

Science Department Program Review

Philosophy Vision Statement:
Engage students in the world of science by developing a foundation of skills strengthened through a wide range of content and experiences.

Pine-Richland School District

May 2024

The information contained in this Report is provided by the Pine-Richland Science Department 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.

Science Department Program Review

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Overview:

During the 2016-2017 school year, the Pine-Richland K-12 Science Department conducted an In-Depth Program Review (IDPR). The department was the first to complete this year-long study designed to identify program-based strengths and areas of opportunity. The findings and recommendations from the 2016-2017 study were shared with the school board and community in June of 2017. Implementation of the recommendations began in the fall of 2017.

One of the essential recommendations from 2017 was the development of the department's vision and philosophy (Figure 1). Integrated into the vision and philosophy are the three dimensions of Next Generation Science Standards (NGSS) - Crosscutting Concepts (Connections), Science and Engineering Practices (Skills), and Disciplinary Core Ideas (Content). At the time, Pennsylvania had not yet adopted revised standards; however, the IDPR study guided the district in making these adjustments based on the research findings.

In 2022, the new Pennsylvania Science, Technology & Engineering, Environmental Literacy and Sustainability (STEELS) Standards were published. The STEELS standards are aligned with NGSS and will be implemented across the state in July 2025. STEELS standards integration is one of the main recommendations identified through this year's "mini" review.



Figure 1

Engage students in the world of science by developing a foundation of skills strengthened through a wide range of experiences.

Mini-Review Process:

Over the past seven years, all other departments have completed an IDPR. The district is now completing "mini" reviews. Science is again the first to complete this process. Figure 2 below describes the steps used to conduct this review.

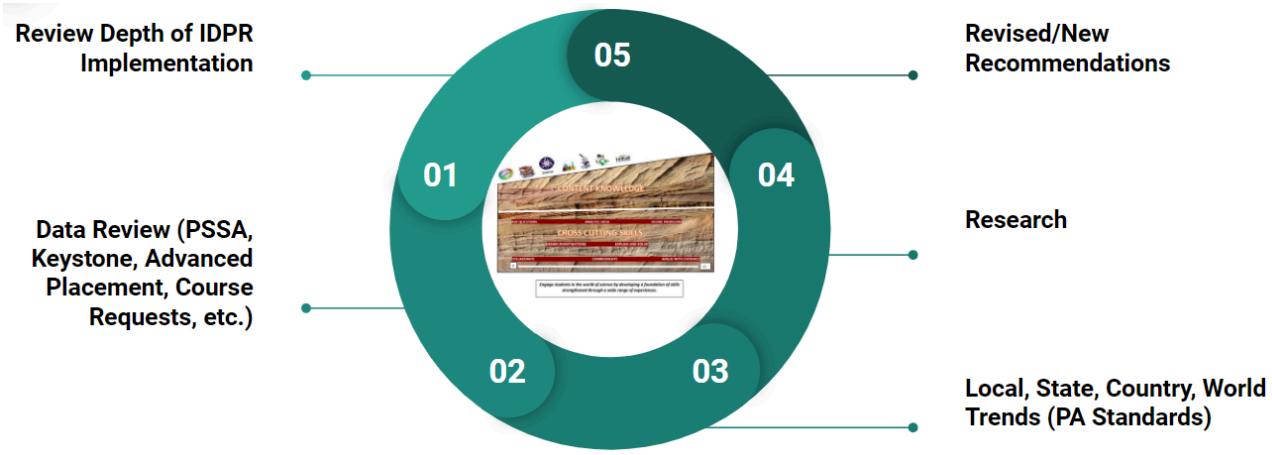


Figure 2

All secondary and some elementary science teachers participated. The **first phase** of the review was designed to evaluate the implementation of the 2016-2017 IDPR Science Department recommendations. Each grade span conducted an analysis of every goal to determine depth of implementation. **Phase two** of the process included the review and analysis of data points connected to the district's K-12 science program (e.g., Advance Placement; Keystone Biology, PSSA results; and Course Request data). The **third and fourth phases** of the mini review included conducting high level research on K-12 science topics, reviewing the STEELS Standards, and interviewing a few selected universities, businesses, and local school districts to identify other emerging trends. **Finally**, the committee reviewed the findings from each phase of the process to identify updated recommendations that will guide the department in making continuous refinements and improvements in the coming years.

