



# Business and Computer Science Department Program Review

Pine-Richland School District

April 2018

*The information contained in this report is provided by the Pine-Richland Business and Computer 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.*

# Business and Computer Science Department In-Depth Program Review

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# Pine-Richland School District

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## Business & Computer Science Department Program Review

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### Executive Summary

The mission of the Pine-Richland School District is to *Focus on Learning for Every Student Every Day*. Within the PRSD Strategic Plan, long-term and short-term goals outlined in the Teaching and Learning category form the foundation for continuous improvement. One of the short-term goals for 2016 - 2017 was to design and pilot an in-depth program review. This initial work was conducted in the areas of Science and Health & Physical Education. **For 2017 - 2018, this short-term strategic goal continued with refinements to the process implemented by the Mathematics and Business & Computer Science Departments.** Further information about the purpose and process for this work is outlined in the next section.

This report outlines the process, findings, and recommendations from that work. As an organization, it is understood that the pace of change may be dependent upon the impact of that change on other aspects of the educational program. The committee utilized the action priority matrix to evaluate each recommendation and established an implementation timeline with associated cost estimates.

One key element of the in-depth program review was the establishment of a departmental philosophy and vision (Figure 1). Given the combination of two distinct content areas within this department, it is especially important for students, staff, and community to understand the major focus and progression within this discipline. The vision is captured through the following image and words:

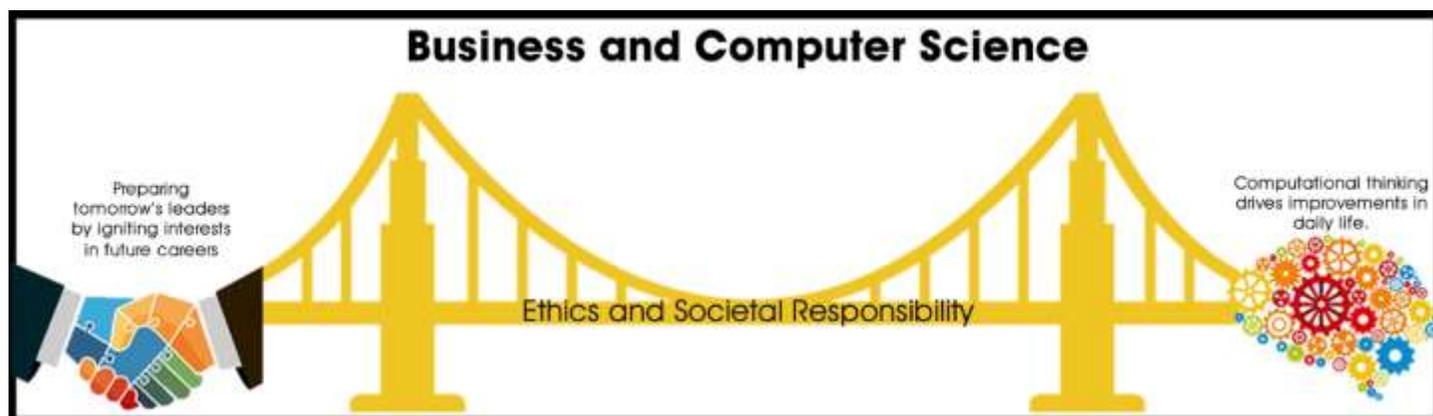


Figure 1

It was determined that a single image could not accurately capture the key message for each department. The “shaking hands” image for business reinforces the career connections to this discipline while also symbolizing the transferable soft skills that are important. For computer science, the concept of “gears driving improvement” was connected to computational thinking. This image also reinforces the connection to daily life. Finally, the bridge between the two departments reinforces the importance of ethical decision-making and the connection to society. Misuse or abuse in these areas can have a negative impact on many and even the global economy.

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### Recommendation Overview

#### **Recommendation #1:**

Adopt and widely communicate the Business & Computer Science Department philosophy and vision to internal and external stakeholders while ensuring a practical connection to program design and delivery.

#### **Recommendation #2:**

Identify business and computer science grade span competencies (K-3, 4-6, 7-8, 9-12) and integrate them into appropriate technology/business curricula in order to maximize the benefit of existing instructional periods (335) in grades K-8 and high school. Competency categories may include:

- Computational thinking and coding (e.g., creating computational artifacts, abstraction; analyzing problems and artifacts; communicating processes/results; and working collaboratively in teams)
- Financial Literacy (e.g., budgeting, savings, investments, credit management, and interest)
- Keyboarding and general computer skills (e.g., file management, navigation, and research)
- Application-based skills (e.g., Microsoft Office Suite with an emphasis on Excel and Google Applications)
- Digital Citizenship (e.g., access, communication, etiquette, security, rights and responsibilities)
- Transferable “soft” skills (e.g., communication, leadership, time management, organization, and goal setting)

#### **Recommendation #3:**

Integrate learning opportunities to develop computational thinking across business, computer science, and STEM related courses to improve students’ problem solving skills.

#### **Recommendation #4**

Integrate learning opportunities to develop transferable soft skills across all grade levels and departments (e.g., communication, leadership, time management, organization, and goal setting).

#### **Recommendation #5**

Develop and implement common assessments in business and computer science courses to constantly improve instruction and curriculum.

#### **Recommendation #6**

Create and maintain partnerships and connections with local colleges, universities, businesses, and parents in an effort to strengthen student readiness for their future.

#### **Recommendation #7**

Integrate developmentally appropriate concepts of financial literacy for every student in grades K-8 with additional required competencies for students in grades 9-12.

#### **Recommendation #8**

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Update the program of studies to reflect newly recommended course additions and deletions.

- A. Embed concepts of business law and ethics into existing courses.
- B. Combine and rename the current semester courses of *CHS Java* and *CHS Advanced Computer Science* into a full year, full-time *AP Computer Science* course. This combined course will appear in the PRHS Program of Studies starting in the 2019 - 2020 school year; however, the content is being implemented in 2018 - 2019.
- C. Eliminate *Desktop Publishing* in the current PRHS Program of Studies due to low enrollment beginning with the 2019 - 2020 school year.
- D. Restructure the existing *Personal Finance* course from a full-year course to a one-semester course for the 2019 - 2020 school year.
- E. Offer an *Honors Finance and Investments* semester course for business-minded students to address cybersecurity, fraud detection, long-term financial planning and investment vehicles at a more in-depth level with *Personal Finance* serving as the prerequisite for this course for the 2019 - 2020 school year.
- F. Develop a course related to *Game Development and App Design* for the 2019 - 2020 school year.
- G. Create a course to target the growing field of *Cybersecurity* for the 2020 - 2021 school year.

### **Recommendation #9**

Establish a professional development plan for ongoing training related to computer applications, coding, and career exploration for business and computer science.

### **Recommendation #10**

Review and evaluate resources to support current trends in business and computer science.

- Identify and evaluate hardware resources to support various applications and learning goals within the curriculum.
- Identify and evaluate software (online) programs that provide students with exposure to various learning platforms, coding, simulations, digital citizenship, and programming languages.
- Determine potential elements/components of a Makerspace at certain developmental levels to foster computational thinking, problem-solving, and hands-on discovery learning.
- Identify and evaluate curriculum resources, such as textbooks or ancillary materials, to support the written curriculum of each business and computer science course (e.g., Accounting 1).

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### In-Depth Program Review Process

The process for in-depth program review was developed in the 2016 - 2017 school year and refined throughout the 2017 - 2018 school year. To help ensure a clear understanding of the process elements, a process diagram was developed and reviewed on a regular basis. Major elements of this image are further described below:

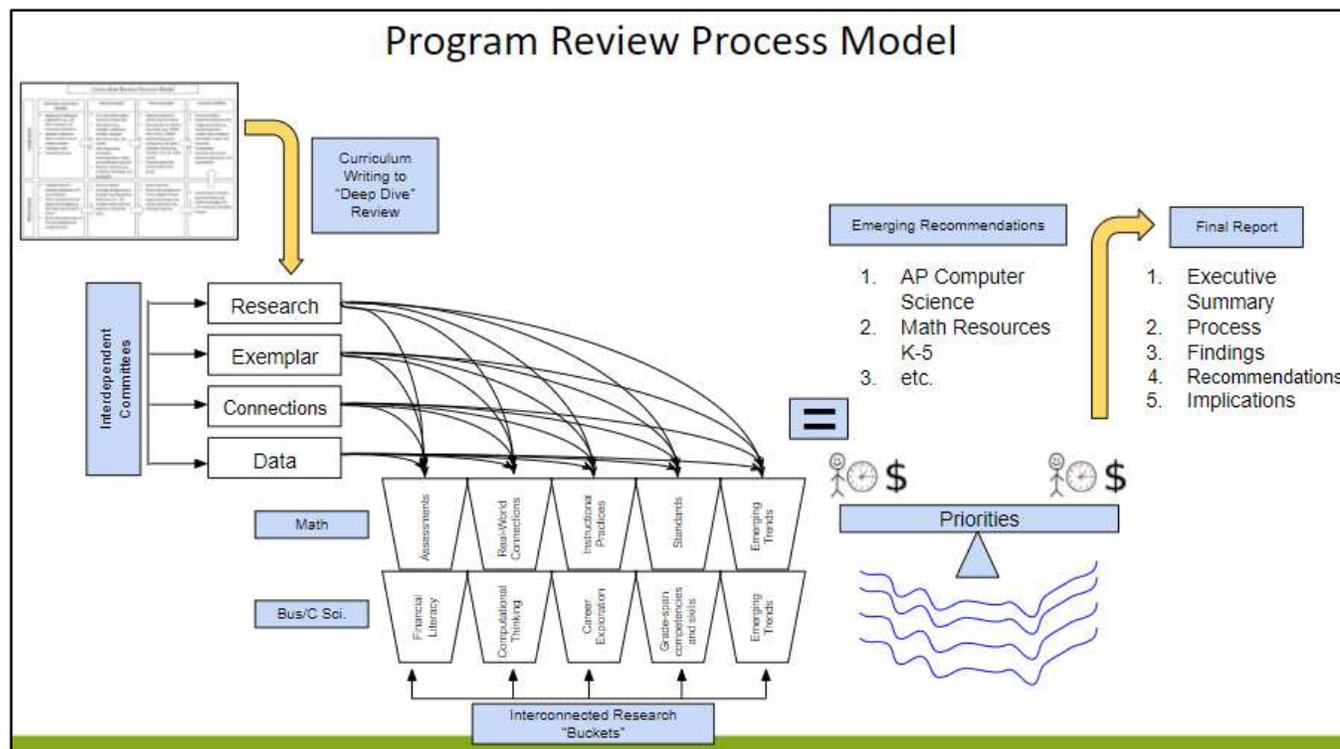


Figure 2

### Curriculum Writing to “Deep Dive”

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

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

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### Committee Composition and Structure

