship with your team? Have any conflicts developed? What has been your contribution to the project? Is this evident in the team documents? Can you show me?
- What team documents have you been using? Do you have access to all of them? How is your team communicating with each other outside the classroom? Have you set up times to meet/check-in? What's your plan when someone is absent?
- Have you practiced your presentation (if applicable to project)? Did you advocate for which part of the presentation you felt most comfortable sharing?

Evidence of Growth in PBL

Project Based Learning creates a unique learning environment in which students have an opportunity to develop competitive skills supportive of academic and professional growth. As an instructional team, we design and implement projects, norms, and systems toward this aim. As parents, you can support your student by encouraging them to regularly assess their progress in these categories and by encouraging them to advocate for themselves where they need help in establishing these skills.

Areas we target in the classroom...	**Evidence that your student is making progress in this category... ...or if the student is not there yet, consider these goals to work toward...**
Curriculum Standards	● Displays and applies learning at high levels with deep understanding ● Meets the standards for the grade level or courses each year
Communication	● Expresses him/herself well in small and large group situations ● Utilizes effective verbal skills, including during presentations ● Utilizes effective written skills, in formal and casual settings ● Utilizes technology tools for effective and appropriate communication ● Is proactive in their communications with team/teachers
Leadership	● Ability to serve as the leader of a team during a project ● Displays various leadership skills to lead to the success of the team ● Participates actively in the team huddle ● Takes ownership and responsibility for their role on the team (does not wait for others to tell him/her what to do)
Collaboration	● Displays ability to work well with others ● Is accepting of others' Ideas ● Celebrates individual and team accomplishments ● Able to serve as a leader as well as a group member ● Advocates for roles that leverages his/her strengths and recognizes learning opportunities when assigned a challenging role ● Communicates proactively with their team (even if they need to initiate those communications on their own)

Critical Thinking & Problem Solving	● Analyzes situations to create effective solutions ● Is able to work independently and with others to solve problems (related to content and project management) ● Is able to evaluate information for accuracy, relevance, and credibility
Creative Thinking	● Utilizes “out-of-the-box” thinking ● Expresses self in various creative ways ● Merges original ideas with others’ creative ideas for high quality products ● Generates ideas during brainstorming and offers those ideas to the group
Iterative Design (Reflection and Critique)	● Accepts feedback for the purpose of improving ● Is able to give feedback to others for the purpose of improvement ● Strives for high quality work and products
Authentic Learning	● Engages in projects that address real problems and situations ● Applies learning of curriculum standards to authentic situations to make a difference in the local or global community ● Shares products and/or presentations to authentic audiences (e.g., local businesses, city council, school board, etc.)
Research	● Employs a variety of tools and processes to research what is needed to learn and complete the project ● Recognizes the need to gather information from resources that include technology applications, hard-copy text, and people ● Is able to summarize and paraphrase information and synthesize to convey to appropriate audiences in effective format(s) ● Develops a research plan that connects to the project scope and learning targets
Time Management	● Is able to stay on task when working independently and with others ● Monitors time as work occurs to meet deadlines ● Commits to extra time if needed to meet a deadline ● Sets intermediate (personal) deadlines to help him/her meet rigid (teacher-directed) deadlines ● Communicates with team members and teachers before a conflict with a deadline

Project Summary Sheet

The Project Summary Sheet is available on the Arlington Tech Canvas site. This one page document helps students synthesize the most important aspects of a project. Students who may need extra help organizing and managing the project workload are encouraged to complete the Project Summary Sheet and refer to it regularly. It is a communication tool that parents and students can use in discussing projects and prioritizing work.

Arlington Tech's PBL Framework

The Arlington Tech PBL Framework Infographic can be found at https://goo.gl/hSttCY.

Launch

"The project launch is a two-phase process. The first phase motivates the students with an "entry event" that sparks student interest and ignites curiosity. The second phase, which follows directly, is when you seize on student interest and curiosity to formally begin the inquiry process." *(Larmer, 2017, p. 59)*

At the project launch, the teacher will define an engaging, challenging problem and complex question for students to investigate. This driving question becomes the basis for the students' inquiry and directs their learning. An entry event can take many forms, click here to see a list of great entry events.

Once students have become interested in the project and are familiar with the driving question(s), the teacher should review the learning objectives (detailed in a rubric) and the project requirements (detailed in a checklist). There will need to be a process for students to pre-assess their knowledge of the learning objectives and inventory of what they need-to-know (N2K). This should occur individually (with teacher support) as is specific to each student.