Research and Recommendation Focus Areas:

Five key areas of focus were identified: 1) Inquiry/Project-Based Learning Experiences and Career Education; 2) STEELS Standards Integration; 3) Course Pathway Options (high school); 4) Physical Space Modifications; and 5) Assessment/Benchmarking Strategies.

In the pages below, each of these focus areas includes one or more recommendations for the department to implement beginning in the 2024 - 2025 school year.

Recommendation Overview

Recommendation #1:

1A. Increase phenomenon/inquiry-based learning activities (in accordance with Science, Technology, Engineering, Environmental Literacy, and Sustainability (**STEELS**) Standards) into all K-12 science courses.

1B. Add career education and work standard learning activities into all K-12 science courses.

1C. Integrate reading in the content area strategies in science classes to support and challenge all students (e.g., structured literacy aligned with word parts, vocabulary, background knowledge, etc).

Recommendation #2:

2A. Modify unit-based curriculum to include STEELS standards.

2B. Determine an approach to address the earth and space science standards at the secondary level.

Recommendation #3:

3. Revise course pathway options and sequencing of resources considering the following:
   A. Expand anatomy pathway options (e.g., academic to Advanced Placement; consideration of zoology);
   B. Adjust high school science pathway recommendations based on mathematics readiness;
   C. Identify non-traditional science courses to integrate into the Program of Studies (e.g., forensics, theoretical physics);
   D. Modify Earth and the Environment course/pathway options;
   E. Explore College in High school and dual enrollment options;
   F. Audit the Amplify units K-8 to ensure that they are the correct units, properly sequenced in each grade level, to ensure mastery of STEELS standards.

Recommendation #4:

4A. Identify physical space modifications needed to support the phenomenon/inquiry-based learning activities (e.g., high school physics classrooms; lab resources). Include those recommendations in the capital funding plan.

Recommendation #5:

5A. Modify assessments (e.g., common, unit, benchmark) to align with STEELS standards.

Recommendations

Recommendation #1:

1A. Increase phenomenon/inquiry-based learning activities (in accordance with STEELS Standards) into all K-12 science courses.

1B. Add career education and work standard learning activities into all K-12 science courses.

1C. Integrate reading in the content area strategies in science classes to support and challenge all students (e.g., structured literacy aligned with word parts, vocabulary, background knowledge, etc).

FINDINGS:

Internal Analysis

1. Students benefit from inquiry-based learning, but struggle with taking initiative in their own learning and persevering when they do not know the answer instantly (PRSD Science Vertical Team, 2024).
2. Begin implementing the instructional methodology changes prior to beginning the deep work of realigning standards and getting lost in the coding of the standards. While curricular coding with standards needs to occur, it is disconnected from the teachers' and students' lived experiences. By creating students, who are able to think scientifically and work through a phenomenon and explain its occurrence, they will be able to approach additional scientific scenarios with the ability to think through the problems without specific background knowledge also. By having teachers and staff alter the instructional approach, they will be better able to capture the standards within the curriculum after making explicit connections to instruction (PRSD Science Vertical Team, 2024).
3. Current K-8 curricular resources include Amplify Science units, which are designed with a phenomenon-based approach to instruction based on the Next Generation Science Standards (NGSS), which can be expanded upon. At the high school level, the inquiry- and phenomenon-based approach is not widely used and will require some redesign in instructional approach. (PRSD Science Vertical Team, 2024).

External Analysis

1. "Professional learning aligned to college- and career-ready standards has the power to improve instruction as well as student outcomes…The design of each of those experiences must reflect certain research-based non-negotiables, or Principles for High-Quality, Standards-Aligned Professional Learning. **Principle 1**: Professional learning **must be content-focused**. Professional learning builds teachers' content knowledge and pedagogical content knowledge necessary to teach the concepts of their discipline. **Principle 2**: Professional learning **must be teacher- and student-centered**. Professional learning promotes collective responsibility for students' learning and cultivates a dynamic culture for adult learning. **Principle 3**: Professional learning **must be instructionally relevant and actionable**. Professional learning is anchored in the instructional priorities of teachers' daily work and is sustained in a coherent system of collaborative planning, classroom practice, observation, feedback, and continuous cycles of inquiry grounded in evidence of student learning." (Achieve the Core, 2024).