We strongly believe that meaningful and lasting change requires engagement of all key stakeholders. Since the in-depth process was being developed and implemented at the same time, the first organizational decision was the use of a **core team** and an **expanded team**. The core team included several district office administrators, building principals/assistant principals based on vertical team assignment, and a small group of academic leadership council members (i.e., department chairs) and teachers. The core team conducted the planning and thinking necessary to maximize the efficiency and effectiveness of the expanded team. The expanded team included all core team members and additional teachers to ensure representation by all buildings, levels, and courses. Although this was a larger group, it was still a small representation of the overall business & computer science department.

Within the expanded team, members were then organized by **four main subcommittees**: (1) Research; (2) Exemplar K-12 Schools; (3) Connections to Universities, Businesses, and the Community; and (4) Data and Information. While each subcommittee was responsible for specific tasks, two overarching elements were critical. First, the arrows on the left side of the subcommittees indicate that the groups must collaborate and exchange information (i.e., no silos). Second, the arrows on the right side of the subcommittees demonstrate that key findings/learning were captured and organized by major research buckets.

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

### Research “Buckets”

Within each discipline, five key areas of investigation were identified to guide the work of the subcommittees. **As business and computer science information was gathered by subcommittees, it was organized into five key “buckets”: (1) Financial Literacy; (2) Computational Thinking; (3) Career Exploration; (4) Grade-span Competencies and Skills; and (5) Emerging Trends.** In the early months of the process, the “buckets” were dynamic, meaning that some initial concepts were removed or combined with other key themes. As the expanded team continued to learn, those titles were then finalized. Importantly, the arrows on the bottom of the buckets also demonstrate the relationship between areas (i.e., no silos). The subcommittees’ learning and identification of information for the buckets were interconnected, as information from one area informed others. Based upon the information gathered through the bucket findings, a set of emerging recommendations was developed.

### Emerging Recommendations

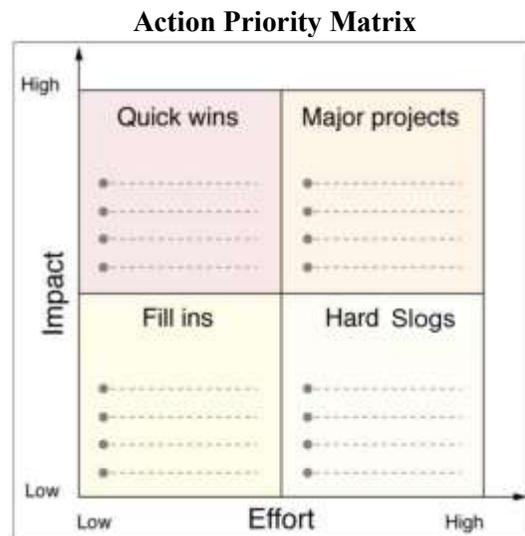
A systems thinking approach was critical to the in-depth program review process. The transition from “findings” to “emerging recommendations” required skills of synthesis, critical thinking, healthy debate, and communication. The entire expanded team used one set of lenses to review the list of internal strengths and weaknesses. The lenses refer to the four subcommittees. Some emerging recommendations were designed to improve current gaps and weaknesses. Other emerging recommendations were identified in the analysis of exemplary programs, universities, businesses, or in the research

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literature. The team brainstormed recommendations by identifying recurring themes, ideas, and opportunities for growth. The team discussed, modified, and edited the recommendations. Emerging recommendations were consolidated into a draft. The expanded team worked with the draft to link the emerging recommendations to data provided by the subcommittees.

### **Balancing Priorities and Resources**

As a system, the “ripple effect” of recommendations was built into the process model. The team then put the emerging recommendations into the action-priority matrix. The action-priority matrix evaluates the impact versus the effort of the emerging recommendations. Examining the use of people, time, and money allows for the identification of which recommendations were quick fixes, major projects, fill-ins, and hard slogs. For example, a hard slog was used to categorize those recommendations that would require much effort but have little impact on student learning. The team then identified the final emerging recommendations.



**Figure 3:** Elmansy, Rafiq. “Time Management Tips for Designers: The Action Priority Matrix.” *Designorate*, 14 June 2016, [www.designorate.com/time-management-the-action-priority-matrix/](http://www.designorate.com/time-management-the-action-priority-matrix/). Accessed 14 Mar. 2017.

### **Continuum of Improvement**

Throughout the in-depth program review process, it was important to maintain perspective on the nature of program improvements. Especially when considering effective elements of exemplary schools or programs, the desire to move from the current program ("Point A") to an ideal future ("Point Z") is natural. However, it is more realistic to recognize that meaningful program improvement within an organizational system will often result from a series of smaller steps ("Points B, C, D, etc."). Although depicted as a straight line in the image below (Figure 4), the in-depth program review committee recognizes that continuous improvement is not always a linear process.



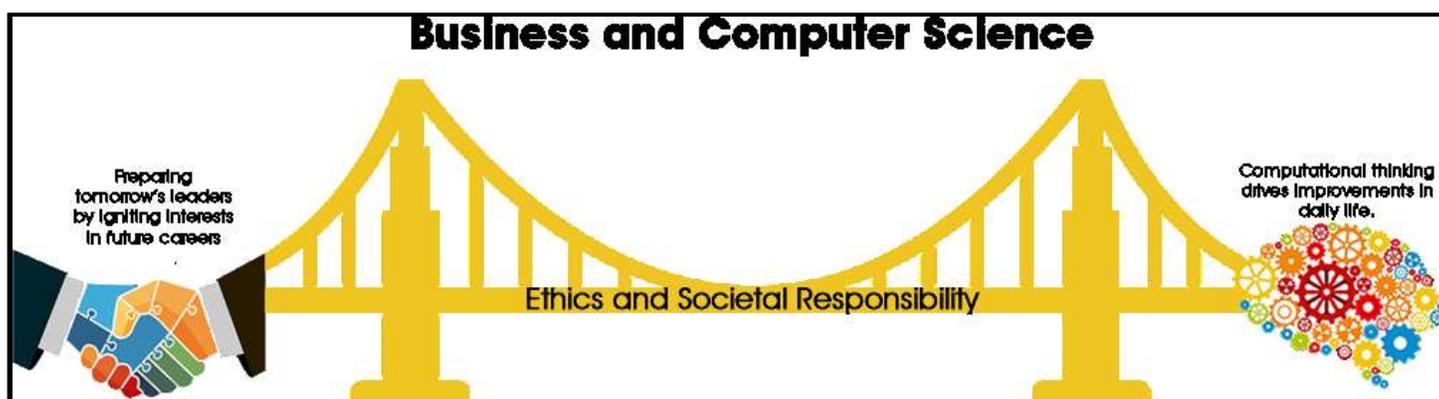
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Figure 4

### **Recommendation #1:**

Adopt and widely communicate the Business and Computer Science Department philosophy and vision to internal and external stakeholders while ensuring a practical connection to program design and delivery.



### **FINDINGS:**

#### **Internal Analysis**

1. Students need to leave K-12 and post-secondary education prepared to adjust to the ever changing needs of society and technology advancements (Community Input, PNC Bank, 2018).
2. The business and computer science departments currently do not have a vision and philosophy that is clearly communicated to staff, students, and community (PRSD Expanded Team, 2018).
3. A clear vision statement serves as a reference that anchors the focus of the department with a clear picture of the future (PRSD Expanded Team, 2018).

#### **External Analysis**

1. An intentional foundation and progression of computational thinking skills is being implemented through a variety of programs, such as coding (South Fayette SD and Fox Chapel Area SD, 2018).
2. Computer science has emerged as an area of focus, new courses, curriculum development, partnerships with outside organizations, extracurricular clubs, and potential job opportunities (Canon-McMillan SD and South Fayette SD, 2018).
3. Traditional known "soft" skills, such as adaptability, teamwork, grit, initiative, and persistence support are critical for college and career success (University of Pittsburgh, 2018).

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4. Coding, in combination with the use of robotics, are common tools used to develop computational thinking skills across all grade levels K-12 (Fox Chapel Area SD, South Fayette SD, Montour MS, and Canon-McMillan SD, 2018).
5. A wide variety of course offerings allow students to explore and develop relevant skills for professional life (South Fayette SD, 2018).
6. Project- and problem-based learning experiences are important (Allegheny Intermediate Unit, 2018).
7. International learning opportunities provide students with exposure to different cultures and approaches to business development (University of Pittsburgh, 2018).
8. Benchmark objectives, standards, performance indicators, skills for K-2, 3-5, 6-8, 9-12 (Hempfield Area SD, 2018).
9. It is important to be well rounded with math, computer science and business courses along with the ability to work with multiple digital platforms and emerging financial apps (PNC Bank, 2018).
10. Two year effort underway to vertically and horizontally align computer science K-12 with a particular focus around computational thinking (Fox Chapel Area SD, 2018).
11. Our vision is that every student in every school should have the opportunity to learn computer science, just like biology, chemistry, or algebra (Code.org, 2017).
12. Entrepreneurship is a major component of the business education programming and is desired among current employers. PDE has recognized this need as well and has developed a reporting system for the Career Education and Work Standards (PDE, 2018).
13. Professional organizations are dedicated to the development of future business leaders and computational thinkers and have vision statements aligned to the language of our department (NBEA, 2018; CSTA, 2018; K-12 Computer Science Framework, 2016; Code.org, 2017).

