In the following report, Hanover Research examines practices to support problem-based learning and interdisciplinary teaching at the high school level.
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EXECUTIVE SUMMARY AND KEY FINDINGS

INTRODUCTION

In the following report, Hanover Research (Hanover) investigates instructional strategies and organizational practices that support the successful integration of problem-based learning (PBL) and Inter-Disciplinary Teaching (IDT). Findings from Hanover’s analysis of secondary literature, published reports, and district programs are organized into three main sections:

- **Section I: Integrating Problem-Based Learning and Interdisciplinary Teaching** examines best practices for incorporating PBL and IDT in high school curriculum and instruction.

- **Section II: Organizational Practices to Support Instruction** discusses administrative policies—such as professional development (PD) and scheduling protocols—and facility design principles that help support PBL and IDT.

- **Section III: School Profiles** describes three high schools that currently implement PBL and IDT practices.

KEY FINDINGS

- **Teachers can use PBL strategies to challenge their students to apply knowledge and skills from multiple disciplines and generate viable solutions to real-world issues.** Specifically, PBL exposes students to actual or simulated problems that require them to use critical and creative thinking skills and collaborate with peers to reach a solution. Students explore topics through sustained, self-directed inquiry to better understand target content and design a public product. Furthermore, students’ generated solutions integrate knowledge from multiple fields of study and articulate awareness of several viewpoints. Research finds that PBL positively impacts students’ academic performance, soft skills (e.g., research, problem-solving), and self-confidence.

- **Integrating IDT principles with PBL will involve centering instruction on a broad topic, problem, or skill, and using content from individual disciplines to guide student learning and encourage cross-disciplinary connections.** Teachers will act as facilitators who offer feedback on students’ collaborative work and stimulate deeper investigation of issues through strategies such as metacognitive questioning. In this way, IDT can positively impact students’ knowledge acquisition, interdisciplinary understanding, and ability to contemplate multiple perspectives. However, teachers should recognize the challenges of IDT and PBL—such as unpredictability in daily instruction—and commit to extensive pre-planning and reevaluation of progress during instruction to ensure efficacy in curricular delivery.

- **To ensure long-term commitment to PBL and IDT and effective delivery of instruction, districts should actively address both approaches in its PD programs.** Any PD program must possess clear value for teachers to encourage their active...
attention and commitment to using target skills. Over the course of a PD program, teachers should receive a recap of relevant theory, view exemplary demonstrations of strategies, and practice new skills. Sustained coaching or additional work within a professional learning community (PLC) should follow workshops and presentations to support teachers in developing their proficiency with PBL and IDT and establishing collaborative working relationships with colleagues.

- **School districts should adjust teacher schedules to allow time for collaborative interdisciplinary planning.** Without common planning time, teachers may struggle to integrate their disciplines within a unified framework. Potential strategies that a district can use to guarantee common planning time include: reorienting the school master schedule so collaborating teachers’ non-instructional periods overlap; hiring substitutes to cover classes so teachers can plan with their interdisciplinary team; and embedding monthly teacher work sessions into the school calendar for collaborative planning. Ultimately, however, districts should convene relevant stakeholders (e.g., administrators, teachers) to decide which arrangement is the most viable.

- **During high school redesign processes, School districts should emphasize common spaces to facilitate interdisciplinary collaboration among teachers and other school staff.** District leaders may consider having multiple teachers share individual classrooms and clustering classrooms around common areas by interdisciplinary team. Common office spaces for interdisciplinary teams can also reduce barriers to communication and enable teachers to collaborate in their planning. Such design components can help teachers explore the connections between their content areas through informal conversations and formal strategy sessions.

- **Instructional spaces should be designed for maximum flexibility and to encourage student collaboration.** Ideally, classrooms will provide “break-out” areas where students can work independently or in groups. The integration of movable walls and screens in classroom construction can also help teachers and students create breakout spaces as needed. Furthermore, furnishing classrooms with mobile, reconfigurable desks, chairs, and tables allows occupants to rearrange the space to accommodate various student grouping arrangements and instructional activities.
SECTION I: PROBLEM-BASED LEARNING AND INTERDISCIPLINARY TEACHING

In the following section, Hanover describes PBL and IDT and presents research on their effects on student and teacher outcomes. This section concludes with an examination of instructional strategies that support the successful incorporation of PBL and IDT in the classroom.

DEFINITIONS

PBL and IDT are increasingly important approaches in education given societal trends toward integrated knowledge and transferable interdisciplinary skills. Concerns about curricular relevancy, a lack of connections between disciplines, and the growing need for workers to solve problems requiring knowledge of many fields drive the push toward PBL and IDT. Notably, both approaches seek “to better prepare students for solving real-world problems and issues while teaching them what they need to know to succeed in school.” More specifically, PBL and IDT seek to develop:

- Personal and social responsibility;
- Planning, critical thinking, reasoning, and creativity;
- Strong communication skills, both for interpersonal and presentation needs;
- Cross-cultural understanding;
- Visualizing and decision making; and
- Knowing how and when to use technology and choosing the most appropriate tool for the task.

According to a 2006 Interdisciplinary Journal of Problem-Based Learning article, PBL is:

...an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem. Critical to the success of the approach is the selection of ill-structured problems (often interdisciplinary) and a tutor who guides the learning process.

