Project Lead The Way [PLTW] Introduction to Engineering Design (IED)

PEIMS Code: N1303742

Abbreviation: IED

Grade Level(s): 9-12

Award of Credit: 1.0

Approved Innovative Course

- Districts must have local board approval to implement innovative courses.
- In accordance with Texas Administrative Code (TAC) §74.27, school districts must provide instruction in all essential knowledge and skills identified in this innovative course.
- Innovative courses may only satisfy elective credit toward graduation requirements.
- Please refer to TAC §74.13 for guidance on endorsements.

Course Description:

Introduction to Engineering Design (IED) is an Activity-Project-Problem-Based course designed to build on foundational engineering concepts with an emphasis on the application of modeling in the engineering design process to develop solutions.

Embedded throughout the course are important engineering concepts, such as engineering mindset, systems thinking, and computational thinking. Students will dig deep into the engineering design process, applying math, science, and engineering standards to hands-on projects. Students will work both individually and in teams to design solutions to a variety of problems using 3-D modeling software and use an engineering notebook to document their work.

This course prepares students for college, a career, or the military by developing their spatial reasoning, design thinking, problem-solving skills, and transportable skills and by exposing them to a variety of careers.

Essential Knowledge and Skills:

(a) General Requirements. This course is recommended for students in 9th-12th grade. There are no required prerequisites. Students shall receive one credit for successful completion of this course.

(b) Introduction.

(1) Introduction to Engineering Design (IED) is designed to build on foundational engineering concepts with an emphasis on the application of modeling in the engineering design process to develop solutions.

(2) Embedded throughout the course are important engineering concepts, such as engineering mindset, systems thinking, and computational thinking. Students will dig deep into the engineering design process, applying math, science, and engineering standards to hands-on

projects. Students will work both individually and in teams to design solutions to a variety of problems using 3-D modeling software and use engineering notebooks to document their work.

(3) This course prepares students for college, a career, or the military by developing their spatial reasoning, design thinking, problem-solving skills, and transportable skills and by exposing them to a variety of careers.

(4) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and Skills.

(1) Career Readiness. The student demonstrates awareness of the education and skills required for professional practice in an engineering field. The student is expected to:

(A) define engineering as the creation of solutions, such as new and improved products, technologies, systems, and processes, to meet the needs of people and society; and

(B) identify technical and nontechnical skills common to all engineering disciplines that are gained from specialized and intense education, training, and experience, including problem-solving, the design process, data processing and interpretation, handling uncertainty, systems thinking, and modeling.

(2) Career Readiness. The student analyzes the role of engineering professionals in society. The student is expected to:

(A) describe the discipline of engineering and a variety of subdisciplines related to engineering such as mechanical, environmental, electrical, civil, nuclear, data, and agricultural, technical roles, surveyor, process technology, and GIS analyst; and

(B) identify and describe contemporary engineering issues of local, global, and cultural significance.

(3) Communication. The student communicates effectively with an audience based on audience characteristics. The student is expected to:

(A) document engineering or scientific work in an organized notebook so that someone unfamiliar with the work can follow and understand the process;

(B) use sketches, tables, charts, and graphs when appropriate to clearly communicate information and to make arguments and claims in oral, written, and visual presentations;

(C) initiate and participate in a range of open and effective interactions, such as one-on-one, in groups, and teacher-led, with diverse participants and across cultures, building on others' ideas and expressing one's own ideas clearly and persuasively;

(D) present information, findings, and supporting evidence clearly, concisely, and logically in writing in which the development, organization, and style are appropriate to task, purpose, and audience;

(E) present information, findings, and supporting evidence clearly, concisely, and logically in oral presentations such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task;

(F) make strategic use of digital media, such as textual, graphical, audio, visual, and interactive elements, in presentations to enhance understanding of findings, reasoning, and evidence to add interest; and

(G) demonstrate active listening.

(4) Collaboration. The student facilitates an effective team environment to promote successful goal attainment. The student is expected to:

(A) develop and follow team norms;

(B) compare and contrast diverse views and beliefs to reach shared understanding, common ground, and workable solutions;

(C) identify basic resolution strategies and employ those strategies as necessary and appropriate; and

(D) develop ideas and create products through positive interdependence among all teammates.