**Implementation Timeline (Anticipated Start/Finish):** 5/1/18 - 9/30/18

**Key Personnel:** Business and Computer Science Staff and Director of Communications

**Major Action Steps:** (1) Finalize words and image; (2) Disseminate them to all members of the K-12 business and computer science department; (3) Publish on the district website; (4) Discuss with students and parents at the start of the 2018 - 2019 school year via syllabus and open house/curriculum nights; (5) Incorporate into published business and computer science curriculum documents; and (6) Incorporate into programs of studies.

**Estimated Budget/Resources:** There is a potential cost associated with producing posters. No other costs are anticipated.

**Potential Implications (Short-Term and Long-Term):** The development, understanding, and communication of a clearly articulated business and computer science department vision/philosophy should strengthen program delivery for all stakeholders (i.e., staff, students, and parents). It provides a perspective that can be reinforced and considered when making future program decisions.

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### **Recommendation #2:**

Identify business and computer science grade span competencies (K-3, 4-6, 7-8, 9-12) and integrate them into appropriate technology/business curricula in order to maximize the benefit of existing instructional periods (335) in grades K - 8 and high school. Competency categories may include:

- Computational thinking and coding (e.g., creating computational artifacts, abstraction; analyzing problems and artifacts; communicating processes/results; and working collaboratively in teams)
- Financial Literacy (e.g., budgeting, savings, investments, credit management, and interest)
- Keyboarding and general computer skills (e.g., file management, navigation, and research)
- Application-based skills (e.g., Microsoft Office Suite with an emphasis on Excel and Google Applications)
- Digital Citizenship (e.g., access, communication, etiquette, security, rights and responsibilities)
- Transferable “soft” skills (e.g., communication, leadership, time management, organization, and goal setting)

### **FINDINGS:**

#### **Internal Analysis**

1. Digital citizenship and internet safety is currently included in K-3, 4-6, and 7-8 curriculum (PRSD SWOT Activity, 2014).
2. Develop a unit-based curriculum for computer science with intentional sequencing K-8 (PRSD Strengths/Needs, 2014).
3. Use coding to introduce problem-solving, and critical-thinking. These similar concepts can be done very early in a student’s academic career (Community Input, 2018).
4. Parents and students agreed that a basic financial literacy course would be highly beneficial (Town Hall Meeting, 2018).
5. Coding options prior to middle school engineering and technology course would be helpful (Student Voice, 2018).
6. Push Microsoft Office application skill development to students in grades K-8 (PRSD Vertical Team, 2014).
7. Students feel keyboarding skills are essential (Student Voice, 2018).
8. Integrating Makerspaces into the major content areas would be helpful to make learning come to life and allow students to have hands-on experiences with the concepts they learn (Town Hall, 2018).
9. Time in business and computer science related courses K-8: Kindergarten one (1) time per week 30-minutes; Grades 1-3 one (1) time per week 40-minutes; Grades 4-6 one (1) time per five (5) day rotation 45-minutes; Grades 7-8 one (1) period per day for 45 days each year 42-minutes per class (PRSD Vertical Team, 2018).

#### **External Analysis**

1. Integrate digital citizenship to ensure students understand the importance of being a high-quality online citizen (University of New Haven, 2018).
2. South Fayette School District has a complete K-8 focus on digital citizenship using Common Sense Media as a resource: Grade 3 creates digital passports with focus on basic digital literacy skills; Grade 4 creates a Digital Pledge; Grade 5 creates video presentations to teach others about what it means to be a good digital citizen. Grades 6-8 also have a digital citizenship component as part of its district-created curriculum (South Fayette SD, 2018).

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3. Elementary programs are separate yet similar with elementary tech teachers meeting once per month to plan and collaborate (Unionville-Chadds Ford SD, 2018).
4. Coding is introduced for primary students through products and activities like, Tynker/Dash & Dot, MakerBot, Robots, Makerspace (Unionville-Chadds Ford SD, 2018).
5. Schools should integrate computational thinking across many content areas. One resource includes B-Bots for early programming. Scratch is another resource for older students and can be as sophisticated as you want (Allegheny Intermediate Unit, 2018).
6. Clearly articulate K-12 focus on computational thinking across grade levels (i.e., computational thinking as a literacy) (South Fayette SD, 2018).
7. We believe that children as young as ten can directly benefit from opportunities to engage in computational thinking. One approach to provide these opportunities is to focus on social game play (University of Maryland, 2012).
8. Benchmark objectives, standards, performance indicators, and skills for K-2, 3-5, 6-8, 9-12 have been implemented with teacher support (Hempfield Area SD, 2018).
9. Offering of advanced level classes (South Fayette SD and North Allegheny SD, 2018).
10. Courses include: Calculus, Economics, and Statistics \*AP/Dual enrollment, Social Media trends with marketing project with businesses. This includes “Excel, Excel, and more Excel - Advanced Excel skills” (University of Pittsburgh, 2018).
11. Computational thinking defined as the thinking and learning behind creating something that can become automated (i.e., emphasis on iterations and algorithms to make something work) (Fox Chapel Area SD, 2018).
12. Excel, soft skills such as problem solving, adaptability, and flexibility to deal with unique situations, 90% problem solving skills, accuracy, written communication skills (First Commonwealth Bank, 2018).
13. Develop a unit-based curriculum for computer science with intentional sequencing K-8 (National Integrated Cyber Education Research Center - NICERC, CSTA, and Fox Chapel Area SD, 2018; Nolten, 2017).
14. Students who take a computer science course in high school are six times more likely to pursue a computer science major, and women are 10 times more likely (PA Dept of Ed, January 2017).
15. Computing occupations are the number one source of all new wages in the U.S. and make up two-thirds of all projected new jobs in STEM fields, making computer science one of the most in-demand skill sets from employers (PA Dept of Ed, January 2017).
16. All students should be exposed to computer science concepts (Allegheny Intermediate Unit, 2018).
17. They need to know the rules and manners associated with the digital world and the consequences that they face if those norms are violated. They also need to understand the laws of privacy and copyright as they pertain to accessing and using information in the 21st Century (Educational Horizons, 2014).
18. “Students develop mathematical thinking when they approach a new situation with a range of mathematical skills in mind. Similarly, they develop computational thinking when they approach a new situation with an awareness of the many ways that computers can help them visualize systems and solve problems.” (Educational Horizons, 2014).
19. Required digital citizenship class in grade 6 in the form of district-created curriculum. (Unionville-Chadds Ford SD, 2018).
20. Required coding course added for grade 7 (2017 - 2018) utilizing Tynker for block-based coding and drones for robotics implementation (Unionville-Chadds Ford SD, 2018).
21. Graduation requirement for Essentials of Computer Apps (.5 credit) course with a strong focus on Excel. Course

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is delivered in three formats: classroom, online and summer options administered through Canvas LMS. GIEP students can take a .25 credit survey course (Unionville-Chadds Ford SD, 2018).

22. Keyboarding in grade 2, along with a basic use of computers in K-1 classrooms (Hempfield Area SD, 2018).
23. Strongly believe keyboarding should be left in the curriculum (North Allegheny SD, 2018).
24. Google classrooms introduced including the use of Google Docs/Slides specifically in grade 3; Google Docs, Slides, and Sheets become the focus in grades 4 and 5 (Hempfield Area SD, 2018).
25. Google training, MicroType, Digital Citizenship, Ever-Fi for Digital Literacy, Online Assignments and introduction of various applications in grade 6 specifically (North Allegheny SD, 2018).
26. It is important to be well rounded with math, computer science and business courses along with the ability to work with multiple digital platforms and emerging financial apps (PNC Bank, 2018).
27. Two year effort underway to vertically and horizontally align computer science K-12 with a particular focus around computational thinking. Elementary course meets 40 minutes/week using Code.org for three areas of spiraled computer science: (1) tech literacy; (2) computational thinking; and (3) digital citizenship. Common Sense Media and Code.org are used for digital citizenship lessons at K-5 levels. Google Suite is introduced in grade 2. Ardublock is being used as a block-programming language above “Scratch and Snap” at the K-5 levels. Interest in increasing computer science for all students at middle level that is starting with Code.org (Fox Chapel Area SD, 2018).
28. “According to the U.S. Bureau of Labor Statistics, CS and IT jobs are projected to grow by 12 percent between 2012 and 2024. [As of January 2017], Pennsylvania has 20,192 open computer science jobs (3.4 times the average demand rate in Pennsylvania)” (PDE, 2017).
29. Having a model for the learning progression (e.g. Use-Modify-Create model) to help break down the computational thinking process and make it more concrete for teachers to roll out to students is beneficial. This assists students in switching from the “end-user” to the “creator” role within technology and computer science (Lee, et. al., 2018).
30. The pillars of computational thinking are defined as (a) abstraction, (b) automation, and (c) analysis and could be infused into the courses in a spiraling manner to ensure that students are mastering these skills (Clayborn, et. al., 2016).
31. It’s important that all K–12 students have an equal chance to experience coding, computer science, and the possibilities they present for a bright future (CSTA, 2017).
32. “While just as important as traditional literacy, ensuring citizens are digitally fluent has not reached a high level of urgency in the United States (U.S). Some countries, including England, recently mandated that every student study code, programming, and computer science (CS)” (Beach, 2016).
33. Students may be digital natives, but they don’t understand the consequences of their actions online. Teaching them how to navigate safely and communicate effectively is essential to their success (Educational Horizons, 2014).
34. Computer science (CS) and information technology (IT) skills, like computational thinking, collaboration, recognizing and defining a problem, generating and using abstractions, testing and refining computational artifacts, design thinking, communicating and collaborating with diverse cultures, are valuable assets in a changing, 21st century economy (Pennsylvania Department of Education, 2017).
35. The K–12 Computer Science Framework envisions a future in which students:
  - a. critically engage in public discussion on computer science topics;
  - b. develop as learners, users, and creators of computer science knowledge and artifacts;
  - c. better understand the role of computing in the world around them; and
  - d. learn, perform, and express themselves in other subjects and interests (K–12 Computer Science Framework, 2017).
36. Future Business Leaders of America (FBLA, 2018), an organization dedicated to developing the future workforce

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and creating a partnership between education and the business, is working to:

- a. develop competent, aggressive business leadership;
- b. strengthen the confidence of students in themselves and their work;
- c. create more interest in and understanding of American business enterprise;
- d. encourage members to develop individual projects that contribute to the home, business, and community;
- e. develop character, prepare for useful citizenship, and foster patriotism;
- f. encourage and practice efficient money management;
- g. encourage scholarship and promote school loyalty;
- h. assist students in the establishment of occupational goals; and
- i. facilitate the transition from school to work.

