TRANSFORMING PROFESSIONAL DEVELOPMENT IN EDUCATION WITH TECHNOLOGY

by

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Abstract

The following doctoral capstone is an action research monograph about a study designed to improve teacher professional development (PD) by positively transforming teachers' perspectives of PD and increasing the implementation of technology at Sol High School (SHS) (pseudonym) in the Spicy School District (SSD) (pseudonym). The PD offered to teachers as part of this study is referred to as the SHS Tech PD. The voluntary development and delivery of the SHS Tech PD occurred over four weeks. One hundred teachers received an invitation to participate in the development and execution of all parts of the PD study via school-wide emails sent out by the principal. Designed in a hybrid format, the PD allowed participants to participate in-person or entirely remotely through the links provided in emails sent to staff. However, no one attended the in-person meetings. Therefore, SHS Tech PD became a remote study instead of a hybrid study. As a result, the discovery that teachers at SHS prefer to participate in remote PD over in-person PD occurred. During the study, participants rated all aspects of the SHS Tech PD higher than prior PD at SHS. Based on the new knowledge acquired from the study, SHS should provide more remote PD opportunities that allow teachers to have more flexible time. Additionally, SHS should offer teacher-selected PD allowing teachers to focus on areas or outcomes that they deem appropriate.

Dedication

To my loving family, in particular, my mom, Janiece Jonsin, for always being my number one fan. To Mateusz Handzel, your ongoing support and sacrifice made this possible. I appreciate your encouragement and motivation, especially in the face of frustration. To Eva Tafoya, my best friend since "Little Shop of Horrors," for always helping me in my time of need. Finally, to my students, especially the AVID Class of 2020, you are my inspiration. Your day to day understanding of this process has kept me going, and I hope it has strengthened your understanding of the education process as you have strengthened my understanding of what it means to be a teacher.

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INTRODUCTION

In order to improve professional development at Sol High School (SHS) and in the Spicy School District (SSD), the creation of the SHS Tech PD study occurred to positively transform teachers' perspectives of PD and increase their use of technology. By requesting teacher input at all stages of development, teachers at SHS had the option to help construct the PD as well as participate in PD modules. Designed as the first hybrid PD model at SHS, the SHS Tech PD gave teachers more participation options than prior PD at SHS. One hundred teachers at the school were asked via school email to volunteer as part of the Professional Development Design Team (PDDT) and as participants in the PD surveys and modules. Using results from Survey 1 (Appendix A) data to construct the SHS Tech PD, the PDDT provided input for the five PD modules (Appendix B) delivered via Padlet (2019) and Survey 2 (Appendix C), a post-survey for module participants. The following is an action research monograph organized into three sections that follow the action research cycle used to conduct the study: plan, implement, and evaluate.

SECTION 1: PLANNING

This section identifies the lack of technology utilization at Sol High School (SHS) as a problem and the reasoning for addressing the problem. It portrays the school site as an organization, explains the use of technology at the school, and describes prior professional development (PD) implementation. The section also provides an overview of the SHS Tech PD intervention, the purpose of the study, and a review of pertinent literature. Finally, the section explains action research methods, study limitations, and ethical issues.

Statement of the Problem

The state education department and the Spicy School District (SSD) identified low-test scores on the digital Partnership for Assessment of Readiness for Colleges and Careers (PARCC) math and language arts assessment (State Public Education Department) as a problem at Sol High School (SHS). In 2018, school district leadership and administrators at SHS asked every content department at the school to analyze the PARCC data and address how to improve test scores, making it the school's main priority for the 2018-2019 school year (2018 Principal's 90 Day Plan). Teachers need to positively transform their perspectives of technology and increase their use of technology in classrooms at SHS. The district-identified need for improving school test scores on the digitally administered PARCC exams, prior professional development (PD) provided at SHS, and the lack of teachers using district-provided technology led to the need.

Sol High School (SHS) needs to improve standardized test scores. The state public education strategic plan (State Public Education Department), the district report card (2018 State Public Education Department Website), the SHS state-issued report card (2018 State Public Education Department Website), the PARCC-Data Analysis (2018 School District Website) included in the school's 90 Day Plan, and 2018 PARCC score data (2018 State Public Education Department Website) all provide evidence of the need for a plan to improve PARCC scores at SHS. Additionally, teachers expressed a need for additional digital instruction during the PD analysis of the implementation of Advancement Via Individual Determination (AVID) strategies schoolwide: writing, inquiry, collaboration, organization, reading, and technology (WICOR+T) PD during the 2017-2018 school year.

The mixed-methods analysis of data collected from prior data folders and prior staff surveys demonstrate evidence of AVID occurring schoolwide and the lack of technology used in classrooms at SHS, a 1:1 computing high school (2018 School Site Document). Even though the Spicy School District (SSD) supplies Chromebooks for all students and teachers, they are often not used in classes at SHS. The teachers are also issued a MacBook Pro, a SMART Board, a DocCam, a teacher iMac, and two or more student iMacs in their classrooms. Additionally, printers, copiers, and scanners are readily available for students and teachers throughout the school. However, this technology is rarely used, if ever, in some classrooms (2018 School Site Document), and teachers have expressed some disdain toward technology in prior professional development (PD) staff meetings. Low test scores on the PARCC, a digitally administered test, may, in part, be linked to the underutilized technology at the school.

The school administers the PARCC to students on student Chromebooks. However, many students lack the technical skills and thinking skills necessary to perform well on the PARCC and other standardized assessments delivered on digital devices because the teachers themselves lack the technical skills to teach their students digitally. Consequently, the teachers avoid using technology, and the teachers deny the students the opportunity to become proficient with technology. The school may remedy this by providing more or better technology-related professional development (PD) to the staff at Sol High School (SHS) while focusing on improving the use of technology to deepen the learning process in preparation for the classroom.

Even though technology has been distributed with equity throughout the school, without proper training for teachers, students will not utilize it in their classes. Students have reported that some of their teachers will not allow them to open their Chromebooks in their classes (2018 School Site Document). Students cannot do well on digital assessments if they are not familiar

with the technology. The school should strengthen the use of technology in classes by using it in ways that foster different levels of thinking as identified by the SAMR model: substitution, augmentation, modification, and redefinition (Puentedura, n.d.) and integrated into content as fostered in the TPACK framework: technology knowledge, pedagogical knowledge, and content knowledge (Mourlam, 2017).

Sol High School (SHS) must address teacher perceptions regarding technology if administrators expect teachers to create lessons that engage students through technology. Students will continue to be at a disadvantage on digital standardized tests, such as the PARCC, if they are not using digital means to learn. Furthermore, students unprepared for digital learning may struggle in college and have trouble finding employment in a 21st Century market (Luterbach & Brown, 2011).

Technology Proficiency

As a global society, one cannot ignore the need for technology education. Becoming proficient with modern technology is required for daily activities, jobs, higher education, and improving overall productivity (U.S. Department of Education, 2019). Therefore, schools must develop technical skills as a means of providing equitable education (NCES, 2018). Teachers' beliefs regarding technology, their technology capabilities, and their implementation of technology are crucial for preparing students to be successful in their future endeavors (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010).

Consequences. School leaders discussed the underutilization of technology at Sol High School (SHS) and the connection to low PARCC scores during leadership meetings in the 2018 - 2019 school year. It is important to improve the problem of school staff utilizing, even

embracing, technology in their classrooms, or students will not have the skills needed to be desirable employees in a 21st Century market (Luterbach & Brown, 2011). Without appropriate technical skills, they will not be the most desirable candidates for scholarships and higher education institutions (U.S. Department of Education, 2017). Without providing effective technology instruction to students and teachers, the technology provided by the Spicy School District (SSD) will remain underutilized. Neither students nor teachers will know how to use it, but the students have the most to lose as a result.

Organizational Context

The purpose of this section is to provide a detailed description of the organization and context for the study. Included are descriptions of SHS's designations, use of technology, and professional development (PD). This section provides reasoning for the development of the SHS Tech PD.

Sol High School (SHS) is a Title I high school located in the southwestern region of the United States. SHS is a Title I school due to the level of poverty experienced in the area. Fortunately, the Spicy School District (SSD) has provided support such as computers for every student and programs designed to assist families living in poverty.

SHS is an Advancement Via Individual Determination (AVID) National Demonstration School and an AVID Schoolwide Site of Distinction. AVID was first implemented at the school over a decade ago as a means to ensure that the high population of students whose families never attended college would receive the rigorous education required to get into college and succeed once admitted (AVID, 2018). The demographics include over a 90% Hispanic population and an almost even male to female student ratio (2018 State Public Education Department Website).

During the last state school grading cycle in 2018, the state graded Sol High School (SHS) a "C" school as assessed by the state public education department. Though it is difficult to understand the state grading criteria, the state links the criteria to PARCC test scores. Schools that receive "A" grades have the majority of their students testing proficient or higher on the PARCC. Those with "F" grades have few to no students scoring proficient; "C" schools are in the middle. Before 2008, SHS was a "D" school. The main factor affecting the evaluation of the school was the lack of student proficiency on the annual PARCC state standardized test (2018 State Public Education Department Website), which is administered every spring on computers.

Sol High School (SHS) has been a 1:1 technology school since the 2015-2016 school year. Every student at the school is issued a Chromebook, and technical support is available. Therefore, the students use their Chromebooks most of the time. The "Digital Learning Plan" has been in place in the district since 2016 to ensure equity in the distribution of technology (2018 School District Website).

Technology and PD at SHS

Despite the implementation of the 1:1 technology environment at the school, the district provides limited professional development (PD) for teachers regarding the utilization of technology in the classroom. PD provided to teachers prior to 2018 made assumptions about teachers' knowledge of technology and PD needs without asking teachers about their PD needs or aptitude for implementing technology in the classroom. All of the district PD was delivered using a presentation or lecture format. As a result, some teachers at the school expressed disdain toward PD as a whole. Only teachers with a strong technology background or a positive view of technology used it in their classrooms regularly. It became clear that addressing PD at school sites and teachers' views of technology must occur before students can truly benefit from being

issued a Chromebook or improve on the digital PARCC assessments (2018 School Site Document).

PD design. School administrators met regularly with teacher leaders to discuss low PARCC scores, the implementation of professional development (PD) at the school, and the use of technology schoolwide during the 2018-2019 school year. During the summer of 2019, the principal at Sol High School (SHS) and district officials received permission requests to conduct the study. After receiving permission from both entities, Capella University provided IRB permission to begin the study. Once all permissions were received, the study began in October of 2019.

At the start of the study, teachers received a request to volunteer their time to form a Professional Development Design Team (PDDT). The team's purpose was to develop professional development (PD) designed to address teachers' PD needs using technology. After forming a survey with the PDDT (Survey 1), all of the staff were asked to complete it and participate in the SHS Tech PD study. The Professional Development Design Team (PDDT) helped to develop the PD along with Survey 2 (Appendix C) based on results from Survey 1 (Appendix A). A schoolwide email asked only those who participated in the SHS Tech PD Padlet (2019) modules (Appendix B) to complete Survey 2.

Intervention

The SHS Tech PD intervention includes the creation of a Professional Development Design Team (PDDT), Survey 1, five Padlet (2019) Modules, and Survey 2. The study was supposed to be a nine week-long action research study using a hybrid professional development model. However, the study takes place in four weeks remotely due to time limitations and lack of participation at in-person meetings.

It began with an email sent to all staff asking them to participate in the Professional Development Design Team (PDDT) and the upcoming SHS Tech PD study by contributing to the two PDDT planning Padlets (2019), completing the five professional development (PD) modules, and Surveys 1 and 2. Planned as a hybrid model for PD delivered through the Google Classroom (Google Suite, 2019) learning management system (LMS) and face-to-face in a classroom, the study occurred with some limitations. No participants came to any of the physical, face-to-face meetings in the classroom, and some participants found accessing the LMS to be difficult. Therefore, members of the PDDT decided that it would be best to provide Padlet (2019) modules and survey links directly to participants using district email, thus foregoing the need for the LMS. Due to the lack of participation at meetings, it became a remote PD study instead of a hybrid study. The purpose of the SHS Tech PD was to positively transform teacher perspectives of PD and increase their use of technology. The purpose of the PDDT was to review and edit surveys and implement SHS Tech PD as a team, so changes could be made to the PD as deemed necessary by the PDDT. After the completion of the SHS Tech PD, the implications of the study were delivered to administrators to guide future PD at Sol High School (SHS).

Description of the Intervention

The action plan intervention used with teachers includes two surveys and a series of five digital hybrid professional development (PD) modules referred to as the SHS Tech PD: content-specific PD, new technology, classroom management, strategies for English language learners (ELLs), and best practices. The implementation of the surveys and modules occurred over four weeks. The design of the PD meets the following objectives:

1.) Improve teacher perceptions of technology integration in all content areas at the school site using the TPACK framework: technology knowledge, pedagogical knowledge, and content knowledge (Mourlam, 2017).

2.) Increase the use of available technology in classrooms at all levels of SAMR: substitution, augmentation, modification, and redefinition (Puentedura, n.d.)

3.) Introduce new apps, programs, and ways technology may be incorporated in classrooms to teachers through digital collaboration (Cordingley, 2015).

Influenced by current studies focused on improving technology in education as well as learning theories from the past, the design of each element of the professional development (PD) includes well-researched methods primarily rooted in adult learning theory (Knowles, 2017), constructivist theory (Bruner, 1966), and Mezirow's transformative learning (Kitchenham, 2008). First and foremost, the PD study is an action research study designed to explore, change, and evaluate the use of technology in education at the school. Action research is described by McAteer (2003) as, "it both explores and theories practice, changes, evaluates and develops practice, provides a platform from which to critique ideology, and in doing so incorporates a moral as well as an epistemological dimension to the research" (p.16). The PD executes action research through surveys designed to understand staff needs while questioning the need for improvement in education through technology.

The initial professional development (PD) survey (Survey 1) included designs to understand better staff perceptions regarding PD, technology, their wants and needs, and current usage of technology in their classrooms. It also asked the staff how to improve instruction, PD, and classroom settings. The survey was a driving force for designing the rest of the PD. Teachers

who participated in the initial survey are professionals who are shaping the teaching and learning at the school.

Steyh (2017) conducted a qualitative study on transformative learning occurring in teacher professional learning. During the study, Steyh (2017) discovered that the teacher participants appreciated professional learning more when treated as professionals who promote the knowledge and skills among other teachers at the school. Therefore, Survey 1 (Appendix A) also cultivated a culture of respect for participants. By asking teachers to help design the professional development (PD), teachers know they are valued, and their needs matter. Survey 1 served as a way to discover what each teacher wants to contribute to PD as well as learn from it. SHS Tech PD modules included collaborative elements designed for teachers to share ideas digitally without time limitations. The results from Survey 1 determined the five PD modules.

The plan for the PD was to administer it in a hybrid format through the Google Classroom (Google Suite, 2019) learning management system (LMS) and five bi-monthly staff meetings occurring on Wednesdays in the school cafetorium from 4:00 - 5:00 pm. Due to time restraints placed on the research, the staff meetings were offered daily in a classroom during lunch and after school from 4:00 - 5:00 pm. Participating teachers had a choice between completing the professional development (PD) with the support of school leadership, the digital learning coach, and administrative personnel at the meetings or remotely from wherever they please. All participants chose to participate remotely.

Participant choice and contributions are essential parts of adult learning theory; and, therefore, are important parts of professional development (PD) (Knowles, Holton, & Swanson, 2012). The choice of in-person or digital PD is one of many choices given to teachers throughout

the PD modules. Asking participants to contribute to collaborative Padlet (2019) pages for staff members allows them to support one another as they use unfamiliar technology in new lessons.

Padlet (2019) is a program that allows communication to happen in real-time on a shared web page through a variety of post types that may be anonymous or otherwise. Teachers can create Padlet (2019) pages in which other teachers or students may freely post content to share. Most of the SHS Tech PD required teachers to share their technology-integrated learning and reflect on learning experiences incorporating technology in their classrooms via Padlet (2019).

The initial email solicits voluntary participation in the SHS Tech PD, and it mentions incentives for teachers who decide to participate in the PD. Ryan and Deci (2000) determined that intrinsic incentives are more effective than extrinsic incentives. The most effective intrinsic incentives include teaching that supports one's feelings of competence, autonomy, and relatedness (Ryan & Deci, 2000). The design of the PD itself is structured with such elements to incentivize teacher participants intrinsically. However, the added Wal-Mart Gift Card for participants, cleared by the IRB, is an external motivator designed to attract teacher participants to try the PD. Once externally motivated, they may become intrinsically motivated to participate. Participants who participated in all PD modules received a Wal-Mart Gift Card. The email with Survey 1 included and an announcement about the gift cards. Designed to motivate teacher participants, this element of the study shows teachers that their time is valuable.

Part of Survey 1 (Appendix A) included a teacher agreement clause regarding participation in the SHS Tech PD action research study. In addition to the teacher agreement clause, Survey 1 included both Likert Scale (QuestionPro Survey Software, 2019) questions and open response questions. The mixed-methods data collected from Survey 1 was analyzed using

Quirkos (2019) qualitative data coding software and a descriptive analysis with measures of central tendency (University of Minnesota, 2019) via Google Sheets (Google Suite, 2019).

Using pseudonyms for participants helped to maintain privacy whenever referring to participants in materials outside of the interactive applications, Google Classroom (2019) and Padlet (2019). Since participant collaboration is a part of professional development (PD), the study did not maintain privacy amongst participants during collaborative modules. However, all information presented outside of the collaborative elements disguises the identities of all participants. Any information provided during this study remains strictly confidential. The emails informed all participants about the purpose of the study, the levels of privacy maintained, and their right to access the study within the time frame granted by district-level administrators and school-site administrators. The implications of the study will be used by the administration at Sol High School (SHS) to guide future implementation of PD.

The rationale for the intervention. The design of SHS Tech PD is to positively transform teachers' perspectives of PD and increase their use of technology. If teachers use technology with their students that incorporates the TPACK framework (Mourlam, 2017) and all levels of the SAMR model (Puentedura, n.d.), their students will be better prepared to take digital tests, to think critically, and to achieve success in a world where 21st-century skills are needed. Audio recordings do not exist due to a lack of participation in physical face-to-face meetings. Similarly, interviews or observations do not exist because teachers did not attend scheduled lunch or after school classroom meetings.

Furthermore, the intervention could not occur over a period of months. Due to delayed permissions and time restrictions, the study took place in a little over a month. The impact of the

time change resulted in teachers having more demands on their time than initially intended, which may have resulted in less participation in the study.

Purpose Statement

The purpose of the study was to improve professional development (PD) at Sol High School by positively transforming teacher perspectives of PD and increasing teacher use of technology. The study impacted those who participated in it, and it will continue to impact future PD at SHS. The expected outcomes included improving teacher perceptions of PD by increasing technology integration in all content areas at the school using the TPACK framework: technology knowledge, pedagogical knowledge, and content knowledge (Mourlam, 2017), increasing the use of available technology in classrooms at all levels of SAMR: substitution, augmentation, modification, and redefinition (Puentedura, n.d.), and introducing new applications, programs, and ways technology may be incorporated in classrooms to teachers through digital collaboration (Cordingley, 2015).

