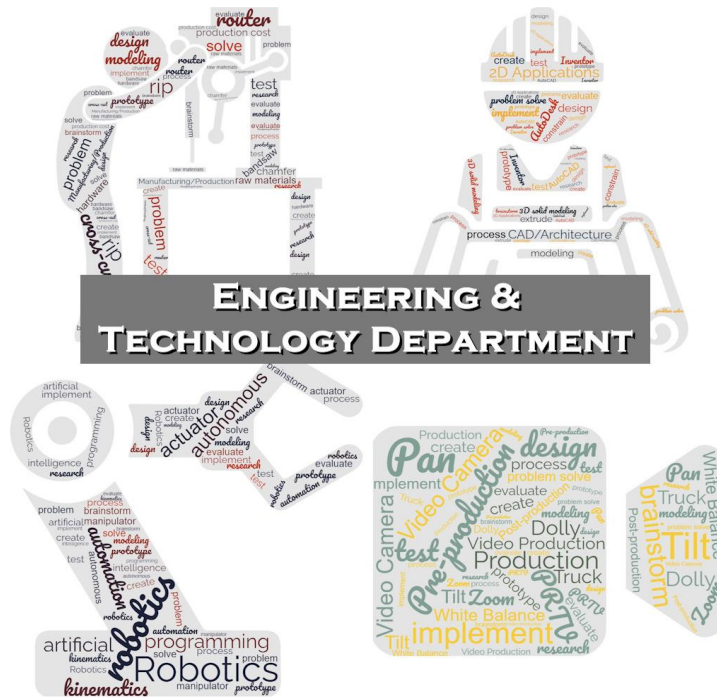


Challenge and engage all students in the engineering process where they design, test, and collaborate in effort to problem solve and innovate.



Engineering, Technology & Video Production Program Review

Pine-Richland School District

June 2023

The information contained in this report is provided by the Pine-Richland Engineering & Technology for general purposes only. While this report serves as a strategic approach to curriculum planning, recommendations must be considered with respect to all programs provided by Pine-Richland School District.

Engineering, Technology, & Video Production Program Review

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Executive Summary

The mission of the Pine-Richland School District is to *Focus on Learning for Every Student Every Day*. Within the PRSD Strategic Plan, long-term and short-term goals outlined in the Teaching and Learning category form the foundation for continuous improvement. One of the short-term goals for 2016 - 2017 was to design and pilot an in-depth program review process for two of our departments (i.e., Science and Health & Physical Education). That initial work led to a final report and set of recommendations for program improvement. The process itself was refined and used in 2017 - 2018 in the areas of Mathematics and Business & Computer Science. **Since that initial year, our district has now supported this comprehensive process for sixteen departments and/or programs.** The sequence of departmental study and implementation for 2019 - 2023 is outlined in Figure 1. Each of the summary reports are publicly available on the Pine-Richland School District website ([“Academics”](#) and [“In-Depth Program Review”](#)).

Figure 1. Strategic Plan: Mini-Engine

2019 - 2020	2020 - 2021	2021 - 2022 Revised	2022 - 2023 Revised
Pine-Richland School District Strategic Plan			
Teaching and Learning			
2019 - 2020	2020 - 2021	2021 - 2022	2022 - 2023
Refine and strengthen each element of the model for teaching and learning with a focus on integration.			
	Educational Continuum (During COVID-19)	Educational Model Transition and Transformation (Post COVID-19)	
In-Depth Program Review: Study (English, Library and Music)	In-Depth Program Review: Study (Special Education, World Language, and Art)	In-Depth Program Review: Study (Special Education, World Language, and Art)	In-Depth Program Review: Study (H/PE, Counseling & Health Svcs., Family & Consumer Science)(Technology Education, Science)
In-Depth Program Review: Implement Recommendations and Resource Integration (Science, Health/PE, Math, B/CS, Gifted, SS)	In-Depth Program Review: Implement (Math, B/CS, Gifted, SS, English, Library, Music)	In-Depth Program Review: Implement (Math, B/CS, Gifted, SS, English, Library, Music)	In-Depth Program Review: Implement (English, Library, Music, Special Ed., W. Lang., Art, Health/PE, Counseling/Health Svcs., FCS)