(5) Collaboration. The student contributes individually to overall collaborative efforts. The student is expected to:

(A) describe one's individual role and expectations of performance within the team, including communication protocol and rules of engagement per the team norms;

(B) demonstrate support of other team members by prompting and offering assistance, if needed, to meet team goals;

(C) present all work to be done individually in a timely manner to the team to gather feedback, inform revision, and gain consensus; and

(D) critically and realistically self-evaluate personal contributions and collaboration effectiveness within a team.

(6) Collaboration. The student analyzes and evaluates the work of others to provide helpful feedback. The student is expected to:

(A) describe the purpose and positive outcomes of a peer review process; and

(B) provide effective feedback to peers through strategies, such as rubrics, gallery walks, and small group discussions that enable improved work and prototypes.

(7) Ethical Reasoning and Mindset. The student applies personal and professional ethical standards as they relate to the habits and characteristics of an engineering professional. The student is expected to:

(A) explain the responsibility that engineers have to serve the public interest, their clients, and the profession with a high degree of honesty, integrity, and accountability according to the professional codes of ethics;

(B) compare the local, national and international perspectives and ideas of others; and

(C) demonstrate and explain the importance of respect and empathy for teammates, mentors, employers, teachers, clients, other professional contacts, and those impacted by engineering decisions.

(8) Ethical Reasoning and Mindset. The student considers the impact of potential engineering solutions on future generations to inform the development of sustainable solutions. The student is expected to:

(A) explain how different engineering solutions can have significantly different impacts on individuals, society, and the natural world;

(B) consider the life cycle of a product or service when designing solutions to complex, real-world problems;

(C) evaluate a solution to a complex, real-world problem and identify the need for trade-offs to address a range of criteria and constraints, including cost, safety, reliability, and aesthetics;

(D) negotiate trade-offs to address a range of criteria and constraints of a complex, real-world problem where the proposed solution alternatives may have possible social, cultural, and environmental impacts; and

(E) design a solution for collective well-being and sustainable development using an ethical decision-making process, including using natural resources effectively and efficiently, considering the safety of those affected by a product, and the potential effects on individual and public health.

(9) Critical and Creative Problem-Solving. The student analyzes a consumer product or system using reverse engineering techniques to document visual, functional, and structural aspects of the design. The student is expected to:

(A) describe the processes and purposes of reverse engineering;

(B) perform a visual analysis of a natural or man-made object and describe the apparent visual principles and elements of design;

(C) perform a functional analysis of a product or system to determine the purpose, inputs and outputs, and operation of a product or system;

(D) perform a structural analysis of a product or system to determine the materials used, the form of component parts, and the configuration and interaction of component parts when assembled;

(E) describe methods to rigidly join parts of an assembly, including press fits, special joints, adhesives, and mechanical fasteners; and

(F) identify joints that allow movement between interfacing parts in an assembly and the degrees of freedom that they remove from the movement between parts, including slots, hinges, balls and sockets, and rotating knobs.

(10) Critical and Creative Problem-Solving. The student optimizes the performance of a mechanical part and assembly. The student is expected to:

(A) apply the principles of design for manufacturability and assembly of mechanical products;

(B) define basic fabrication processes and analyze if a product can be built as designed;

(C) use computer-aided engineering tools, such as generative design and shape optimization, to optimize design performance of a mechanical part or assembly; and

(D) describe how design quality concepts, such as performance, usability, accessibility, reliability, and safety, impact product development.

(11) Critical and Creative Problem-Solving. The student demonstrates independent thinking and self-direction in pursuit of accomplishing a goal. The student is expected to:

(A) explain the limitations of one's knowledge and skills in pursuit of accomplishing a goal;

(B) plan and use time effectively in pursuit of accomplishing a goal without direct oversight; and

(C) design and execute a plan to gain additional knowledge and learning to accomplish a goal.

(12) Critical and Creative Problem-Solving. The student demonstrates curiosity, creativity, flexibility, and adaptability to change. The student is expected to:

(A) ask probing questions to expand and build upon an idea and explore personal curiosities throughout a creative process;

(B) collect and use feedback to improve work and positively influence one's personal and professional development;

(C) communicate orally and in written form critical reflection on past experiences to inform future progress; and

(D) adapt a project as needed to ensure a successful outcome, such as varied roles, job responsibilities, and schedules.

(13) Critical and Creative Problem-Solving. The student perseveres to solve a problem or achieve a goal. The student is expected to:

(A) explain the importance of taking risks in engineering, scientific, or computational processes; and

(B) explain the importance of persistence in accomplishing a difficult challenge.