Review of the Literature

This section includes the integration of three literature reviews to create the SHS Tech PD study and a discussion of how the study relates to systems theory and change theory. The first section analyzes prior technology integration in public schools and the use of professional development to improve technology integration as a means of understanding technology integration and professional development (PD). The second analyzes how one uses action research to address technology integration and PD in educational settings. The third analyzes the theories behind implementing technology PD in education with an emphasis on transformative learning theory, the primary influence in the construction of the SHS Tech PD. Finally, the discussion of systems theory and change theory analyzes the structures and purpose of the study.

Technology Integration in Public Schools

Some commonalities that need examining when integrating technology in a public-school setting that already has all needed technology equipment are staff perspectives, professional development (PD), and classroom management. After reviewing six different scholarly sources about technology integration, these common aspects came to light as the primary aide or hindrance to technology integration in public schools. Almost all the schools mentioned in the articles reviewed addressed the first issue of acquiring computers, sustaining Internet usage, and resolving hardware concerns. Therefore, equipment, the most significant aspect of technology integration, is not included. Instead, this review examines the aspects needed to integrate technology in classrooms once the technology is present entirely, a maintenance plan is in place, and the school is ready to utilize the technology. Providing technology PD was mentioned in every article reviewed on technology integration, so PD is considered a significant aspect of technology integration. The implications from the literature reviewed incorporated in the SHS Tech PD included flexible and comfortable PD using digital means, addressing staff perspective of technology, and classroom management.

Zuniga (2010) conducted a qualitative research study in Texas public schools used to gauge teachers' perspectives on the use of computers in their classrooms. The research sought to understand whether technology integration was being utilized or hindered by teachers' interests in technology integration. Zuniga (2010) found that most teachers do not believe that the level of technology integration in their classrooms meets modern educational standards. Even though most of the teachers surveyed and interviewed in the study believe that technology integration is essential, that it is improving in their district, and that they benefit from technology-oriented training provided by their district, they also felt that their technology integration is not excellent

due to the lack of technology professional development, lack of time (mostly due to testing), fear of technology, and equipping large or rural schools. Many of the findings shared in Zuniga's (2010) study were also in other articles reviewed about technology integration.

The time and testing issues are ones that exist in most school districts throughout the United States. Time allotted for transitioning into being a technology-integrated school instead of a school focused solely on high stakes testing is an issue that needs further examination and evaluation. High stakes testing is a much deeper issue than just the effect it has on technology integration. This issue is similar to the one at Sol High School (SHS). However, most of the schools examined in the literature reviewed are ready to make time for technology integration regardless of testing mandates.

Fear of technology, being the most prominent to affect teachers' perspectives, is a significant cause for the lack of technology integration (King, 2012). If a teacher does not use technology to improve their education and teaching practices, they cannot expect students to use technology to improve their learning. All the articles about technology integration reviewed touched on teachers' perspectives and fear of technology. Additionally, some focused on other school staff members' perspectives on, and assistance in, implementing technology integration. Therefore, staff perspectives are the first aspect that needs examining when implementing technology integration in a public-school setting.

Like Zuniga (2010), Tallvid, Lundin, Svensson, and Lindström (2015) conducted a study involving teacher perspectives on technology integration in the classroom. However, their study took place in Swedish public schools, and it examines the existence of a correlation between increased sanctioned usage and unsanctioned usage of laptops in 1:1 secondary classrooms. Unlike Zuniga (2010), the staff expressed concern over increasing technology integration in the

classroom. The teachers expressed the belief that increased sanctioned time on computers equipped with the Internet: searching for information, utilizing educational audio and video components, and creating presentations, would lead to increased unsanctioned technological activities: surfing the web, playing video games, downloading unsanctioned material, and chatting online.

It is important to note that the study conducted by Tallvid, Lundin, Svensson, and Lindström (2015) examined schools with a "no filter" Internet policy. Students were able to access everything the Internet has to offer. Regular classroom discussions about appropriate and inappropriate computer usage occurred as a deterrent for unsanctioned usage. The qualitative study regarding computer usage examined student and teacher surveys, recorded interviews, and recorded classroom observations. The study did not include any quantitative data they may have accessed through Internet and computer tracking components to examine what students were using computers for and how often they were using them for those purposes. All the information collected was based on teachers' and students' volunteering responses and classroom observations recorded by the researchers.

Nevertheless, Tallvid, Lundin, Svensson, and Lindström (2015) discovered that there was not a correlation between increased sanctioned usage of computers and unsanctioned usage. It was quite the opposite. During the three-year study, they found that sanctioned computer usage increased, and unsanctioned computer usage decreased. This study is vital in understanding that it is perceived fears teachers have about how students will utilize technology that often hinders technology integration. Their study is a step forward in proving that these fears are unwarranted; students are off-task in a classroom that does not utilize technology to the same extent, or even less so, than classrooms that do utilize technology.

Alternatively, Kuzo (2015) focuses on how librarians in the Quakertown Community School District (QCSD) in Pennsylvania assisted in successfully ushering in technology integration in their schools. Their high school librarian received new technology professional development to train their teachers, address their fears, and assist with obstacles in integrating technology in their classrooms. Despite most studies focusing on the perspectives of teachers, utilizing and transforming all school staff perspectives toward technology integration is imperative in successful implementation.

For a school to be ready for full technology integration, they must examine the aspect of staff perspectives. If the school staff is fearful of technology, or fearful that students may behave mischievously utilizing technology in the classroom, those fears must be dispelled before successful technology integration may occur. Additionally, many teachers' concerns and fears exist due to their lack of technical know-how. Therefore, the study provides technology professional development in a way where staff members feel supported and comfortable utilizing technology in their personal and professional endeavors.

Level appropriate technology training provided for all staff members is crucial in successful technology integration at any school. As mentioned previously, Zuniga's (2010) study shows that teachers believe they benefit from district technology trainings. It also mentions that teachers perceive not having enough professional development (PD) as a hindrance to integrating technology in their classrooms. Kuzo's (2015) article claims that one of the reasons they were able to integrate technology in the QCSD schools successfully is due to the PD training they provide their librarians, who, in turn, provided PD and support to their school site staff.

Keengwe, Schnellert, and Mills (2011) conducted a study on how 1:1 laptop integration in classrooms impacts students' learning. Their study primarily consisted of surveying students'

and teachers' perceptions on the impact utilizing technology has on students' participation in class, preparation for class, attendance, behavior, motivation, engagement and interest, ability to work independently, ability to work in groups, ability to retain content material, quality of work, interactions with teachers, and interactions with students. They discovered that 1:1 technology integration increased student engagement and learning, motivation, and the ability to work individually. It also increased students' and teachers' overall usage of technology at home and in classrooms, and the study showed that teachers perceive utilizing 1:1 computing as an improvement to all students' learning experiences. The study did not go into any depth on any negative perceptions students and teachers may have had about the 1:1 computing model.

Unlike the study conducted by Tallvid, Lundin, Svensson, and Lindström (2015), where the belief that teachers discuss sanctioned and unsanctioned computer usage as the sole means of deterring unwanted utilization of computers by students, Keengwe, Schnellert, and Mills (2011) believed that schools must develop robust policies and practices to reduce unwanted computer usage in classrooms. They also believed that focusing on possible learning experiences as opposed to adverse outcomes of 1:1 computing is imperative in the success of technology integration. Most notably, they recognize that there is a need for school faculty to develop computer practices to enhance student learning, i.e., professional development (PD). Keengwe, Schnellert, and Mills (2011) believed that PD needs to incorporate student collaboration to understand classroom technology applications beyond basic Internet browsing and word-processing. They found that the students are capable of training teachers in utilizing technology in more ways than the teachers implemented.

Schools seeking technology integration must provide their staff with professional development (PD). Staff members must be knowledgeable about different aspects of the

technology they are utilizing. Formal PD, regular school site trainings and assistance, and the integration of student knowledge may allow school sites to address what is needed for technology integration adequately. Solely implementing formal technology trainings for teachers may not be as beneficial as having school site members continue to assist with PD and technical support. Additionally, soliciting and incorporating student technology knowledge as a part of PD may strengthen students' utilization of technology and improve their academic success.

In addition to technology professional development (PD) and expunging teachers' fears of integrating technology, PD regarding classroom management must occur too. Since the appearance and nature of a classroom with 1:1 computing is very different from a classroom that has not integrated technology, the way schools implement and handle classroom management must change to meet the needs of a technology-integrated classroom. Classroom management looks different in a digital setting.

Dunleavy, Dextert, and Heinecket (2007) conducted a study on the added value 1:1 laptop computing brings to teaching and learning in urban middle schools located in the southeastern region of the U.S. Some of the benefits they discovered through observations, interviews, and web posts from middle school students, teachers, and other school staff members include conducting online research and utilizing online tools, differentiating learning so students may receive additional practice in needed areas, and utilizing online environments. Online environments include audio, video, and communication capabilities.

The challenges Dunleavy, Dextert, and Heinecket (2007) primarily discovered fell into two categories, classroom management and hardware issues. Since hardware issues fall under the need for working equipment, it is an aspect of technology integration that will always be a constant. Without the technology to integrate, there may be no technology integration. Once

technology equipment is no longer an issue, one must examine the challenge of classroom management in a technology-integrated classroom.

Effective classroom management in a 1:1 computing environment will be different than classroom management in a traditional classroom. Dunleavy, Dextert, and Heinecket (2007) discovered that teachers felt classroom management became more problematic in the 1:1 computing environment. They found the computers to be competitive with their instruction and powerful distractions to learning. They observed teachers asking students to close their laptops when not using them and redirecting students to navigate to the appropriate web page. The teachers' perceptions in this study seem to mirror those in the study by Tallvid, Lundin, Svensson, and Lindström (2015); in both, teachers believe that students are utilizing computers for unsanctioned usage more often than they are utilizing them for sanctioned usage. While classroom management in classrooms that have not integrated technology focus on keeping students engaged in lectures, activities, and book-oriented work, by decreasing distractions or overt off-task behaviors, classroom management in a 1:1 computing environment has subtler classroom management issues, i.e., ensuring students are not utilizing technology in unsanctioned ways.

Schools that wish to integrate technology successfully need to have classroom management training, plans, and regular conversations. The aspect of developing a classroom management system that works with technology, especially 1:1 computing, instead of separate from it, will allow students and teachers to embrace the new means with which learning is occurring entirely. Teachers must also be mindful that they may perceive an increase in students' unsanctioned usage of laptops. Still, in actuality, students may be utilizing computers for

sanctioned activities much more often than they are utilizing them for unsanctioned activities (Tallvid, Lundin, Svensson, & Lindström, 2015).

Technology integration is a possibility for all schools that are willing to pay for the necessary equipment and equipment maintenance costs like the Spicy School District (SSD) does for Sol High School (SHS). However, for schools to successfully integrate technology into classrooms, they must examine school sites' staff perceptions, the incorporation of professional development, and their implementation of effective classroom management strategies designed for a 1:1 computing environment. The design of the SHS Tech PD respectfully provides professional development (PD) to teachers in a flexible manner while providing a space for staff to express their views. It is not surprising that the staff chose classroom management as an area of focus for the SHS Tech PD since incorporating technology into schools brings up management concerns for teachers.

Action research. SHS Tech PD is an action research study designed to improve professional development (PD) at Sol High School by transforming teacher perspectives regarding their use of technology. Action research consists of four stages: planning, acting, developing, and reflecting. Its design helps to solve a problem or make an improvement for a specific demographic (Merlter, 2014).

Five articles about action research conducted to improve professional development (PD) related to technology were analyzed in the following literature review to support the action research structure of the SHS Tech PD study. Four of the five articles are by action researchers pursuing doctorates in education. In all four of the studies, the researchers' objectives were to improve the use of technology at one or more school sites. The one article not written by a researcher in pursuit of a doctorate examined teacher beliefs regarding technology.

Ottenbreit-Leftwich, Galazewski, Newby, and Ertmer (2010) examine the value eight award-winning middle and high school teachers place on using technology in their classrooms. Conducting action research as a two-phase multiple case study design led to the collection of qualitative data from eight case studies. The study showed that teachers who value technology use it more often in their classrooms than those who do not. It also showed that teachers need professional development that directly supports teachers' needs and technology in the classroom. Since SHS Tech PD aims to develop professional development (PD) to support teachers and technology, its design supports the implications of this study by supporting teachers' needs and technology in the classroom.

Another action research study by Tyner (2018) examines how the implementation of technology professional development (PD) changes teachers' perceptions and attitudes regarding high-level technology utilization in classrooms at the researchers' school. The research showed that increased technology PD leads to an increase in high-level technology utilization. Tyner (2018) used a mixed-methods descriptive design to collect and analyze data from teachers. Tyner (2018) uses surveys and interviews to collect data and descriptive statistics to analyze the data. Similarly, descriptive statistics analyze the survey data and the professional development participation data used in the SHS Tech PD.

Bettis (2015) used action research to examine the effects of professional development (PD) offered to fourteen K-5 teachers using technology to support their classroom and integrating technology into their classroom instruction. Bettis (2015) conducted a mixed-methods study using surveys, interviews, and journal entries. The study found that teachers increased their use of technology in their classrooms after participating in the PD. Similarly, one

goal of the SHS Tech PD is to increase teachers' use of technology by using technology to participate in the SHS Tech PD.

Turner (2019) examined the effect of technology-specific professional development (PD) on teachers' beliefs, attitudes, and confidence regarding technology integration in their classrooms using a mixed methods action research study. In two years, implementing the design included using Google surveys, exit tickets following PDs, and hand-delivered questionnaires.

Turner (2019) found that the technology-specific PD improved teachers' technology proficiency and that teachers would use more technology in their classrooms if they had a more flexible curriculum. Though the SHS Tech PD did not consist of the face-to-face PD planned nor questionnaire delivery, the Google surveys are similar to those used in the study, including school email as the primary form for delivery. Additionally, one of the objectives for using a remote model for conducting the SHS Tech PD is to improve the flexibility of PD in the hopes that more teachers engage in meaningful participation.

Bond's (2015) study examines technology integration in the classrooms of private school teachers PreK3 through 12th grade. It is a mixed-methods study. The study includes reflections and a technology integration matrix used to collect data during five professional development (PD) sessions regarding technology integration in curriculums. A school email solicited 115 possible participants, of whom 36 became the study participants that make up the convenient sample. In the end, the researcher found that those who participated in the five PD sessions improved the level of technology integration in their classrooms. In order to acquire participants for SHS Tech PD, a similar school email soliciting 100 possible teacher participants was the method for taking a convenient sample.

The SHS Tech PD study employed action research to influence a positive change in the use of technology at Sol High School (SHS). Action research is different from other research methods because the researcher is part of the process, and the research solves a problem or produces insight. Just as all of the action researchers mentioned in this section sought to improve technology integration in education in one or more areas, the SHS Tech PD sought to improve technology integration in classrooms at SHS.

Transformative learning theory. The SHS Tech PD action research study includes aspects of adult learning theory (Knowles, 2017) and constructivist theory (Coupal, 2004); however, transformative learning theory (Steyn, 2017), which incorporates both adult learning theory and constructivist theory, is at the heart of the study. Transformative learning theory fosters the change of fixed mindsets with thinking rooted in assumptions and expectations by acquiring change through open, reflective, and inclusive processes designed with methods likely to generate beliefs and opinions geared toward justified actions (Mezirow, 2003). The SHS Tech PD's digital setting fosters flexible inclusivity with shared reflections in an open environment.

It provides professional development (PD) teachers find valuable while encouraging teachers to improve their views about technology integration in education. Since teachers at Sol High School (SHS) hold negative points of view or assumptions about technology (2018 School Site Document), transformative learning theory helps teachers identify and analyze their beliefs about PD and technology. Through the transformative learning process, teachers will question their mindsets about PD and technology by engaging in a reflective process designed to improve PD and the use of technology in their classrooms.

The following literature review analyzes fourteen scholarly articles about transformative learning. Seven of the articles are empirical studies; four are mixed-methods studies, and three

are qualitative studies. All of the empirical studies provide evidence of transformative learning, improving teaching and learning in a variety of educational contexts. Three of the articles are reviews of literature examining transformative learning. The last two articles are neither empirical studies nor literature reviews. One article explores the epistemology of transformative theory, and one compares Confucianism humanism with transformative learning. Themes of using transformative learning to examine teacher beliefs and initiate changes that improve education are apparent in all the articles. Therefore, transformative learning theory is a well-researched theory that is suitable as the basis for this study. The goal of SHS Tech PD is to change teachers' beliefs and improve professional development (PD) at Sol High School (SHS).

The first article used to develop SHS Tech PD is King's (2002) mixed-methods study with 175 Mid- Atlantic region metro area teachers and teachers-in-training attending graduate school at private universities. The study included an assessment tool referred to as "The Learning Activities Survey" to collect quantitative data from graduate students near the end of their course. King's study collected qualitative data in the form of interviews, essays, and journal entries. It analyzed the qualitative data through the qualitative comparison method of determining and coding emergent themes.

The outcomes of King's (2002) study includes evidence of educators experiencing significant changes in their outlooks and practice due to professional development (PD) 89.1%, or 156/175, of teachers and teachers-in-training, had transformative experiences with as assessed by the survey. The qualitative data provided themes of transformative perspectives regarding their profession and technology in the role of the educator and their world view of education. The author claims that this study proves that a "radical alteration" of teaching perspectives is possible with transformative PD.

Since the objective for utilizing the SHS Tech PD was to change teacher perspectives and improve the incorporation of technology in instruction, this study is the most influential in the development of the action research study proposed for Sol High School (SHS). It includes a similar mixed-method design with similar data analysis methods. The objectives of the SHS Tech PD are similar to King's (2002) professional development (PD). However, King's (2002) PD does not only study the transformation of educators using technology; it also studies the transformation of teacher perspectives regarding PD.

Johnson and Fargo (2010) also conducted a mixed-methods study about the use of transformative professional development (TPD) with a teacher population. Johnson and Fargo asked middle school science teachers from four schools in the U.S. to participate in the study. Science teachers at two of the schools participated in TPD over a period of two years. The other two schools were control schools, so those teachers did not participate in TPD. The method of qualitative data collection was random, unannounced teacher observations, teacher interviews, and teacher engagement in the TPD. The form of quantitative data was student test scores from the annual State Criterion-Referenced Test. Results from the study demonstrated that teacher participation in TPD leads to changes in instructional practices and improvement in study learning.

The aim of the SHS Tech PD study is similar to that of transformative professional development (TPD) to change instructional practices leading to improvements in teaching and learning. Though the TPD took place over a much more extended period of time than the SHS Tech PD, allowing for more forms of data collection, the SHS Tech PD utilizes the same methods of providing PD. Teachers engaged in a transformative process to construct meaningful activities for students.

Christie, Carey, Robertson, and Grainger's (2015) article is a culmination of three case studies using action research designed to improve adult educators and future educators' ability to teach students through understanding social structures and belief systems. This mixed-methods study was conducted in different locations at different times with different learners, all of which are women working toward an advanced degree at a university. Some attend a Swedish Engineering University while others attend an Australian Regional University. The research collected data in the form of surveys addressed controversial questions. The data obtained from the surveys were presented to the participants in a PowerPoint. Participants also engaged in workshops surrounding questions brought up in the survey and education. Another article followed as a more in-depth analysis of the workshops.