This report outlines the process, findings, and recommendations from that work related to the Engineering, Technology, & Video Production Education Department. As an organization, it is understood that the pace of change may be dependent upon the impact of that change on other aspects of the educational program. When conducting this work in an individual department, it is important and difficult to balance competing interests and constraints. The process model reflects this challenge as the “ripple effect” of balancing people, time and money. Practically, the committee utilized the action-priority matrix to evaluate each recommendation and established an implementation timeline with associated cost estimates.

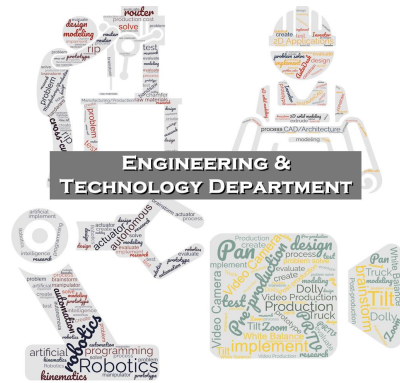
One element of the in-depth program review was the establishment of a departmental philosophy and vision (Figure 1). As a result, the vision is captured through the following image and words:

Recommendation Overview

Recommendation #1: Philosophy and Vision

1. Adopt and widely communicate the Engineering and Technology philosophy and vision to internal and external stakeholders while ensuring a practical connection to program design and delivery.

Challenge and engage all students in the engineering process where they design, test, and collaborate in effort to problem solve and innovate.



Recommendation #2: Curriculum & Pathways of Study

1. Create a sequence of courses for career clusters/pathways within the Engineering and Technology Department that provides for both flexibility and deeper exploration while understanding the constraints of space, resources, and staff.
 - a. Architecture
 - b. Engineering
 - c. Video Production
 - d. Materials/Manufacturing
2. Eliminate Project Lead the Way Classes. (Students currently enrolled in the program will be able to complete the courses aligned with their graduation plans).
3. Develop honors level or College in High School (CHS) courses aligned within the newly developed Engineering and Technology Pathway (e.g., potential Dual Enrollment Credit and/or Affiliation Agreements).
4. Modify the existing Introduction to Engineering and Technology course to reflect each of the sub-disciplines within the Engineering and Technology Department.
5. Identify opportunities for professional development to enhance the capabilities of the departmental team and allow a reasonable level of cross-training to support curricular enhancements, particularly to the Introduction to Engineering and Technology course (e.g. additional video production content; CAD; VEX).

Recommendation #3: Real World Applicability & Skill Development

1. Emphasize and reference real world applicability of skills learned throughout courses in grades 7-12 with connections to current projects and outcomes.
2. Foster the development of soft skills, problem solving, measurement, safety, and clear communication skills, etc. to increase employability and readiness in the career setting (e.g. connections).
3. Create more engaging opportunities for students to become familiar with the careers in Engineering and Technology, possibly including guest speakers, job shadowing, (e.g. middle school courses introducing types of engineering).

Recommendation #4: Facilities, Equipment, and Room Utilization

1. Redesign the classroom space within the middle school to allow for both a design lab and an application manufacturing space.
2. Continue to update and forecast capital expenditures (e.g., computers, software, laser printers, machinery, course-specific equipment, etc.).

Recommendation #5: Student Engagement & Activities

1. Expand the Technology Student Association (TSA) opportunity to middle school students to help bolster interest and application opportunities for students to be connected in Technology & Engineering.
2. Implement live announcements at Pine-Richland High School and expand student engagement in athletic, extra- and co-curricular events (broadcasting, marketing, set design, etc.).