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5 Quotation taken verbatim, with added emphasis, from: Savery, J.R. “Overview of Problem-Based Learning: Definitions and Distinctions.” Interdisciplinary Journal of Problem-Based Learning, 1:1. 5/22/06. p. 12. http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1002&context=ijpbl
PBL challenges students to apply their knowledge and skills from multiple disciplines to generate viable solutions to real-world issues. “Ill-structured” problems—social, political, economic, or scientific issues with unclear solutions—serve as the foundation for PBL. The Center for Teaching Excellence at Cornell University emphasizes that students must learn new concepts by collaborating with their peers to solve these open-ended problems. Similarly, McMaster University in Ontario, Canada, states that PBL is a framework that interrogates problems through cooperative learning. Notably, PBL shares many attributes with project-based learning—a strategy “in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge.” Thus, effective PBL can integrate the design elements of project-based learning (see Figure 1.1 below), which emphasize student-directed inquiry.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Knowledge, Understanding, and Success Skills</td>
<td>Students learn how to apply content knowledge to real-world problems and develop their aptitudes for critical thinking, problem-solving, collaboration, self-management, perseverance, and creativity.</td>
</tr>
<tr>
<td>Challenging Problem or Question</td>
<td>A meaningful, open-ended problem frames student inquiry and the application of content knowledge gained from instruction and research in multiple disciplines.</td>
</tr>
<tr>
<td>Sustained Inquiry</td>
<td>Students engage in rigorous, extended research to determine a solution to the foundational problem. This requires broad and persistent knowledge application.</td>
</tr>
<tr>
<td>Authenticity</td>
<td>The project features or simulates real-world contexts and performance standards, or addresses students’ concerns, interests, or problems.</td>
</tr>
<tr>
<td>Student Voice and Choice</td>
<td>Students make decisions about their research process, collaborative dynamic, and pursuit of a solution to the foundational problem, with guidance from a teacher.</td>
</tr>
<tr>
<td>Reflection</td>
<td>Students reflect on their learning, the efficacy of their research process, the quality of their work, and how to surmount challenges.</td>
</tr>
<tr>
<td>Critique and Revision</td>
<td>Students give and receive constructive peer feedback and use feedback from peers and teachers to improve their process and products.</td>
</tr>
<tr>
<td>Public Product</td>
<td>Students present their final product or answer publicly to classmates, school staff, and other community members.</td>
</tr>
</tbody>
</table>

Source: Buck Institute for Education

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11 Please note that Hanover will use the abbreviation PBL for both problem- and project-based learning for the remainder of this report given the extent of their shared design principles.
Importantly, **PBL challenges students to connect knowledge from multiple disciplines to guide learning and find solutions to problems.** Teachers can facilitate this process with an interdisciplinary pedagogy that “covers an idea, topic, or text by integrating multiple knowledge domains [and crossing] the boundaries of a discipline or curriculum in order to enhance the scope and depth of learning.”

Similarly, **IDT helps “create connections between traditionally discrete disciplines such as mathematics, the sciences, social studies or history, and English language arts.”** Students receiving IDT-based instruction study themes or problems using the perspectives of more than one discipline. In IDT, students must understand the limitations of individual disciplines and learn how to integrate knowledge from several subjects to achieve a comprehensive understanding of a given topic. Consequently, IDT is unconstrained by the norms or biases of a single discipline; rather, it represents a systemic framework that amalgamates multiple viewpoints to guide student inquiry. Below, Figure 1.2 displays key traits of IDT, including the conception of knowledge (i.e., interrogating facts and opinions through multiple lenses) and student-centered practices.

**Figure 1.2: Attributes of IDT**

- Interdisciplinary skills and concepts are embedded in curricular standards
- Knowledge is constructed using all disciplines
- Problems have many correct answers
- Teachers act as content facilitators
- Emphasizes democratic values and life skills (e.g., teamwork, self-responsibility)
- Culminating activities integrate all disciplines
- Backward design guides planning
- Demands student inquiry and differentiation

Source: Association for Supervision and Curriculum Development

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**STUDENT AND TEACHER OUTCOMES**

**Benefits**

PBL helps improve students’ research, social, and problem-solving skills while providing an avenue to think critically, retain information, and practice lifelong learning habits. More specifically, PBL gives students opportunities to develop skills related to:

- Teamwork;
- Project management;
- Evaluation of group collaboration;
- Leadership;
- Oral and written communication;
- Self-awareness;
- Critical thinking and analysis;
- Applying learning to real-world contexts;
- Evidence-based research;
- Information literacy; and
- Problem-solving across multiple disciplines.

A 2009 meta-synthesis of eight meta-analyses published in the *Interdisciplinary Journal of Problem-Based Learning* determines that PBL is an effective strategy to promote long-term retention of knowledge and academic performance, though the authors note that it underperforms traditional instruction in short-term knowledge retention. Similarly, a 2013 case study of teachers implementing PBL by researchers from the University of Memphis finds improvements in students’ performance, work ethic, topical understanding, and soft skills (e.g., research, communication, collaboration, time management). Furthermore, teachers in the case study reported higher levels of student creativity, motivation, and engagement. Additional research on PBL finds that it positively influences students’ confidence and ability to transfer problem-solving skills to professional or personal situations.

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A literature review of PBL completed by researchers at the University of Indianapolis confirms many of the positive outcomes associated with the approach. Below, Figure 1.3 presents the positive student outcomes that this literature review highlights.

**Figure 1.3: Synthesis of Research-Based PBL Outcomes**

- Students with low verbal ability and content knowledge learn more than in traditional classes
- Increases use of critical thinking skills (e.g., synthesis, evaluation) for low- and high-ability students
- Students with disabilities develop social skills such as patience and empathy
- Low-ability students demonstrate initiative, management, and teamwork
- Students report enjoying PBL due to opportunities to work with peers and establish new friendships
- Students are more engaged, confident, and enthusiastic about learning
- Students score higher on standardized tests and tests of problem-solving and content application

Source: University of Indianapolis

According to the Science Education Resource Center (SERC) at Carleton College in Minnesota, IDT benefits students in four cognitive areas: perspective-taking, structural knowledge development, integrating conflicting insights from several disciplines, and interdisciplinary understanding. Through IDT, students learn to understand multiple opinions on a topic, appreciate differences in those opinions, and synthesize aspects of varying viewpoints to reach their own conclusions. In addition, IDT hones students’ factual and procedural knowledge through its investigation of complex concepts. In specific terms, IDT promotes six elements of learning that benefit students’ ability to reflect on course content:

- **Foundational Knowledge**: Acquiring information and understanding new ideas.
- **Application**: Developing an understanding of how and when to use new skills.
- **Integration**: Gaining the capacity to connect ideas from many disciplines.
- **Human Dimension**: Recognizing the social and personal implications of issues.
- **Caring**: Acknowledging the role of feelings, interests, and values in issues.
- **Metacognition**: Obtaining insights into the learning process.