The study introduced adult learners to new perspectives about teaching pedagogy and the role of the instructor in classroom settings. Teachers experienced disorienting dilemmas as carefully designed exercises with an effect on student learning. The design questioned world views regarding teaching, and such questions led to self-examination. Changes in perspective occurred because of engaging in discourse, not from being forced to change in a top-down manner. The researchers concluded, "the exercise helped students to acknowledge that no matter how objective they endeavor to be in the classroom, differences in values exist, and those differences, if they come to the surface, can help or hinder learning" (Christie, Carey, Robertson, & Grainger, 2015, p.21).

The SHS Tech PD aimed to provide similar disorienting dilemmas as part of the surveys and modules teacher participants engage in throughout the study. Except, the disorienting dilemma initiated during Survey 1 (Appendix A) does not include as many broad topics as those

in the prior study. Instead, the SHS Tech PD asked teachers to examine their beliefs regarding technology and best practices in education.

Stansberry and Kymes (2007) conducted a study at Oklahoma State University with students in the Technology, Learning, and Leadership Master's Degree Program. Over the period of four semesters, 78 students created teaching with technology e-portfolios. One hundred sixty students completed pre and post surveys. The surveys were analyzed statistically using the SPSS quantitative statistical analysis software package. Final reflections completed by 78 students were analyzed qualitatively with Nvivo qualitative software. The surveys asked questions about teachers' likeliness to use technology in their classrooms with students after creating e-portfolios.

Stansberry and Kymes (2007) determined that teacher participants are likely to use technology in their classrooms with their students. Still, it is unlikely that they will use the technology to create web-based e-portfolios. The transformative process executed during this study included teachers questioning their values surrounding teaching with technology and the use of portfolios as an assessment tool. The Nvivo qualitative software used in the Stansberry and Kymes (2007) mixed-methods study is similar to the Quirkos (2019) software used to code and analyze qualitative data for the SHS Tech PD. Both mixed-methods studies make use of educator surveys and reflections in their data collection.

Additionally, both studies use transformative methods as a design to examine teacher perspectives regarding technology in education. Though Stansberry's and Kymes's (2007) study emphasized the use of e-portfolios, the teachers at Sol High School (SHS) determined the topics for the modules addressed in the SHS Tech PD study. SHS Tech PD did not include a portfolio module because teachers did not express a need for it during Survey 1 (Appendix A).

Steyn's (2017) qualitative case study recorded staff members' professional learning experiences at a South African primary school. Steyn's (2017) study examines math teachers' approach to utilizing the transformative learning process in knowledge acquisition and skills development in mathematics. The math department at the school engaged in a socially constructed professional learning team where they expressed their perceptions of learning experiences. Steyn collected data through open-ended questionnaires and principal interviews.

In Steyn's (2017) study, transformative learning in the team occurred through conversations about the math curriculum and instructional experiences. The SHS Tech PD study initiated similar conversations through modules focused on what teachers specifically wish to get out of PD instead of from subject-based teams. The module structure was not subject-based, though teachers that teach the same subject may have participated in the same module. Sol High School (SHS) requires subject-aligned meetings to occur weekly, but teachers rarely interact with teachers outside of their subject area. The SHS Tech PD modules provided an opportunity for teachers to examine their teaching perspectives with teachers they may not yet have worked with prior.

Another qualitative case study in South Africa by Vaughn (2016) focuses on transformative learning in oppressive contexts involving trauma and fear. It collected and analyzed in-depth interviews, observations, and more than 100 project documents with attention focused on the life experiences of educators. In which, the participants chose their pseudonyms with which to share their experiences and perspectives. The data provided from the study supports addressing the needs of educators and supporting their ongoing work in healing and preparation to be emotionally available for their students. It also supports the need for educators

to become aware of their biases, frames of references, and perspectives based on their own experiences.

Sensitivity to student trauma was a focus of Sol High School (SHS) professional development (PD) in the past. However, teacher experiences and needs have not been a focus of PD. The SHS Tech PD includes transformative pieces that target the needs of teachers before addressing the needs of students. The shift in focusing on teacher needs prior to student needs will allow the teachers to feel supported before they must support their students.

Furthermore, teachers could choose to provide a pseudonym for themselves before being assigned one in the SHS Tech PD, as was done in this study to honor the privacy of the participants. By asking for a designation of their choosing before assigning one to those who opt-out of choosing one for themselves, participants are able to know how they have contributed to the study without revealing their identity to anyone else. Most SHS Tech PD participants chose pseudonyms for themselves. However, during the data analysis process, some were assigned. The SHS Tech PD study refers to anonymous participants as such; they did not receive separate pseudonyms.

Zanchetta et al. (2017) conducted a qualitative study with undergraduates pursuing a degree in nursing. During the study, mentors, consisting of three nursing faculty members at Ryerson University ranging in age from 45 to 57, partnered with eighteen mentees, four male and fourteen female nursing students ranging in age from 25 to 32. Mentors worked with mentees on scholarly writing for publication related to the field of nursing.

The study culminated with the analysis of reflective narratives through a qualitative coding process. In which, both parties found the process mutually satisfying. They stated that the process was reciprocal, inclusive, respectful, supportive, and emancipatory. The three major

themes that emerged in the reflections are liberating self-transformation, reciprocal transformation, and social transformation. All participants, both mentors and mentees, are co-authors on the article publishing the study.

The SHS Tech PD aimed to improve professional development (PD) at Sol High School by transforming teacher perspectives regarding their use of technology. The intent of the PD design was for teachers to find it reciprocal, inclusive, respectful, supportive, and emancipatory. Therefore, some of the planned modules included a partnering component like the mentor-mentee one in the aforementioned study, in an effort to provide support to those who need and want additional support. However, SHS Tech PD participants did not post a need for a mentor or a willingness to find a mentee in module sections designed for such input.

Additionally, Zanchetta et al.'s (2017) study includes older mentors than mentees. An anticipated obstacle to overcome in the SHS Tech PD is one of having influential young teachers who may need to provide mentor-like support for older teachers. Despite the older teachers having more years of experience, many of the younger teachers are more adaptable at using technology in their teaching. Cultivating relationships of mutual respect like those found in this study may be challenging. Yet, it is well worth aiming for the cultivation of such relationships. Unfortunately, due to the lack of physical participation and mentor-mentee requests during the SHS Tech PD study, fostering such relationships did not directly occur.

Kitchenham's (2008) literature review examined the history of Mezirow's transformative learning theory. Themes of critical reflection, points-of-view or perspective, and types of learning emerged in the articles reviewed. Ultimately, the author concluded that adult education has evolved due to the transformative learning theory. It has been studied and used in studies for

the past three decades, which has led to critiques and a definitive framework for transformative learning, including the following ten phases listed by Kitchenham (2008):

- A disorienting dilemma
- A self-examination that evokes feelings about one's perceptions
- A critical assessment of assumptions
- Recognition that one needs to engage in the process of transformation
- Exploration of options for new roles, relationships, and actions
- Planning a course of action
- Acquisition of knowledge and skills for implementing a plan of action
- Provisional trying of new roles
- The building of competence and self-confidence in new roles and relationships
- Integration of new competence and perspectives into one's life

SHS Tech PD's design guides teachers through the ten steps of transformational learning while requiring teachers to take ownership of their learning and personal growth. Reviewing the evolution of transformational learning helped guide the process of evolving SHS Tech PD. The surveys and modules embedded the ten phases and avoided the pitfalls identified in the implementation of prior models.

Callja (2014) wrote an article about the evolution of Mezirow's transformative learning theory with an emphasis on three major philosophical influences and the effect transformative learning had on nine educators in a confessional school on the Island of Malta. The article discusses the influences of Thomas Khun's philosophical conception of paradigm, Freire's concept of conscientization and consciousness growth, and Habermas' domains of learning and the discussion of language as communicative action on transformative learning. Callja (2014)

emphasizes the process of transformation as a mutually interdependent process utilizing the ten different phases of transformative learning mentioned prior. Callja (2014) concluded that "adult learning goes beyond the acquisition of knowledge; it transforms action and in turn transforms the community in which learning takes place" (p.133).

Transformation of PD, teaching styles, and classroom learning are all outcomes of the SHS Tech PD. By engaging in the 10 phases of transformative learning, the Sol High School (SHS) community may have changed their views regarding the use of technology in teaching and learning similarly to the nine teachers on the Island of Malta who engaged in the process successfully. At the very least, the SHS community participated in a mutually interdependent process.

Santalucia's and Johnson's (2010) transformative learning article does not focus on teachers. Instead, it reviews transformative learning theory in relation to the field of occupational theory. The article's focus is to educate occupational therapy students about transformational learning and adult education.

Though the teachers at Sol High School (SHS) are not occupational therapists, the article focuses on one's readiness to engage in transformative learning experiences, and it applies to any adult learning situation. The article reminds one that transformation cannot be taught or delivered in professional development (PD), but PD may foster a transformational experience if the participants are open to engaging in a transformation. SHS Tech PD provided such an opportunity for teachers at SHS. However, the limited amount of time and lack of face-to-face engagement inhibited the potential for fostering similar experiences.

Mezirow's (2003) study examines the epistemology of transformative learning regarding its relevance to adult education and the nature of reasoning. It addresses the incorporation of

instrumental learning and communicative learning in relation to transformative learning. Instrumental learning involves controlling an environment in such a way that claims are like facts; they are as they are supposed to be. One may get to them through deductive reasoning. Communicative learning identifies the way in which we communicate. It involves being able to understand the meaning and nuances of what another expresses. One must be able to make inferences utilizing abductive reasoning to understand what another is communicating fully. Both types of learning are essential parts of transformative learning. However, communicative learning is imperative in the reflective process required to help one develop the skills, insights, and dispositions required to improve one's thinking.

Introducing instrumental learning and communicative learning during the transformative learning process as part of the SHS Tech PD may have helped teachers identify ways to engage in and improve their communicative learning capabilities. Just by analyzing their learning, teachers engaged in the reflective process required to transform. Therefore, SHS Tech PD embedded these concepts in an effort to begin the transformative process by getting teachers to engage in reflective thinking.

Finally, Wang and King (2006) compare Confucianism humanism and Mezirow's theory of reflectivity within transformative learning. The article focuses on the nature of reflection in Confucian eastern philosophy and the western philosophy of transformative learning. Both involve a model of learning through a reflective process. Yet, the western idea of reflection involves a highly rational and behaviorist way of thinking. In contrast, the eastern idea of reflection evolved from spiritual traditions throughout history. Both are worth examining as one engages in reflective practices.

SHS Tech PD included reflective questions geared toward engaging teachers in a reflective process. The reflection process stems from western philosophical means and eastern philosophical means. By questioning how one reflects after introducing the teacher to both styles of reflection, a teacher may have a disorienting dilemma as an introspective realization of reflection that will lead to a transformation in thinking.

Systems theory and change theory. Systems theory is a theory that operates on a set of abstract assumptions and rules regarding how systems operate. Systems are organized wholes made up of components that are distinct in their interactions and exist for a substantial period. There are open systems that continuously exchange energy with their environment and closed systems which operate in isolation from their environment. Within each system structure, there is input, throughput, output, either negentropy or entropy, and feedback. Subsystems are smaller systems that may exist within a focal system, the system one is looking at, and suprasystems, or larger systems, may exist outside of where the focal system is situated (Potts & Hagan, 2000).

The SHS Tech PD study is the focal system in this paper. It is an open system that the outside school environment and teacher participants made exchanges with, causing the study to take shape and change. The school administrators and teacher participants provided input in planning and executing the study as they analyzed the need for change within the PD modules. The throughput occurred as cumulative information was shared amongst teachers in the modules, along with the results of the study. The output will occur when school administrators and district staff use the study to alter the professional development environment at Sol High School and the school district in which it is located. Feedback occurred in the form of teacher posts in the modules and surveys teachers completed. It is a nonentropic system because it requires participant and stakeholder energy to exist. It exists as a focal system within the suprasystem of

the school environment, and it includes teacher interactions that are functionally subsystems for analysis purposes.

Change theory is a theory around the acceptance and need for change. It emphasizes viewing change positively and confidently, even though change is often uncomfortable and challenging. Real change occurs when one passes through zones of uncertainty. It requires one to embrace the unknown in order to improve one's practice (Robinson, 1997).

With regard to teacher participants in the SHS Tech PD study, change theory manifests in their willingness to participate in a new and different kind of professional development (PD). By participating in the study, teacher participants were open to accepting the need for a change in the PD delivery method at Sol High School (SHS). All of them embraced the unknown as they read and posted material in the modules.

Conclusion. All of the articles included in the literature review had an impact on the SHS Tech PD study. The articles addressing technology integration in public schools informed the digital delivery of the study. Since teachers expressed the need for comfortable and flexible professional development (PD) that addresses perspectives of technology and classroom management, the study implemented digital delivery to provide support while allowing for flexible participation from wherever a participant might feel most comfortable.

The action research articles primarily informed the mixed methods design of the study, including the surveys and participation structures. The SHS Tech PD study is part of an action research plan: planning, acting, developing, and reflecting. The planning and developing stages occurred as the Professional Development Design Team (PDDT) participants reviewed and modified the surveys and the SHS Tech PD Padlet (2019) modules as needed, both prior to sending the surveys and throughout the implementation of the study. The acting stage occurred

as teachers participated in the SHS Tech PD. Survey 2 (Appendix C) included reflective questions designed for teachers to reflect on the process they participated in during the SHS Tech PD. Additional conversations with administrators and staff that will occur in the future as a result of this study will also be a part of the reflecting stage. Without information from the reviewed action researchers who have conducted studies on PD designed to improve technology integration using transformative learning theory, the SHS Tech PD would not exist. It is the culmination of such knowledge that allowed the formation of the study.

The transformative learning theory articles informed the interactive and reflective nature of the study and the need for teacher requests and surveys approved by the leadership team to form the basis of the professional development (PD). Its design enabled teachers to focus on examining their implementation of technology in their classrooms and their views regarding technology in different contexts. Transformative learning theory guided the SHS Tech PD because it combines adult learning (Knowles, 2017) and constructivist theory (Coupal, 2004).

The SHS Tech PD used Survey 1 (Appendix A) to invoke a disorienting dilemma and provide a self-examination, the first two steps in transformative learning. Other elements of transformative learning, i.e., assessment of assumptions, engaging in the process of transformation, and acquisition of knowledge and skills, were embedded in the conversation-style PD provided in chats on Padlet (2019) (Appendix B). Though the SHS Tech PD was designed for teachers to engage in face-to-face interviews and conversations to further guide each teacher's transformative learning journey, the lack of participation in face-to-face options only allowed for a remote exploration of transformative learning as a whole. Survey 2 (Appendix C) served as the final piece of transformative learning, an assessment of the integration of technology teachers engaged in after participating in SHS Tech PD.

Systems theory and change theory informed the analysis of the SHS Tech PD study as a system and the willingness of teacher participants to accept change by engaging in the study. By looking at the study as a system, one may gain an appreciation for the energy used to create and execute the study within the school or suprasystem. Teacher participants embraced change theory by engaging in a new and different professional development, the SHS Tech PD.

Action Research Methods

This section includes information about the study's participants and stakeholders. It outlines the initial design of the SHS Tech PD intervention implementation plan as well as expected outcomes. It identifies the action research questions, and there is an overview of the data sources, collection procedures, and data analyses. Finally, it examines limitations and ethical issues.

Participants and Stakeholders

The participants were all instructional staff members at Sol High School (SHS) who volunteered to participate in one or more aspects of the study. A school email invited all 100 instructional staff members to participate. Seven instructional staff members participated in the Professional Development Design Team (PDDT), 32 instructional staff members anonymously participated in Survey 1 (Appendix A), 18 instructional staff members participated in one or more professional development (PD) modules (Appendix B) (assuming three anonymous participants are different people), and 15 instructional staff members participated in Survey 2 (Appendix C) after completing one or more PD modules. Therefore, the study consists of self-selected samples of the school's population based on voluntary participation. Since the study's goal is to improve PD and technology integration at SHS, it may impact any instructional professional at the school.

Furthermore, the school site administrative team and teachers at Sol High School (SHS) are the primary stakeholders because the outcome of the study will inform the future of professional development (PD) at SHS. Further stakeholders include district personnel, students at SHS, and the students' parents. The district may choose to use the findings from the study to conduct additional PD at other Spicy School District (SSD) schools. Students will benefit from any technology integration gains made by the staff at SHS. Their parents will benefit from their students' ability to assist with technology in a home situation and in their students' ability to be prepared for a career or college once finished with high school.

Intervention implementation plan. Initially, the plan was for a hybrid study using both digital and face-to-face means of communication over a period of nine weeks. However, changes were necessary during implementation. The following is the initial plan with notes about needed changes.

First, the solicitation of staff members occurred at the school site to create the Professional Development Design Team (PDDT). The objective of the PDDT was to approve the surveys given to staff and the professional development (PD) topics covered in the modules. An expectation was the PDDT would alert the team to any changes needed throughout the study. Next, all staff members at the school site received a survey (Survey 1) via email with an explanation of the study, a rationale for the study, and full disclosure of the purpose, intent, and permissions requested as part of the study. A member of the administrative team would disseminate such information to the entire school through an email. Staff notification included the information that those who participated in SHS Tech PD would not have to attend some of the school-scheduled whole-staff PD sessions. Those who participated in all of the PD modules received a Wal-Mart gift card as a financial incentive and extrinsic motivator.

By completing Survey 1, teachers agreed to engage in modules designed to target what they expressed they wanted and needed to improve the implementation of technology in their classrooms. Survey 1 expressed at its start the purpose of the study, privacy protocols, and implications of consent. A follow-up email provided the results of Survey 1 to participants, including an invitation to join the SHS Tech PD Google Classroom (Google Suite, 2019) learning management system (LMS). In the LMS, teachers were to engage in a series of modules created by the SHS Tech PD leadership team as determined by data collection in Survey 1. However, few teachers used the LMS due to complications with district Google account permissions.

Teacher participants who were part of the Professional Development Design Team (PDDT) had the opportunity to review the data from Survey 1 and plan the modules with the team. They would, upon agreement, provide the role of "mentor" or teacher leader in modules that apply to their strengths as an educator. The mentor-mentee relationship would cultivate in the five modules as a reciprocal, inclusive, respectful, supportive, and emancipatory relationship (Zanchetta et al., 2017). The idea was that the PDDT would consist of volunteer administrators and teachers invested in developing meaningful, transformative learning experiences targeting teacher needs with regards to the implementation of technology in classrooms. However, no administrators joined the study, and no one opted for a mentor or mentee role in any of the modules.

The Professional Development Design Team (PDDT) planned to meet face-to-face twice throughout the study, once after completion of Survey 1, and once after completion of Survey 2. The meeting times and locations were to be determined by the school administration. However,

administrators did not participate in the study, and no one from the study attended planned face-to-face meetings in a classroom.

All conversations and planning occurred digitally via email and in Padlet (2019). If face-to-face meetings and discussions had occurred, recordings of the meetings would exist. They would have been transcribed to text and analyzed. The study included email communication as a means of transparent data collection. Meetings and communication with the Professional Development Design Team (PDDT) serve as a rationale behind the decision-making process for the five modules and as additional analysis of data beyond the initial analysis.

The design of Survey 1 was to address phases one and two of transformative learning. Its design included questions chosen to provide a disorienting dilemma and a self-examination of one's feelings regarding technology (Kitchenham, 2008). It inquired about one's readiness to engage in a transformative process (Santalucia & Johnson, 2010), and it asked teachers to examine their perspectives of professional development (PD) (King, 2002). By answering questions in Survey 1, teachers explained their use of technology in their classrooms and their understanding and implementation of best practices in their practice (Christie, Carey, Robertson, & Grainger, 2015). Furthermore, it invited teachers to reflect on their practice by analyzing their learning and teaching methods (Mezirow, 2003).