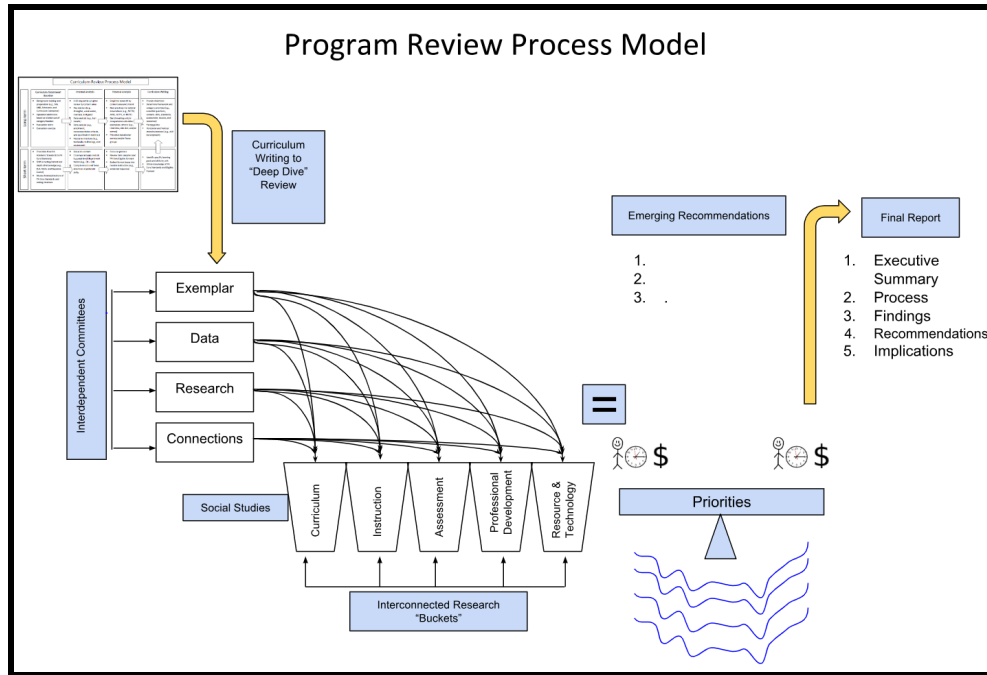
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In-Depth Program Review Process

The process for in-depth program review was developed in the 2022-2023 school year and has been refined through multiple cycles of improvement. The process has been ongoing throughout the school year. The .

To help ensure a clear understanding of the systematic approach to program improvement, the following process diagram was developed and reviewed on a regular basis. Major elements of this image are further described below:

Figure 3 IDPR Process Model



Curriculum Writing to “Deep Dive”

Given the time and effort invested into curriculum writing at Pine-Richland from 2014 - 2016, it is important to understand the relationship of that work to the in-depth program review process. The two-year curriculum writing process was designed to capture the current content in a consistent format through vertical teams (e.g., units, big ideas, and learning goals). That process allowed the department to identify strengths and opportunities for improvement. Most of the attention was directed internally at a review of our district’s current structure and practices.

The **in-depth program review process has a broader focus** on all elements of the department. Importantly, the process was designed to emphasize a balance of internal needs and a review of best practices from external sources. It asks questions, such as, “Are we doing the right things?” or “Do we need to consider more significant changes in program design?” In the image above, the curriculum writing process is like a “springboard” to “dive” more deeply into the content area. The personnel, structure, and work were organized into four major sub-committees.

Committee Composition and Structure

We strongly believe that meaningful and lasting change requires engagement of all key stakeholders. The overall size of the department is an important consideration in study team design. In smaller departments, all members participate in the process. In very large departments, a representative sample of teachers are included. In medium departments, effort is made to ensure that all levels and courses are addressed by at least one member. Within the study team, members were then organized by **four main subcommittees**: (1) Research; (2) Exemplar K-12 Schools/Districts/Programs; (3) Connections to Universities, Businesses, and the Community; and (4) Data and Information. Two overarching elements were critical. First, the arrows on the left side of the subcommittees indicate that the groups must collaborate and exchange information (i.e., no silos). Second, the arrows on the right side of the subcommittees demonstrate that key findings/learnings were captured and organized by major research buckets.