SERC also highlights IDT’s positive impact on student biases and world view. IDT provides students with an avenue to uncover their preconceptions about curricular topics and recognize the origin of their biases by exposing them to new perspectives. Students can then identify the ambiguous nature of many global issues and accept that a single discipline’s perspective on a problem cannot encompass its totality or complexity.

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28 Ibid.
Multiple studies have demonstrated that the impact of IDT on students’ content knowledge is comparable, if not superior, to traditional programs. In particular, an analysis of integrated curriculum—a synonymous practice with IDT—in Los Angeles finds that IDT participants experienced statistically significant gains in writing ability and content knowledge.  

Similarly, a literature review drafted by Kevin Costley—an Associate Professor of Early Childhood Education at Arkansas Tech University—indicates that IDT produces achievement gains, reduces achievement gaps, and improves standardized test performance.

Furthermore, an Education Northwest literature review indicates that student motivation, self-direction, attendance, and homework completion improve when participating in IDT. These attitudinal shifts also apply to teachers who respond favorably to integrated curricula. Teachers implementing IDT tend to prefer it over traditional pedagogy and express appreciation for peer collaboration, greater comfortability with teaching, revitalized interest in course content, and familiarity with new instructional techniques.  

Again, Costley’s review confirms these findings, highlighting the increased enjoyment students and teachers experience with IDT and improved relationships between students and teachers.

The College Board highlights several additional benefits of IDT for teachers and students (see Figure 1.4 on the following page). These benefits include student choice, reinforcement of learning through multiple content areas, and increased enthusiasm for and comprehension of academic content by teachers.

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**Figure 1.4: Benefits of IDT**

<table>
<thead>
<tr>
<th>STUDENT BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Real-world learning, not isolated educational experiences</td>
</tr>
<tr>
<td>▪ More opportunities for students to connect new learning with what they know and are interested in</td>
</tr>
<tr>
<td>▪ Provides more ways for students to learn and demonstrate their skills and understanding</td>
</tr>
<tr>
<td>▪ Highlights student strengths and builds confidence to overcome learning challenges</td>
</tr>
<tr>
<td>▪ Gives students choices about what and how they learn</td>
</tr>
<tr>
<td>▪ Encourages students to become personally invested in their work</td>
</tr>
<tr>
<td>▪ Multiple teachers in different classes address common learning goals</td>
</tr>
<tr>
<td>▪ Students see teachers model: continued learning; interest in their discipline and others outside of their specialty; collaboration; making connections between what they know and new ideas; working from new and different perspectives; problem-solving; creativity; and flexibility</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEACHER BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Sharing ideas about a discipline and teaching with enthusiastic colleagues to attain a common goal</td>
</tr>
<tr>
<td>▪ Seeing one’s discipline from a fresh perspective builds excitement about teaching</td>
</tr>
<tr>
<td>▪ Opportunities to learn from students’ sometimes unexpected interdisciplinary connections</td>
</tr>
</tbody>
</table>

Source: College Board

**CHALLENGES**

When implementing PBL, teachers will likely encounter challenges that would not typically arise within a traditional framework. For example, PBL often consumes more class time than traditional teaching methods and reduces a teacher’s ability to cover a pre-defined syllabus. Lesson plans are more difficult to design due to PBL’s emphasis on student-guided inquiry, and teachers may struggle to select suitable content. Depending on a teacher’s past experiences and established style, they may struggle to supervise multiple projects at once, facilitate active student collaboration and engagement, and balance inquiry-based activities with reflective tasks.

Another prominent challenge is the unpredictability of PBL, as teachers may face challenges helping students with material outside of their content specialty. Any direct instruction is vulnerable to unfamiliar challenges or unexpected questions; for instance, a language arts teacher may need to answer questions about complex scientific topics. This potential for unpredictability may make teachers apprehensive about using PBL and anxious about admitting that they cannot answer a question that lies outside their content specialty.

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33 Figure adapted from: “Toolkit for Interdisciplinary Learning, Teaching, and Assessment.” College Board. https://apcentral.collegeboard.org/pdf/ap-interdisciplinary-teaching-and-learning-toolkit.pdf?course=ap-environmental-science


36 Ibid.

Similarly, IDT teachers must navigate issues that stem directly from an instructional design that constructs learning tasks using content from multiple disciplines. The first issue, known as the Potpourri Problem, arises when curricular units arbitrarily sample knowledge from several subjects without a clear content scope or instructional sequence. For example, an interdisciplinary unit on Ancient Egypt might require students to learn about the Nile River in geography, read about Egyptian mythology in language arts, and examine mummification in science without integrating this material in a meaningful way through a capstone project. In such a case, the only cross-curricular focus is that individual classes address somewhat related material during a similar timeframe.

The second dilemma, known as the Polarity Problem, arises when individual teachers feel that their discipline will be neglected or minimized in the IDT structure. Teachers may also perceive that IDT’s integration of multiple perspectives will iniquitably challenge their expert opinions on a given topic or accepted knowledge in their field. One example of this dynamic is when an interdisciplinary unit on volcanic activity prioritizes geological study of the planet, mathematical calculations of the economic impacts of eruptions, and historical study of events such as the Pompeii disaster while relegating language arts to reading informational articles that simply reinforce the content of the other three disciplines. Situations like this can ignite tension between collaborating teachers and negatively impact the planning of future IDT instruction.

In the remainder of this section, Hanover discusses instructional strategies to facilitate simultaneous implementation of PBL and IDT and minimize the challenges described above. Sections II addresses organizational practices (e.g., professional development, scheduling) and building design principles that further support the implementation of PBL and IDT.