The SHS Tech PD, scheduled to occur during the entire fall 2019 quarter of instruction at Sol High school (SHS), only occurred over four weeks starting in October of 2019. As a hybrid model of professional development (PD), teachers originally had the option to participate remotely via the learning management system (LMS) or to participate in-person during after school PD meetings. There were a series of five modules posted in the LMS based on what the teachers expressed in Survey 1 and what the leadership team determined to be pertinent from the

data in Survey 1. Each module invited teacher participants to contribute to reflective conversations, provide samples of teaching and learning, and engage in discussions with other teachers (Steyn, 2017), all within a Padlet (2019) shared webpage.

The completion of one module a week was to be the expectation of participants in the SHS Tech PD. Yet, the flexibility of the study allowed participants to participate in any module at any time. Modules were allowed to be completed remotely without any physical meetings, or participants could complete them with additional support and clarification at in-person meetings. Initially scheduled for Wednesdays after school, each physical meeting was to occur for approximately one hour, scheduled from 4:00 to 5:00 p.m. Due to time restraints, the meetings times changed to daily during lunch and after school during the study. However, no one attended an in-person meeting.

The design of each of the five modules incorporated a common theme inspired by the ten phases of transformational learning (Kitchenham, 2008). Engaging in each module was to take place in a variety of formats depending on what teachers express their needs are in Survey 1 (Appendix A) and what the leadership team determined to be an area of need for SHS teachers. Yet, time and space limitations required the study to be executed remotely through emails and links to modules. The professional development design team's (PDDT's) role was to help develop meaningful activities for each module teachers engaged in as part of a transformative process (Johnson & Fargo, 2010).

During the creation and implementation of the five modules, phases three through nine of transformative learning occurred. Teachers engaged in a critical assessment of their assumptions as they engaged in the process of transformation by answering questions about professional development (PD) and their teaching practice. The study was designed for teachers to explore

new roles, relationships, and actions in their classrooms and their relationships with their colleagues. Yet, lack of time and participation did not allow for relationships to blossom outside of the online platform. Some teachers planned a course of action requiring the acquisition of knowledge and skills using resources from the modules. New roles and relationships occurred as the cultivation of teacher leadership and participant roles occurred, improving teacher competence and self-confidence. By engaging in these phases during the five modules, SHS teachers transformed PD, teaching styles, and classroom learning (Callja, 2014).

It was challenging to predict what each of the five modules should include because their basis was dependent on responses to Survey 1, incorrect assumptions occurred about the need to focus on assessment and reflective thinking. The SHS Tech PD plan anticipated them being the focus of one or more modules. The examination of assessment was not only expected, but the examination of e-portfolios as a means of assessment was planned (Stansberry & Kymes, 2007). Yet, participants did not choose assessment as a focus, so there were no e-portfolio resources in an assessment module.

Additionally, the plan for the study assumed that reflective thinking would develop as a module theme. In anticipation of such a module, an examination of how reflection occurs as well as what motivates reflection was analyzed (Wang & King, 2006). The professional development design team (PDDT) determined that the development of a reflective thinking module was not needed based on feedback from Survey 1. Survey 2 examined the reflective process.

The distribution of Survey 2 occurred via the learning management system (LMS) after the completion of the five modules. The professional development design team (PDDT) designed the five modules after an analysis of data collected from Survey 1. The design of Survey 2 was to answer the research questions. It also addressed the tenth phase of transformative learning by

asking how the process has helped participants integrate new competencies and perspectives in their life. It measured the level of effectiveness of engaging in transformational learning, via the SHS Tech PD, and the use of technology integration in classrooms. Data collected from Survey 2 was to be analyzed by the SHS Tech PD leadership team and distributed to all participants via the LMS. Instead, the data from the study was delivered via school email.

Expected outcomes. The outcomes expected from participating in the study included the increased implementation of technology in classrooms using TPACK (Mourlam, 2017) and SAMR (Puentedura, n.d.). Teachers were encouraged to have a positive experience using a hybrid model PD, and their perspectives of PD may have changed as a result, especially regarding the flexibility of when one may participate and where one may participate from, i.e., remote participation. All participants and stakeholders were encouraged to see the value in PD that addresses teachers' needs, cultivates conversations, and is respectful of teachers' schedules. The design of the SHS Tech PD increases technology integration in classrooms as a result of participating in the SHS Tech PD.

Action research questions. The following research questions guided this study.

1.) What proportion of teacher participants will experience a positive transformation with regards to their use of technology in education?

2.) In what ways will teacher participants' perspectives of PD change?

3.) How will technology integration in classroom instruction change as a result of SHS Tech PD?

Data sources and collection procedures. The study collected mixed-methods data in the form of surveys and posts in the SHS Tech PD collaborative Padlet (2019) pages. The study intended to collect data in the form of recordings during in-person professional development

(PD) meetings. However, the lack of attendance caused the elimination of this data collection process. Both surveys include the quantitative Likert Scale (QuestionPro Survey Software, 2019) questions and open-ended qualitative questions. Staff emails were sent through the school principal with invitations to participate in the Professional Development Design Team (PDDT) via Padlet (2019), to complete Survey 1 (Appendix A), to participate in the 5 PD modules in Padlet (2019) (Appendix B), and to complete Survey 2 (Appendix C). An email invited participants to join the Google Classroom (Google Suite, 2019) LMS with the 5 PD modules and Survey 2, but the LMS became an optional structure as school district Google accounts blocked participation in the out-of-district LMS. Table 1 identifies the data procedures used during the SHS Tech PD.

Table 1

Data Procedures

Data Source/Type	Research Question	Data Collection Procedure
2 Professional Development Design Team (PDDT) Padlets (2019)	In what ways will teacher participants' perspectives of PD change?	Emailed to school staff as a Padlet link. Data collected from the Padlet (2019).
Survey 1	What proportion of teacher participants will experience a positive transformation with regards to their use of technology in education?	Emailed to school staff as a Google Form link. Data collected from the Google Form (Google Suite, 2019).
5 Padlet PD Modules	What proportion of teacher participants will experience a positive transformation with regards to their use of technology in education?	Emailed to school staff as Padlet links. Data collected from the Padlets (Padlet, 2019).
Survey 2	What proportion of teacher participants will experience a positive transformation with regards to their use of technology in education? In what ways will teacher participants' perspectives of PD change?	Emailed to school staff as a Google Form link. Data collected from the Google Form (Google Suite, 2019).

Data analysis. Data collection and analysis occurred using both quantitative and qualitative means. Data collection occurred quantitatively in the surveys via the Likert Scale (QuestionPro Survey Software, 2019) questions. Qualitative data collection occurred from all data sources: Professional Development Design Team (PDDT) Padlets (2019), Surveys, and 5 PD Module Padlets (2019). Qualitative data was analyzed using Quirkos Limited (2019)

software using a coding re-coding analysis. Quantitative data collection occurred in graph form from Google Forms (Google Suite, 2019). Coded qualitative data was put into table and graph form using Google Sheets (Google Suite, 2019). All data were analyzed using descriptive statistics. The study uses the descriptive statistics design because its design informs the staff at Sol High school (SHS) and the Spicy School District (SSD); it is not designed to reach conclusions beyond the population at SHS. The data analysis procedure, used for each source of data, is explained in Table 2.

Table 2

Data Analysis

Data Source/Type	Data Analysis Procedure
2 PDDT Padlets (2019)	Qualitative analysis of content contributed by teachers analyzed using Quirkos Limited (2019) coding software during a coding re-coding analysis.
Survey 1	Quantitative analysis of Likert Scale Questions (QuestionPro Survey Software, 2019) using descriptive statistics analyzed and visually represented with Google Sheets software (Google Suite, 2019). Qualitative coding re-coding analysis of open response questions using Quirkos Limited (2019) coding software.
5 Padlet PD Modules	Quantitative analysis of participant engagement represented in the modules using descriptive statistics analyzed and visually represented with Google Sheets software (Google Suite, 2019). Qualitative analysis of content contributed by teachers analyzed using Quirkos Limited (2019) coding software during a coding re-coding analysis.
Survey 2	Quantitative analysis of Likert Scale Questions (QuestionPro Survey Software, 2019) using descriptive statistics analyzed and visually represented with Google Sheets software (Google Suite, 2019). Qualitative coding re-coding analysis of open response questions using Quirkos Limited (2019) coding software.

Limitations

The sample size of the teacher population does not represent all teachers in the city, state, or country. It does not even represent all of the teachers at Sol High School (SHS). Therefore, the study is limited to SHS and the Spicy School District (SSD). However, this study is an action research study. Therefore, it only intends to cause a positive change at the SHS school site, so the lack of application is reasonable for action research. The mixed-methods surveys and data collection from participation in the modules include the opinions of teacher participants at the school site. Since one cannot control the honesty of teachers, the answers may be biased. However, reassuring teachers that the study will not affect their evaluations and that their identities will remain anonymous when delivering the findings from the study, teachers may have been more forthcoming with honest information.

Time is another limitation. Teachers had some inherent time restraints. Yet, the hybrid nature of the study allowed teachers to contribute whenever possible throughout the one-month time frame of the study. Due to the study starting later than anticipated, time became one of the most hindering factors. Intended to be a nine-week study, it was a month-long study.

The survey tools were reviewed by the Professional Development Design Team (PDDT) to ensure validity prior to delivery via staff email. The consistency in delivering the surveys and Padlet (2019) pages, along with the review of Survey 1 (Appendix A) data by the PDDT, ensured reliability. Furthermore, the study honored all requests made by members of the PDDT to add or alter questions in the surveys. Additionally, the delivery of the professional development (PD) modules (Appendix B) and Survey 2 (Appendix C) changed based on feedback from the PDDT. By referring to the PDDT throughout the study, the team ensured that the study was accessible and relevant for the staff at SHS. The scope of the study, improving technology integration and

PD at Sol High School (SHS) by addressing teachers' needs, was addressed in all aspects of the study.

Therefore, the most significant limitation of the study was voluntary participation. It was challenging to find teachers at SHS willing to participate in the study. Those that did participate in the study did so remotely. They did not participate in any of the in-person meetings. This fact alone fundamentally changed the nature of the study from one intended to examine a hybrid model of PD to examining a remote model of PD instead.

Ethical Considerations

Before beginning, the study obtained IRB permission from Capella University, permission from the school district, and permission from school administrators. The data analysis is responsible and fully disclosed to all stakeholders before publication. The Professional Development Design Team (PDDT) reviewed and helped interpret survey data and analyses as part of the process. Therefore, the study obtained an ethical consensus regarding the survey data.

Additionally, the study asked participants to choose their preferred non-associative pseudonyms. Those who did not choose a pseudonym were issued a non-associative pseudonym. The process of allowing participants to choose their pseudonym provides them with some control over their representation in the study. It also allows them to recognize their contribution without others being able to identify them (Vaughn, 2016).

Though one strives to be ethical in the creation and delivery of the SHS Tech PD with sensitivity to race, gender, age, and prior knowledge, one cannot predict how participation in a study as communication oriented as the SHS Tech PD study affected individual participants. No participants brought up concerns. The study itself did not include any face-to-face

communication amongst participants or questions that asked participants to reveal personal information, so it is considered a low-risk study.

The study established credibility through methods triangulation and member-checking. They occurred throughout the study to ensure that all data collected and analyzed are credible. Methods triangulation occurred through different question types in the survey, Likert and open response, as well as through collecting separate data from participation in the five modules.

Member-checking occurred as all data was reviewed by the leadership team and provided to all participants before publication to ensure accuracy in collection and analysis. The study established dependability through a coding re-coding process engaged in with the assistance of Quirkos Limited (2019) qualitative coding software. The transferability of the study will apply to future professional development (PD) at Sol High School (SHS) as well as any other teacher PD inside and outside of the Spicy School District (SSD). The study utilized thick description in describing the means of data collection, so the scene of the study is clear. That way, one may apply a socio-cultural analysis of the study as well as identify bias from the detailed description of occurrences, their times, and other events associated with the study.

There was no identifiable coercion throughout the study. Though some participants in the professional development (PD) modules were aware of each other, others chose to participate anonymously, and identifiable factors included in the study were voluntary. Thus, the study upheld the confidentiality of participants. A conflict of interest regarding the request for multiple PD participation did occur. It was addressed by working with the instructional coach who delivers PD during content-alike PD time to mitigate some of the time restraints placed on teachers. Though technology bias is inherently present, the contributions of all participants were

constructive and open to learning new content. All intellectual property included in the PD modules were done so with links to the original intellectual property. At no point did the Professional Development Design Team (PDDT) or participants attempt to claim the work of others as their own.

SECTION 2: IMPLEMENTATION

Despite the intention of a hybrid PD study, SHS Tech PD was implemented remotely via emails, Google Classroom (Google Suite, 2019), and Padlet (2019). No participants attended the in-person meetings set up during lunch and after school. Since all interactions were text-based, recording participants' input happened organically. The process included asking teachers to be part of the Professional Development Design team (PDDT), reviewing and implementing Survey 1 (Appendix A), creating and contributing to the 5 Padlet (2019) PD modules (Appendix B), and evaluating the PD in Survey 2 (Appendix C).

Process Analysis

Participation in the study was strictly voluntary. It was executed via email using Spicy School District's (SSD) staff issued Gmail (Google Suite, 2019), Google Forms (Google Suite, 2019) surveys, the Google Classroom (Google Suite, 2019) LMS, and seven Padlet (2019) web pages. Two of the Padlet (2019) pages were structured for the Professional Development Design Team (PDDT) to collaborate about the SHS Tech PD, and five were structured to deliver the SHS Tech PD modules. The study, intended to be implemented in a hybrid fashion where participants could participate at any time remotely and in-person during meetings, lunch, or after school in a classroom, did not include the in-person meetings. No one attended them. Therefore, the study ceased to be a hybrid PD study; instead, it became a remote PD study.

The study started with a request for the teachers at the school site to participate as members of the Professional Development Design Team (PDDT). After establishing the PDDT, they reviewed a draft of Survey 1 (Appendix A) and recommended changes or additions to Survey 1 before sending it out to all staff. After the PDDT modified Survey 1, the principal sent out the email with Survey 1 to staff. The data from Survey 1 was collected, analyzed, and then

given to the PDDT. The second request of the PDDT was to review the Survey 1 results, provide input for the five PD modules based on results from Survey 1, review a draft of Survey 2, and recommend changes or additions for Survey 2 before giving the survey to module participants. The PDDT members recommended changes or additions to the study throughout its implementation as needed. Since the entire study occurred via emails and participation in Padlet (2019) pages, documentation of the study occurred in a text format as the PDDT and participants communicated.

Emails

The implementation of the study began with an email sent to all staff by the principal of Sol High School (SHS) via the schoolwide Gmail (2019) system in place. Initially, the principal was going to send out four schoolwide emails inviting teachers to participate at different stages in the study. In the end, the principal sent out seven emails due to the need for clarification and reminders to participate. The study was supposed to occur over a period of nine weeks, from August of 2019 until November of 2019. Due to delayed IRB permission and time restrictions, participation in the study occurred over a four-week period. It began in October of 2019 and ended in November of 2019.

The first school-wide email, Email 1, requested teacher participants for the Professional Development Design Team (PDDT), and it outlined the SHS Tech PD study in entirety. Email 2 requested participants for Survey 1 (Appendix A). Email 3, not one of the originally planned emails, was deemed necessary due to the initial low number of participants completing Survey 1; it requested additional Survey 1 participants. Email 4 requested participants for the SHS Tech PD study in entirety as outlined in Google Classroom (2019) LMS (Appendix B). Emails 5 and 6 were not part of the original plan either. Email 5 occurred the same day as Email 4. Email 5

addressed the need to modify the execution of the study. The study was no longer solely executed through the organization of the Google Classroom (2019) LMS. It became accessible via hyperlinks in emails 5, 6, and 7. Email 6 requested additional participation in the study due to a low number of participants. Email 7, the last email, also requested additional participants, and it reminded SHS staff that the study would end in two days. Emails 5, 6, and 7 also included links to Survey 2 (Appendix C).

The professional development design team. After sending the initial email requesting members for the professional development design team (PDDT), seven PDDT participants contributed to the development of Survey 1 via Padlet. Members of the PDDT requested that five changes modify the survey. The Survey 1 changes requested by the PDDT members occurred, and the survey was emailed to SHS staff. The results were analyzed and provided in the second PDDT Padlet.

Members of the PDDT were asked via email to participate in the second PDDT Padlet (2019) by using the Survey 1 data to identify and develop the five PD modules and recommend changes or additions for Survey 2. The PDDT confirmed that Survey 1 data showed strong support for the 5 PD modules to include PD regarding Department/Content Specific PD (Module 1), New Technology (Module 2), Classroom Management (Module 3), Strategies for Teaching ELLs (Module 4), and Best Practices (Module 5). Therefore, the study includes those five modules.

PDDT members also confirmed that the first draft of Survey 2 was appropriate in entirety. The PDDT requested only one change to Survey 2 in the second PDDT Padlet (2019), and the change occurred. A PDDT member requested another change to the SHS Tech PD via a

verbal exchange. After the principal sent Email 4 to SHS staff, the PDDT member noticed that accessing the Google Classroom (2019) LMS was difficult from the school due to the fact that SSD Google accounts do not allow participation in Google related items outside of the SSD organization. Therefore, links to each module, and Survey 2 were provided in Emails 5, 6, and 7, allowing participants to bypass using the LMS to access modules.

Survey 1. The first survey, Survey 1 (Appendix A), was created using Google Forms (2019), and it was modified based on input received from the PDDT. It consists of seven Likert scale questions, six open response questions, and one multiple option question. Sent to the entire SHS staff via a schoolwide email, there is absolutely no identifiable information collected in Survey 1. Therefore, there are no demographics provided. After a week, only nine staff members completed the survey, so the SHS principal sent out a follow-up email requesting additional staff participation. In total, 34 staff members completed Survey 1, or 34% of teachers at SHS.

PD modules. After analyzing Survey 1 (Appendix A) data, it was determined by the Professional Development Design Team (PDDT) that the five PD modules consist of the following PD topics: Department/Content Specific PD (Module 1), New Technology (Module 2), Classroom Management (Module 3), Strategies for Teaching ELLs (Module 4), and Best Practices (Module 5) (Appendix B). Therefore, five Padlet (2019) pages were created for each of the five modules. Initially, the study was structured where each module would be delivered weekly via Google Classroom (2019), followed by the delivery of Survey 2 (Appendix C) to module participants.

However, time restraints caused the delivery of all the modules at once with Survey 2 in Google Classroom (2019). Due to issues accessing Google Classroom (2019) with school-issued

Google accounts, all of the modules and Survey 2 also had to be delivered via links in Emails 5, 6, and 7. In emails 5 and 6, the link to Module 3 redirected participants to Module 4 due to a linking error. In Email 7, the link error was corrected. Two SHS Tech PD participants alerted the Professional Development Design Team (PDDT) to the link error, one verbally, and one in Module 3.