It is important to note that the study teams also used a systematic approach to listen to students and parents. Student focus groups were organized at the high school, middle school, upper elementary, and the primary buildings. These groups were representative of the student body and a wide range of academic rigor. In addition, parent and community input was gathered during day and evening town hall sessions. Parents who were unable to attend those face-to-face meetings were able to submit comments electronically.

Research “Buckets”

Within each discipline, information and findings that emerge from each subcommittee become known as research buckets. These buckets help the department members begin to organize concepts and themes. In the early months of the process, the buckets are dynamic, meaning that some initial concepts were removed or combined with other key themes. As the process evolves and teams continue to learn, the themes begin to solidify. Importantly, the arrows on the bottom of the buckets also demonstrate the relationship between areas (i.e., no silos). The subcommittees’ learning and identification of information for the buckets were interconnected, as information from one area informed others. Based upon the information gathered through the bucket findings, a set of emerging recommendations was developed.

Emerging Recommendations

A systems thinking approach was critical to the in-depth program review process. The transition from “findings” to “emerging recommendations” required skills of synthesis, critical thinking, healthy debate, and communication. At both the start of the study phase and again at the point of emerging recommendations, the team revisits the departmental strengths and opportunities that had been historically developed in the department. Some emerging recommendations were designed to improve current gaps and weaknesses. Other emerging recommendations were identified in the analysis of exemplary programs, universities, businesses, or in the research literature. The team brainstormed recommendations by identifying recurring themes, ideas, and opportunities for growth. The team then discussed, modified, and edited the recommendations. Emerging recommendations were consolidated into a draft. The expanded team worked with the draft to link the emerging recommendations to data provided by the subcommittees.

Balancing Priorities and Resources

The action-priority matrix evaluates the impact versus the effort of the emerging recommendations (Figure 4). Emerging recommendations were categorized as fill-ins, quick wins, major projects, and hard slogs. For example, a hard slog was used to categorize those recommendations that would require much effort but have little impact on student learning. As a system, the “ripple effect” of recommendations was built into the process model (Figure 5). This is further described in the next section.

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Figure 4. Action Priority Matrix

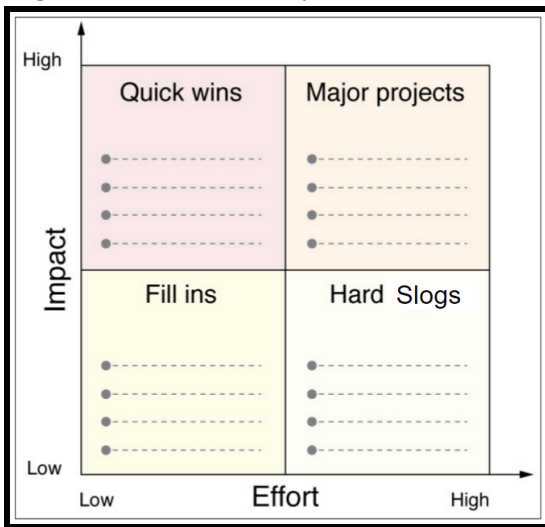
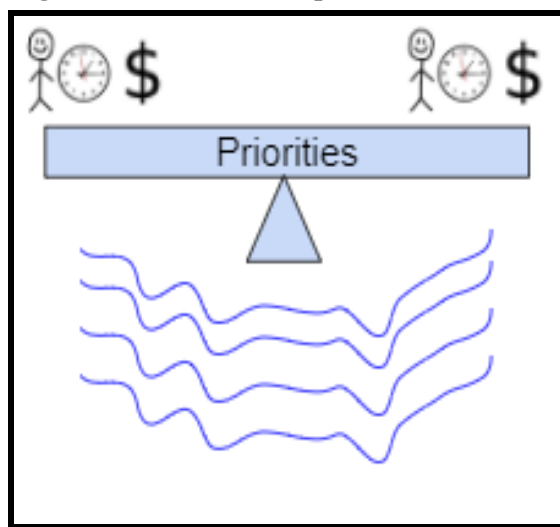


Figure 5. Balance of People, Time and Money



Elmansy, Rafiq. "Time Management Tips for Designers: The Action Priority Matrix." *Designorate*, 14 June 2016, www.designorate.com/time-management-the-action-priority-matrix/. Accessed 14 Mar. 2017.