INTEGRATING APPROACHES

To integrate PBL and IDT practices, schools should organize curricula around common learning themes, concepts, and skills that transcend individual subjects. In interdisciplinary PBL (IPBL), individual disciplines remain identifiable but assume peripheral importance in comparison to achieving multidisciplinary comprehension of content and mastery of target skills such as literacy, numeracy, or research (see Figure 1.5).42

![Figure 1.5: The IPBL Approach](image)

Source: Association for Supervision and Curriculum Development43

To build a strong foundation for IPBL, teachers must engage in extensive pre-instructional planning. Planning helps teachers identify topics that are conducive to IPBL and develop guiding questions to direct instructional activities.44 In particular, teachers should articulate the target learning outcomes of specific IPBL tasks and identify the real-world problems that will serve as catalysts for cross-disciplinary instruction.45 Teachers should also establish the degree of integration that they are willing to commit to.46 They can choose to weigh disciplines equally in an instructional plan or select one discipline as the primary focus.47 Regardless of the final determination, this decision will help clarify each teacher’s role in the learning process, minimizing the chances that the Potpourri or Polarity Problems will arise.48

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43 Figure adapted from: Ibid.
Teachers should meet as a team during the initial planning phase and throughout the IPBL process to revise instruction and share observations as necessary.\(^{49}\) Below, Figure 1.6 lays out a nine-step process that teachers can follow to prepare for IPBL and successfully collaborate with their colleagues. It requires teachers to reflect on and research the applicability of different disciplines to curricular topics and identify areas of conflict and commonality to create a cohesive framework for instruction.\(^{50}\) Equally important, this planning sequence encourages teachers to obtain content knowledge outside of their discipline, define connections between courses, and construct timelines and tasks that address standards from all included subjects.\(^ {51}\) Section II discusses scheduling strategies to facilitate this level of planning in greater detail.

**Figure 1.6: Steps to Successfully Plan IPBL**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Define problems, issues, topics, or questions that warrant interdisciplinary examination.</td>
</tr>
<tr>
<td>2.</td>
<td>Present a clear rationale for taking an interdisciplinary approach.</td>
</tr>
<tr>
<td>3.</td>
<td>Identify relevant disciplines.</td>
</tr>
<tr>
<td>4.</td>
<td>Conduct a literature review on the topic in each discipline.</td>
</tr>
<tr>
<td>5.</td>
<td>Identify key underlying assumptions and methods of evaluation.</td>
</tr>
<tr>
<td>6.</td>
<td>Study the problem and generate insights and predictions from each of the relevant disciplines.</td>
</tr>
<tr>
<td>7.</td>
<td>Identify conflicts and areas of commonality between disciplines.</td>
</tr>
<tr>
<td>8.</td>
<td>Develop a cohesive framework of analysis.</td>
</tr>
<tr>
<td>9.</td>
<td>Combine disciplinary insights to construct an integrated understanding of the topic.</td>
</tr>
</tbody>
</table>

Source: SERC\(^ {52}\)

An important second step is introducing students to PBL and IDT methodologies to ease the transition away from traditional instruction (e.g., lectures, singular instruction in one subject) toward a more comprehensive learning approach. Teachers should clarify the distinction between discipline-based and interdisciplinary learning and emphasize that IPBL can help students achieve a richer understanding of content and greater skills proficiency.\(^ {53}\) Likewise, teachers should articulate the learning objectives of IPBL instruction so students can gain conscious knowledge of target outcomes.\(^ {54}\)

During IPBL instruction, a teacher’s primary role is to relinquish control of learning to their students and act as a facilitator of group investigations.\(^ {55}\) In monitoring student inquiry, teachers can use several effective instructional strategies (see Figure 1.7 on the next page). Relevant facilitation practices include asking students to verbalize their cognitive processes, pushing students to explain their thinking about a topic, and encouraging students to record their newfound knowledge textually and visually.

\(^ {49}\) Ibid.  
\(^ {52}\) Figure adapted from: “How to Teach with an Interdisciplinary Approach,” Op. cit.  
\(^ {53}\) Ibid.  
\(^ {54}\) “Problem-Based Learning,” Op. cit.  
### Figure 1.7: Facilitation Strategies for IPBL

<table>
<thead>
<tr>
<th>STRATEGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metacognitive Questioning</td>
<td>The teacher requires students to answer questions about their thinking and verbalize their perspectives on a topic.</td>
</tr>
<tr>
<td>Pushing for Explanation</td>
<td>The teacher asks students to explain their answers and delve into the logic behind their decisions.</td>
</tr>
<tr>
<td>Revoicing</td>
<td>The teacher restates what students have said to reiterate important points and clarify the content of communications.</td>
</tr>
<tr>
<td>Summarizing</td>
<td>The teacher asks students to summarize their understanding or learning progress to engage less vocal students and facilitate self-reflection.</td>
</tr>
<tr>
<td>Generating Hypotheses</td>
<td>The teacher encourages students to articulate their own hypotheses about an issue to focus inquiry and identify knowledge deficits.</td>
</tr>
<tr>
<td>Information Recording</td>
<td>The teacher pushes students to catalog findings, record supporting data, and list gaps in knowledge to reference in future research.</td>
</tr>
<tr>
<td>Encouraging Visual Representation</td>
<td>The teacher suggests that students represent findings graphically or pictorially to reinforce understanding of a topic.</td>
</tr>
</tbody>
</table>

Source: *Interdisciplinary Journal of Problem-Based Learning*

Additional strategies that teachers can use in IPBL arrangements include conducting regular assessments, holding whole class discussions, and encouraging peer feedback. Regular assessments allow teachers to check student progress throughout a project timeline and determine potential misconceptions that they can help students correct through research—or direct instruction if necessary. Assessments also provide an avenue for teachers to mediate inefficiencies or conflicts within groups. Furthermore, class discussions provide a forum for students to exchange ideas. In both the periodic assessments and class discussions, teachers should encourage students to critique each other’s work to broaden their consideration of course content and refine their understanding.

Schools might also consider team-teaching—using two or more teachers to instruct a class and organizing students into teams that share teachers—as a technique for IPBL. Such an approach allows teachers from separate disciplines (e.g., a language arts teacher and a social studies teacher) to share responsibility for the same course. However, research findings on this approach are mixed, with some studies showing that team-teaching positively impacts student learning outcomes and others finding that such arrangements lack cohesion and are potentially disruptive.

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SECTION II: ORGANIZATIONAL PRACTICES TO SUPPORT INSTRUCTION

In the following section, Hanover discusses organizational practices that can support IPBL: professional development for teachers (PD), common planning time, and facilities design.

PROFESSIONAL DEVELOPMENT PRACTICES

To ensure long-term commitment to IPBL and effective delivery of instruction, districts should actively target both PBL and IDT pedagogy in their PD programs. Learning Forward—a professional association that supports educator PD—frames PD as sustained, “intensive, collaborative, job-embedded, data-driven, and classroom-focused” activities that provide teachers with “the knowledge and skills necessary to enable students to succeed.”