Each PD Module consists of links to researched information from academic articles and digital media resources about each topic. Additionally, there were prompted conversations and sharing in each module based on feedback from verbal conversations conducted with a few PDDT members. The beginning of the Padlets (2019), before participants posted, are in Appendix B in a revised format. For confidentiality reasons, the final Padlet (2019) pages, including posts for each module, cannot be included.

Survey 2. The second survey, Survey 2 (Appendix C), was created using Google Forms (2019). The modification of one question occurred for clarity due to feedback from a Professional Development Design Team (PDDT) member. The survey consists of a pseudonym request question, seven Likert scale questions, and five open response questions. It was sent to the entire Sol High School (SHS) staff via schoolwide email in Emails 5, 6, and 7 with a request that only SHS Tech PD participants complete the survey. A pseudonym question, designed to discern responses from staff participants and nonparticipants, was included. A follow-up email was sent to known participants to clarify pseudonyms and ensure that Survey 2 data included data collected from participants. If participants could only access the survey via the Google Classroom (Google Suite, 2019) LMS, the need for clarification would not have occurred. In total, 15 known staff members participated in one or more of the SHS Tech PD Modules and completed Survey 2, or 15% of teachers at SHS.

Data Analysis

The surveys provided both quantitative and qualitative data, and the Padlet (2019) PD modules solely provided qualitative data. All of the qualitative data went through a coding re-coding analysis process using Quirkos (2019) software. The use of descriptive statistics to analyze both quantitative and qualitative data helped draw conclusions about the implementation of SHS Tech PD. Differential statistics were chosen as the analysis process because the study design is to inform the staff at Sol High School (SHS) and the Spicy School District (SSD); it is not designed to reach conclusions beyond the population at SHS.

PDDT

Seven participant members of the Professional Development Design Team (PDDT) contributed to the PDDT Padlet 1. Six participant members of the PDDT contributed to the PDDT Padlet 2. Differential statistics via Google Forms (2019) are used in Table 3, Table 4, and Table 5 to visually represent the responses received in the PDDT Padlets (2019).

Table 3 is a qualitative analysis of the Professional Development Design Team (PDDT) responses made in the PDDT Padlet 1. In PDDT Padlet 1, PDDT participants were asked to view Survey 1 in its draft form and provide feedback. The feedback was used to make changes to Survey 1 before giving the survey to the staff at Sol High School.

Table 3

Professional Development Design Team (PDDT) Padlet 1 Responses

Comment/Change Made by PDDT for Survey 1	Frequency
Good survey, Looks good, Way to go	7
Add - What type of PD do teachers prefer?	2
New teacher PD module	1
Add - Collaboration with technology section	1
Add - Where do you find out about new technology?	1
Add - Do teachers like interactive (hands-on) or lecture PD more?	1
Add - Space for additional comments	1
Teachers should request PD	1

Note: Add = Change to Survey 1

Table 4 is a qualitative analysis of the Professional Development Design Team (PDDT) responses made in the PDDT Padlet 2. In PDDT Padlet 2, PDDT participants were asked to view Survey 2 in its draft form and provide feedback. The feedback was used to make changes to Survey 2 before giving the survey to the staff at Sol High School.

Table 4

Professional Development Design Team (PDDT) Padlet 2 Responses

Comment/Change Made by PDDT for Survey 2	Frequency
Good survey, Looks good, I like the survey	4
PD should be set up by need and interest	2
PD should be designed and delivered to subject-alike instructors	1
PD is best when participants can use the information	1
There is a need for new technology and classroom management	1
Maybe staff meetings or other PDs can be opted out of for this PD	1
The survey asks for vital information	1
Change - Question number 4 [of the survey] is ambiguous	1

Table 5 is a representation of the quantitative number of Professional Development Design Team (PDDT) participant posts made in both PDDT Padlets (2019) 1 & 2 about Surveys 1 & 2. The participants who wished to choose a pseudonym chose the ones used in this study. Those who did not choose a pseudonym were assigned one. The use of participant-chosen pseudonyms was intentional to allow participants to see their contributions while keeping them anonymous. This idea came from the South African study by Vaughn (2016) referenced in the literature review, and the IRB approved the use of pseudonyms for this study. Table 5 also shows how many PDDT participants also participated in the SHS Tech PD study. Not everyone who provided feedback about the surveys and the Padlet (2019) modules in the PDDT Padlets (2019) participated in the SHS Tech PD study.

Table 5

Professional Development Design Team (PDDT) Participant Posts

Participant Pseudonym	Survey 1 Posts	Survey 2 Posts
Ms. Cleo	1	2
Ms. Butterfly*	1	0
Mr. Bird	1	0
Ms. Strawberry*	1	0
Ms. Mouse*	1	0
Ms. Rainbow	1	0
Ms. Flower*	1	0
Anonymous	0	4

Note. 4/7 PDDT Members Participated in the SHS Tech PD Modules*

Survey 1. Emailed to Sol High School (SHS) staff through district email by the school principal, all responses to Survey 1 are from anonymous SHS staff. Mixed methods data collected from Survey 1 includes Likert scale questions (QuestionPro Survey Software, 2019) and open response questions. The Likert scale questions (QuestionPro Survey Software, 2019) produced quantitative data automatically generated into graphs by Google Forms (2019) and analyzed using differential statistics. The open response questions were first coded using Quirkos (2019) qualitative data analysis software. Then, the coded data set for each question were analyzed using differential statistics and put into Google Forms (2019) to create visual representations of the data.

Figures 1-9 include responses to seven Likert scale questions and two list choice questions given to the Sol High School (SHS) staff in Survey 1. All nine of these questions provide quantitative data. They explore the professional development (PD) teacher participants

received before the study, the amount of technology the teacher participants use in their classrooms, the PD style they prefer, and the PD topics they want to cover.

Q1:

On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of effectiveness of the professional development (PD) you have engaged in thus far in your teaching career.

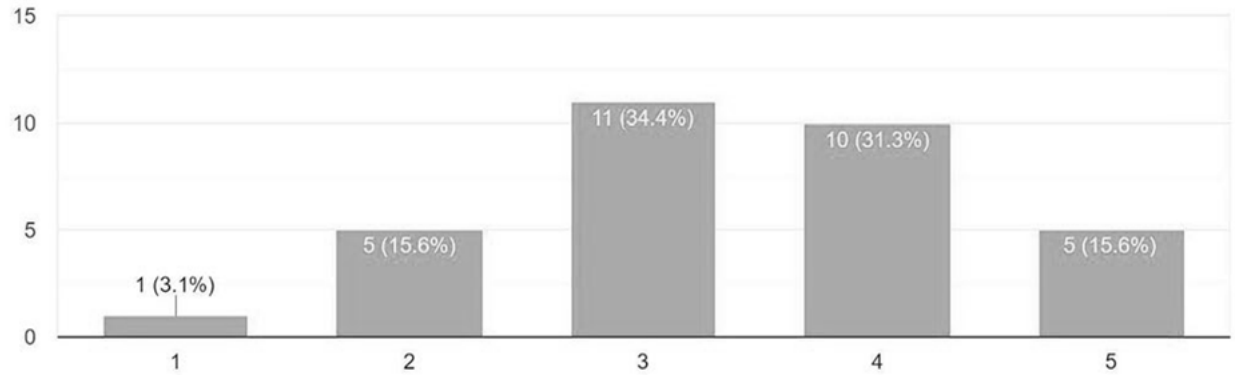


Figure 1. Survey 1 Question 1. Quantitative results from Likert Scale question 1 answered by Survey 1 participants.

Q2:

On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the positivity level of your experiences with teacher PD.

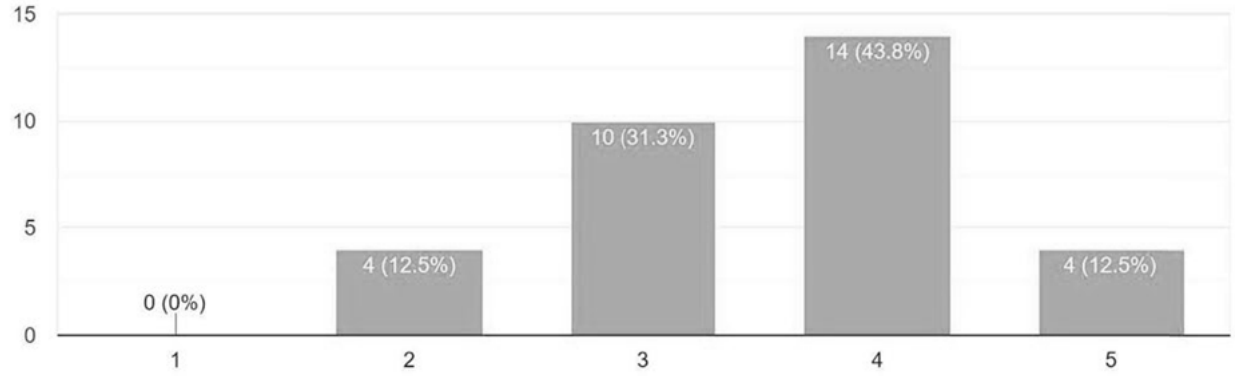


Figure 2. Survey 1 Question 2. Quantitative results from Likert Scale question 2 answered by Survey 1 participants.

Q3:

On a scale of 1 to 5 with 1 being little to none and 5 being a significant amount, please rate the level of input you have had in develoing PD.

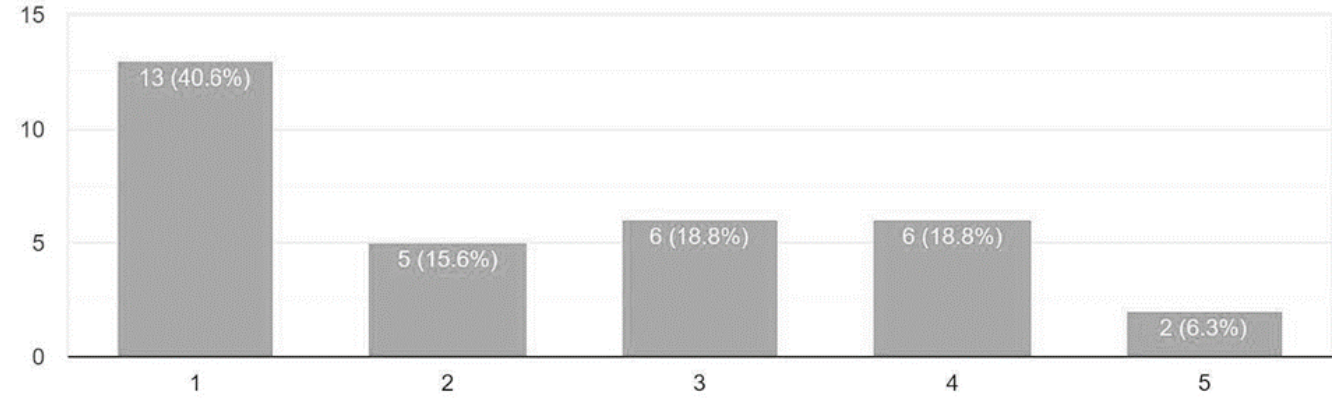


Figure 3. Survey 1 Question 3. Quantitative results from Likert Scale question 3 answered by Survey 1 participants.

Q4:

On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the amount of technology used during PD.

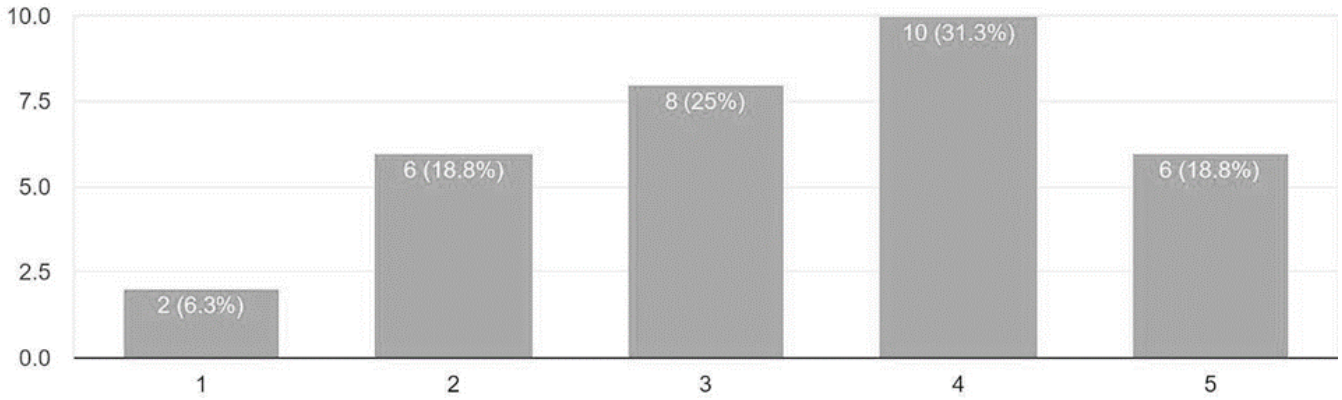
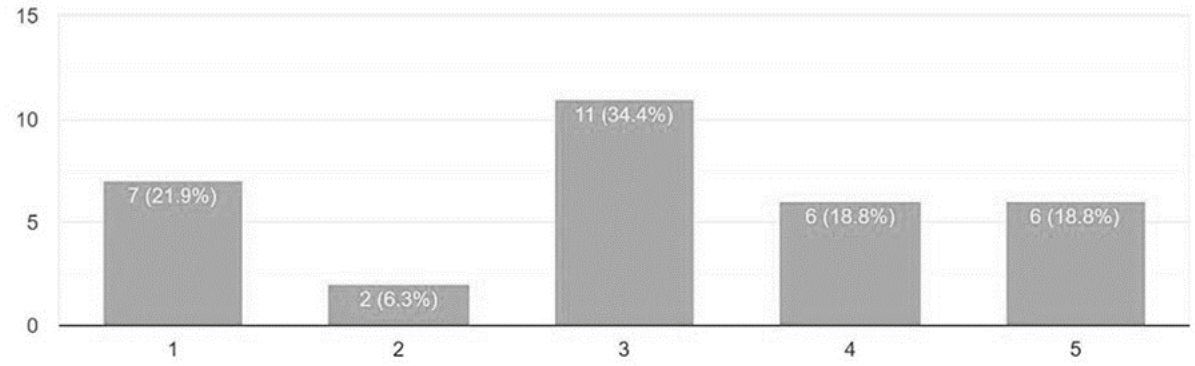


Figure 4. Survey 1 Question 4. Quantitative results from Likert Scale question 4 answered by Survey 1 participants.

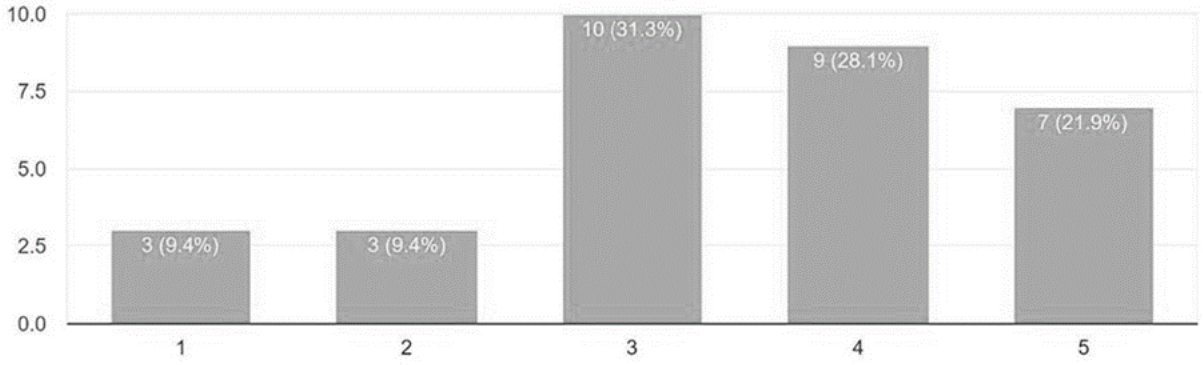
Q5:

On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of support you received in creating and implementing lessons via PD.



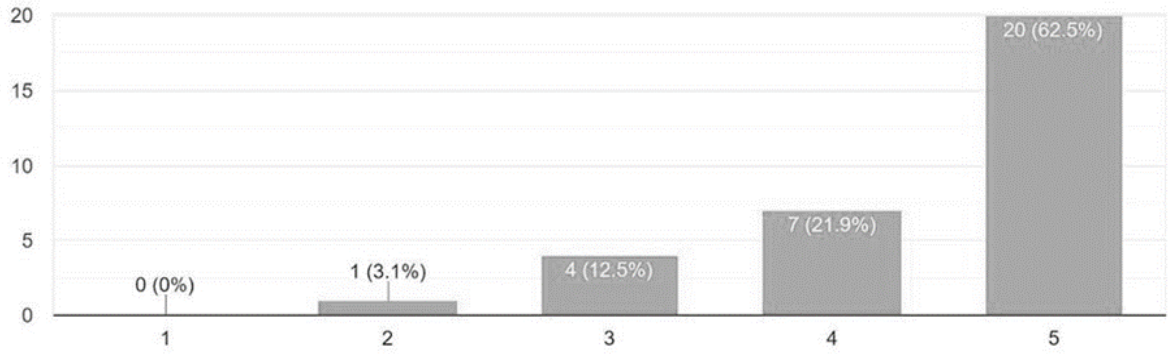
Q6:

On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of support you received in utilizing technology in your classroom via PD.



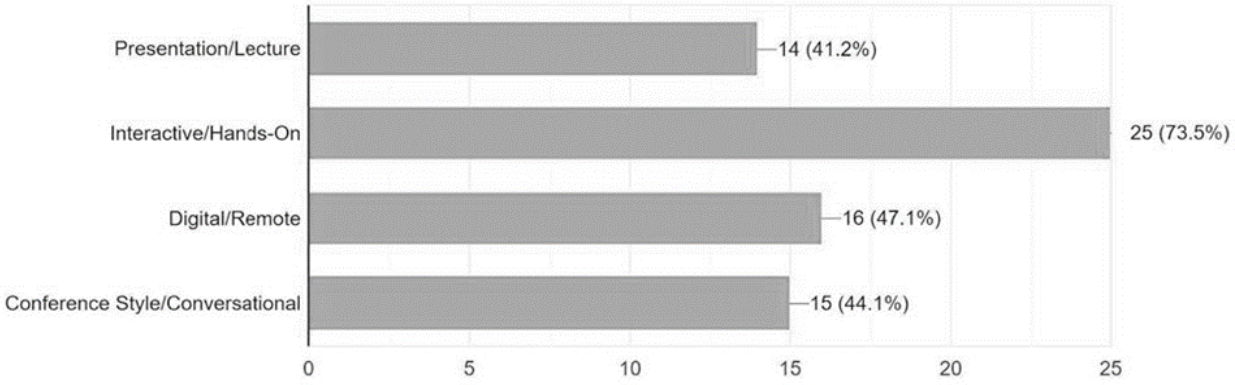
Q7:

On a scale of 1 to 5 with 1 being once in a while and 5 being daily, how often do you use technology in your classroom?



Q14:

What PD format do your prefer? Please check all that apply, and add your won if applicable.



Q15:

What topics would you like to cover inPD this year? Please check all that apply, and add your own if applicable.