Tensions of Balancing People, Time and Money with a Rigorous Research Process

It is important to address the challenge that emerges at this stage of the work. At Pine-Richland, we have a culture that believes in the pursuit of excellence at the organizational, department and individual levels. Our departments are composed of certified, experienced, dedicated and passionate educators. Through the in-depth program review, the process exposes department members to current literature/research, exemplary programs, data/information, community connections and focused dialogue about internal strengths and opportunities.

At this point, it is common for a recommendation to directly or indirectly require expanded resources of additional people, time and/or money. Time is impacted by the structure and schedule of the existing day at each level (i.e., K - 3, 4 - 6, 7 - 8 and 9 - 12). **Simply stated, additional time for one content area has the effect of reducing time in another area. Additional staff added to one department may have the effect of possible reduction in another department.** The assignment of staff and/or scheduling parameters are also addressed through the collective bargaining agreement (e.g., teaching periods and course preparations).

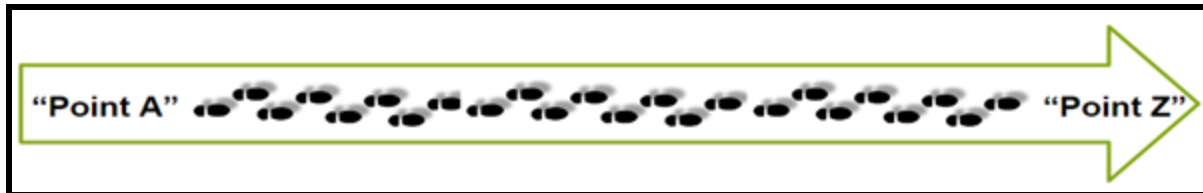
These discussions can be difficult. They are conducted with honesty, support and an understanding of potential implications for the entire system. For example, the concept of adding requirements and/or courses - with associated staff - were discussed in Health/Physical Education, Music, Business & Computer Science to name a few. We work creatively to determine how we can strengthen the specific department, take steps on the improvement continuum and also ensure sustainability and fiscal responsibility. For example, personal finance was addressed at the high school level as a graduation competency and not a required course. If a course was required, we would need to increase staff and that requirement would have decreased flexibility for elective course selections. In science, a recommendation was implemented for "science every day" at Eden Hall. This recommendation caused a major "ripple" in the master schedule and student day. It required a curriculum revision. It impacted multiple other content areas (i.e., ELA, math and social studies). However, it was also able to be addressed without additional staffing requirements.

Given all of this discussion, the team then identified the final emerging recommendations to support continuous improvement.

Continuum of Improvement

Throughout the in-depth program review process, it was important to maintain perspective on the nature of program improvements. Especially when considering effective elements of exemplary schools or programs, the desire to move from the current program ("Point A") to an ideal future ("Point Z") is natural. However, it is more realistic to recognize that meaningful program improvement within an organizational system will often result from a series of smaller steps ("Points B, C, D, etc."). Although depicted as a straight line in the image below (Figure 6), the in-depth program review committee recognizes that continuous improvement is not always a linear process.

Figure 6 Continuum



Recommendations

Recommendation #1: Philosophy and Vision

1. Adopt and widely communicate the Engineering and Technology philosophy and vision to internal and external stakeholders while ensuring a practical connection to program design and delivery.

Internal Analysis

- Confusion exists among students, parents, and some internal stakeholders regarding the departmental offerings, particularly with regard to video production, (IDPR Committee, 2023; Town Halls 2023; Current Student Voice, 2023).
- Skills and competencies developed from these departmental offerings help to prepare students for collegiate training and careers beyond Pine-Richland School District (IDPR Committee, 2023; Town Halls 2023; Student Focus Groups 2023).