Students work independently in the launch phase and with direction from the teacher.

What Students Think About in LAUNCH	How Teachers Support Inquiry in LAUNCH
• What is the project asking me to do? • What do I need to know? • What are the learning objectives? • Why is this work important? • What kind of professional does this work? • Who will I be sharing my work with?	• Conduct entry event and present (or co-create) driving question(s) • Present project rubric and checklist to define learning objectives and project requirements • Administer a pre-assessment to measure students background knowledge of learning objectives • Facilitate the development of a Needs-to-Know for each student

Source: Adapted from Solis, Larmer, & Olabuenarga, PBL 101 Workbook, 2017, p.4

Learn

The purpose of the learn phase is mastery of the learning objectives - in fact, it should be the sole focus of this phase. Initially, it may feel like you are putting the project on hold, but in reality, you are building the content

knowledge and skills that are needed for project completion. Teachers should continually remind students how the learning objectives and the work they are doing in the learn phase connect to the project.

The N2K document (completed during the launch) allows each student to personalize their journey in this phase. The teacher will plan workshops, labs, activities, direct instruction, practice worksheets, extensions/remediations and any other relevant instructional experience in response to the needs of the classroom. Much of the work in the learn phase will derive from teacher-provided lessons and resources.

For the most part, students work independently in the learn phase. They may complete activities and labs as small groups but formal teaming has not yet taken place. Every student monitors their progress against their individual N2K.

Formative assessments should be regularly administered to help track a student's mastery of the learning objectives. We want our students to be self-directed learners - to do so, they need feedback that helps them measure their learning against the objectives. The rubric that was distributed during Launch is an important reference tool here. A student should be able to review their performance on a formative assessment and compare their performance to the rubric to see how much progress they have made and what remains for them to work on. The results of a formative assessment may reveal that you need to plan additional instructional experiences, provide more support for struggling learners, or adjust your timeline.

Sustained inquiry is an important part of the learn phase. By inquiry, we mean that students are asking, investigating, and answering questions as they build knowledge and skills. The teacher's responsibility here is to design learning experiences that help direct the learner, who has an active role in the process. The traditional "sit and absorb" model of learning does not promote inquiry and should be used sparingly in a PBL classroom. The good news is that by designing engaging driving questions, well-detailed rubrics, and by using the N2K documents, you have already set the learner down a path of inquiry.

One of the most engaging strategies for promoting inquiry is to leverage subject-matter experts as part of the learn phase. A subject-matter expert (SME) is a professional who uses the content knowledge or skill relevant to your project regularly in their job. Plan a time to invite the SME into your classroom (either virtually or in-person); but before they arrive, have students develop a list of questions that they need to discuss. Explain the importance of the SME and encourage them to take advantage of this valuable learning opportunity. An SME may host a workshop, demonstration, or simply be interviewed by the students.

The learn phase ends with a summative assessment. A summative assessment can be traditional like a test or essay, or it can be an interview/performance assessment. Students should be able to connect how they did on the summative assessment with the rubric to better understand their level of mastery of the learning objectives.

What Students Think About in LEARN	How Teachers Support Inquiry in LEARN

● What is my role in the process? ● What workshops do I need to request and participate in? ● What extra practice may I need to meet mastery of the learning objectives? ● What do the assessments tell me about the progress I am making? ● What additional questions do I have about the content? ● What resources can and should I use?	● Provide lessons, scaffolds, and guidance in response to student needs ● Plan regular formative assessments and help students reflect on their performance as it compares to the learning objectives rubric ● Assign additional learning to students that need extension opportunities or extra practice ● Plan an SME visit and help students prepare questions ● Encourage students to evaluate resources and model research techniques

Source: Adapted from Solis, Larmer, & Olabuenarga, PBL 101 Workbook, 2017, p.4

Create

In the create phase, things get really exciting. Students will team up and begin building their solution to the problem or answer to the question. This process is often iterative and many layers of feedback (from peer, teacher, and client) should be included. There will be a physical product created by the end of the create phase.

The first step in the create phase is teaming. Although PBL can be done when students work independently, working collaboratively allows students to practice important workplace skills that they will need in the future. An ideal team size is 3, if not 3, try for 2 or 4. When teams get to be 5 or larger, it becomes harder to ensure that all members are contributing to the work.