The organization outlines seven standards for PD (see Figure 2.1 below) which emphasize improving student outcomes and using data to guide and evaluate professional learning.

<table>
<thead>
<tr>
<th>STANDARD</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Communities</td>
<td>PD occurs within communities committed to continuous improvement, collective</td>
</tr>
<tr>
<td></td>
<td>responsibility, and goal alignment.</td>
</tr>
<tr>
<td>Leadership</td>
<td>PD needs leaders who encourage teachers and create support systems.</td>
</tr>
<tr>
<td>Resources</td>
<td>PD prioritizes, monitors, and coordinates resources.</td>
</tr>
<tr>
<td>Data</td>
<td>PD uses a variety of data sources and types to plan and evaluate training.</td>
</tr>
<tr>
<td>Learning Designs</td>
<td>PD integrates theories, research, and models to reach target outcomes.</td>
</tr>
<tr>
<td>Implementation</td>
<td>PD applies research on change and sustains support for implementation.</td>
</tr>
<tr>
<td>Outcomes</td>
<td>PD aligns with educator performance and curriculum standards.</td>
</tr>
</tbody>
</table>

A separate report by the Learning Policy Institute—a non-profit research organization that supports evidence-based PD—emphasizes common features of effective PD based on three decades of research literature. Attributes it identified include:

- **Content Focus**: PD focuses on discipline-specific or cross-disciplinary curriculum development and teaching pedagogies.
- **Active Learning**: PD uses authentic artifacts and interactive tasks to engage participants in designing and experimenting with new strategies.

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60 Figure adapted from: “Standards for Professional Learning.” Learning Forward. https://learningforward.org/standards-for-professional-learning

61 “About the Institute.” Learning Policy Institute. https://learningpolicyinstitute.org/about

Collaboration: PD supports collaboration, encouraging teachers to share ideas and experiences, often in job-embedded contexts.

Models Effective Practice: PD offers exemplary models of lesson and unit plans, student work, and teacher practice.

Coaching and Expert Support: PD connects teachers with content or strategy experts to exchange insights and new knowledge related to participants’ needs.

Feedback and Reflection: PD provides opportunities for participants to reflect on, receive input on, and adapt their pedagogy.

Sustained Duration: PD provides teachers with adequate time to learn, practice, implement, and reflect on new strategies.

Before delivering any PD program on IPBL, districts should emphasize how it supports teachers in the classroom and benefits student outcomes. According to a report from Houghton Mifflin Harcourt, PD “must relate directly to what teachers are doing every day [and focus] on the materials and programs teachers are using for instruction.”63 Aligning PD with district and school priorities provides value and helps promote participant buy-in.64

Importantly, effective PD requires facilitators who recognize the dual role of participants as both teachers and learners. This means that teachers must be motivated to learn the material addressed in PD sessions. To foster motivation, districts and training facilitators must indicate the value of learning a new skill and promote teachers’ ability to adapt new practices within their classroom. Allowing teachers to practice new strategies and receive feedback on their learning can assist in the valuation and promotion of PD.65

Effective PD for IPBL should incorporate a review of relevant theory, demonstration of target skills, opportunities for practice and evaluation, and coaching and follow-up on teacher learning (see Figure 2.2 on the next page). First, PD should address the underlying research and rationale for teachers learning IPBL strategies. Next, facilitators should present exemplars of target practices through demonstrations. Following this, teachers should receive an opportunity to practice new skills and get feedback from the facilitator about their progress. Upon the conclusion of the session, districts should ensure that they monitor teachers’ use of IPBL through follow-up activities and offer feedback to refine teachers’ pedagogy. Following this sequence—and repeating steps as necessary—will help teachers feel supported and capable of collaborating across disciplines and delivering IPBL instruction.66

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65 “Kathleen Cushman on Teaching as a Team Sport.” The Teaching Channel. https://www.teachingchannel.org/videos/coaching-for-teachers-and-students-nvps

Specific PD frameworks that can support interdisciplinary learning include professional learning communities (PLCs), coaching, and workshops. PLCs are “an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve.” In different terms, the North Carolina Department of Public Instruction describes a PLC as:

...a collegial group who are united in their commitment to an outcome. In the case of education, the commitment would be to student learning. The community engages in a variety of activities including sharing a vision, working and learning collaboratively, visiting and observing other classrooms, and participating in shared decision-making. The benefits of a professional learning community to educators and students include reduced isolation of teachers, better informed and committed teachers, and academic gains for students.

PLCs should focus their efforts on integrating multiple disciplines within an interdisciplinary framework and establishing cross-disciplinary partnerships. The community arrangement fosters interdisciplinary thinking by providing teachers with opportunities to collaboratively make connections between courses to address curricular concerns. Furthermore, PLCs offer a venue to plan cross-disciplinary units and projects and reflect on the IPBL process.

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67 Figure adapted from: Ibid., p. 4.
68 “About PLCs.” All Things PLC. http://www.allthingsplc.info/about
70 “What Do Professional Learning Communities Look Like in Schools and Districts?” North Carolina Department of Public Instruction. http://www.dpi.state.nc.us/profdev/resources/proflearn/looklike
Similarly, coaching arrangements pair two or more teachers for the purpose of providing feedback and improving practice. IPBL coaching can group equal partners (e.g., teachers within a PLC) or pair a teacher with a more experienced mentor or content area specialist (e.g., a PBL coach). Coaching can help build a culture of collaboration and model collaborative norms in provided feedback. Moreover, coaches can schedule strategy sessions or workshops related to specific IPBL topics based on teacher needs. Importantly, coaching sessions can also highlight teachers’ successes to bolster staff confidence and sustain energy for improvement.

Workshops are another useful instrument for delivering PD; however, districts must integrate them in a larger initiative involving follow-up training, PLCs, or coaching. Faculty should prepare for workshops through pre-reading of related materials and initial discussions with their colleagues to acquaint them with the target material. Districts seeking PD in the areas of PBL and IDT can design their own training or contract outside organizations to facilitate sessions. For example, Microsoft offers an online course on PBL while organizations such as the Buck Institute for Education—a leading organization in PBL practices—and the University of Delaware provide in-person training.