External Analysis

- Newly developed Standards for Science Technology & Engineering and Environmental Literacy (STEELS Standards) and Pennsylvania Department of Education endorsed standards depict the wide array of offerings within the department and support the need to include “communication” to fully reflect the content within courses (Pennsylvania Technology Education K-12 Program Rationale and Guide, 2023; ITEEA - Standards for Technological and Engineering Literacy (STEELS), 2023).

Implementation Timeline (Anticipated Start/Finish): June 2023 - June 2024

Key Personnel: Engineering, Technology, & Video Production Department Teachers; Assistant Superintendents; Assistant Superintendents’ Assistant; Principals

Major Action Steps: (1) Present the Vision and Philosophy to Board and Community; (2) Make Posters for Display in Classrooms; (3) Include in the Program of Studies; (4) Share with Students and Parents in Communications, Course Syllabi, and Open House; and (5) Embed in Departmental Agendas and Documents

Estimated Budget/Resources: There are minimal costs anticipated (e.g. cost of printing and distributing the posters; professional development time and resources to share IDPR ideas).

Potential Implications (Short-Term and Long-Term): Having a shared vision and philosophy will unify the department and clearly communicate the values and outcomes desired for our students within the Engineering, Technology, & Video Production Department.

Recommendation #2: Curriculum & Pathways of Study

1. Create a sequence of courses for career clusters/pathways within the Engineering and Technology Department that provides for both flexibility and deeper exploration while understanding the constraints of space, resources, and staff.
 - a. Architecture
 - b. Engineering
 - c. Video Production
 - d. Materials/Manufacturing
2. Eliminate Project Lead the Way Classes. (Students currently enrolled in the program will be able to complete the courses aligned with their graduation plans).
3. Develop honors level or College in High School (CHS) courses aligned within the newly developed Engineering and Technology Pathway (e.g., potential Dual Enrollment Credit and/or Affiliation Agreements).
4. Modify the existing Introduction to Engineering and Technology course to reflect each of the sub-disciplines within the Engineering and Technology Department.
5. Identify opportunities for professional development to enhance the capabilities of the departmental team and allow a reasonable level of cross-training to support curricular enhancements, particularly to the Introduction to Engineering and Technology course (e.g. additional video production content; CAD; VEX).

Internal Analysis

- Students are unsure of which courses to take and in which sequence within the department and lack the connection to their desired career pathways at times (Student Focus Groups & PRSD In-Depth Program Review Town Hall, 2023).
- Students desire an additional course beyond the Computer Aided Drafting course within the Engineering pathway to lead to application within the Engineering & Design pathways (Student Focus Groups, 2023).
- Continual declining enrollment within Project Lead the Way courses, and lack of sustaining student interest in successive courses. (IDPR Committee, 2023; Student Focus Groups, 2023).
- Staff striving for continual improvement and expanding teaching flexibility within different specialty areas of the department (IDPR Committee, 2023).
- Staffing for PLTW courses is rigid due to course specific certification requirements, and thus limits the flexibility of teaching assignments. (IDPR Committee, 2023).
- Honors weight impacts the course selection process made by students. Many students focus on GPA over what course is better to prepare for college (IDPR Committee, 2023).
- Robert Morris University and Point Park University have been rapidly expanding CHS opportunities throughout the region (IDPR Committee, 2023).

External Analysis

- Exemplar schools offer pathways within the Engineering & Technology Department to clarify sequencing of courses (Upper St. Clair; Chartiers Valley; West Allegheny; Central Valley, 2023).
- Project Lead the Way courses have had consistently low enrollment and have been eliminated at exemplar school districts (Chartiers Valley and West Allegheny IDPR site visits, 2023).
- Many schools throughout Pennsylvania are beginning to add College in High School programs within Engineering and Technology Departments to assist with course rigor and weighting for those students interested in higher level courses (Pennsylvania Department of Education Engineering and Technology Advisor; Fox Chapel; West Allegheny; Chartiers Valley; 2023).