2. Students have a wide range of prerequisite knowledge and what classes they took in high school will assist them in their college experiences (Carnegie Mellon & Duquesne, 2024).
3. Students lack soft skills, such as time management, independence, conflict management, and accountability (A.W. Beattie, Human Capital Advisors, 2024).
4. Students need to improve critical thinking and problem solving skills (Human Capital Advisors, Sitech, 2024).
5. Students are tech savvy, but schools need more understanding with appropriate usage of Artificial Intelligence (Human Capital Advisors, Sitech, 2024).
6. The district prioritizes professional development and training for K-12 teachers. A two-day professional development opportunity was provided for all teachers solely focused on NGSS which included demonstrations and modeling. The district also provided 5E training (Engage, Explore, Explain, Elaborate, Evaluate) to all K-5 teachers (Neshaminy, 2024).
7. Designing units around phenomena will allow students to explore, question, and discover solutions collaboratively. This means of instruction can help inquiry and provide opportunities for students to apply knowledge creatively, ultimately fostering ownership of their learning process (Red Lion SD, 2024).
8. The National Science Teachers Association (NSTA, 2024) has created a repository of "Daily Dos", which showcases different phenomena to kick start a unit of inquiry, assisting teachers with standards-aligned unique and authentic problems to ensure the inquiry- and phenomenon-based approach to lessons can be easily achieved.
9. There is a benefit to teaming elementary and secondary science teachers for the development of instruction/curriculum. Collaboration between elementary and secondary science teachers fosters vertical alignment of curriculum, ensuring a smoother transition for students. It promotes coherence in learning objectives, instructional strategies, and assessments, enhancing the overall effectiveness of science education. (Red Lion SD, 2024).
10. The district acknowledges the difficulties associated with the implementation of the STEELS standards. Existing courses are using a unit-based approach to implementation. This allows them to develop a process for completion while addressing common pitfalls that occur along the way. As new courses are developed they are STEELS aligned from inception (Huntington SD, 2024).
11. The NASD secondary science department is focused on the identification of open source materials, simulations, and other technology-based resources to augment the traditional standards-aligned textbook. This approach allows teachers to identify current, relevant resources that illustrate scientific concepts and better engage student interest (North Allegheny SD, 2024).
12. Utilizing phenomena in science education at the elementary/secondary level offers tangible, real-world contexts for learning, fostering curiosity and engagement. By connecting abstract concepts to observable events, students grasp complex ideas more readily. Moreover, it promotes interdisciplinary connections, as phenomena often transcend traditional subject boundaries. It is important that when using this methodology, numerous resources are considered and adapted for our students to grow and develop (Red Lion SD & Neshaminy SD, 2024).
13. Traditional textbook resources remain important. When evaluating resources, alignment to STEELS is a consideration. These traditional resources can provide a foundation for teachers transitioning to STEELS (Huntington SD, 2024).

14. The train-the-trainer model was adopted with pilot teams of teachers within grade spans. These training teams can design and implement units and assessments, evaluate the process share experiences (Neshaminy SD, 2024)
15. "The 5E Model of Instruction promotes active learning. Students are involved in more than listening and reading. They learn to ask questions, observe, model, analyze, explain, draw conclusions, argue from evidence, and talk about their own understanding. Students work collaboratively with peers to construct explanations, solve problems, and plan and carry out investigations" (Science Resource Center, Accessed 2024).
16. The 5E Model for Learning takes learning from a teacher-centered environment to a student-centered learning experience. The students become accountable for their own learning and are forced to interact with the course content (NSTA, 2020).
17. The Simple View of Reading created in 1986 by researchers Tumner and Gough equates reading comprehension skills to the product of a reader's word recognition times their language comprehension. This was later further developed by Scarborough in the development of The Reading Rope. Language comprehension skills can be bolstered by teachers of all content areas as it is broken down into the following subskills: (1) background knowledge including facts, concepts, etc.; (2) vocabulary including breadth, precision, and links, etc.; (3) language structures such as syntax, semantics, etc.; (4) verbal reasoning and the ability to make inferences, metaphor, etc.; and (5) literacy knowledge such as print concepts, genres, etc. By ensuring knowledge of root words and meanings, students can be scaffolded into decoding and also comprehending complex academic vocabulary to master their meaning with the hope of accessing and understanding material and utilizing the terms to communicate with others (Allegheny Intermediate Unit Training & Consultation Team Structured Literacy PD Series, 2023 - 2024).
18. Career awareness will help students analyze career options based on personal interests, abilities, aptitudes, achievements, and goals (Career Education and Work Standards, 2024).