SCHEDULING PRACTICES

School administrators should designate time for collaborative interdisciplinary planning to ensure teachers can design instructional activities, select applicable content from each participating discipline, and gather necessary resources for lesson delivery. Regardless of how insightful or effective PD is, a lack of planning time can impede teachers’ ability to apply...
new learning.\textsuperscript{78} Notably, an \textit{Education Week} teacher survey finds that 53 percent of respondents “completely agree” and 26 percent “somewhat agree” that common planning time with other teachers improves their pedagogy.\textsuperscript{79}

Common planning time is “the institutionally expected and sanctioned practice of [teachers] meeting together on a frequent and regular basis to review and craft plans.”\textsuperscript{80} Structured team planning time can facilitate interdisciplinary curriculum design and related PD.\textsuperscript{81} However, establishing shared planning periods requires that schools modify instructional schedules or create extra time during or outside of the work day for common planning.\textsuperscript{82} Administrators can use the following tips to create more time for common planning and encourage better use of already established shared preparatory periods:\textsuperscript{83}

- Hire substitutes or engage volunteers to work with students during regularly scheduled blocks of time;
- Eliminate or reduce teacher administrative assignments or schedule these assignments so that collaborating teachers can be free during the same periods;
- Extend the lunch period one or two times per week and enlist support staff or volunteers to supervise;
- Organize regularly scheduled large-group activities for students (e.g., art exhibits) that can be managed by support staff and substitutes;
- Create planning websites to support the team planning process;
- Publish a standardized protocol during for planning meetings to maximize efficiency;
- Make sure the school community understands the reasons for common planning;
- Discourage the use of planning time for extraneous matters (e.g., socializing); and
- Incentivize meetings outside of the school day by offering to purchase meals.

Furthermore, districts can facilitate common planning time by embedding monthly teacher work days, mornings, or afternoons dedicated to collaborative team planning. Having these

common planning periods will enable teachers to create interdisciplinary units and projects that equitably address the content of all involved disciplines.\textsuperscript{84}

Below, Figure 2.3 displays two sample teacher schedules. The top schedule includes common planning periods each day and half-day professional development every Wednesday. Similarly, the lower schedule displays common planning time for staff in the core disciplines at the same time each day. Though these samples and the preceding suggestions can facilitate discussions about common planning, \textit{ultimately, a district or school should convene relevant stakeholders to decide which solution is the most viable for it.}\textsuperscript{85}

**Figure 2.3: Sample Teacher Schedules with Common Planning**

<table>
<thead>
<tr>
<th>DAY</th>
<th>PERIOD 1</th>
<th>PERIOD 2</th>
<th>PERIOD 3</th>
<th>PERIOD 4</th>
<th>PERIOD 5</th>
<th>PERIOD 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>Class</td>
<td>Common Planning</td>
<td>Class</td>
<td>Lunch</td>
<td>Class</td>
<td>Individual Planning</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Advisory</td>
<td>Seminar</td>
<td>Common Planning</td>
<td>Class</td>
<td>Lunch</td>
<td>Individual Planning</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Common Planning</td>
<td>Class</td>
<td>Class</td>
<td>Staff Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td>Class</td>
<td>Common Planning</td>
<td>Class</td>
<td>Lunch</td>
<td>Class</td>
<td>Individual Planning</td>
</tr>
<tr>
<td>Friday</td>
<td>Class</td>
<td>Common Planning</td>
<td>Class</td>
<td>Lunch</td>
<td>Class</td>
<td>Individual Planning</td>
</tr>
</tbody>
</table>

Source: University of Michigan and Association for Middle Level Education\textsuperscript{86}


FACILITIES DESIGN PRACTICES

BUILDING DESIGN

A well-designed school building can support student learning outcomes and increase teacher productivity. To create a facility that is conducive to IDT, PBL, or IPBL, a school must be “flexible, have room for student and teacher collaboration, and allow for public exhibition of student work.”

Moreover, the Buck Institute for Education publishes criteria for a 21st century school building such as:

- A "wow space" commons room for formal and informal gatherings;
- Project studios for student gatherings, small group work, and presentations;
- Teaching neighborhoods for integrated curriculum delivery;
- Movable walls between teaming teachers and classrooms;
- Shared teacher offices and workspaces;
- Highly flexible, multi-purpose seminar rooms;
- Ubiquitous technology;
- Multiple venues for display and exhibition of student work; and
- Indoor to outdoor connections.

In the physical construction of school buildings, districts should account for the utility of all educational spaces (e.g., hallways, science labs, media centers, and classrooms). Facility planning committees should ensure that all spaces are accessible and flexible enough that they can be modified to accommodate future technology upgrades, changing academic priorities, or shifting enrollment. Architectural plans should also account for aesthetics so that teachers and students are comfortable and not over- or under-stimulated by any aspects of the building. Furthermore, building designers should consider sensory and cognitive impacts that can result from specific construction features (see Figure 2.4 on the following page). Distracting aspects of the environment can disrupt learning, while positive stimuli can support it.

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88 Larmer, J. “Architects for Building or Remodeling a School for PBL.” Buck Institute for Education, February 14, 2017. https://www.bie.org/blog/architects_for_building_or_remodeling_a_school_for_pbl
89 Bulleted text quoted with minor adaptations from: Larmer, J. “Architects for Building or Remodeling a School for PBL.” Buck Institute for Education, February 14, 2017. https://www.bie.org/blog/architects_for_building_or_remodeling_a_school_for_pbl
Figure 2.4: Sensory Impacts on Learning and Teaching

<table>
<thead>
<tr>
<th>SENSORY AREA</th>
<th>INFLUENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing</td>
<td>Excessive reverberation and background noise can distract students.</td>
</tr>
<tr>
<td>Breathing</td>
<td>Clean, fresh air is essential to students’ health and their ability to learn.</td>
</tr>
<tr>
<td>Sight</td>
<td>Daylight affects bodily processes that impact how alert and ready students are to learn. Additionally, long distance views help keep eyes healthy and prevent eyestrain.</td>
</tr>
<tr>
<td>Feeling</td>
<td>Students who are comfortable in their classrooms can concentrate better.</td>
</tr>
<tr>
<td>Thinking and Learning</td>
<td>The environmental factors in a classroom affect how a student takes in and retains information and how well a teacher can effectively communicate with their students.</td>
</tr>
<tr>
<td>Movement</td>
<td>The location and design of schools can influence physical activity.</td>
</tr>
</tbody>
</table>

Source: U.S. Green Building Council

Importantly, school campuses should encourage a sense of community for both students and teachers to help facilitate collaboration. Design principles that can foster community include establishing gathering spaces, clustering classrooms around common areas, decentralizing administrative offices for more visible leadership, and creating home bases for students (e.g., homerooms) and teachers (e.g., offices).