Implementation Timeline (Anticipated Start/Finish): June 2023 - 2025

Key Personnel: Engineering, Technology, & Video Production Department Teachers; Assistant Superintendents; Assistant Superintendents' Assistant; Principals; School Counselors as a Part of Scheduling Processes

Major Action Steps: (1) Review the new standards and update the curriculum for each course; (2) Create the new departmental pathways; (3) Phase out the Project Lead the Way courses beginning with the 2024-2025 school year's Program of Studies; (4) Update the Program of Studies description for newly titled courses (e.g. Advanced Robotics) and accurately describe the curricular and content updates to the Introductory course to attract additional students; (5) Add in the dual enrollment courses as they are developed in conjunction with higher education partners and focus marketing efforts to students and families around the benefits of receiving college credits within high school courses; and (6) Identify and participate in professional development sessions geared towards the curricular revisions to being strengthening the capabilities of the departmental staff through cross-training efforts.

Estimated Budget/Resources: There are some anticipated costs with regard to professional development opportunities and the potential for curriculum writing to occur outside of the scheduled school year. Additionally, some curricular resources may need to be purchased and yet are also accounted for within recommendation #4.

Potential Implications (Short-Term and Long-Term): While some courses are being eliminated (e.g. Project Lead the Way courses), the enrollment numbers have been trending downward for some time. Additional opportunities for students within our own pathways will be created by revising our curriculum to retain students within the Engineering, Architecture, Technology, & Video Production pathways. Revising the introductory course to reflect a survey of all subdisciplines, including video production and architecture which were not traditionally referenced. Exposure to these disciplines have the potential to encourage students to remain within a pathway aligned with their envisioned career cluster or collegiate training to be sought post-high school. Students seeking more academic courses with dual enrollment opportunities will have the ability to engage in this manner given the revised pathways and course structure.

Recommendation #3: Real World Applicability & Skill Development

1. Emphasize and reference real world applicability of skills learned throughout courses in grades 7-12 with connections to current projects and outcomes.
2. Foster the development of soft skills, problem solving, measurement, safety, and clear communication skills, etc. to increase employability and readiness in the career setting (e.g. connections).
3. Create more engaging opportunities for students to become familiar with the careers in Engineering and Technology, possibly including guest speakers, job shadowing, (e.g. middle school courses introducing types of engineering).

Internal Analysis

- Authentic projects that connect to real world challenges and applications are engaging and valuable for students (Student Focus Groups, 2023).
- Students and parents seek direction, clarification, and connections to career opportunities within the Engineering field (Town Hall, 2023).

External Analysis

- Partnerships with local companies have reinforced the need for authentic challenges, and continued focus on soft skills as students enter post secondary pathways (Eaton Corporation, 2019);(Bova Corp; JV Manufacturing; Baur Manufacturing, 2023).
- Newly developed Standards for Science Technology & Engineering and Environmental Literacy stress the importance of authentic learning, teamwork, and application of learned content and skills (Pennsylvania Technology Education K-12 Program Rationale and Guide; ITEEA - Standards for Technological and Engineering Literacy, Pennsylvania Career Education and Work Standards, 2023).

Implementation Timeline (Anticipated Start/Finish): August 2023 - Ongoing

Key Personnel: Engineering, Technology, & Video Production Department Teachers; Local Company Partners, Regional post secondary educational partners

Major Action Steps: (1) Coordinate with middle school counselors to ensure engineering representation on career day. (2) Continue to expand partnerships with local businesses in order to foster opportunities for authentic challenges, and career exploration.

Estimated Budget/Resources: If writing occurs during the school year on non-in-service days, the cost of substitutes and/or ancillary pay could be incurred.

Potential Implications (Short-Term and Long-Term): Edits to online curriculum may be necessary to reflect changes. Project based assessments will continue to be the focus, however, adjustments could be needed to focus on authenticity of projects.

Recommendation #4: Facilities, Equipment, and Room Utilization

1. Redesign the classroom space within the middle school to allow for both a design lab and an application manufacturing space.
2. Continue to update and forecast capital expenditures (e.g., computers, software, laser printers, machinery, course-specific equipment, etc.).