Implementation Timeline (Anticipated Start/Finish): August 2024 - Ongoing
Key Personnel: All science teachers K-12.
Major Action Steps: (1) Professional development with STEELS standards will be provided through the train-the-trainer model given teams learning with the Allegheny Intermediate Unit 3**;** (2) Lesson modifications to identify the overarching phenomenon question for each unit of study to foster the inquiry-based learning process; (3) Throughout each unit, teachers will reflect on the STEELS standards to indicate where the new eligible content are reflected within the unit to assist with later mapping activities; (4) Instructional opportunities with a 5E model will be designed for each course or leveraged within existing phenomenon-based learning experiences; and (5) Language comprehension and each sub-factor can be bolstered for students to help them comprehend and leverage academic vocabulary needed.
Estimated Budget/Resources: Some costs will be associated with initial trainer training in STEELS standards and resource procurement for training sessions; however, the majority of this work requires professional development and grade level/course instructor time only and not a financial commitment.
Potential Implications (Short-Term and Long-Term): By taking this process one step at a time, we intend to anchor it in the lived, daily experiences of teachers and students in order to contextualize the updates to the standards in a low-risk environment. Updates will be made over the course of the first several years of the IDPR implementation in order to ensure sustainable and transformative changes are maintained.

Recommendation #2:

2A. Modify unit-based curriculum to include STEELS standards.

2B. Determine an approach to address the earth and space science standards at the secondary level.

FINDINGS:

Internal Analysis

1. Based on the incoming STEELS Science standards, there is a need to adjust the current unit curriculum to incorporate STEELS Standards (PRSD Science Vertical Team, 2024)**.**
2. At Pine-Richland High School, an average of 31 students requested Earth and the Environment over the past 4 years (PRSD Science Vertical Team, 2024).
3. Earth and Space standards are addressed in grades K-6 (PRSD Science Vertical Team, 2024).
4. Current PRSD curriculum compared to STEELS standards crosswalk was completed for all science domains (Life, Earth, Physical). Gaps were identified to support the transition (PRSD Science Vertical Team, 2024).

External Analysis

1. STEELS Timeline: 2024 - 2025 curriculum alignment to STEELS Standards; 2025 - 2026 First year PSSA and Keystone exams are aligned to STEELS standards (PDE SAS, 2024).
2. Science is central to the development of society. Scientific thought processes - asking questions, critical thinking, and problem-solving - are key to preparing students for their future (Carnegie Corporation of NY, 2009; Carnegie Mellon University and Duquesne University, 2024).
3. The US is lagging behind other countries in scientific readiness. In 2012, 69% of graduates failed to meet the readiness benchmark levels in science (Next Generation Science, 2013).
4. Designing units around phenomena will allow students to explore, question, and discover solutions collaboratively. This means of instruction can help with inquiry and provide opportunities for students to apply knowledge creatively and ultimately foster ownership of their learning process (Red Lion SD, 2024).
5. There is a benefit to teaming elementary and secondary science teachers for the development of instruction/curriculum. Collaboration between elementary and secondary science teachers fosters vertical alignment of curriculum, ensuring a smoother transition for students. It promotes coherence in learning objectives, instructional strategies, and assessments, enhancing the overall effectiveness of science education (Red Lion SD, 2024).
6. The shift to STEELS standards is a time-intensive process that may require additional time and resources to accomplish the work (Red Lion SD; Sutter, Neshaminy SD, 2024).
7. The district acknowledges the difficulties associated with the implementation of the STEELS standards. Existing courses are using a unit-based approach to implementation. This allows them to develop a process for completion while addressing common pitfalls that occur along the way. As new courses are developed they are STEELS aligned from inception (Huntington SD, 2024).

8. The 5E Model (Engagement, Exploration, Explanation, Elaboration, Evaluation) for Learning takes learning from a teacher-centered environment to a student-centered learning experience. The students become accountable for their own learning and are forced to interact with the course content (Duran & Duran, 2004).
9. Earth and Space standards exist through grade 12 in the STEELS standards (PDE SAS, 2024).