37. More exposure to coding at the elementary and upper elementary level would be helpful (Student Voice, 2018).

38. Integrating Makerspaces into the major content areas would be helpful to make learning come to life and allow students to have hands-on experiences with the concepts they learn (Town Hall, 2018).

**Implementation Timeline (Anticipated Start/Finish):** Planning 6/1/18 - 6/1/19 for Student Roll-out in 2019-2020

**Key Personnel:** Assistant Superintendents; Business and Computer Science Department Chair; Representative Group of Business and Computer Teachers

**Major Action Steps:** (1) Form a writing committee to analyze current use of teaching periods, establish grade span competencies, evaluate existing resources; (2) Develop a roll-out plan; (3) Research and identify specific resources needed for implementation; (4) Develop competency assessments for each grade level; and (5) Plan and provide professional development as needed for implementation.

**Estimated Budget/Resources:** Initial planning and work will begin in the summer of 2018. A representative sample of the department will be paid ancillary rate to complete curriculum development work for a maximum of three days. As recommendations emerge for specific units or activities, the purchase of resources will become more clear (e.g., devices, robots, and software). Financial requirements will be incorporated into the 2019 - 2020 operational budget.

**Potential Implications (Short-Term and Long-Term):** In the next year, teachers within the Business and Computer Science Department will engage in professional development and curricular planning. Students in grades K - 8 currently spend 335 class sessions in this department. With the implementation of this recommendation, the use of time in each grade level will shift to align with the priorities outlined above (e.g., computational thinking, keyboarding, transferable “soft” skills, and digital citizenship).

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### **Recommendation #3:**

Integrate learning opportunities to develop computational thinking across business, computer science, and STEM related courses to improve students' problem solving skills.

### **FINDINGS:**

#### **Internal Analysis**

1. Computational thinking is occurring across some courses; however, we need to make it an assured experience (PRSD Curriculum, 2018).
2. Students should be introduced to problem solving, critical thinking, the scientific method, and coding at an early age (Town Hall, 2018).
3. More exposure to coding at the elementary and upper elementary level would be helpful (Student Voice, 2018).
4. Integrating Makerspace into the major content areas would be helpful to make learning come to life and allow students to have hands-on experiences with the concepts they learn (Town Hall, 2018).

#### **External Analysis**

1. Problem solving skills are vital. Employees must be able to identify the problem, take ownership of the problem, get help from the right people, develop a solution, and communicate the solution plan effectively (First National Bank, 2018).
2. Clearly articulated K-12 focus on computational thinking across grade levels (i.e., computational thinking as a literacy) and project-based thinking across the curriculum (South Fayette SD, 2018).
3. Professional development is offered in-house across K-12 and includes a summer institute. Additional training is offered via Carnegie Mellon University for intensive immersion in Python (South Fayette SD, 2018).
4. Computational thinking should be integrated across many content areas not just computer science (AIU, Carnegie Mellon University, 2018).
5. Employees must be able to "connect the dots" and use technology skills to solve problems. Entry level employees must have very high problem solving skills because businesses do not have the time to teach it (PNC Bank, 2018).
6. The use of games offers a way to engage young children in natural computational thinking learning. Learning scientists and education researchers have found that children show a variety of computational thinking skills while playing games (University of Maryland, 2018).
7. South Fayette has a clearly articulated K-12 focus on computational thinking across grade levels (South Fayette SD, 2018).
8. Makerspace is integrated across grade levels to create space and time for creativity, innovation, and problem solving (South Fayette SD, 2018).
9. K-5 grade span is implementing both coding and robotics; coding is primarily introduced using Scratch Code.org and BlocksCAD; robotics elements include Hummingbird, VEX IQ (3-5), and Makey Makey (K-2) (South Fayette SD, 2018).

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10. Coding is introduced for primary students to develop computational thinking (i.e., Tynker/Dash & Dot, MakerBot, Robots, Makerspace) (Unionville-Chadds Ford SD, 2018).
11. Required coding course were added for grade 7 (2017 - 2018) utilizing Tynker for block-based coding and drones for robotics implementation to further computational thinking development (Unionville-Chadds Ford SD, 2018).
12. A two-year effort is underway at Fox Chapel to vertically and horizontally align computer science K-12 with a particular focus upon computational thinking (Fox Chapel Area SD, 2018).
13. Fox Chapel identified a generalized need for more expertise and discipline-specific skills with computer science staff (Fox Chapel Area SD, 2018).
14. Fox Chapel is interested in increasing computer science for all students at middle level, starting with Code.org (Fox Chapel Area SD, 2018).
15. As a generalization, most teachers, at the middle school level, do not have background with computer science or computational thinking resulting in an identified need for professional development (Fox Chapel Area SD, 2018).
16. Includes debugging in curriculum as skill set for problem solving including specific computational thinking practice (Fox Chapel Area SD, 2018).
17. Schools should integrate computational thinking across many content areas. One resource includes B-Bots for early programming. Scratch is another resource for older students and can be as sophisticated as you want (AIU3, 2018).
18. We believe that children as young as ten can directly benefit from opportunities to engage in computational thinking. One approach to provide these opportunities is to focus on social game play (University of Maryland, 2018).
19. The use of games offers a way to engage young children in natural computational thinking learning. Learning scientists and education researchers have found that children show a variety of computational thinking skills while playing games (University of Maryland, 2018).
20. Students develop mathematical thinking when they approach a new situation with a range of mathematical skills in mind. Similarly, they develop computational thinking when they approach a new situation with an awareness of the many ways that computers can help them visualize systems and solve problems (Educational Horizons, 2014).
21. In a world in which digital technology plays an important role in carrying out essential daily-life tasks, it is imperative individuals have the education, knowledge, and skills to critically understand the technological systems they use, as well as to be able to troubleshoot and problem solve when things go wrong (Wing, 2006; Czerkawski, 2015; National Research Council, 2010).
22. Utilizing a model for the learning progression (e.g. Use-Modify-Create model) to help break down the computational thinking process and make it more concrete for teachers to roll out to students is beneficial. This assists students in switching from the “end-user” to the “creator” role within technology and computer science (Lee, et. al., 2018).
23. The pillars of computational thinking are defined as (a) abstraction, (b) automation, and (c) analysis and could be infused into the courses in a spiraling manner to ensure that students are mastering these skills (Clayborn, et. al., 2016).

**Implementation Timeline (Anticipated Start/Finish):** Planning 6/1/18 - 6/1/19 for Student Roll-out in 2019-2020

**Key Personnel:** Assistant Superintendents, Academic Leadership Council, Principals, Assistant Principals, & Teachers of STEM and Business/Computer Science courses

**Major Action Steps:** (1) Create a core K-12 team to design the integration of computational thinking; (2) Train the team in computational thinking and develop a common definition for the term “computational thinking”; (3) Identify

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areas of integration within the PRSD unit-based curriculum; (4) Incorporate computational thinking into the courses; and (5) Assess the development of computational thinking in students.

**Estimated Budget/Resources:** Professional development costs could be incurred if guest speakers are utilized as experts to train the team.

**Potential Implications (Short-Term and Long-Term):** The professional development required could occur during the identified in-service sessions, with the potential for the development of computational thinking to be incorporated as an instructional strategy to enhance our students' skill sets. Infusing the identified activities into the learning goals and unit-based curriculum should enhance existing learning activities, not replace them; however, the potential for revisions to this exist.

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### **Recommendation #4**

Integrate learning opportunities to develop transferable soft skills across all grade levels and departments (e.g., communication, leadership, time management, organization, and goal setting).

### **FINDINGS:**

#### **Internal Analysis**

1. Communication skill development is occurring across some courses; however, we need to make it an assured experience (PRSD Curriculum, 2018).
2. Integrating Makerspace into the major content areas would be helpful to make learning come to life and allow students to have hands-on experiences with the concepts they learn (Town Hall, 2018).
3. The general feeling of soft skills within the community is that it would be beneficial within business course, most importantly, public speaking and the ability to present information to an audience (Town Hall, 2018).