In addition, districts may consider sharing classrooms between multiple teachers and creating common office spaces for interdisciplinary teaching teams. This practice helps eliminate the inclination for teachers to view a classroom or workspace as their private domain and instead invites cross-curricular consultation and collaboration. Through these informal interactions, teachers can explore connections between content areas to facilitate IPBL and select foundational content and skills for cross-disciplinary projects. Communal offices also provide established spaces for teachers to use during common planning time.

CLASSROOM DESIGN

Notably, trends in classroom design arise from the technological advances of recent decades and the “belief that classrooms should be more interactive and mirror the workplaces of today and the future.” Classrooms should provide areas where students can work independently and in different group configurations.
- **Breakout Niches**: Open areas or recesses in walls or hallways that schools can furnish with small tables and chairs for semi-private exchanges between students.
- **Breakout Hollows**: Semi-enclosed areas within a classroom or hallway that extend space and include furnishings to accommodate more private student collaboration.
- **Breakout Rooms**: Additional rooms that are attached to or detached from the main classroom space where larger groups of students can meet.

Furthermore, classroom architecture provides greater flexibility when built with moveable walls. If students and teachers can move walls, they can reorient classrooms to create defined breakout spaces as required by the learning task. Mobile screens can add more options to classroom arrangements. Notably, flexible walls and mobile screens can bolster student collaboration if they also function as writing surfaces to brainstorm ideas on.

The main classroom space should also include tables or desks that students can rearrange to form different collaborative groups. Consequently, districts will want to purchase lightweight, moveable, and reconfigurable furniture—including mobile instructor stations—to facilitate collaboration and diminish segregation within the classroom’s physical space. Such furnishings will allow teachers to easily adapt classroom arrangements as required by the instructional task, rather than static furnishings that require the same student groupings and diminish curricular flexibility.

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SECTION III: SCHOOL PROFILES

In the following section, Hanover profiles three high schools that utilize PBL and IDT principles in their curriculum and instruction. To identify potential schools to profile, Hanover conducted searches of news articles for “PBL high schools,” “interdisciplinary high schools,” and “innovative high school designs.” The three high schools profiled in this section are:

- e³ Civic High School;
- Illinois Mathematics and Science Academy; and
- Southeast Raleigh Magnet High School.

E³ CIVIC HIGH SCHOOL

Key Facts
Location: San Diego, California
Enrollment: 405 students
Special Education: No data available
English Language Learners: 14.6%
Free and Reduced Price Lunch: 69.1%
Demographics:
- Hispanic: 66.2%
- Black: 16.3%
- White: 11.9%

e³ Civic High School (e³ Civic) is a charter school in the San Diego Unified School District. The school’s vision is to “engage, educate, and empower [students], teachers, and parents in a community of passionate, lifelong learners who value excellence in academics, civic engagement, and individual success.” Furthermore, e³ Civic seeks to develop students’ creative, problem-solving, and communicative aptitudes to prepare them for professional work.

e³ Civic occupies two floors in the San Diego Central Library and is believed to be the only U.S. high school co-located inside of a library. This arrangement offers opportunities for collaboration and engagement and establishes a partnership between the school and community. The building’s developer, LPA Inc., also solicited community input during construction through tours, workshops, and image-sharing to promote stakeholder involvement. e³ Civic’s interior layout organizes classrooms into “villages” to promote resource sharing, teacher collaboration, and student work

108 “E3 Civic High.” LPA Inc. https://www.lpainc.com/work/e3-civic-high
exhibitions. Moreover, e³ Civic features movable glass walls, surfaces that students can write on, break-out learning spaces, modular furniture, a plaza area for assemblies, and a central staircase that doubles as a collaborative space (photos are available here).

In developing student aptitudes and best utilizing the available instructional space, e³ Civic highlights specific signature practices in its operations and instruction such as PBL, student creation and defense of portfolios, and internships (see Figure 3.1 below). In addition, the school’s curriculum emphasizes interdisciplinary connections. For example, courses in the humanities integrate material from both language arts and social studies:

- **Humanities 1**: A course that integrates language arts and civics to explore students’ rights and duties as U.S. citizens.
- **Humanities 2**: A course that integrates language arts and world history to explore major events from the late 18th century and later that shaped the modern world.
- **Humanities 3**: A course that integrates language arts and U.S. history to trace the foundations of the United States from the Revolutionary War.

**Figure 3.1: e³ Civic High School Signature Practices**

<table>
<thead>
<tr>
<th>Project-based learning</th>
<th>Civic engagement</th>
<th>Internships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher-designed projects</td>
<td>Advisory</td>
<td>Early college</td>
</tr>
<tr>
<td>Essential knowledge and skills</td>
<td>Digital portfolios</td>
<td>Community service</td>
</tr>
<tr>
<td>Mastery grading</td>
<td>Project exhibitions</td>
<td>Professional development</td>
</tr>
<tr>
<td>Revision and peer critique</td>
<td>Portfolio defenses</td>
<td>Teacher evaluation focused on growth goals and feedback</td>
</tr>
<tr>
<td>Assessments</td>
<td>Student-led conferences</td>
<td></td>
</tr>
<tr>
<td>Student leadership</td>
<td>Service learning</td>
<td></td>
</tr>
</tbody>
</table>