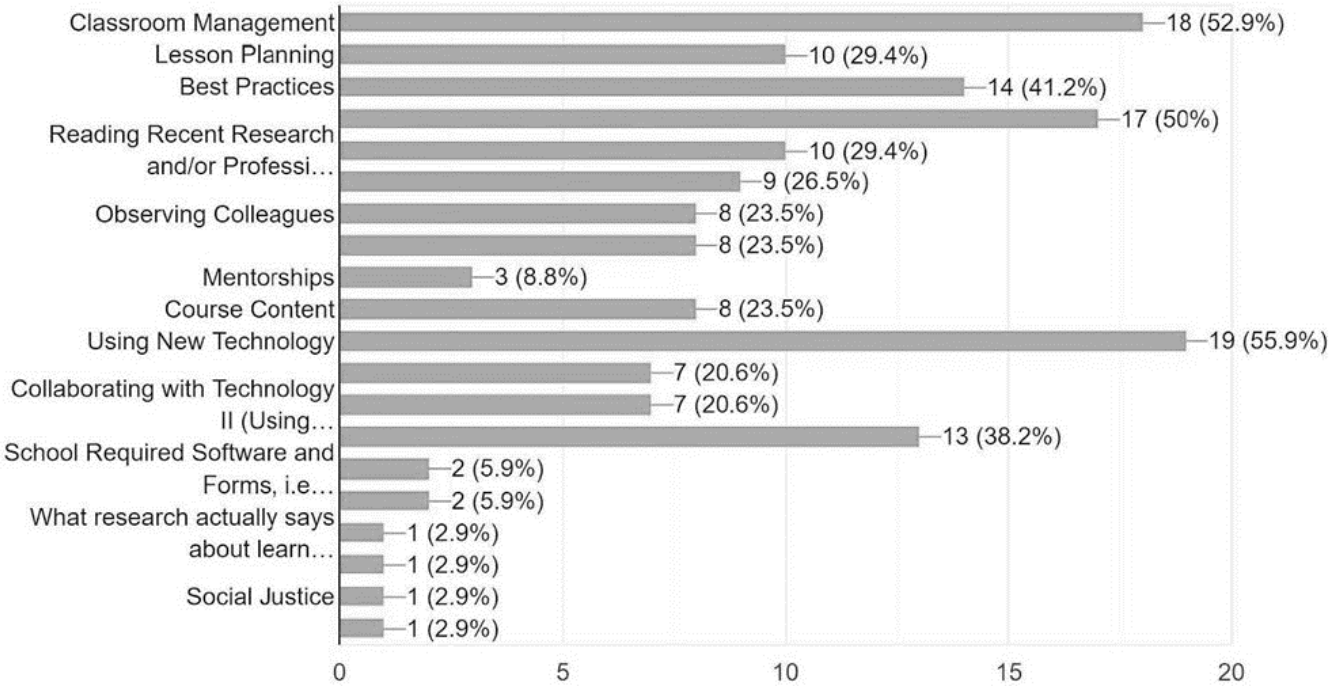


Figure 9. Survey 1 Question 15. Quantitative results from list choice question 2 by Survey 1 participants.

Figures 10-15 include responses to 6 open response questions given to the Sol High School (SHS) staff in Survey 1. All 6 of these questions provided qualitative data coded using Quirkos (2019) qualitative data analysis software. The open response questions were crafted to allow for independent feedback regarding the Likert Scale questions asked prior, technology use, past professional development (PD) experiences, and the focus of the PD.

Q8: *Optional* If you have any comments/thoughts about the “On a scale of 1 to 5” questions, please provide them here.

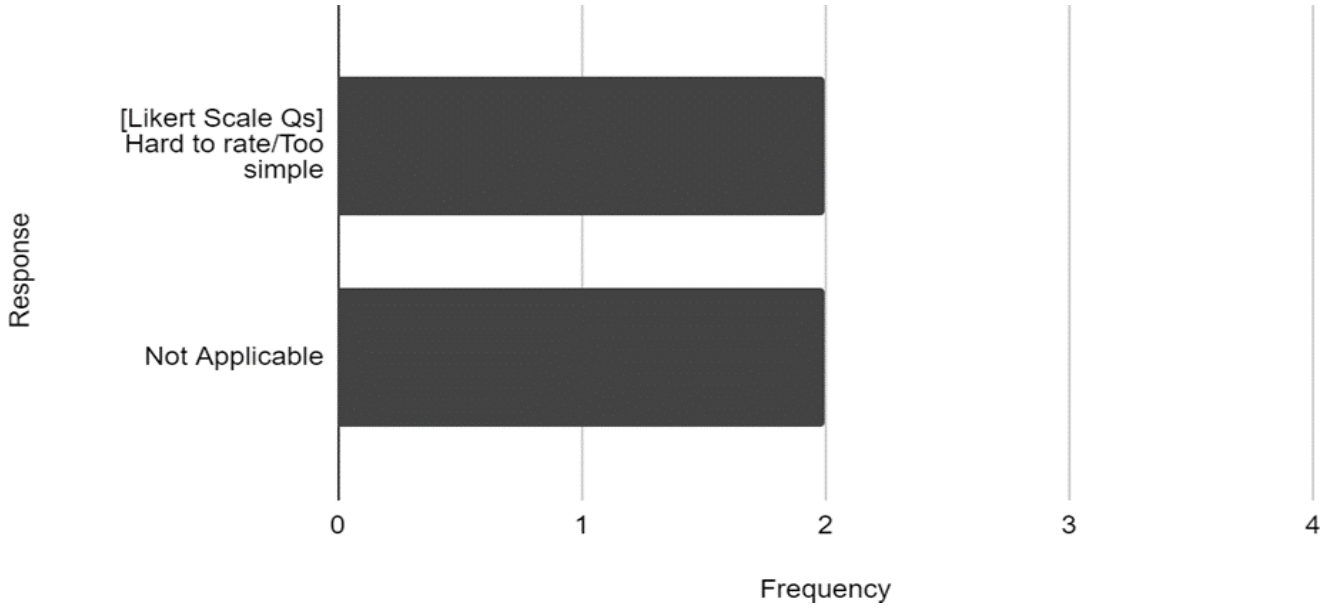


Figure 10. Survey 1 Question 8. Qualitative results from open response question 1 answered by Survey 1 participants.

Q9: Where do you usually find out about new technology?

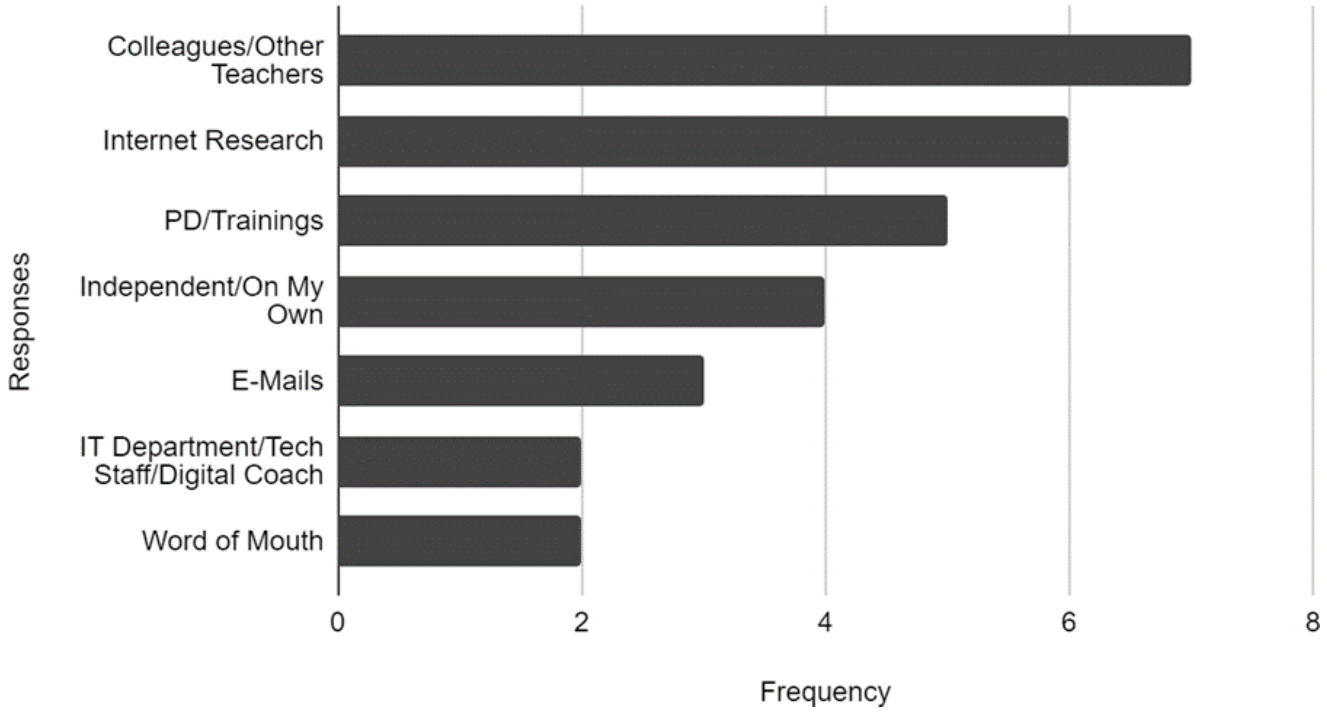
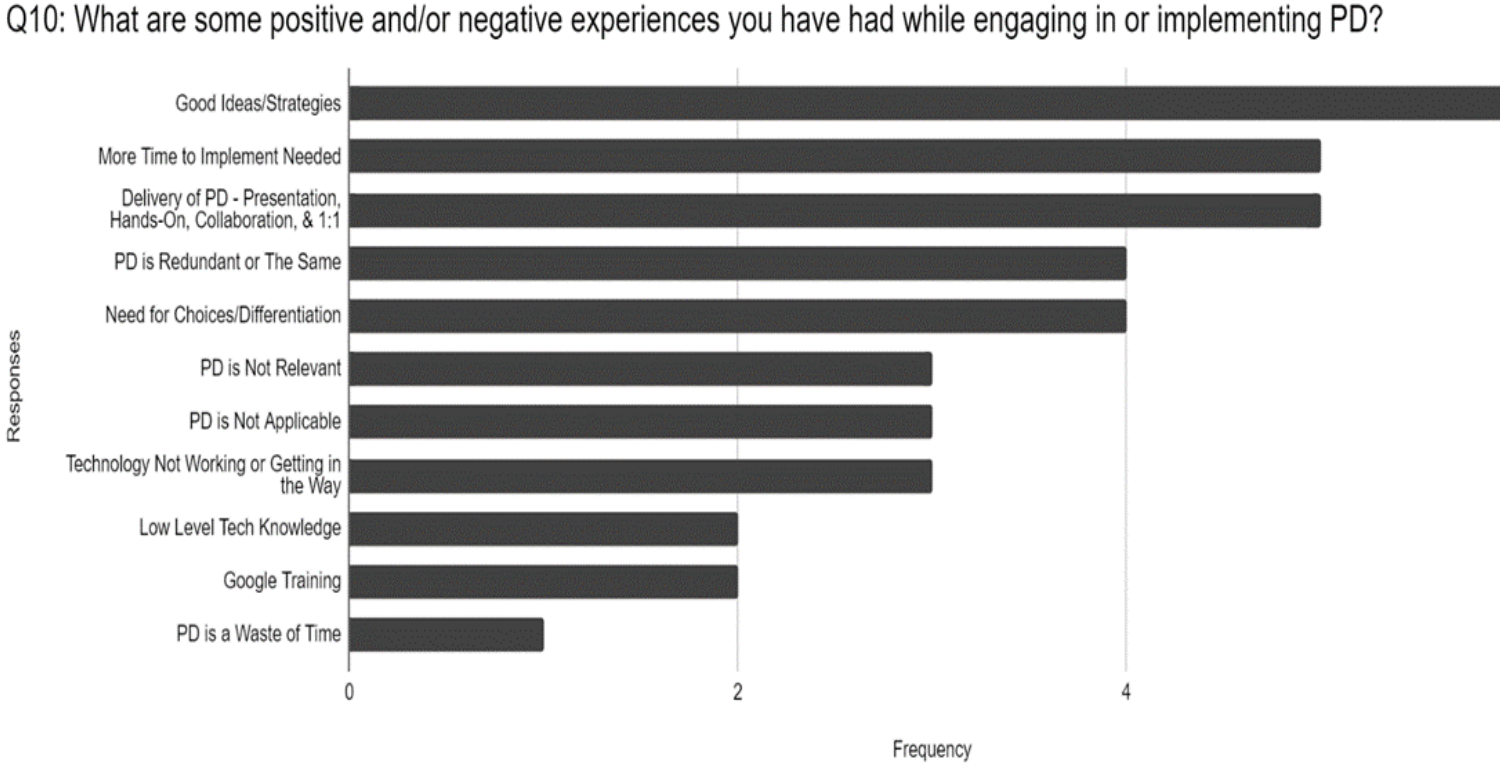
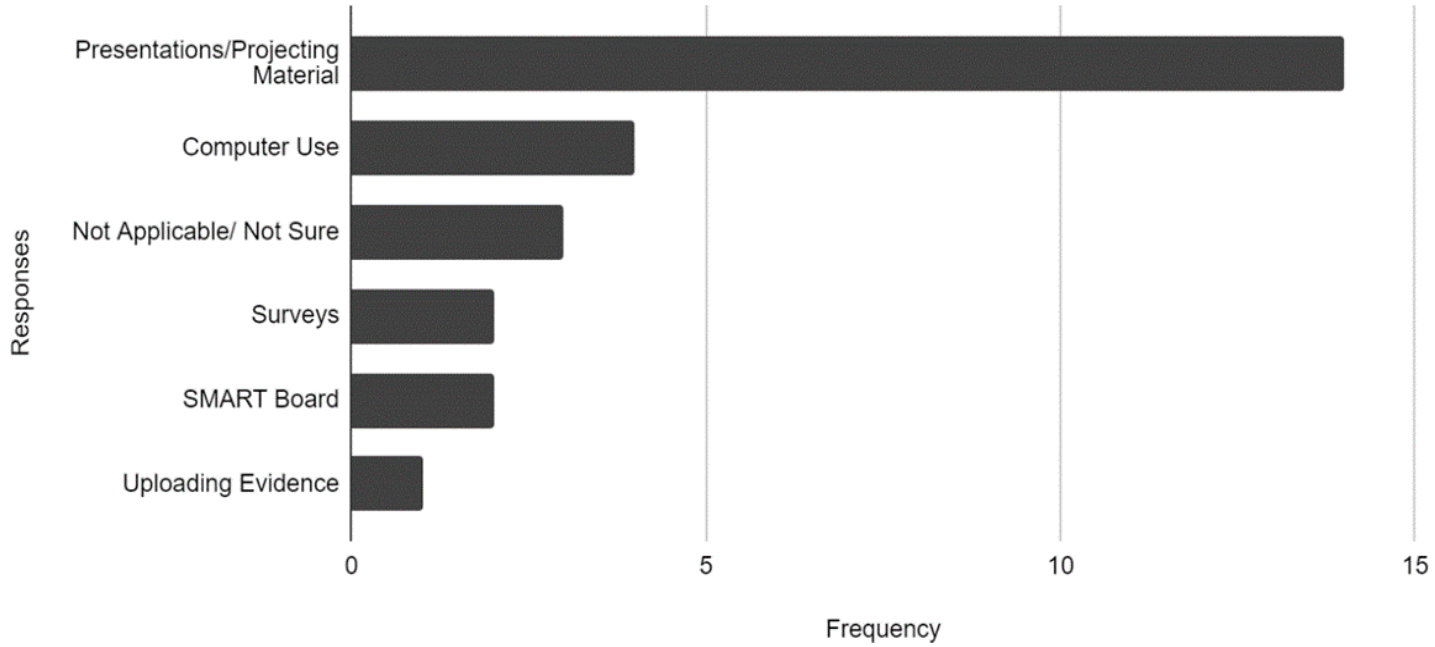


Figure 11. Survey 1 Question 9. Qualitative results from open response question 2 answered by Survey 1 participants.



Q11: How was technology implemented during PD?



Q10: What are some positive and/or negative experiences you have had while engaging in or implementing PD?

Q12: What would you change about the PD you have previously participated in?

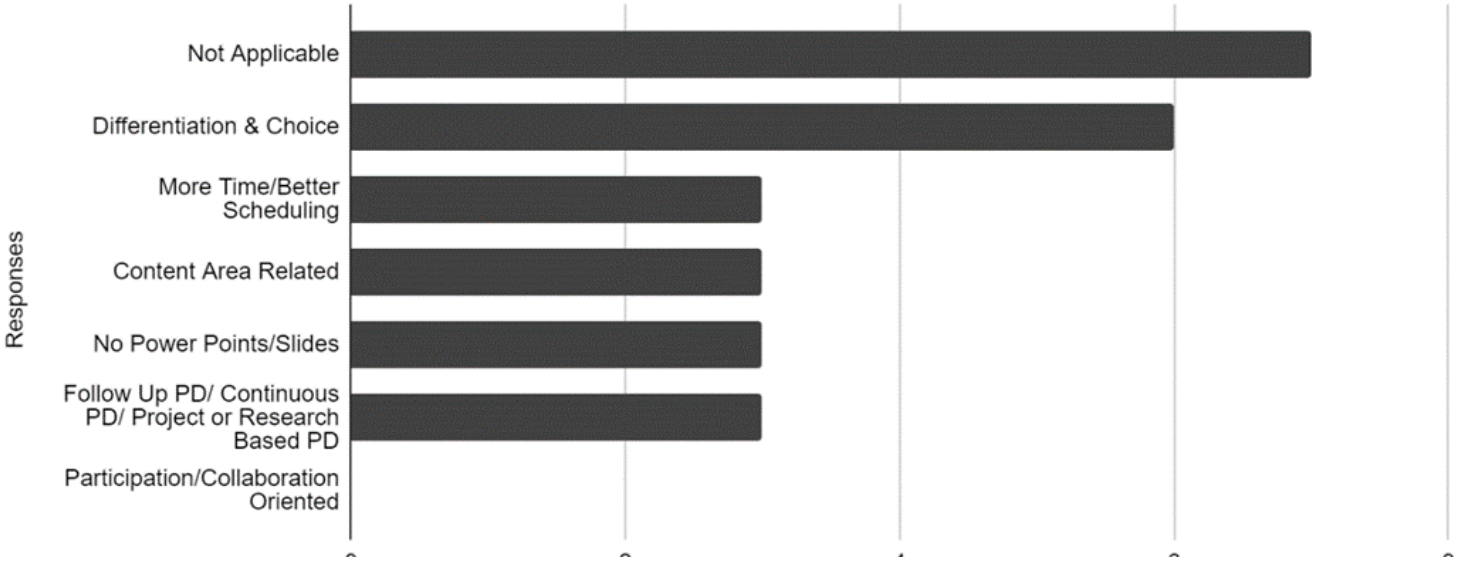


Figure 13. Survey 1 Question 11. Qualitative results from open response question 4 answered by Survey 1 participants.

Figure 14. Survey 1 Question 12. Qualitative results from open response question 5 answered by Survey 1 participants.

Q13: What do you think PD should focus on? What requests do you have for PD?