#### **External Analysis**

1. The most lethal person in this zone is someone who excels in math/computer science and can communicate their ideas and work within a team effectively (analytical with deep science background and can communicate at a very high level) (UPMC, 2018).
2. Preferred skills include proficiency in Excel, as well as soft skills such as problem solving, adaptability, and flexibility to deal with unique situations. Successfully performing your duties relies 90% problem solving skills, accuracy, and strong written communication skills (First Commonwealth Bank, 2018).
3. Students need "soft skills" collaboration, ability to be flexible, persevere. They need to be able to stick with a problem and solve it (AIU3, 2018).
4. The general feeling of soft skills within the community is that it would be beneficial within business courses that students learn a variety of them. Most importantly, public speaking and the ability to present information to an audience. This could be accomplished through long projects and PowerPoint presentations. Additionally, it would be helpful for the students to understand overall business edict such as dress, eye contact, digital language and general social behavior... and project-based learning (Town Hall, 2018).
5. South Fayette School District implements and supports project-based design thinking across the curriculum (South Fayette SD, 2018).
6. Building a growth mindset in students will help them to increase their perception of being able to handle rigorous courses like computer science. This is particularly important as we evaluate the gender balance and interest we have through course requests and enrollment. We should also be intentional in discussing the iterative process of programming and approaching computer science so that students can demonstrate perseverance in the face of a challenge and find success and confidence in their ability to think through a presented problem/bug (Nix, 2016).

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7. Humanities and computer science is an ideal career path (AIU, 2018).
8. Makerspace is integrated across grade levels to create space and time for creativity, innovation and problem solving (South Fayette SD, 2018).
9. Students need social skills in both team environments and also social environments on campus (Carnegie Mellon, 2018).
10. High schools are giving credit for math when students take computer science courses. The concern here is students still need the math knowledge (Public School Code Section 1605/Hempfield Area SD and North Allegheny SD, 2018).
11. All students should be exposed to computer science concepts (AIU3, 2018).
12. Banking skills are more about people skills than money skills "we can teach banking" (First Commonwealth Bank, 2018).
13. When considering admittance, along with academic skills, the University of Pittsburgh values: evidence of leadership, strong written and communication skills, initiative, persistence, teamwork, and resourcefulness (University of Pittsburgh, 2018).
14. It is important to be well rounded with math, computer science, and business courses along with the ability to work with multiple digital platforms and emerging financial apps (PNC Bank, 2018).
15. Fluidity and adaptability are important (PNC Bank, 2018).

**Implementation Timeline (Anticipated Start/Finish):** Planning 6/1/18 - 6/1/19 for partial roll-out in 2019 - 2020

**Key Personnel:** Principals, Business/Computer Science Department, and Grade Level Teachers

**Major Action Steps:** (1) Establish a core team to identify the "soft" skills to be integrated K-12; (2) Create grade-span specific rubrics to assess/provide feedback to students regarding the development of their skills; (3) Make the rubrics available to other departments for integration when applicable; and (4) Utilize rubrics to provide feedback to students to encourage skill refinement.

**Estimated Budget/Resources:** There will be minimal costs associated with this recommendation, as the only need would be substitutes/ancillary pay to permit collaboration for any work not accomplished during embedded in-service days.

**Potential Implications (Short-Term and Long-Term):** Students only continue to grow from the provision of feedback. Establishing rubrics for the development of "soft" skills will permit the transfer of "soft" skills across content areas.

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### Recommendation #5

Develop and implement common assessments in business and computer science (technology) courses to constantly improve instruction and curriculum.

### FINDINGS:

#### Internal Analysis

1. Common assessments do not currently exist across many of the business and computer science courses (PRSD Vertical Teams, 2018).
2. As a result of the curriculum writing process, common assessment development started for K-12 in March, 2018 (PRSD Strategic Plan, 2018).

#### External Analysis

1. Elementary programs are separate yet similar with elementary tech teachers meeting once per month to plan and collaborate (Unionville-Chadds Ford SD, 2018).
2. South Fayette SD implements graduation requirement courses in: Presentation Applications, Excel, Public speaking, College and Career Planning (South Fayette SD, 2018).
3. Teachers are encouraged to think like assessors to evaluate the evidence necessary to substantiate that learning has occurred at the appropriate level of rigor and to design instruction to ensure students' mastery of these benchmarks (Wiggins & McTighe, 2005).
4. Assessments are not designed to simply generate grades, but should be viewed through an integrated lens linking the results to necessary adjustments to instruction and curriculum (Wiggins & McTighe, 2005).
5. Simply assessing a student, without providing meaningful, formative feedback, will not lead to increased learning. It is only through ongoing, clear feedback and encouragement towards growth tied to learning goals that students might improve (Marzano, 2006).
6. Teachers of similar courses and grade levels are encouraged to meet regularly to review student work and check for understanding. This process involves the team using common assessment results to alter their instructional approach and reflect on the curriculum, after sharing best practices backed by evidence in student performance (Fisher & Frey, 2007).
7. Reviewing assessment data to inform instructional and curricular decisions is cyclical and continuous. Reviewing the results frequently and formatively can provide opportunities or differentiation and interventions for learners across the spectrum, ensuring that they master the content and skills in a manner that transfers to real world scenarios (Fisher & Frey, 2007).

**Implementation Timeline (Anticipated Start/Finish):** 03/2018 - 05/2019

**Key Personnel:** Assistant Superintendents, Academic Leadership Council, Principals, Assistant Principals, & Teachers of STEM and business, and computer science courses

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**Major Action Steps:** (1) Establish the frequency with which common assessments will take place and create a schedule for their administration annually; (2) Develop common assessments utilizing a variety of knowledge depths and types; (3) Create a shared folder of common assessments and scoring guidelines; (4) Create a database for entering scores from common assessments for analysis; (5) Train teachers in the use and scoring of common assessments and ensure inter-rater reliability; (6) Schedule departmental time to analyze and report on scores from common assessments; (7) Build a cycle of continued review, analysis, reporting, and implementation of subsequent, responsive curricular and instructional actions; and (8) Modify the mid-term and final exams across courses. Scheduling of exams will need to be adjusted based upon course vs. period.

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

**Potential Implications (Short-Term and Long-Term):** Within the model for teaching and learning, instruction and curriculum will be better aligned with the assessments as a common benchmark. Teachers will be able to utilize the data gleaned from common assessments to adjust their own instruction to be responsive to learners. Additionally, changes to the curriculum and/or instructional strategies could be explored and documented for the department to utilize when helping students successfully master and employ the concepts and skills intended through the written curriculum.

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### Recommendation #6

Create and maintain partnerships and connections with local colleges, universities, businesses, and parents in an effort to strengthen student readiness for their future.

### FINDINGS:

#### Internal Analysis

1. Real world examples in business classes are very helpful (Student Voice, 2018).
2. A College and Career Planning course would be beneficial (Student Voice, 2018).
3. A career research project would help students with future planning (Student Voice, 2018).
4. Additional guest speaker visits from industries & universities would be appreciated (Town Hall - PRSD, 2018).
5. Parents are surprised that more teachers don't request parent participation as industry experts (Town Hall - PRSD, 2018).
6. AIU internships and job shadows are available through GATE, but interest & participation is low (Town Hall-PRSD, 2018).
7. Use the community resources to work with all students (This occurs with K-6, but less so within middle school and high school) (Town Hall - PRSD, 2018).
8. Researching careers during 8th grade would be helpful (Student Voice, 2018).

#### External Analysis

1. Banking skills are more about people skills than money skills "we can teach banking." In an effort to increase the number of women in leadership positions, we recommend introducing girls to female leaders in the field. Formal mentorship programs are helpful as well. First Commonwealth participates in career days (First Commonwealth Bank, 2018).
2. University of New Haven is willing to become a partner in regards to Cybersecurity education in order to help our students become more experienced in the field (University of New Haven, 2018).
3. Microsoft Philanthropies offers TEALS (Technology Education and Literacy in Schools) to help high schools throughout the U.S. build and grow sustainable computer science programs. They provide, at no cost, an advisor/volunteer to help high schools either start or help develop a computer science program. There are several Pittsburgh high schools already participating (AIU, 2018).
4. South Fayette SD has a dedicated administrator with the title Curriculum, Innovation, and Technology Coordinator who is heavily connected to regional partners (South Fayette SD, 2018).
5. Unionville-Chadds Ford School District implemented a partnership with Franklin Institute for the creating & implementation of Makerspaces for the basics of creation & technology at the elementary levels (Unionville-Chadds Ford SD, 2018).
6. Zulama engages teenagers in programming and STEM subjects through game design. Their expert instructional designers work with faculty from one of the top game design programs in the world at Carnegie Mellon University. Zulama developed a mix of modules and courses that fit within middle school and high school curriculum (Zulama, 2017).

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7. Fox Chapel emphasized computational thinking and computer science by hiring an Executive Director of Instructional and Innovation Leadership who serves as the point person to leverage and streamline key partnerships (Fox Chapel Area SD, 2018).
8. CMU Academy offers free professional development for computer science teachers (Carnegie Mellon University, 2018).

**Implementation Timeline (Anticipated Start/Finish):** 06/2018 - 06/2019

**Key Personnel:** K-12 Business and Computer Science Teachers, Building Administrators, Office of Communications, and Assistant Superintendent

**Major Action Steps:** (1) Identify curricular areas to be enhanced by guest speakers, partnerships, and connections to computer science in action; (2) Examine the current partnerships and resources utilized to bring content to life and determine if additional connections with these same partners can be made; (3) Explore new partnerships with organizations offering beneficial connections and learning opportunities for our students and establish these opportunities as assured experiences across grade levels and/or courses; and (4) Communicate and promote a desire to establish partnership opportunities within the community through both seeking and reporting on these types of experiences in our classrooms.

**Estimated Budget/Resources:** Parent Teacher Organizations (PTOs) might represent a supplemental funding source for these types of experiences and can be approached as opportunities arise. Additionally, some partners and organizations might prefer to donate their resources and time to the schools. Costs could be associated with field trips or guest speakers.

**Potential Implications (Short-Term and Long-Term):** Students would gain an appreciation for and understanding of the importance of computer science and business beyond the walls of the classroom. These experiences might encourage them to pursue a career within these fields and will minimally broaden their knowledge about the application of learning in real world scenarios.

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### Recommendation #7

Integrate developmentally appropriate concepts of financial literacy for every student in grades K-8 with additional required competencies for students in grades 9-12.