Source: e³ Civic High School

Students at e³ Civic receive personalized learning plans that give them a voice in directing their learning and contributing to the larger school community. Learning occurs through self-paced online instruction, direct teacher instruction, student-led small group instruction, and PBL tasks. For example, Grade 12 students engage in Community Classroom Design Thinking Projects to solve problems they are passionate about. In these PBL tasks, students develop their soft skills (e.g., communication and research) using the Design Thinking Process. Through this framework, students seek to empathize with those who are impacted by a given

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113 Figure text taken with minor adaptations from: “Biomedical Engineering Curriculum,” Op. cit.
problem, define the parameters of the problem, and generate potential solutions. From there, students create a prototype product or policy from one of the brainstormed solutions and test it to refine its final form and determine if it has the potential for success.116

**ILLINOIS MATHEMATICS AND SCIENCE ACADEMY**117

The Illinois Mathematics and Science Academy (IMSA) enrolls students in Grades 10 through 12 in a residential college preparatory program focused on STEM (i.e., science, technology, engineering, and mathematics) coursework. IMSA’s curriculum focuses on exploring issues through research, innovating new products, and developing leadership skills, and all learning experiences adhere to the four attributes of IMSA’s core competency (see Figure 3.2 below).118 For example, IMSA’s English program emphasizes interdisciplinary literacy to assist students in considering “the richly layered cultural contexts of their learning in other disciplines,” such as the STEM fields.119 Furthermore, learning occurs in several frameworks, including the Student Inquiry and Research (SIR) and Total Applied Learning for Entrepreneurs (TALENT) programs.120

**Figure 3.2: IMSA’s Core Competency**

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competency-Driven</td>
<td>Learning experiences enable students to: (1) acquire strong bases of disciplinary content knowledge and skills, key ideas, and connections among these ideas; (2) use the ideas, processes, and tools of individual disciplines for acquisition and generation of new knowledge; and (3) apply knowledge when addressing issues and solving real-world problems.</td>
</tr>
<tr>
<td>Inquiry-Based</td>
<td>Learning experiences promote analytic thinking, knowledge generation and application, and construction of meaning through mindful investigation driven by compelling questions that have engaged, or have the potential for engaging, the learner’s curiosity.</td>
</tr>
<tr>
<td>Problem-Centered</td>
<td>Learning experiences are those in which learners grapple with complex, meaningful, and open-ended problems and work toward their resolution.</td>
</tr>
<tr>
<td>Integrative</td>
<td>Learning experiences forge meaningful connections of concepts, constructs, and principles within and across academic subjects and real-world situations.</td>
</tr>
</tbody>
</table>

Source: IMSA121

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121 Figure text taken with minor adaptations from: “Academic Core Competency.” Illinois Mathematics and Science Academy. https://www.imsa.edu/academics/academicprograms
SIR engages students in sustained inquiry to answer questions about issues of interest. Program participants conduct original research and collaborate with peers, teachers, and professional researchers to develop solutions and reach conclusions. To further bolster the PBL process, students present their work during student showcases. Similarly, TALENT gives students the opportunity to participate in on- and off-campus experiences to develop entrepreneurial business ideas. These opportunities include workshops, internships at technology startups, and competitions to develop business ideas.¹²²

Notably, IMSA provides training to teachers in all disciplines to help them design PBL materials and instructional tasks. Furthermore, these PD sessions help participants become skillful coaches so that they can assist their students and colleagues in engaging in PBL programming. During a three-day Problem-Based Learning Design Institute, participants analyze IMSA’s PBL model and apply acquired knowledge to their pedagogy under the guidance of experienced PBL instructors. Through the training, participants:¹²³

- Identify learning objectives linked to state and national standards and benchmarks;
- Design a PBL scenario considering local context;
- Develop problem materials and documents;
- Understand coaching in PBL; and
- Design assessment opportunities and the problem documents.

**SOUTHEAST RALEDGE MAGNET HIGH SCHOOL¹²⁴**

**Key Facts**

- **Location:** Raleigh, North Carolina
- **Enrollment:** 1,538 students
- **Special Education:** No data available
- **English Language Learners:** No data available
- **Free and Reduced Price Lunch:** 57.8%
- **Demographics:**
  - Black: 72.1%
  - Hispanic/Latino: 15.5%
  - White: 6.9%

Southeast Raleigh Magnet High School (SRMHS) centers on the themes of leadership and technology and emphasizes academic values such as interdisciplinary learning, collaboration, and communication.¹²⁵ The school features Academies of Biomedical Science, Engineering, and Information Technology and Cybersecurity in its program offerings.¹²⁶ In addition, SRMHS is part of the New Tech Network, a consortium of schools that emphasize collaboration and PBL.¹²⁷

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New Tech classrooms at SRMHS are furnished with computer stations and conference tables to mirror professional settings, rather than using traditional desks. In addition, some classrooms feature a mobile partition that allows teachers to combine classes during collaborative lessons or tasks. SRMHS uses these design features to encourage communication and teamwork between teachers and students and facilitate cross-disciplinary curricular integration.128

SRMHS teachers launch student investigations using genuine problems that impact students and the community. By using PBL, SRMHS confronts students with challenges lacking obvious answers, requiring them to apply their learning in creative ways. Moreover, PBL projects require students to develop solutions from multiple disciplines (e.g., math, science, digital arts, civics).129 In guiding the PBL process, SRMHS instructors progress students through a sequence that involves active learning tasks and periodic reflection and culminates in a terminal event or presentation (see Figure 3.3 below).

![Figure 3.3: PBL Instructional Sequence](source: New Tech Network130)

Students participating in the New Tech program also receive grades for their content knowledge as well as the skills that they develop throughout the PBL process. Assessed areas for New Tech students at SRMHS include knowledge and thinking, oral communication, written communication, collaboration, and agency (see Figure 3.4 below). Such assessment practices emphasize the importance of both content knowledge and professional skills.

![Figure 3.4: Evaluation Criteria for New Tech Students](source: SRMHS131)

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130 Figure adapted from: “Doing Projects vs. Project Based Learning PBL.” New Tech Network, August 8, 2016. https://newtechnetwork.org/resources/projects-vs-project-based-learning-pbl/
131 Figure adapted from: “Grades and Echo.” Southeast Raleigh Magnet High School. http://www.wcpss.net/Page/11632
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