The teacher assigns teams - which is not done at random, the needs of the group, the direction students may take in the project, or a common interest that may make the team work effectively together are considered. At the first team meeting, students should develop a process for how they will collaborate by building their working agreement, defining roles, and developing a team calendar.

The second step in the create phase is brainstorming. “Instead of just turning students loose to brainstorm with their team, teach them to make the most of the process. Remind them that the goal of brainstorming is to build an idea bank - the more ideas, the better.” *(Boss, 2013, p. 99)* Creativity experts call the abundance of ideas creative fluency. There are a number of specific strategies students may use in brainstorming.

The third step in the create phase is a peer critique of the brainstorming process. The goal here is to narrow down and revise ideas before a team gets too attached. Peer critique is a difficult skill and needs to be properly developed in students. It is critical that teachers use a structured protocol for peer critiques.

The fourth step in the create phase is for the team to develop their project plan and to seek the approval (or recommended revisions) from their client or teacher. The project plan is a proposal of the team’s best idea. Please refer to the document below for the project plan format.

The fifth step in the create phase is to complete the project deliverable based on the the final approved project plan. This is when the final product begins to come together.

The last step in the create phase is to prepare to deliver the product to the client. Most often, there will be a presentation that needs to be planned as part of this step.

Benchmarks, which are evidence of work in progress, should be identified throughout the create phase and highlighted on the Canvas course calendar. Benchmarks ensure that teams are working on pace toward their deadline and allow the teacher to intermittently assess the project work.

What Students Think About in CREATE	How Teachers Support Inquiry in CREATE
● What tools and agreements does my team need to work effectively? ● What is my role on the team? What strengths do I have that support this role? ● How do I apply what I learned to the project? ● What new questions do I have? ● Do I need more information? ● Is my work on the right track? ● Are we meeting our clients' needs and deadlines?	● Help students apply learning to the project tasks ● Ensure productive collaborations among team members, consulting with teams regularly to assess this ● Set regular benchmarks to keep teams on track ● Help students evaluate their work and facilitate peer critiques

Source: Adapted from Solis, Larmer, & Olabuenarga, PBL 101 Workbook, 2017, p.4

Reflect

"Taking time to reflect on a project is an important last step that often gets overlooked. Research shows that reflection helps students retain what they learn, and it can help teachers improve their projects plans for upcoming units." *(Boss, 2013, p. 112)* More importantly, reflection develops a growth mindset, an openness between teacher and students, and a classroom culture that promotes inquiry. This last phase of the project allows teams to recognize and celebrate the significance of the work they accomplished!

There are two tasks that need to be completed in the reflect phase - (1) an individual evaluation of self and team and (2) a classroom debrief of the project. The individual assessment is a opportunity for each student to think through and communicate what went well in the project and what did not - the focus being on individual accountability. Additionally, this private feedback will help the teacher understand the varying needs of students and team dynamics.

The classroom meeting is an opportunity for the teacher to hear students thoughts about the project. Was it engaging? Was the workload appropriate? Were the assessments fair? Were the learning objectives defined well and addressed fully? Did students get the right amount of support? In a PBL classroom, students are

active participants and deserve the opportunity to contribute this type of feedback toward improving a project. Please refer to the classroom meeting agenda in the documents below.

What Students Think About in REFLECT	How Teachers Support Inquiry in REFLECT
• What have I learned and what should I improve for the next project? • What worked well in our team's collaborations? What needed improvement? • Did I fulfill my responsibilities to the team? • How could I have been more active in managing my learning? • What supports did I need from my teacher that I should advocate for in the future? • Were all benchmarks on time? Why or why not? • What challenges did I have in meeting the client's needs? • What was most engaging about this project?	• Facilitate student reflection on learning and process • Help students to evaluate their work • Be open to student feedback • Provide examples of what thoughtful feedback looks like

Source: Adapted from Solis, Larmer, & Olabuenarga, PBL 101 Workbook, 2017, p.4

Research on PBL

Adapted from BIE's Overview of PBL (2018).