### FINDINGS:

#### Internal Analysis

1. The consensus among both students and parents is that a knowledge of basic banking skills, credit card management, and borrowing money is needed to be successful in the future (Town Hall Meeting, 2018).
2. Over the past three years, Pine-Richland High School students have requested at least five (5) sections of the elective course - Personal Finance (PRHS Course Request Documents, 2017-2019).
3. Currently, financial literacy concepts are not integrated into K-7 technology courses (PRSD Vertical Team, 2018).

#### External Analysis

1. Next Generation Personal Finance (NGPF) offers resources and curriculum (South Fayette SD, Hempfield Area SD, Fox Chapel Area SD, Unionville-Chadds Ford SD, Student Voice, Townhall, University of Pittsburgh, and PNC Bank, 2018).
2. Hempfield Area School District's curriculum includes a .5 credit graduation requirement for grade 9 titled "Financial Literacy" (Hempfield Area SD, 2018).
3. Data released from the the Financial Industry Regulatory Authority's Investor Education Foundation reveal high school students who are required to take personal finance courses have better average credit scores and lower debt delinquency rates as young adults (NGPF, 2016).
4. Next Generation Personal Finance believes that all students deserve the Gold Standard: at least one semester of required personal finance coursework for high school graduation. This coursework is not embedded in other classes, but solely dedicated to financial concepts and decision-making (NGPF, 2007).
5. Before graduation, students must learn money management and budgeting skills, as well as the importance of building good credit habits in order to become financially secure adults in the "real world." Without exposure to these skills in school, they often learn them by making costly mistakes with lasting consequences (NGPF, 2017).
6. Recommendation of mandated personal financial literacy courses for graduation (NGPF, 2007; Financial Education Association, 2016).
7. Students develop better credit behaviors in early adulthood in states where personal finance is a formal course, when teachers are trained, and students are held accountable for meeting learning objectives (CNBC, 2016).
8. Our population's lack of basic financial literacy skills like budgeting, saving for the future, and understanding credit became more evident after the 2008 events. Among our college student population we also see an increasing student loan indebtedness and lack of comprehension of it (Journal of Financial Education, 2016).
9. Financial literacy course being proposed for next year (North Allegheny SD, 2018).
10. Schools should consider financial literacy at the middle school level (PNC Bank, 2018).
11. Dr. Patrick Malloy spoke to the growth of the cybersecurity and financial fraud programming at the University of New Haven (University of New Haven, 2018).
12. Like general or health literacy, financial literacy could be conceptualized as having two dimensions—understanding

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(personal finance knowledge) and use (personal finance application) (Measuring Financial Literacy, 2010).

13. It is important to be well rounded with math, computer science, and business courses along with the ability to work with multiple digital platforms and emerging financial apps (PNC Bank, 2018).

**Implementation Timeline (Anticipated Start/Finish):** 6/4/2018 - 8/2019

**Key Personnel:** K-12 Business and Computer Science Teachers; Assistant Superintendents for Elementary and Secondary Education; Business and University Partners

**Major Action Steps:** (1) Identify the benchmark competencies and skills that students must know and understand by the end of grades 3, 6, 8, and 12; (2) Update the written curriculum for business/technology courses in grades K-7; (3) Update the grade 8, Introduction to Business course curriculum; (4) Identify ways to ensure all high school students are exposed to the identified key competencies and skills regardless of their course requests; and (5) Identify ways to assess students' acquisition of those competencies and skills.

**Estimated Budget/Resources:** Costs could include curriculum resources, online learning platforms, substitute costs for curriculum revisions.

**Potential Implications (Short-Term and Long-Term):** (1) K-3 technology curriculum will need to be designed and implemented; (2) Revisions to the grade 4-8 business/technology curriculum; (3) Members of the K-12 business and computer science departments will need time to research and make recommendations for benchmark competencies; and (4) High school students and families will need to understand the implications of this recommendation within the course request process and graduation requirements.

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### **Recommendation #8**

Update the program of studies to reflect newly recommended course additions and deletions.

- A. Embed concepts of business law and ethics into existing courses.
- B. Combine and rename the current semester courses of *CHS Java* and *CHS Advanced Computer Science* into a full year, full-time *AP Computer Science* course. This combined course will appear in the PRHS Program of Studies starting in the 2019 - 2020 school year; however, the content is being implemented in 2018 - 2019.
- C. Eliminate *Desktop Publishing* in the current PRHS Program of Studies due to low enrollment beginning with the 2019 - 2020 school year.
- D. Restructure the existing *Personal Finance* course from a full-year course to a one-semester course for the 2019 - 2020 school year.
- E. Offer an *Honors Finance and Investments* semester course for business-minded students to address cybersecurity, fraud detection, long-term financial planning and investment vehicles at a more in-depth level with *Personal Finance* serving as the prerequisite for this course for the 2019 - 2020 school year.
- F. Develop a course related to *Game Development and App Design* for the 2019 - 2020 school year.
- G. Create a course to target the growing field of *Cybersecurity* for the 2020 - 2021 school year.

### **FINDINGS:**

#### **Internal Analysis**

1. Interest was expressed at the Town Hall session by parents and students in a cybersecurity course given the growing importance and future career opportunities (Town Hall, 2018).
2. Desktop publishing has not been offered in three of the last four years due to low student requests (PRHS Course Request Document, 2019).
3. Students should be introduced to problem solving, critical thinking, the scientific method, and coding at an early age (Town Hall, 2018).

#### **External Analysis**

1. Dr. Patrick Malloy spoke to the growing fields of cybersecurity and financial fraud and the responsive programming at the University of New Haven to train additional individuals (University of New Haven, 2018).
2. The use of games offers a way to engage young children in natural computational thinking and learning. Learning scientists and education researchers have found that children show a variety of computational skills while playing games (University of Maryland, 2018).
3. Desktop publishing course was not offered by any of the exemplar schools interviewed (Exemplar Schools, 2018).
4. Marketing is changing because of social media. App design is emerging (Allegheny Intermediate Unit, 2018).
5. App development & programming is growing with two new courses recently added. These courses, Video Game Programming and Mobile App Development, are currently taught within the department. (Hempfield Area SD, 2018).

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6. Grade 7 students focus on digital citizenship and coding using App Inventor. Grade 8 students focus on Media Literacy 8 course that includes Digital Citizenship; Mandatory Rotation with Python (taught by high school teacher) use of text based coding; embedded with robotics; martian with robot completing challenges (South Fayette SD, 2018).
7. Grade 7 - new coding course added (2017-2018) utilizing Tynker for block-based coding and drones for robotics implementation (Unionville-Chadds Ford SD, 2018).
8. Hempfield is changing middle school curriculum to add coding with newly implemented block scheduling and the addition of BCIT teachers (Hempfield Area SD, 2018).
9. Canon-McMillan Middle school implemented a TOPS (Team Oriented Problem Solving) course required at middle school - 9 weeks in 2018; the course utilizes a Sphero robot which students can program using a phone or tablet and JavaScript language (Three Rivers Educational Technology Conference, 2018).
10. Fox Chapel is considering computer science as a full year/full time core course (Fox Chapel Area SD).
11. UPMC values employees who excel in math and computer science and can communicate their ideas and work within a team effectively (University of Pittsburgh Medical Center, 2018).
12. AP Computer Science was offered in all Exemplary schools interviewed (Exemplary Schools, 2018).
13. Data security is a growing field (Carnegie Mellon, 2018).
14. University of Pittsburgh and Code HS offers complete cybersecurity curriculum (University of Pittsburgh, 2018).
15. Digital Citizenship is being taught at higher grade levels district-wide using Common Sense media (Hempfield Area SD).
16. University of Pittsburgh offers two [CHS Courses](#)- Cybersecurity and the Law (INFSCI 0014) and Computer Security (INFSCI 1074) - (University of Pittsburgh). North Allegheny Senior HS offers CHS course in cybersecurity (North Allegheny SD, 2018).
17. As computing has become an integral part of our world, public demand for computer science education is high. Most parents want their child's school to offer computer science (Google & Gallup, 2015), and most Americans believe computer science is as important to learn as reading, writing, and math (Horizon Media, 2015). Many of today's students will be using computer science in their future careers, not only in science, technology, engineering, and mathematics (STEM) fields but also in non-STEM fields (K-12 Computer Science Framework Steering Committee, 2014).
18. Zulama has developed an unprecedented way to engage teenagers in programming and STEM subjects—through game design. “Our expert instructional designers worked with faculty from one of the top game design programs in the world at Carnegie Mellon University. We developed a mix of modules and courses that fit within middle school and high school curriculum” (Zulama, 2017).
19. App development & programming is growing with two new courses recently added. Courses such as Video Game Programming and Mobile App Development, are currently taught within the business department (Hempfield Area SD, 2018).
20. College level cybersecurity class from the University of Pittsburgh includes the law and technology (North Allegheny SD, 2018).
21. It is important to be well-rounded with math, computer science, and business courses along with the ability to work with multiple digital platforms and emerging financial apps (PNC Bank, 2018).
22. Several exemplar schools recognize the need for additional opportunities in computer science beyond AP computer science. Considerations include cybersecurity, integration of robotics (Raspberry PI, Arduino), game design and

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mobile app development (South Fayette SD, Unionville-Chadds Ford SD, North Allegheny SD, and Fox Chapel Area SD, 2018).

23. As educators, we are tasked to empower, educate, and develop our future leaders and our future workforce. Our responsibility is simple—at an early age introduce students to, and prepare them for, cyber opportunities, including current career fields and those 21st century jobs that do not yet exist (The Voice of K-12 Computer Science Education and its Educators, 2017).
24. Department of Homeland Security offers scholarships in the field of cybersecurity due to the need to continue recruiting skilled individuals for the growing field (Department of Homeland Security, 2018).
25. Student and parent voices expressed interest in cybersecurity courses at the Town Hall (Town Hall, 2018).
26. The threats facing Department of Defense's (DoD's) unclassified information have dramatically increased as we provide more services online, digitally store data, and rely on contractors for a variety of information technology services. Recent high-profile incidents involving government information demand that information system security requirements are clearly, effectively, and consistently communicated to both government and industry. (Office of Small Business Programs; Department of Defense, 2018).
27. App development and programming is growing with two new courses recently added. These courses, Video Game Programming and Mobile App Development, are currently taught within the business department (Hempfield Area SD, 2018).
28. It is important to be well rounded with math, computer science, and business courses along with the ability to work with multiple digital platforms and emerging financial apps (PNC Bank, 2018).