(14) Critical and Creative Problem-Solving. The student makes judgments and decisions based on evidence. The student is expected to:

(A) identify relevant data in credible sources, such as literature, databases, and policy documents;

(B) collect, analyze, and interpret information relevant to a problem or opportunity at hand to support engineering decisions;

(C) evaluate point of view, reasoning, and use of evidence and rhetoric in oral or written communication and identify deficiencies, limitations, and biases; and

(D) draw valid conclusions based on supporting evidence while acknowledging the limitations, opposing views, and biases.

(15) Critical and Creative Problem-Solving. The student applies an iterative design process to creatively address a need and solve a problem. The student is expected to:

(A) transform an ill-formed problem into a meaningful, well-defined problem using relevant information;

(B) define measurable visual, functional, and structural design requirements and realistic constraints, including cost, safety, reliability, manufacturability, and aesthetics;

(C) apply effective techniques and appropriate guidelines to generate multiple creative ideas and potential solutions to a problem;

(D) carry out a plan to compare competing solution ideas and justify the selection of a solution path with respect to design requirements and constraints;

(E) develop a potential solution and implement a plan to test and evaluate a solution with respect to design criteria and constraints;

(F) identify design flaws of and potential enhancements to a proposed design solution; and

(G) iterate steps of the design process to improve and optimize a solution.

(16)Critical and Creative Problem-Solving. The student designs and performs an experimental protocol to investigate a phenomenon and gain knowledge. The student is expected to:

(A) develop a testable hypothesis, experimental controls, and important independent and dependent variables to address a problem or answer a question;

(B) identify best strategies and appropriate tools for data collection, documentation, and analysis;

(C) summarize the objective and relevancy of an experiment;

(D) read and accurately follow established protocols and instructions; and

(E) identify possible sources of errors and redesign and repeat the experiment when appropriate.

(17)Critical and Creative Problem-Solving. The student uses appropriate statistical methods and visualization techniques to justify claims based on evidence. The student is expected to:

(A) represent experimental data for a single count or measurement with charts or plots on the real number line, such as dot plots, box plots, and histograms;

(B) use statistics appropriate to the shape of a data distribution to compare center, including median, mean, and spread;

(C) interpret differences in shape, center, and spread in the context of data sets;

(D) apply inferential reasoning to make and support claims about populations based on data; and

(E) draw conclusions related to a hypothesis and support conclusions using experimental data.

(18)Critical and Creative Problem-Solving. The student applies project management tools when designing and developing a solution to successfully deliver a product using available resources. The student is expected to:

(A) define project deliverables and constraints, such as scope, time, cost, quality, resources, and risk;

(B) develop a project schedule, including the critical path identified when appropriate, allocate tasks among team members, and track progress for successful completion of the project; and

(C) select and use collaborative tools, such as cloud-based tools, document sharing, and video and text functions, to successfully complete a project.

(19)Critical and Creative Problem-Solving. The student applies systems thinking to consider how an engineering problem and its solution may be thought of as containing subsystems and as being a sub-system of a larger system. The student is expected to:

(A) describe a system in terms of its components and subsystems and their interactions, such as an electronic circuit's source, path, and load that provide power to a larger system to produce mechanical motion;

(B) describe a system in terms of its subsystems and their interactions, such as a building's including power system, communication system, lighting system, ventilation system, water system, sewer system, safety system, social system, transportation system, and structural system;

(C) predict what the effect of making a change to a component of a system will have on the system as a whole;

(D) describe a system using a black box model, indicating inputs, outputs, and boundaries; and

(E) predict the local and global risks and impacts of an engineering solution to segments of the society, such as the economy or the environment;

(20)Critical and Creative Problem-Solving. The student assesses the sustainability of an engineering solution based on the impacts within the system or interrelated systems that result from implementation of the solution. The student is expected to:

(A) define sustainability and identify principles that help guide development of sustainable solutions, such as generative design and life cycle assessment; and

(B) explain the benefits of human-centered design and apply principles to align product design with intended use.

(21)Algorithms and Programming. The student applies problem decomposition skills to break down data, problems, and processes into manageable parts. The student is expected to separate a complex process into multiple subprocesses that can be implemented in an organized way to complete the larger process.

(22)Algorithms and Programming. The student uses algorithms to create a solution with or without the use of a computer program. The student is expected to:

(A) use existing correct algorithms as building blocks for constructing a new algorithm to help ensure that the new algorithm is correct; and

(B) write a set of ordered instructions, with or without a computer, involving multiple discrete steps to accomplish a complex task or achieve a desired result.