Internal Analysis

- Courses requiring utilization of advanced software can be hampered by the lack of resources to support that programming. Mobile devices with required RAM could increase flexibility of course offerings and ensure appropriate technological access to support programming (IDPR Committee, 2023).
- The current classroom at Pine-Richland Middle School is combined and reflective of manufacturing and machining, without the environment required to support the focused teaching and learning elements reflected in the curriculum for the computer-aided design portions. High ceiling, and exposed HVAC system provides for a loud classroom environment. Also, the computer arrangement has created a safety concern, with many extension cords, wires, and cables spread throughout the room. (IDPR Committee, 2023).

External Analysis

- Impressed with the hybrid space created when a MS wood shop was split into CAD lab and smaller manufacturing shop a local exemplar school (Upper Saint Clair Fort Couch Middle School, 2023).
- The Pennsylvania Safety Guidelines for Elementary Science & Technology Education underscore the importance of well-ventilated and stimulating environments to address the learning needs of students within the Facilities Design section of their document (Safety Guidelines for Elementary Science & Technology Education, 2023).

Implementation Timeline (Anticipated Start/Finish): August 2023 - Ongoing

Key Personnel: Engineering, Technology, & Video Production Department Teachers; Superintendent; Assistant Superintendents; Building Principals; Maintenance staff

Major Action Steps: (1) Consult with PR Building and Grounds, and Maintenance. (2) Consult with Architects to develop design (3) Evaluate feasibility, cost, and benefits

Estimated Budget/Resources: Cost associated with these recommendations include: Classroom modifications would be necessary to create the hybrid space (“clean” computer lab and manufacturing lab). Additional cost may be associated with potential hardware and software needed to support courses (e.g. Autodesk, computers, 3D printers). Annual revisions to the capital funding plan are made to consider the life cycle and replacement needs for equipment also and will continue to occur.

Potential Implications (Short-Term and Long-Term): Analysis of current space and equipment will be needed. Investment into architectural design, construction, and furnishings, may be necessary.

Recommendation #5: Student Engagement & Activities

1. Expand the Technology Student Association (TSA) opportunity to middle school students to help bolster interest and application opportunities for students to be connected in Technology & Engineering.
2. Implement live announcements at Pine-Richland High School and expand student engagement in athletic, extra- and co-curricular events (broadcasting, marketing, set design, etc.).

Internal Analysis

- Eden Hall and Pine-Richland Middle School broadcast and livestream announcements at present to the entire school (IDPR Committee, 2023).
- The Technology Student Association (TSA) club is only available to students at the high school level currently (IDPR Committee, 2023).
- Students express interest in additional extracurricular experiences with technology such as programming, and robotics (Student Focus Groups, 2023).
- Students are exposed through the current curriculum and course discussion to a few of the careers requiring training in Engineering, Technology, and Communications and experience Career Education and Work standards experiences, which could be bolstered to ensure students are informed of the diverse array of careers (IDPR Committee; Student Focus Groups; Town Hall, 2023).

External Analysis

- Shaler Area, Seneca Valley, North Allegheny broadcast/stream announcements live (Shaler Area, Seneca Valley, North Allegheny, 2023).
- Other area exemplar programs are participating in middle school level TSA (North Allegheny, Blackhawk, 2023).
- Resources exist to support the development of high quality TSA programs at both the middle and high school (Technology Student Association tsaweb.org, 2023).

Implementation Timeline (Anticipated Start/Finish): August 2023 - May 2025

Key Personnel: Engineering, Technology, & Video Production Department Teachers; Building Principals; School Counselors

Major Action Steps: (1) Explore Technology Student Association chapter addition in the middle school, and club sponsor and eventual board approval for club and potential supplemental contract. (2) Coordinate with HS administration to align TV production course offerings, with appropriate time for announcements.

Estimated Budget/Resources: There are minimal costs anticipated with the implementation of live announcements. Some cost with the addition of a club sponsor for middle school TSA, and possible purchase of materials or resources to facilitate the operation of the TSA club.

Potential Implications (Short-Term and Long-Term): Adjustment to high school bell schedule to align homeroom time with the offering of TV Production class.

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