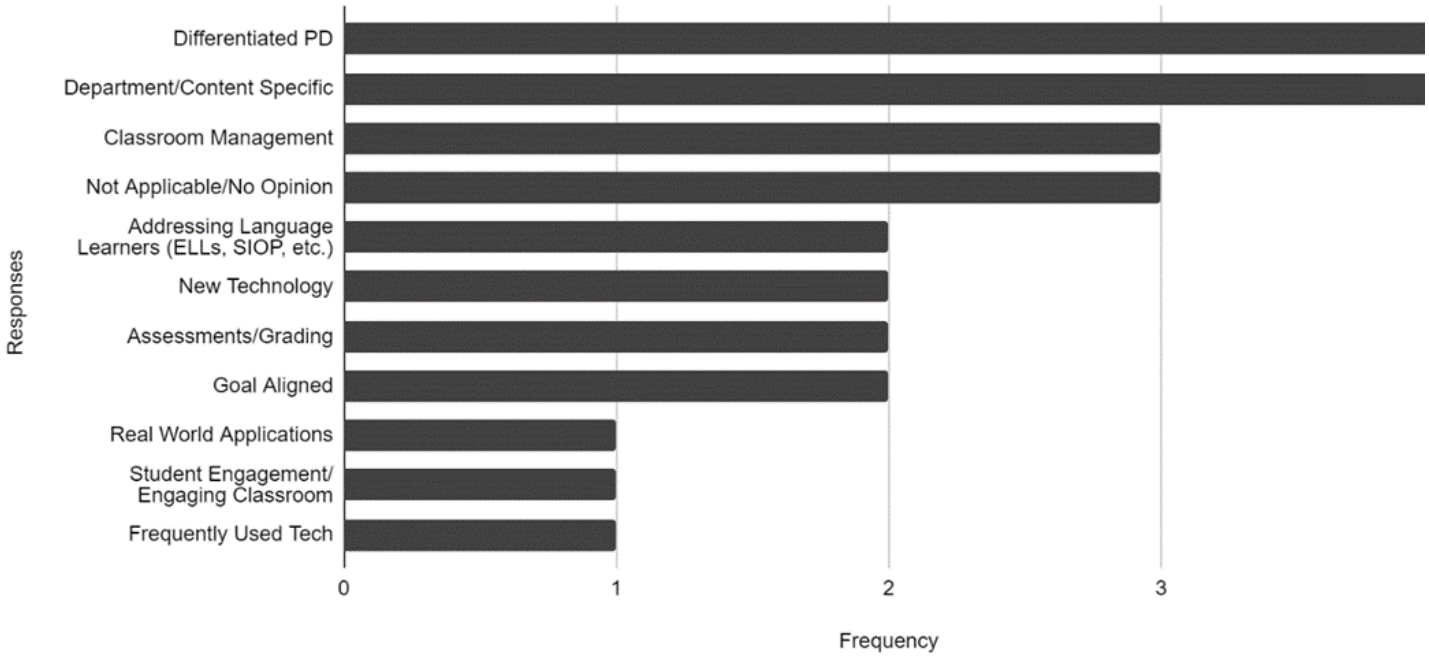
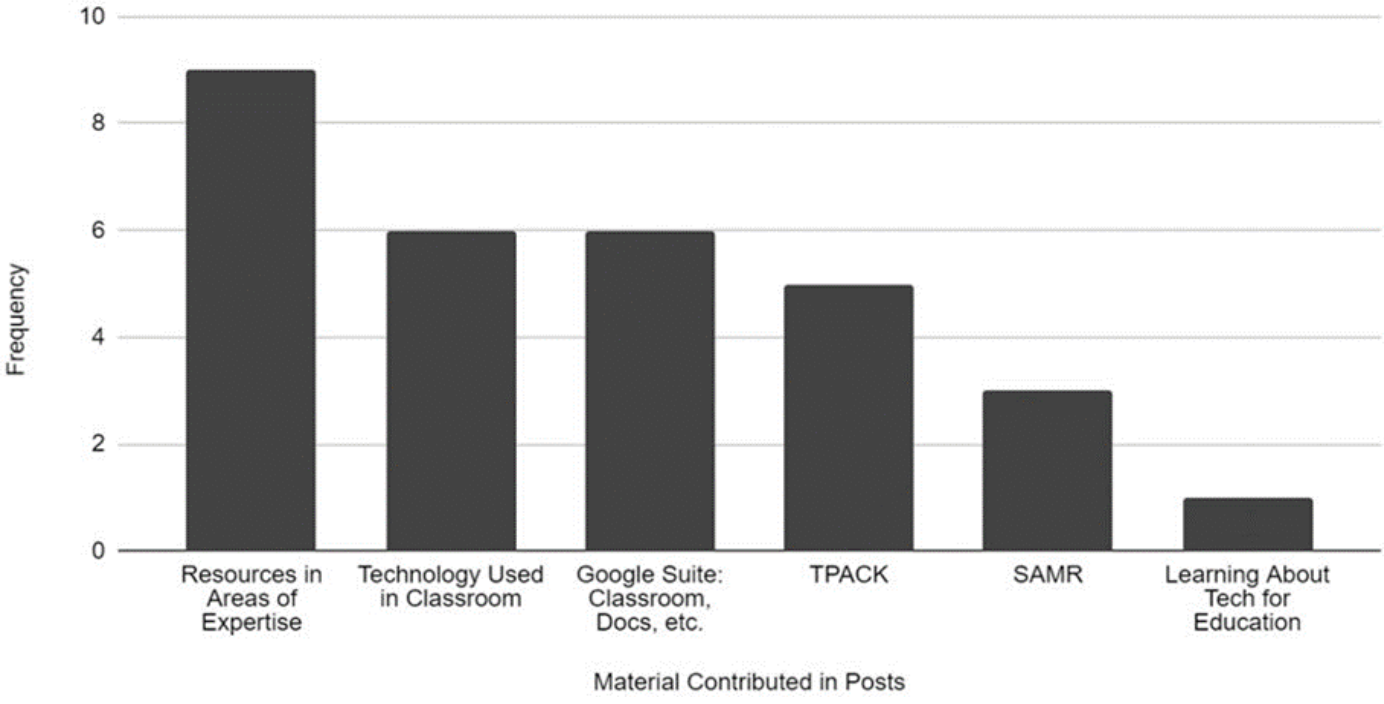


Figure 15. Survey 1 Question 13. Qualitative results from open response question 6 answered by Survey 1 participants.

PD modules. Like the qualitative data from the surveys, qualitative Padlet (2019) participation data from all five modules were first coded using Quirkos (2019) qualitative data analysis software. Then, the coded data set for each module were analyzed using differential statistics and put into Google Forms (Google Suite, 2019) to create visual representations in data graphs. Participants who self-identified in the posts by providing their names are assigned a pseudonym. However, three anonymous posts are counted as separate individuals for this study. Yet, there is no way to know whether they are all from the same individual or separate individuals.

Figures 16-20 include qualitative data retrieved from module posts on digital Padlet (2019) pages. Each post was entered into Quirkos (2019) qualitative data analysis software and

Material Contributed in Module 1: Department/Content Specific PD



coded. The coded data is displayed graphs from each module in the SHS Tech PD.

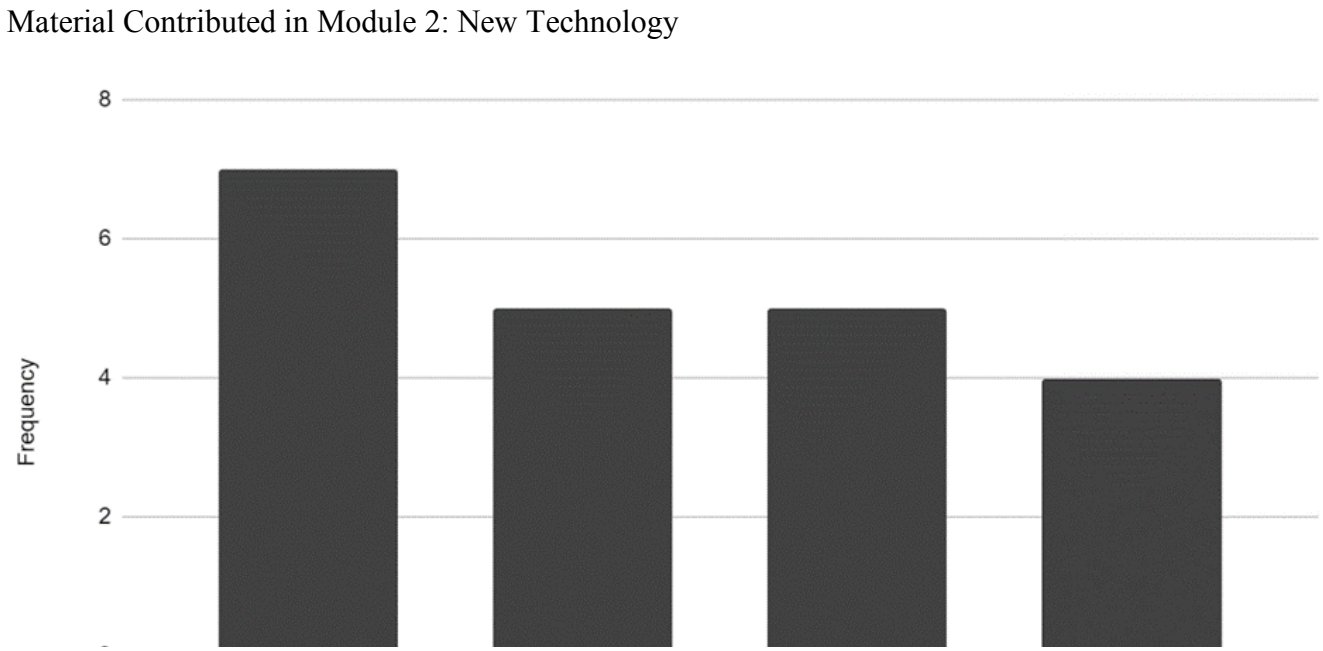
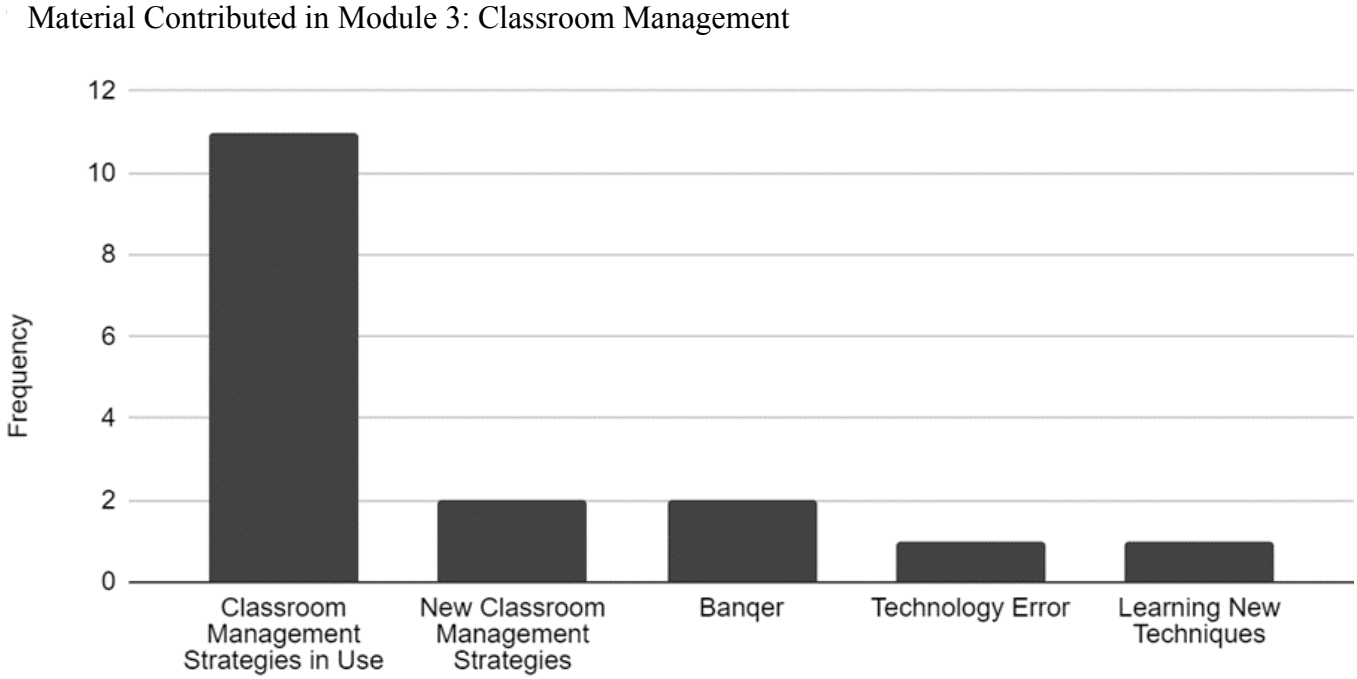


Figure 16. Module 1. Qualitative results from posts in the Department/Content Specific PD Padlet (2019).

Figure 17. Module 2. Qualitative results from posts in the New Technology Padlet (2019).



Material Contributed in Module 4: Strategies for Teaching ELLs

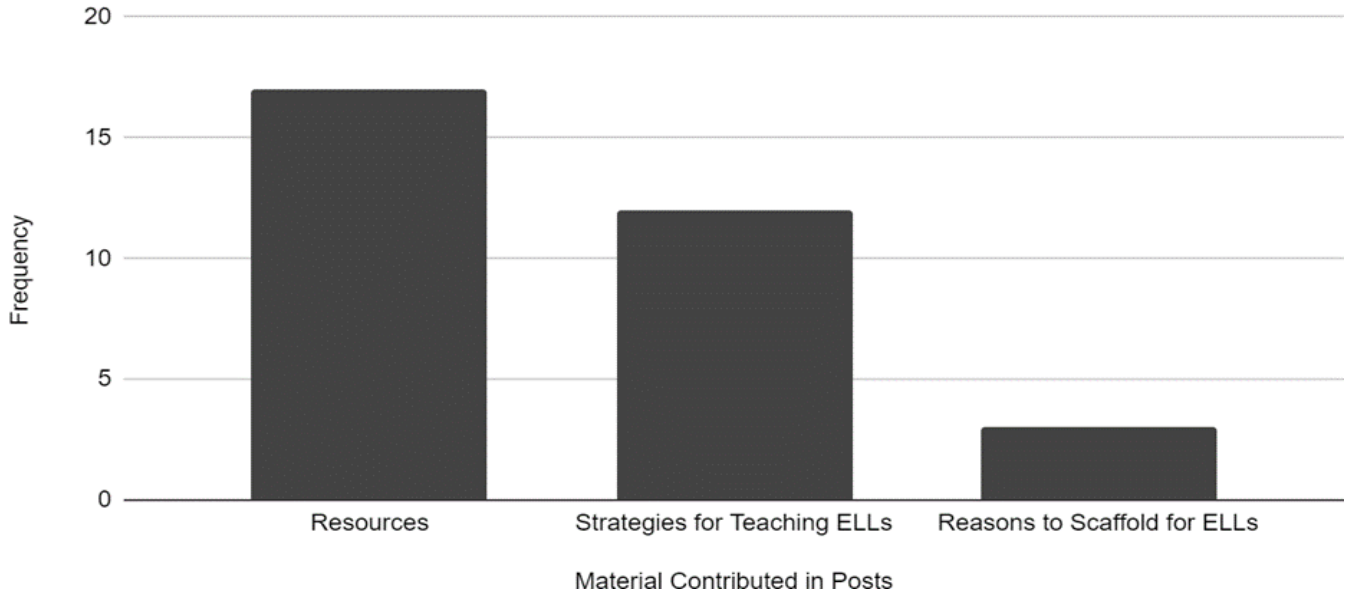
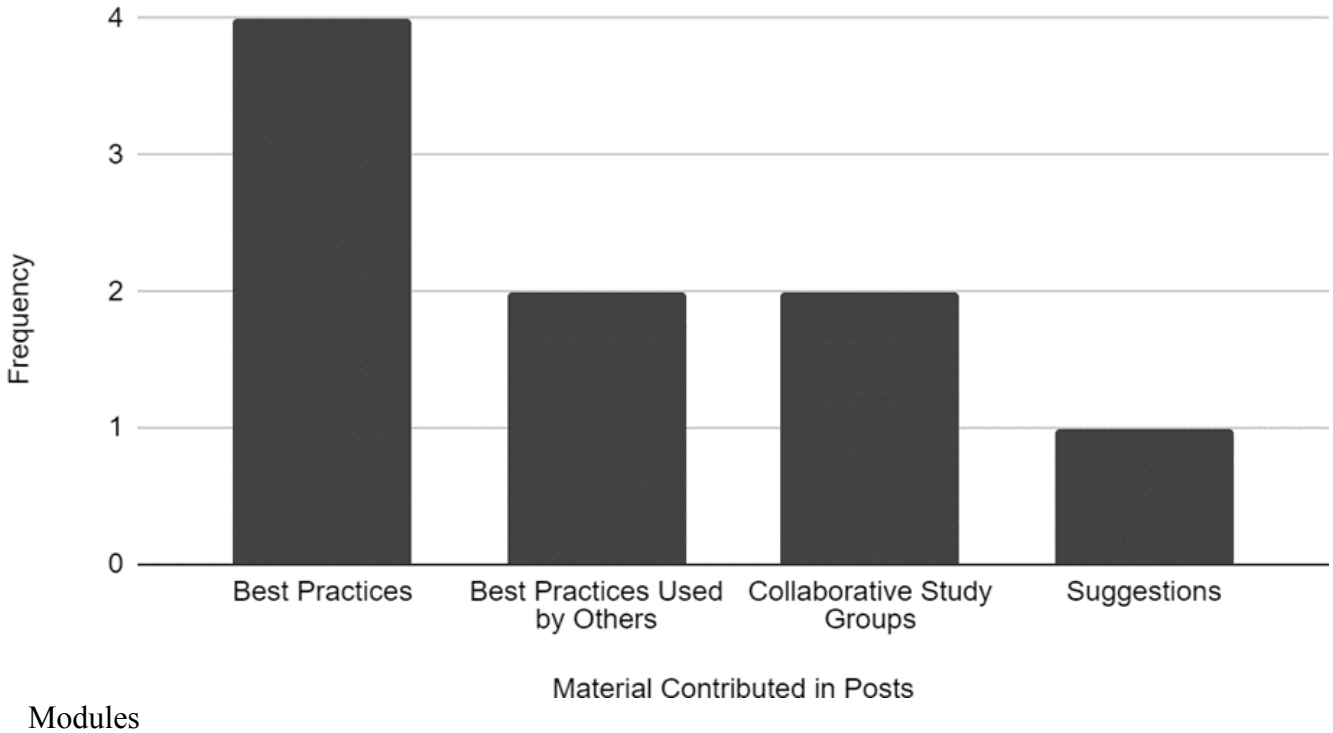


Figure 19. Module 4. Qualitative results from posts in the Strategies for Teaching ELLs Padlet (2019).

Material Contributed in Module 5: Best Practices



Modules

Participant data represented in Table 6 is from posts in the SHS Tech PD Padlet (2019) modules. The use of participant-chosen pseudonyms in Table 6 is intentional. It allows participants to see their contributions while keeping them anonymous (Vaughn, 2016). The IRB approved the use of participant pseudonyms for this study.