(23)Algorithms and Programming. The student formulates solutions that use automation to solve a problem. The student is expected to automate a human-powered device using a mechanical and electrical system.

(24)Algorithms and Programming. The student collects, organizes, and analyzes data to help define and solve a problem. The student is expected to:

(A) populate a spreadsheet application with data and organize the data to be useful in accomplishing a specific goal; and

(B) use the functions and tools within a spreadsheet application to manipulate, analyze, and present data in a useful way, including graphs, regression analyses, and descriptive statistical analyses.

(25)Algorithms and Programming. The student applies abstraction to generalize problems and solutions. The student is expected to identify what has been made more general by an abstraction and what details have been hidden or removed.

(26)Algorithms and Programming. Using a variety of measuring devices, the student reports quantities accurately and to a precision appropriate for the purpose. The student is expected to:

(A) explain why all measurements are an approximation of the true value of a quantity;

(B) describe the accuracy and precision of a measurement or measuring device and differentiate between the two;

(C) use dimensional analysis and unit conversions to transform data to consistent units that are appropriate for a particular purpose or model; and

(D) choose a measurement device based on the level of precision and accuracy needed.

(27) Engineering Tools and Technology. The student applies scientific knowledge related to frictional forces to solve a problem and design a physical system. The student is expected to:

(A) explain why friction is a force that opposes motion;

(B) determine the coefficient of friction between two surfaces; and

(C) identify the force of friction between two interacting components in a mechanism and explain how frictional force impacts the function and efficiency of the mechanism to recommend design revisions to improve performance.

(28) Engineering Tools and Technology. The student applies basic materials science concepts to inform a design process. The student is expected to:

(A) describe different types of materials and their common usages in product design;

(B) identify material properties that are important to design, including mechanical, chemical, electrical, and magnetic properties;

(C) conduct non-destructive tests, such as hardness, flexure, and conductivity, on different material types to investigate material properties;

(D) explain how design criteria and constraints, such as cost, performance, safety, risk, aesthetics, and environmental impact, often limit the material choices available for a given design; and

(E) select and justify the use of materials for prototyping and manufacturing products.

(29) Engineering Tools and Technology. The student understands how different machine elements influence the motion of a mechanical system. The student is expected to:

(A) describe different types of motion, such as rotary, oscillating, linear, reciprocating, intermittent, and irregular;

(B) explain how cams and followers can be used to move objects in periodic or irregular motion;

(C) select and use simple mechanisms, such as cams, gears, pulleys and belts, sprockets and chains, springs, and levers, to create and control motion to solve a problem; and

(D) use mechanisms in a design to transform a motion without changing its type, such as slow to fast rotary motion, magnifying linear movement, or changing axis of motion.

(30) Engineering Tools and Technology. The student integrates an electrical circuit with a machine to solve a problem. The student is expected to:

(A) calculate circuit resistance, current, and voltage within a circuit; and

(B) design and build an electrical circuit that includes a motor, a switch, and variable resistance to power and control the speed of a mechanism.

(31) Modeling. The student develops models and simulations to represent information, processes, and objects to an appropriate level of abstraction for the intended purpose. The student is expected to:

(A) identify that models use abstraction to represent a simplified version of a complex phenomenon and that there is no guarantee that the model accurately represents the real object or phenomenon;

(B) compare differences between model behavior and the behavior of the real object, system, or process that it represents and identify limitations of the model, such as specific characteristics being studied, accuracy, precision, and range of conditions; and

(C) develop a model to accurately represent information or important characteristics of an object, data, process, or design idea for an intended purpose.

(32) Modeling. The student applies mathematical models and interprets the output of models to test ideas or make predictions. The student is expected to:

(A) build and use a mathematical model, including algorithms, table of values, equations, and graphs, to represent data, describe relationships and processes, and make predictions in the context of the problem;

(B) represent data for two quantitative variables on a scatter plot and describe how the variables are related;

(C) apply a function to a set of data, use the function to solve problems, and make predictions in the context of the data;

(D) interpret the rate of change and the y-intercept in mathematical models in the context of a set of data; and

(E) use mathematical modeling to optimize design criteria.