Implementation Timeline (Anticipated Start/Finish): August 2024 - Ongoing
Key Personnel: K-12 Science Teachers & Building/District Administrators
Major Action Steps: (1) Upon completion of the instructional approach modification to phenomenon-based learning opportunities for each unit and the reflection upon units within the context of the STEELS standards through one academic year, the team will begin to update the curricular maps to include STEELS-aligned adjustments; and (2) Continuous monitoring of student assessment data (e.g., unit, benchmark, standardized) will be leveraged to make adjustments to curricular approaches, sequencing, and content emphasized with changes brought forth in the annual review and approval of curriculum.
Estimated Budget/Resources: No costs are anticipated with regard to this recommendation.
Potential Implications (Short-Term and Long-Term): Mirroring the pacing articulated within Recommendation #1, we intend to anchor our standards-alignment experiences in the daily instruction of teachers and student experiences in order to contextualize the updates in a low-risk environment. Updates will be made over the course of the first several years of the IDPR implementation in order to ensure sustainable and transformative changes are maintained. Board action on the updates to the curriculum guides will occur at the conclusion of the 2024-2025 school year and potentially beyond as adjustments are made through cycles of learning and improvement.

Recommendation #3:

Revise course pathway options and sequencing of resources considering the following:

A. Expand anatomy pathway options (e.g., academic to Advanced Placement; consideration of zoology);
B. Adjust high school science pathway recommendations based on mathematics readiness;
C. Identify non-traditional science courses to integrate into the Program of Studies (e.g., forensics, theoretical physics);
D. Modify Earth and the Environment course/pathway options;
E. Explore College in High school and dual enrollment options;
F. Audit the Amplify units K-8 to ensure that they are the correct units, properly sequenced in each grade level, to ensure mastery of STEELS standards.

FINDINGS:

Internal Analysis

1. Interest in Anatomy courses remains high with both Comparative and Honors Anatomy and Physiology having increased in enrollment (PRSD Vertical Team, 2024).
2. Changes in the Anatomy course pathways will be considered after more information about the AP Anatomy and Physiology course is developed by the College Board (PRSD Vertical Team, 2024).
3. Students enrolled in honors biology as 9th graders who are not concurrently enrolled in honors geometry or a higher level mathematics course are not finding alignment between their mathematics pathway and prerequisites for higher level science courses. In addition, the level of critical thinking required for higher level science courses is developed throughout the mathematics curriculum (PRSD Vertical Team, 2024).
4. Student interest in science electives remains high. There are many AP elective courses, however there is a need to develop additional courses at the academic level (PRSD Vertical Team, 2024).
5. Course request numbers have gone down in Earth and the Environment (PRSD Vertical Team, 2024).
6. College In High School courses will provide students the opportunity to experience college-level course work and potentially earn college credit (Pine-Richland School District Strategic Plan, 2024).
7. In a curricular audit against the STEELS Standards, a need to shift the 3rd grade Amplify Science Inheritance & Traits unit to the beginning of the year was identified. This unit will swap places with the Balancing Forces unit, which will now take place at the conclusion of the year. Eligible content regarding genetic traits and heredity was not addressed in any other grade level in the elementary span, making mastery of this unit important. The shift will allow an alignment between the science unit and an ELA unit regarding foxes and wolves, with wolves being the subject matter of the Inheritance & Traits unit for more powerful cross-curricular alignment. Additionally, students had many real world experiences with magnets and the concept of Maglev trains needs less instructional emphasis and will make a better quick unit at the conclusion of the school year (PRSD Science Vertical Team, 2024).

External Analysis

1. Advanced classes expose students to higher level thinking. Classes that foster study skills, time management and require conflict resolution are important (A.W. Beattie, 2024).
2. “Mathematics provides an effective way of building mental discipline and encourages logical reasoning and mental rigor. In addition, mathematical knowledge plays a crucial role in understanding the contents

of other school subjects such as science, social studies, and even music and art (International Commission on Mathematical Instruction, 2024).

3. Earth and Space standards exist through grade 12 in the STEELS standards (PDE SAS, 2024).
4. Evaluate school-based opportunities for career awareness/preparation, such as, but not limited to: Career days Career portfolio, Community service, Cooperative education, Graduation/senior project, Internship Job shadowing, Part-time employment, Registered apprenticeship, School-based enterprise (Career Education and Work Standards, 2024).
5. Advanced science electives, computer sciences - particularly computer programming, there is not a lot of U.S. talent out there specific to programming (JAVA) (Human Capital Advisors, 2024).