- Multiple studies have shown that when PBL is done well, students score higher on both traditional and performance based assessments compared to similar students learning the same material using traditional instructional methods. Some studies show no difference, but no studies show lower scores. (Reference 1, 2, 3, 4, 5, 6, 7, 8)
- PBL is aligned with current thinking about how to help students learn with understanding, retain what they learn, and apply it to new situations. (Reference 6)
- PBL is aligned with current thinking about maximizing student motivation and interest. (Reference 7)
- Students in schools that feature PBL have high attendance and graduation rates and are more likely to succeed in a four-year university. (Reference 8)
- Check out this great anecdote from a PBL high school graduate: http://www.bie.org/blog/how_my_project_based_school_prepared_me_for_columbia

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Glossary

Benchmark (Create) - A check-in of sorts in order to monitor the team progress. Benchmarks are written into the Team Contract and can be modified within the timeframe with prior approval from the team and teacher. Benchmarks may not be moved on the "day of" as part of project management protocols required pre-planning and constant benchmark monitoring.

Brainstorming (Create) - a ways to create as many ideas as possible. During this phase of a project, judgement should be deferred and the first 5-10 minutes should be individual. Research shows that brainstorming as a group first actually decreases the possible solutions.

Client (Learn or Create) - Person or organization that has requested students consult or provide other services for their organization.

Deadline (Create) - This is the date on which the project must be delivered to the client. It is determined by the client and is considered non-negotiable. If a deadline needs to be adjusted, a request, in writing, must be submitted to the client no later than halfway through the project. Failure to meet a deadline will impact the evaluation of the overall success of the project.

Formative Assessment (Learn) - Designed to help students and teachers identify student strengths and weaknesses in order to drive instruction. This feedback helps students prepare for a summative assessment.

Learning Objectives (Learn) - The standards and competencies outlined by the Virginia Department of Education.

Learning Rubric (Learn) - Done individually, this provides students with clear expectations of what they should be able to know and do. The learning rubric is what the summative assessment is based upon.

Needs-to-Know (N2K) (Learn) - Based on the standards of learning or competencies, a N2K chart is so students take ownership of the content they need to learn in order to be able to contribute to the group project in the Create phase. This is individual learning and students will be held accountable for the content on a summative assessment.

Peer and Self Evaluation (Create) - This allows students to reflect on their contributions to the group and the contributions of their teammates as outlined in the team contract. This is an opportunity for the students and teacher to celebrate accomplishments, reset if things are off-track and revisit team norms and contracts. It is a way to hold each other accountable so that benchmarks and deadlines are met with all members contributing equally.

Peer Critique (Create) - Students provide positive feedback to one another in order to help each other better clarify questions for client, articulate ideas or propose project solutions.

Project (Create) - Collaborative product that meets the criteria and constraints of the client.

Project Checklist (Create) - Completed as a team, this is a list of the criteria and constraints that the project must meet and done prior to the deadline of project delivery to the client.

Project Plan (Create) - Process to establish the objectives and scope of the project and includes: criteria and constraints of client, benchmarks, deadlines and responsibilities of individual team members. This is the crux of project management and will be used throughout the create stage to monitor benchmarks and deadlines.

Protocols (Launch, Learn, Create & Reflect) - the procedure used in each phase to ensure learning outcomes, collaboration, communication, teammate contributions and project completion.

Reflection (Reflect) - The act of thoughtfully considering the overall learning process and project completion. It should include what went well, where were the struggles/pitfalls and possible ways to better navigate the struggles and pitfalls in the next project. This is key to helping students metacognate and grow as a learner.

Research (Create) - Students take raw information they gather from a variety of resources and create a project that meets the client's needs. Research is <u>not</u> where students embark on a fact finding mission and then report what has already been done or learned.

Subject Matter Expert (Learn & Create) - An invited guest can speak to the content or project as an authority on the topic.

Summative Assessment (Create) - Evaluates student learning at the end of a unit.

Teacher Critique (Create) - Designed to help facilitate deeper thinking of the process or product. This occurs throughout the Create stage and may act as a formative assessment and benchmark check-in.

Team Contract (Create) - This is the outline of how the team will implement their project plan. It includes: how teammates will work together, identifies the protocols, determines benchmarks (including dates), articulates the responsibility of each team members and identified the deadline. Students will continually refer to the team contract as it is the guide for the peer and self evaluation as well as the protocol.

Team Dynamics (Create) - the way in which a team behaves or performs. The way in which a team communicates and collaborates often determines the dynamics and overall performance of the team.

Team Norms (Create) - Behaviors that exist within a team.

Working Agreements (Create) - Protocols that team members have agreed to follow while working on the project.

Work-Based Learning (WBL) - The Virginia Department of Education defines work-based learning as a school-coordinated, coherent sequence of on-the-job experiences that are related to students' career goals and/or interests, are **based** on instructional preparation, and are performed in partnership with local businesses, industries, or other organizations in the community.

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