(33) Modeling. The student uses engineering graphics to represent physical objects. The student is expected to:

(A) identify three-dimensional objects generated by rotation of a two-dimensional object;

(B) build a physical representation of an object or system based on graphical representations of the object or system, including building solid objects, electrical circuits, mechanical devices, and complex systems according to technical drawings;

(C) sketch by hand isometric views of a simple object or part at a given scale using the actual object, a detailed verbal description of the object, a pictorial view of the object, or a set of orthographic projections;

(D) identify errors and omissions in orthographic projections and multiview drawings, including errors in line locations, line types, number of views, scale, dimensioning, and view orientation, to fully detail an object or part using the actual object, a detailed verbal description of the object, or a pictorial and isometric view of the object;

(E) identify errors and omissions in a full or half-section view, including errors in line locations, line types, location of cutting plane line, scale, dimensioning, and view orientation, to fully detail an object or part;

(F) identify necessary and appropriate views to fully detail a part or assembly; and

(G) read and interpret a hole note to identify the size and type of hole specified.

(34) Modeling. The student applies appropriate engineering tolerances to specify the allowable variation, size of individual features, orientation, and location between features of an object. The student is expected to:

(A) identify and differentiate among a limit dimension, unilateral tolerance, and bilateral tolerance;

(B) determine the specified dimension, tolerance, upper limit, and lower limit for any given dimension and related tolerance, such as any distance that is dependent on the given dimensions with a technical drawing;

(C) determine the allowance between two mating parts of an assembly based on dimensions given on a technical drawing; and

(D) identify the need for and specify appropriate dimensions to create a clearance fit or interference fit where appropriate.

(35)Modeling. The student creates and interprets a computer model to inform engineering decisions and solve problems. The student is expected to:

(A) create a computer model to represent an object or conceptual idea and inform design decisions;

(B) design and constrain a three-dimensional solid computer model to accurately represent the physical characteristics and behaviors of a design idea or real object;

(C) create relationships among part features and dimensions using parametric formulas; and

(D) apply joints to constrain multi-component models and simulate the realistic relative motion of the component parts.

(36)Modeling. The student creates technical drawings using 3D computer-aided design (CAD) software to document a design according to standard engineering practices. The student is expected to:

(A) generate an annotated multiview technical drawing using CAD software to fully describe a simple part;

(B) apply appropriate and sufficient annotation, including dimensioning methods to a drawing, to fully describe an object or system using accepted technical drawing techniques; and

(C) generate an assembly drawing using CAD software to identify component parts and show details of assembly using part identification numbers, a parts list, and other annotations.

Recommended Resources and Materials:

3D Hubs.2019. How to design parts for Injection molding. Retrieved from https://www.3dhubs.com/knowledge-base/how-design-parts-injection-molding#rules

Brockotter, R. 2019. Key design considerations for 3D printing. 3D Hubs. Retrieved from https://www.3dhubs.com/knowledge-base/key-design-considerations-3d-printing/

Menin, S. 2015. Working with Dimensional Tolerances. Retrieved from https://www.machinedesign.com/materials/working-dimensional-tolerances

Cunningham, P. 2018, April. Where Should I Start With Metacognition? Retrieved from https://www.improvewithmetacognition.com/where-to-start-with-metacognition/

World Health Organization. 2015. Water. Retrieved from http://www.who.int/topics/water/en/

National Academy of Engineering. 2015. NAE Grand Challenges for Engineering. Retrieved from http://www.engineeringchallenges.org/

The most recent Project Lead The Way teacher and student resources can be retrieved from https://my.pltw.org/login

The most recent Project Lead The Way software and technology requirements can be retrieved from https://pltw.org/pltw-software

Sample of General IED Course Materials:

- PLTW Engineering Notebook
- Dial Calipers
- Computer with internet access
- 3D Printer
- Spreadsheet application
- 3D CAD program
- Collaboration space (group whiteboard, poster paper, sticky notes)
- Reverse Engineering Toolkit

Recommended Course Activities:

- Design Basics: The student explores the engineering design process and applies their knowledge and skills to collaboratively design a carnival game.
- Students build models of their solutions to communicate their ideas for solution before creating a prototype or deciding on a final solution to their problem. They are then able to convey their ideas with better special awareness and physical properties than a drawing or sketch alone.
- CAD Fundamentals: The student focuses on building their CAD skills by creating 3D forms.
- Product Improvement: The student applies the design process and the skills and knowledge they have gained in this unit to evaluate and improve a consumer product design to meet stakeholder needs in a project-based learning environment.
- Take It Apart: The student applies engineering principles and practices to reverse-engineer and improve a consumer product.
- A Material World: The student investigates a variety of materials through experimentation and learns how to assign specific materials to CAD models.
- Fix It: The student works collaboratively in a project team to reverse engineer, troubleshoot, and redesign a multi-component mechanical device.
- Students study product life cycle and learn about the importance of environmental impact when applying materials and processes that have impacts beyond the design of their product or solution. Students apply these concepts to a current product that has such impacts and design an alternative.
- Solve a Problem: The students act as an engineering consultant group to solve a problem from a list of problems gathered from school and/or community stakeholders.
- Make It Move: The student applies the design process to develop an electromechanical system to power multiple automata using a single electrical circuit and motor.

Suggested methods for evaluating student outcomes:

PLTW supports a balanced approach to assessment for all programs. PLTW offers assessments that measure subject-matter knowledge as well as the in-demand, transportable skills that students need to succeed beyond high school.

A sample of theses assessment types are:

- Journal Assessments
- Student Reflections
- Informative Assessments (by Unit)
- End of Course Assessment
- Project Rubrics
- Written Records of Student Work
- Discussions and Observations
- Conclusion Questions for Each Lesson
- Checklists
- Performance Checks (example: CAD animations)

Teacher qualifications:

- PLTW Introduction to Engineering Design Recommended Educator Certifications:
- Master Science Teacher (Grades 8-12).
- Mathematics/Physical Science/Engineering: Grades 6-12.
- Mathematics/Physical Science/Engineering: Grades 8-12.
- Physical Science: Grades 6-12.
- Physical Science: Grades 8-12.
- Physics/Mathematics: Grades 7-12.
- Physics/Mathematics: Grades 8-12.
- Science: Grades 7-12.
- Science: Grades 8-12.
- Science, Technology, Engineering, and Mathematics: Grades 6-12.
- Secondary Industrial Arts (Grades 6-12).
- Secondary Industrial Technology (Grades 6-12).
- Secondary Physics (Grades 6-12).
- Secondary Science (Grades 6-12).
- Secondary Science, Composite (Grades 6-12).
- Technology Education: Grades 6-12.
- Master Mathematics Teacher (Grades 8-12).
- Mathematics: Grades 7-12.
- Mathematics: Grades 8-12.
- Secondary Mathematics: Grades 6-12
- Chemistry: Grades 7-12
- Chemistry: Grades 8-12
- Secondary Physical Science (Grades 6-12)
- Technology Applications: Grades EC-12
- Technology Applications: Grades 8-12
- Technology Education: Grades 6-12
- Secondary Physical Science (Grades 6-12)

- Trade and Industrial Education: Grades 6-12. This assignment requires appropriate work approval.
- Trade and Industrial Education: Grades 8-12. This assignment requires appropriate work approval.
- Vocational Trades and Industry. This assignment requires appropriate work approval.

Additional information:

PLTW's Core Training for Introduction to Engineering Design requires approximately 90 hours of instruction led by PLTW approved Master Teachers (80 hours of class time plus 10 hours of prerequisite work). It is offered year-round with multiple options to allow teachers to select dates and pacing of their training session. Course mastery is demonstrated by the submission and approval of a course portfolio that meet's PLTW's requirements. After successful completion of Core Training, teachers receive access to the National PLTW Engineering Professional Learning Community, course-specific student and classroom instructional resources, and Ongoing Training resources through the PLTW Content Management System.

Current details, such as pricing and listings for all PLTW professional development, can be found at https://www.pltw.org/our-programs/professional-development/core-training. At the time of this application submission, the course cost is $2,400.

Note: Currently, PLTW offers a training guarantee to schools. The PLTW Training Guarantee protects a district's investment in PLTW programs by guaranteeing if a teacher leaves within four years of earning a PLTW credential, PLTW will provide a grant in the amount of the training fee for the district to train a teacher in the same course, replace the credential(s), and support continued student learning.

* PLTW Professional Development Fees are subject to change annually. Changes are communicated via email from PLTW Communications and on the PLTW website at least 90 days prior to the effective date for the upcoming school year. There are no changes for the 2023-24 school year.

Districts may use these course materials with the approval of Project Lead The Way.

Please contact Project Lead The Way directly for questions about these requirements:

Project Lead The Way

Solution Center

Toll Free: 877.335.PLTW (7589) solutioncenter@pltw.org