Implementation Timeline (Anticipated Start/Finish): August 2024 - Ongoing
Key Personnel: K-12 Science Teachers
Major Action Steps: (1) Evaluate pathways for anatomy courses following the release of information from the College Board related to the AP Human Anatomy program; (2) Identify and submit program of studies revisions related to math prerequisites for science courses; (3) Research and create new elective course options to be added to the high school pathways; (4) Develop an alternative pathway to biology; (5) Research opportunities for College in High School programs within the science pathways. Present findings and recommendations related to the implementation of these courses within the high school course pathway; (6) Audit the Amplify units K-8 and make required adjustments.
Estimated Budget/Resources: There will potentially be costs associated with required resources for new courses. The addition of AP or CHS courses will require staff training.
Potential Implications (Short-Term and Long-Term): The addition of new courses along different levels within the high school pathways will expand opportunities for our students, while revisions to the necessary prerequisites for our upper level courses will ensure that students are prepared for the critical thinking aspects of these courses. An audit of the K-8 until will ensure that these grades are aligned with the STEELS concepts. Each course or pathway will need to be approved at the school board level through the annual program of studies and curriculum review process.

Recommendation #4

Identify physical space modifications needed to support the phenomenon/inquiry-based learning activities (e.g., high school physics classrooms; lab resources). Include those recommendations in the capital funding plan.

FINDINGS:

Internal Analysis

1. Average projected class size for the 2024 - 2025 School Year for Academic Physics is 25 and for Honors Physics is 27 (PRSD Vertical Team, 2024).
2. Currently, two of our four PRHS Physics classrooms do not have separated dedicated lab spaces (PRSD Vertical Team, 2024).
3. Some science rooms have not been updated or repaired since they were originally built in 1993 (PRSD Vertical Team, 2024).
4. The shift to the inquiry based STEELS curriculum will more frequently engage students in hands-on laboratory work. This will require the purchase of additional lab equipment as well as the repair of existing equipment (PRSD Vertical Team, 2024).
5. Budgetary considerations need to be contemplated and mapped out in advance of purchases for capital funding and moveable fixtures and equipment (PRSD Vertical Team, 2024).

External Analysis

1. Classroom resources and the balancing of schedules have to be considered for science courses with regard to the ability to provide “safety, adequate workspace, and effective teaching and student attention” (NSTA, 2014).
2. The goal of STEELS is to move students away from the process of memorizing science facts toward, “having students productively participating in scientific discourse and practices, involving students in sustained investigation to support deeper understanding,” (PDE SAS, 2024).
3. There is a disconnect between the classroom and career skills/preparedness. Students need help taking what happens in the classroom and translating that into skills they can showcase for employers to make themselves more marketable. Classrooms can be used in different ways to provide students with these experiences (Human Capital Advisors, 2024).
4. Students need to "do" science regularly and students need to be able to move seamlessly back and forth from lab group investigations to whole-class discussion sense-making (Edutopia, 2014).
5. STEM classrooms encourage active learning, which is the practice of engaging students through projects and activities instead of passive listening from lectures (AMS, 2024).
6. A free-flowing layout is ideal for project-based learning because it allows students to innovate and solve problems both individually and in teams. Fluid spaces support brainstorming, building, testing and experimenting, inspiring students to work together to find solutions to real-world challenges (AMS, 2024).

Implementation Timeline (Anticipated Start/Finish): August 2024 - Ongoing
Key Personnel: Science Teachers, Administrators, Maintenance Staff, School Board, Finance Department; Architectural firms
Major Action Steps: (1) Develop a prioritized list of facility and capital funding equipment needs; (2) Work with architectural firms to identify specifications;(3) Identify approximate costs of those items; (4) Recommend when the projects/equipment should be added to the district's capital funding budget.
Estimated Budget/Resources: To be determined.
Potential Implications (Short-Term and Long-Term): In collaboration with the school board, the annual budget development process will need to be considered. Other district-wide capital funding projects must be considered. Scheduling challenges may exist while rooms are being renovated. Other projects may be delayed based on the prioritized needs of the district.

Recommendation #5

Modify assessments (e.g., common, unit, benchmark) to align with STEELS standards.