### **Implementation Timeline (Anticipated Start/Finish): 5/2018 - 6/2020**

**Key Personnel:** 7-12 Business and Computer Science Teachers; 7-12 Building Administrators; Assistant Superintendents; Director of Communications

**Major Action Steps:** (1) Identify the big ideas and learning goals related to business law and ethics that will be embedded into existing courses; (2) Develop course outlines for new courses (unit plans, scope and sequence, big ideas and learning goals); (3) Identify resources needed to support new courses; (4) Modify existing personal finance course and develop the honors level personal finance course; (5) Identify learning opportunities for coding and computational thinking within existing middle school courses inside and outside of business and computer science; and (6) Communicate changes to students and families.

**Estimated Budget/Resources:** Cost associated with these recommendations include: professional development for staff; resources to support the new and updated curriculum; substitute or after-hour costs for staff to work on curriculum.

**Potential Implications (Short-Term and Long-Term):** Modification and additions to the PRHS Program of Studies will impact student course options. The addition of semester courses may provide more flexibility. The addition of an AP course will provide students with options to take the AP exam or CHS exams. There will be professional development needs for our staff. Possible staffing implications based upon student interest in new and existing courses.

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### Recommendation #9

Establish a professional development plan for ongoing training related to computer applications, coding, and career exploration for business and computer science.

### **FINDINGS:**

#### **Internal Analysis**

1. Ongoing professional development will be necessary for our staff members to remain knowledgeable about and responsive to new developments in the fields of business and computer science (PRSD Vertical Team, 2018).

#### **External Analysis**

1. Professional development is offered in-house across K-12 and includes a summer institute. Additional training is offered via Carnegie Mellon University for intensive immersion in Python (South Fayette SD, 2018).
2. A conference model is used for professional development - teacher driven & delivered (Unionville-Chadds Ford SD, 2018).
3. South Fayette SD offers professional development by offering a summer institute for grades 3-5 (in house); high school training via CMU- intensive immersion Python (South Fayette SD, 2018).
4. Professional development and learning is critical since the shift to computer science often involves the same teaching staff (South Fayette SD and Unionville-Chadds Ford SD, 2018).
5. A conference model is used for professional development - teacher driven & delivered (Unionville-Chadds Ford SD, 2018).
6. Today's students need to learn computer skills for tomorrow's jobs. Yet teaching technology is the very thing that most schools are struggling to provide, because schools can't find technology curriculum and most teachers aren't certified to teach computer science (Zulama, 2017).
7. The key for the further development and enhancement of STEM, cyber, and computer science education begins with the teacher (Beac, 2017).
8. Google provides a free online course entitled "Computational Thinking for Educators" to provide professional development for integrating computational thinking into curriculum ([Computational Thinking for Educators](#), 2018).
9. Google offers Exploring Computational Thinking (ECT) resources as a curated collection of lesson plans, videos, and other resources on computational thinking. The content was created to provide a better understanding of computational thinking for educators and administrators, and to support those who want to integrate computational thinking into their own classroom content, teaching practice, and learning ([Exploring Computational Thinking \(ECT\)](#), 2018).

**Implementation Timeline (Anticipated Start/Finish):** 06/2018 - Ongoing to be Responsive to New Developments

**Key Personnel:** Professional Development Committee, Assistant Superintendents, Academic Leadership Council, Principals, Assistant Principals, & Teachers of STEM and Business/Computer Science courses

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**Major Action Steps:** (1) Designate training dates and times through the Professional Development Committee; (2) Identify areas of necessary professional development annually based on staff and course needs; and (3) Procure training annually, working with identified community connections and partners.

**Estimated Budget/Resources:** Provision of funding for professional development opportunities would need to be considered, as well as the potential for substitutes or ancillary pay when training falls outside of in-service time.

**Potential Implications (Short-Term and Long-Term):** By providing professional development to our staff members, we will ensure they are qualified to instruct students in the newly developed courses and competencies.

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### **Recommendation #10**

Review and evaluate resources to support current trends in business and computer science.

- Identify and evaluate hardware resources to support various applications and learning goals with the curriculum.
- Identify and evaluate software (online) programs that provide students with exposure to various learning platforms, coding, simulations, digital citizenship, and programming languages.
- Determine potential elements/components of a Makerspace at certain developmental levels to foster computational thinking, problem-solving, and hands-on discovery learning.
- Identify and evaluate curriculum resources, such as textbooks or ancillary materials, to support the written curriculum of each business and computer science course (e.g., Accounting 1).

### **FINDINGS:**

#### **Internal Analysis**

1. The community feels there are several emerging trends which would benefit students in the district. These include: working with more robotics, Raspberry PI, Arduinos, cybersecurity, artificial intelligence, and more advanced computer science classes at the high school level (Town Hall Meeting, 2018).
2. Business and computer science departments noted the need for improved and updated hardware and software to support the curriculum (PRSD Vertical Team, 2014).
3. Integrating Makerspaces into the major content areas would be helpful to make learning come to life and allow students to have hands-on experiences with the concepts they learn (Town Hall, 2018).

#### **External Analysis**

1. Unionville-Chadds Ford School District is piloting 1:1 Chromebook usage in grade 9 (Unionville-Chadds Ford SD, 2018).
2. South Fayette School District is providing 1:1 Devices: iPads: grades K-1; HP Revolve: grades 3-12 (South Fayette SD, 2018).
3. Students have 1:1 laptops at North Allegheny High School (North Allegheny SD, 2018).
4. The district currently has 1:1 iPads initiative at Grades 6-8 (Fox Chapel Area SD, 2018).
5. Integrating Makerspaces into the major content areas would be helpful to make learning come to life and allow students to have hands-on experiences with the concepts they learn (Town Hall, 2018).
6. Introduce block-based coding beginning at the elementary level with a sequential progression through the K-12 program (Unionville-Chadds Ford SD, South Fayette SD, and Fox Chapel Area SD, 2018).
7. Schools should integrate computational thinking across content areas. One resource includes B-Bots for early programming and Scratch programming for slightly older students (Allegheny Intermediate Unit, 2018).
8. Microsoft Philanthropies offers TEALS (Technology Education and Literacy in Schools) to help high schools throughout the U.S. build and grow sustainable computer science programs. They provide, at no cost, an advisor/volunteer to help high schools either start or help develop a computer science program. [Eight Pittsburgh high school participate](#) (Town Hall, 2018).
9. Coding is introduced for primary students (i.e., Tynker/Dash & Dot, MakerBot, Robots, Makerspace) (Unionville-Chadds Ford SD, 2018).

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10. Unionville-Chadds Ford School District implemented a required coding course for grade 7 (2017-2018) utilizing Tynker for block-based coding and drones for robotics implementation (Unionville-Chadds Ford SD, 2018).
11. Fox Chapel School District is utilizing Ardublock as a block-programming language above “Scratch and Snap” at the K-5 levels (Fox Chapel Area SD, 2018).
12. Montour uses [Bitsbox.com](http://Bitsbox.com) classroom kits in K-5, a learning system that teaches coding (Three Rivers Educational Technology Conference, 2018).
13. Montour Middle school utilizes Scratch for block-based programming in grades 5+ in conjunction with Makey Makey (Three Rivers Educational Technology Conference, 2018).
14. K-5 grade span is implementing both coding and robotics; coding is primarily introduced using Scratch Code.org and BlocksCAD; Robotics elements include Hummingbird, and VEX IQ (3-5) and Makey Makey (K-2) (South Fayette SD, 2018).

**Implementation Timeline (Anticipated Start/Finish):** 06/2018 - Ongoing

**Key Personnel:** K-12 Business and Computer Science Teachers, Technology Director, Building Administrators, and Assistant Superintendents

**Major Action Steps:** (1) Identify resources to support the newly developed written curriculum for K-3 computer classes; (2) Analyze current written curriculum for gaps and overlaps; (3) Identify possible hardware and software resources; (4) Develop a specific budget, timeline, and allocation plan for hardware and software resources; (5) Identify elements for Makerspaces at each developmental level; and (6) Explore expansion of Makerspace opportunities at each level through identification and procurement of resources necessary to support implementation.

**Estimated Budget/Resources:** TBD

**Potential Implications (Short-Term and Long-Term):** Resources - print and technological - must be considered within the overall district budget and priorities.

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### Works Cited

#### Research Subcommittee

*Anybody can learn* | Code.org, Powered by Amazon Web Services. Accessed 12 Dec. 2017.

Beach, Gary J. "Computer science for all: A CIO's perspective." *The Voice of K-12 Computer Science Education and its Educators*, vol. 12, no. 2, May 2016, p. 3. Accessed 12 Dec. 2017.

Bujewski, T. (n.d.). In *Office of Small Business Programs; Department of Defense*. Retrieved February 26, 2018, from <http://business.defense.gov/Small-Business/Cybersecurity>.

"BUSINESS MAJORS DOMINATE LIST OF TOP MAJORS IN DEMAND." *NACE*, 8 Jan. 2018, [www.nacweb.org/job-market/trends-and-predictions](http://www.nacweb.org/job-market/trends-and-predictions). Accessed 30 Jan. 2018.

*Career Readiness Standards*, Pennsylvania Department of Education, 26 Feb. 2018, [www.education.pa.gov/K-12/PACareerStandards/Pages/default.aspx](http://www.education.pa.gov/K-12/PACareerStandards/Pages/default.aspx). Accessed 26 Feb. 2018.