FINDINGS:

Internal Analysis

1. Pine-Richland School District currently utilizes two main tools to assist with science benchmarking, Classroom Diagnostic Tools (CDT) from PDE for PSSA and Keystone courses and Progress Learning for Keystone courses (e.g., Biology). PDE has already indicated that the new STEELS-aligned CDT will be available to users starting in the 2024 - 2025 school year. Progress Learning prides itself on being standards-aligned by state, but they have not released a timeline for the newly-aligned resources to be released through their tool (PRSD Science Vertical Team, 2024).
2. Each Pine-Richland Course has at least 4 common assessments utilized, which are implemented throughout the year and analyzed by teams of teachers as they reflect upon the most effective instructional approaches with the students and identify by strengths and opportunities, from which differentiated instructional responses are designed (PRSD Science Vertical Team, 2024).
3. Current assessments most commonly take the form of traditional pencil and paper assessments, with some lab-based assessments and written assessments becoming more common. There is an opportunity to engage students in applied science assessments in a more authentic manner (PRSD Science Vertical Team, 2024).
4. Consideration of the ability for Progress Learning and the newly-aligned CDT to help predict student performance on the Biology Keystone and Science PSSA should be analyzed more closely through building-level data meetings for utility and ability to respond instructionally to evidenced student needs (PRSD Science Vertical Teams, 2024).

External Analysis

1. "Assessment tasks present an opportunity for students to demonstrate their proficiency with *disciplinary core ideas* (DCIs), *science and engineering practices* (SEPs), and *crosscutting concepts* (CCs) in an integrated format" (Penuel, et al., 2016).
2. "At its core, the NGSS performance expectations and tasks designed for the NGSS require students to develop deep enough conceptual and practical understanding that they can transfer that understanding to a range of real-world scenarios. These scenarios themselves often drive how student performance is emphasized. The familiarity / novelty of the context, the availability of observations and data, the level of collaboration expected, and student prior experience play major roles in determining the complexity potential of the performance" (NGSS, Accessed May 2024).
3. "Generally, the three dimensions of the standards are disciplinary core ideas - what students know; crosscutting concepts - how students think; and science and engineering practices - what students do. Just like in instruction, these three dimensions should be apparent in assessment, blurring the lines between general student work and assessment" (Wisconsin Department of Public Instruction, Accessed, 2024).

4. Designing units around phenomena will allow students to explore, question, and discover solutions collaboratively. This means of instruction can help inquiry and provide opportunities for students to apply knowledge creatively, ultimately fostering ownership of their learning process (Red Lion SD, 2024).
5. There is a benefit to teaming elementary and secondary science teachers for the development of instruction/curriculum. Collaboration between elementary and secondary science teachers fosters vertical alignment of curriculum, ensuring a smoother transition for students. It promotes coherence in learning objectives, instructional strategies, and assessments, enhancing the overall effectiveness of science education. (Red Lion SD, 2024).
6. The district acknowledges the difficulties associated with the implementation of the STEELS standards. Existing courses are using a unit based approach to implementation. This allows them to develop a process for completion, while addressing common pitfalls that occur along the way. As new courses are developed they are STEELS aligned from inception (Huntington SD, 2024).
7. The shift to STEELS standards is a time-intensive process that may require additional time and resources to accomplish the work (Red Lion SD & Neshaminy SD, 2024).
8. The train-the-trainer model was adopted with pilot teams of teachers within grade spans. These training teams can design and implement units and assessments, evaluate the process and share experiences (Neshaminy SD, 2024).
9. Utilizing phenomena in science education at the secondary level offers tangible, real-world contexts for learning, fostering curiosity and engagement. By connecting abstract concepts to observable events, students grasp complex ideas more readily. Moreover, it promotes interdisciplinary connections, as phenomena often transcend traditional subject boundaries. It is important that when using this methodology, numerous resources are considered and adapted for our students to grow and develop (Red Lion SD & Neshaminy SD, 2024).

Implementation Timeline (Anticipated Start/Finish): August 2024 - Ongoing
Key Personnel: K-12 Science Teachers & Building/District Administrators
Major Action Steps: (1) Conduct an audit of the types of assessments most commonly used per course; (2) Create 3D assessments and performance tasks that will capture the rigor and application of the content for each course, yet still ensure a balanced approach to assessment modalities; and (3) Leverage data from common, unit, benchmark, and standardized assessments to identify relative areas of strength and opportunity among our students in order to provide responsive instruction, as well as make adjustments to the curriculum and recommended instructional best practices.
Estimated Budget/Resources: None anticipated.
Potential Implications (Short-Term and Long-Term): Students will potentially be more engaged in the assessment process and have the ability to authentically apply content.

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