Clayborn, Lissa, Daryl Detrick, J. Philip East, Shuchi Grover, and Stephanie Hoepfner. "Reclaiming the roots of CT." *The Voice of K-12 Computer Science Education and its Educators*, vol. 12, no. 1, Mar. 2016, pp. 1-15, [https://c.ymcdn.com/sites/www.csteachers.org/resource/resmgr/Voice/csta\\_voice\\_03\\_2016.pdf](https://c.ymcdn.com/sites/www.csteachers.org/resource/resmgr/Voice/csta_voice_03_2016.pdf). Accessed 12 Dec. 2017.

Commonwealth of PA, . "Fulfilling High School Graduation Requirements with Computer Science Coursework." *Pennsylvania Dept of Education*, Pennsylvania Department of Education, Jan. 2017. Accessed 26 Sept. 2017.

Department of Homeland Security. *Cybersecurity Overview*, Department of Homeland Security, 27 Sept. 2016, <https://www.dhs.gov/cybersecurity-overview>. Accessed 26 Feb. 2018.

Fisher, Douglas, and Nancy Frey. *Checking for Understanding: Formative Assessment Techniques for your Classroom*. Alexandria, Association for Supervision and Curriculum Development, 2007, pp. 120-33.

*FBLA-PBL Purpose Statement*, <http://www.pafbala.org/general/whatis.php>. Accessed 03 April, 2018.

Huston, Sandra J. "Measuring Financial Literacy." *The Journal of Consumer Affairs*, vol. 44, no. 2, 2010, pp. 296-316, [www.jstor.org/stable/23859793](http://www.jstor.org/stable/23859793). Accessed 26 Sept. 2017.

## Business & Computer Science Department Program Review

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K-12 Computer Science Framework Steering Committee, . "K12 Computer Science Framework." ACM Digital Library, edited by K-12 Computer Science Framework Steering Committee, Association for Computing Machinery, 2016. Accessed 26 Sept. 2017.

Kinshuk, Hui-Wen Huang, Demetios Sampson, and Nian-Shing Chen. "Grand Challenges and Research Directions in e-Learning of the 21st Century." *Journal of Educational Technology & Society*, vol. 16, no. 2, Apr. 2013, pp. 3-20, [www.jstor.org/stable/jeductechsoci.16.2.3](http://www.jstor.org/stable/jeductechsoci.16.2.3). Accessed 24 Apr. 2018.

Lee, Irene, Fred Martin, and Katie Apone. "Integrating Computational Thinking Across the K-8 Curriculum." . Accessed 26 Feb. 2018.

Lee, Tak Yeon, Matthew L. Mauriello, June Ahn, and Benjamin B. Bederson. "CTArcade: Computational Thinking with Games in School Age Children." University of Maryland, Human-Computer Interaction Lab, [www.cs.umd.edu/hcil/trs/2012-22/2012-22.pdf](http://www.cs.umd.edu/hcil/trs/2012-22/2012-22.pdf). Accessed 26 Feb. 2018.

Litemind, <https://litemind.com/problem-definition/> . Accessed 14 Mar. 2018.

Lusardi, Annamaria, and Olivia S. Mitchell. "The Economic Importance of Financial Literacy: Theory and Evidence." *Journal of Economic Literature*, vol. 52, no. 1, 2014, pp. 5–44. *JSTOR*, JSTOR, [www.jstor.org/stable/24433857](http://www.jstor.org/stable/24433857).

Martinez, Valeria. "Financial literacy among our students: Assessing and improving their knowledge." *Financial Education Association*, vol. 42, no. 3-4, Dec., pp. 291-303. Accessed 27 Oct. 2017.

Marzano, Robert. *Classroom Assessment and Grading that Work*. Alexandria, Association for Supervision and Curriculum Development, 2006, pp. 1-11.

Millar, Bill. "Video in the C-Suite: Executives Embrace the Non-Text Web." *Forbes Insight*, 2010, pp. 1-11, [https://images.forbes.com/forbesinsights/StudyPDFs/Video\\_in\\_the\\_CSuite.pdf](https://images.forbes.com/forbesinsights/StudyPDFs/Video_in_the_CSuite.pdf). Accessed 30 Jan. 2018.

*NBEA Vision Statement*, [www.nbea.org/newsite/about/vision.html](http://www.nbea.org/newsite/about/vision.html).

*NICERC: An Academic Division of the Cyber Innovation Center*, National Integrated Cyber Education Research Center, 2016. Accessed 3 Apr. 2018.

Nix, Samantha. "Perceived Abilities Impact Participation." *The Voice of K-12 Computer Science Education and its Educators*, vol. 11, no. 6, pp. 3-4, [https://c.ymcdn.com/sites/www.csteachers.org/resource/resmgr/Voice/csta\\_voice\\_01\\_2016.pdf](https://c.ymcdn.com/sites/www.csteachers.org/resource/resmgr/Voice/csta_voice_01_2016.pdf). Accessed 12 Dec. 2017.

Nolten, Kevin. "The education discovery forum: Empowering educators and transforming classrooms through cs." *The Voice of K-12 Computer Science Education and its Educators*, vol. 13, no. 2, May 2017, pp. 5-6. Accessed 12 Dec.

## Business & Computer Science Department Program Review

...

2017.

Pennsylvania Department of Education, . "Fulfilling high school graduation requirements with computer science coursework." , Pennsylvania Department of Education, Jan. 2017. Accessed 30 Jan. 2018.

Schnabel, Bobby. "The importance of CSTA to ACM and the world." *The Voice of K-12 Computer Science Education and its Educators*, vol. 12, no. 4, Sept. 2016, pp. 5-6,  
[https://c.ymcdn.com/sites/www.csteachers.org/resource/resmgr/Voice/csta\\_voice\\_09\\_2016.pdf](https://c.ymcdn.com/sites/www.csteachers.org/resource/resmgr/Voice/csta_voice_09_2016.pdf). Accessed 12 Dec. 2017.

Schwartz, Shelly. *CNBC*, 28 Jan. 2016. Accessed 12 Dec. 2017.

Sedgwick, Vicky, Maya Israel, Meg J. Ray, Jennifer Rosato, and Bryan Twarej. *VOICE*, vol. 13, no. 3, July 2017, pp. 4+,  
[https://c.ymcdn.com/sites/www.csteachers.org/resource/resmgr/Voice/csta\\_voice\\_07\\_2017.pdf](https://c.ymcdn.com/sites/www.csteachers.org/resource/resmgr/Voice/csta_voice_07_2017.pdf). Accessed 12 Dec. 2017.

Young, Donna. "A 21st-Century Model for Teaching Digital Citizenship." *Educational Horizons*, vol. 92, no. 3, 2014, pp. 9–12. *JSTOR*, JSTOR, [www.jstor.org/stable/42927228](http://www.jstor.org/stable/42927228).

University of New Haven. March 7, 2018. Malloy, Dr. Patrick. Director MS Investigation Programs, Senior Lecturer.

Wiggins, Grant, and Jay McTighe. *Understanding by Design*. 2nd ed.nd ed., Alexandria, Association for Supervision and Curriculum Development, 2005, pp 146-171.

Wing, 2006; Czerkawski, 2015; National Research Council, 2010

Zulama, Zulama, Inc. , [zulama.com/](http://zulama.com/). Accessed 12 Dec. 2017.

### **Exemplar Subcommittee**

Fox Chapel Area School District (FCASD). February 12, 2018. Cicconi, Megan. Executive Director of Instructional and Innovative Leadership.

Hempfield Area School District (HASD). January 30, 2018. Howell, John. BCIT Department Chairperson. Fantaske, Bill. Math and Computer Science Teacher.

North Allegheny School District (NASD). December 12, 2017. Langué, Jordan. BCIT Department Chairperson. Prosser, Laura. Math and Computer Science Teacher.

South Fayette School District (SFSD). December 12, 2017. Deramo, David. Assistant Superintendent. Owens, Aileen. Director of Technology. DeLuca, Stephanie. Curriculum, Innovation, and Technology Coordinator.

Unionville-Chadds Ford School District (UCFSD). January 30, 2018. Hoffman, Tim. Director of Curriculum and

## Business & Computer Science Department Program Review

...

Instruction.

Three Rivers Educational Technology Conference (TRETTC). November 7, 2017. Presentations by Canon-McMillan SD Montour SD.

### **Data and Information Subcommittee**

*BrightBytes*. N.p., n.d. Web. 27 Oct. 2017.

“Business and Computer Science Town Hall Meetings.” 7 Feb. 2018.

“Business and Computer Science Strengths, Weaknesses, Opportunities, Threat Analysis.” PRSD Vertical Team, 13 Oct. 2014.

Pine-Richland High School Course Request Spreadsheet. 03 Mar. 2018. Raw data. Gibsonia.

“Pine-Richland School District Student Voice Focus Groups.” Feb.-March 2018.

### **Connections Subcommittee**

Allegheny Intermediate Unit. January 30, 2018. Samstag, Tyler. Director of Instructional Innovation, Computer Science/Decoding.

Carnegie Mellon University. January 30, 2018. Stehlik, Mark. Assistant to the Dean for Outreach in Computer Science.

First Commonwealth Bank. January 30, 2018. Frank, Anna. Financial Education Program Coordinator.

Pine-Richland School District. March 7, 2018. Parent Community Focus Group.

Pine-Richland School District. March 7, 2018. Student Focus Group Grade 9-12.

PNC Bank. January 30, 2018. Balouris, James. Executive VP of Retail Banking, SWPA, and district parent.

University of Pittsburgh. December 12, 2017. Cherek, Lisa. Director of Admissions/College of Business.

UPMC. February 2, 2018. Bogosta, Charles. Executive Vice President of the University of Pittsburgh Medical Center’s Office of Strategic Business Initiatives.

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