Table 6

SHS Tech PD Posts

Teacher Pseudonym	Module 1 Posts	Module 2 Posts	Module 3 Posts	Module 4 Posts	Module 5 Posts	All Posts
Ms. Plum	2	2	1	1	1	7
Mr. Kind	1	1	0	0	0	2
Ms. Flower	0	0	6	0	0	6
Mr. Park	3	2	2	1	2	10
Ms. Jane	7	0	0	0	0	7
Ms. Cat	1	1	0	1	1	4
Ms. Maestra	1	0	6	2	2	11
Mr. Jaguar	0	0	0	0	0	1
Ms. Butterfly	2	1	1	1	1	6
Ms. Strawberry	1	3	2	1	1	8
Ms. Coconut	1	0	1	0	0	2
Ms. Parrot	2	1	5	1	1	10
Ms. Mouse	0	1	1	0	0	2
Ms. Grape	0	1	0	0	0	1
Ms. Blueberry	0	0	0	1	0	1
Anonymous	3	0	1	3	3	10
Total Number	24	13	26	12	13	88

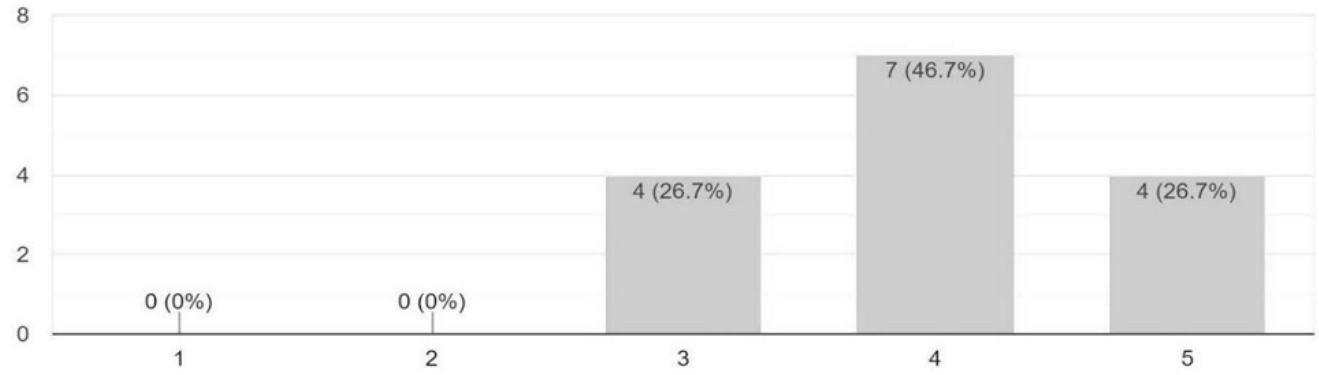
of Posts

Note. Totals calculated assuming each anonymous post is a different participant.

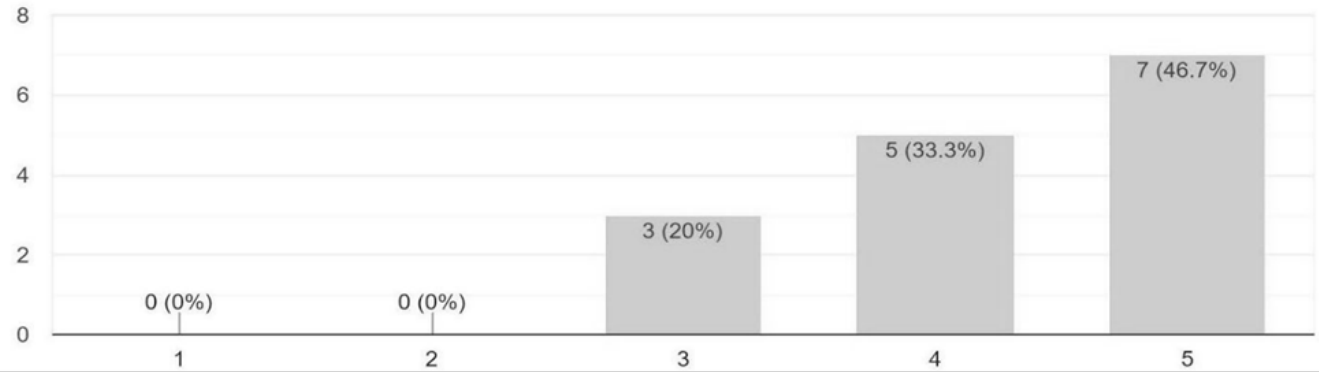
Survey 2. Only the module participants completed the second survey, Survey 2 (Appendix C). Mixed methods data collected from Survey 2 includes Likert scale questions (QuestionPro Survey Software, 2019) and open response questions. The Likert scale (QuestionPro Survey Software, 2019) questions produced quantitative data automatically generated into graphs by Google Forms (Google Suite, 2019) and analyzed using differential statistics. The open response questions were first coded using Quirkos (2019) qualitative data analysis software. Then, the coded data was generated into graphs using differential statistics.

Figures 21-27 include responses to seven Likert scale questions given to the SHS Tech PD participants in Survey 2. All seven of the questions provide quantitative data. They ask participants to score the SHS Tech PD, technology usage, and support.

Q1: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of effectiveness of the SHS Tech PD.



Q2: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the positivity level of your experience with SHS Tech PD.



Q3: On a scale of 1 to 5 with 1 being little to none and 5 being a significant amount, please rate the level of input you had in developing the SHS Tech PD.

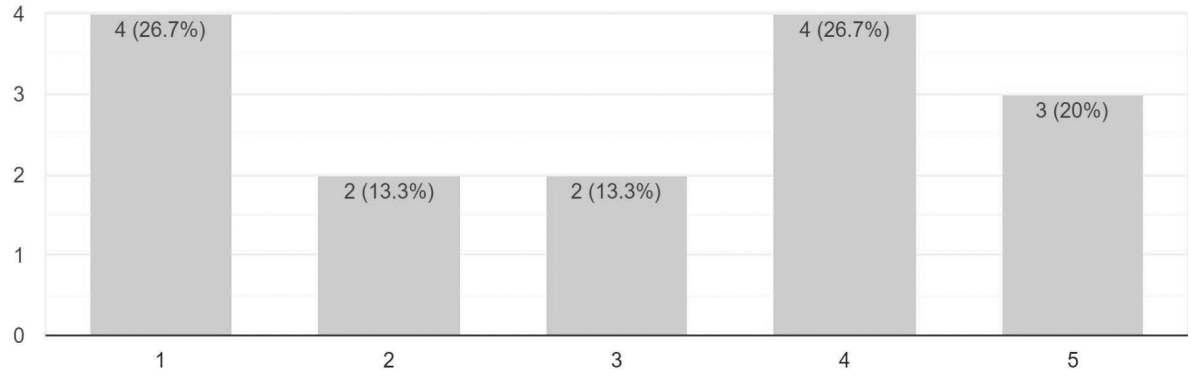


Figure 23. Survey 2 Question 3. Quantitative results from Likert Scale question 3 answered by Survey 2 participants.

Q4: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the amount of technology you used to engage in SHS Tech PD.

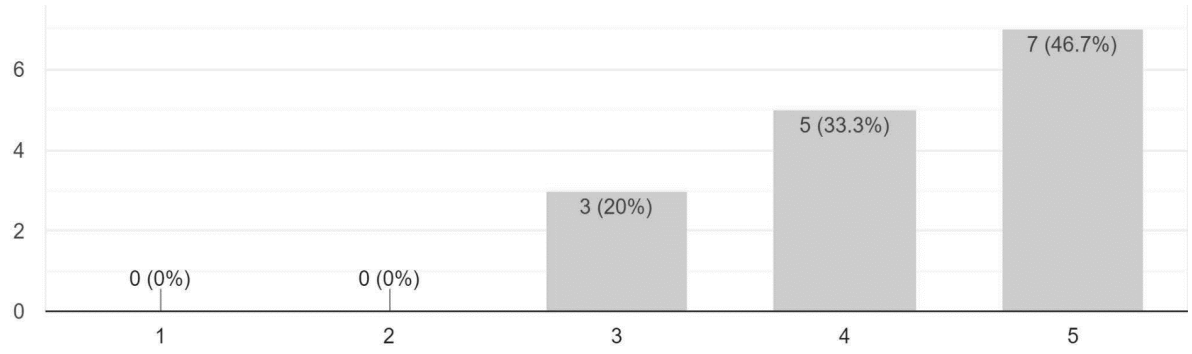


Figure 24. Survey 2 Question 4. Quantitative results from Likert Scale question 4 answered by Survey 2 participants.

Q5: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of support you received in creating and implementing lessons as part of the SHS Tech PD.

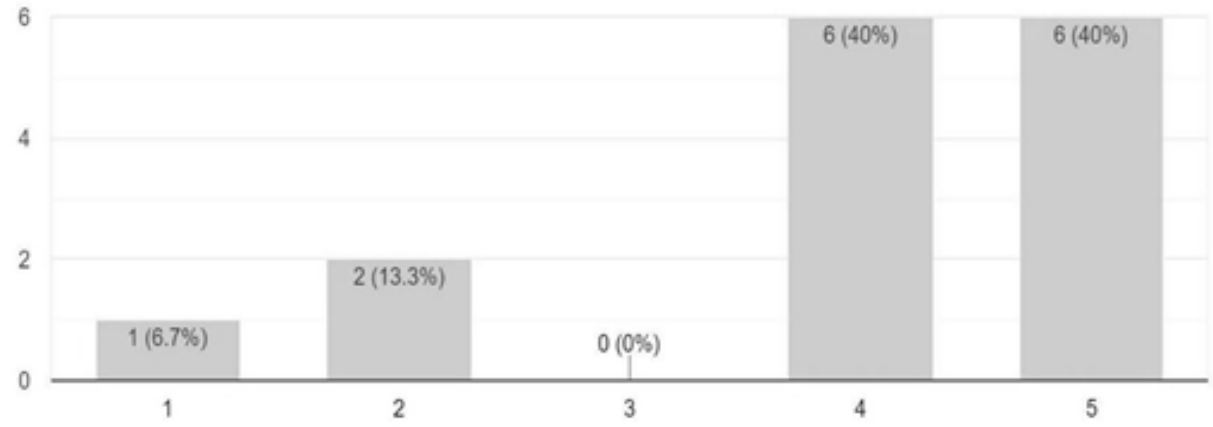


Figure 25. Survey 2 Question 5. Quantitative results from Likert Scale question 5 answered by Survey 2 participants.

Q6: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of support you received in utilizing technology in your classroom via the SHS Tech PD.

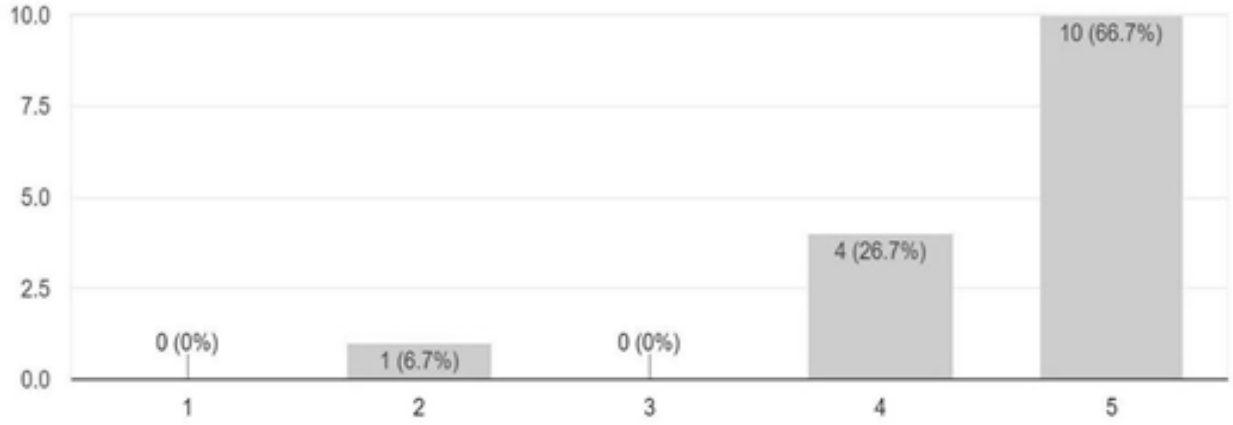


Figure 26. Survey 2 Question 6. Quantitative results from Likert Scale question 6 answered by Survey 2 participants.

Q7: On a scale of 1 to 5 with 1 being once in a while and 5 being daily, how often do you currently use technology in your classroom?

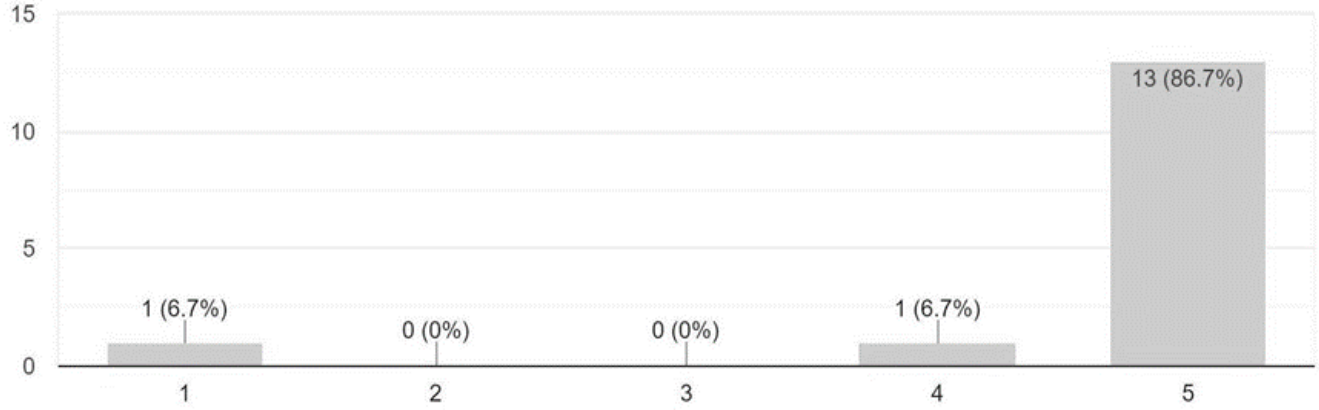


Figure 27. Survey 2 Question 7. Quantitative results from Likert Scale question 7 answered by Survey 2 participants.

Figures 28-32 include responses to five open response questions given to SHS Tech PD participants. All five of these questions provided qualitative data coded using Quirkos (2019) qualitative data analysis software. The open response questions were crafted to allow for independent feedback regarding the SHS Tech PD. Then, the coded data sets for each question were analyzed using differential statistics and put into Google Forms (Google Suite, 2019) to create visual representations of the data.

Q8: What are some positive and/or negative experiences you have had while engaging in SHS Tech PD?

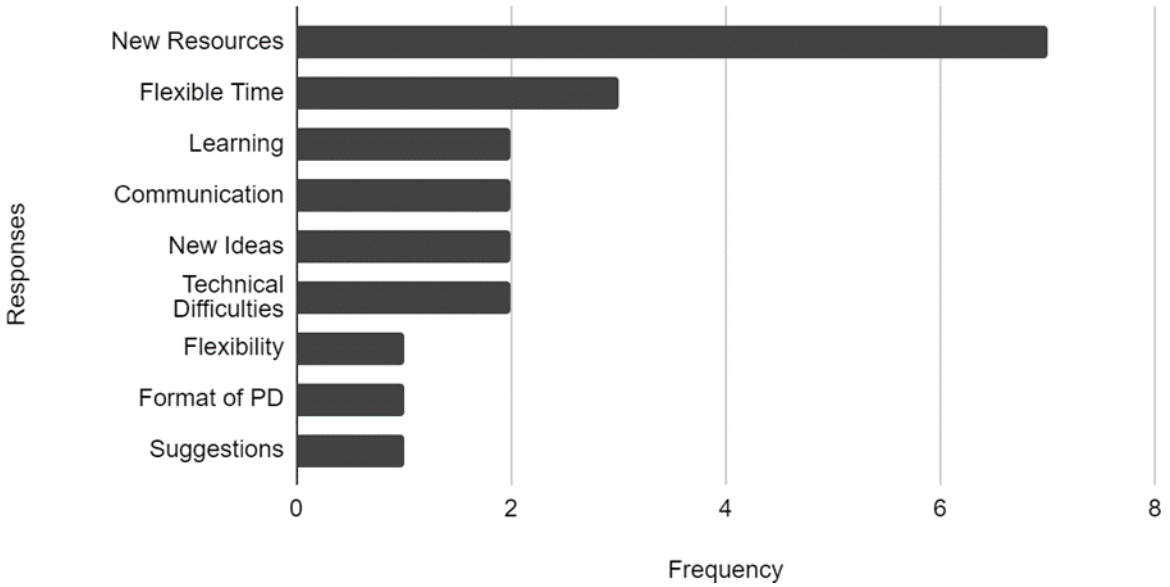


Figure 28. Survey 2 Question 8. Qualitative results from open response question 1 answered by Survey 2 participants.

Q9: How was technology implemented during the SHS Tech PD?

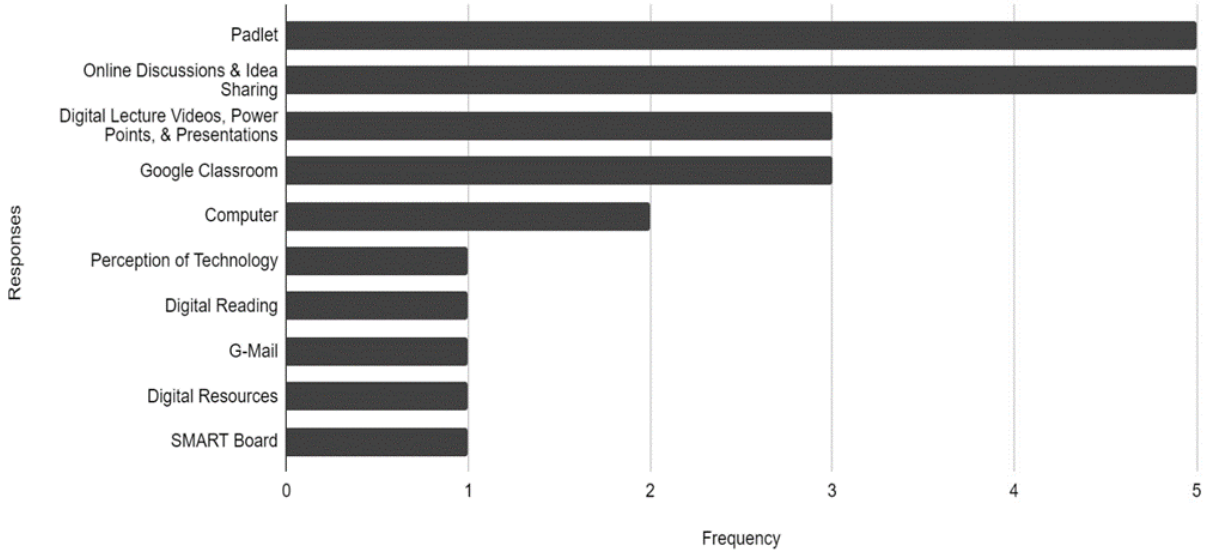


Figure 29. Survey 2 Question 9. Qualitative results from open response question 2 answered by Survey 2 participants.

Q10: What would you change about the SHS Tech PD?

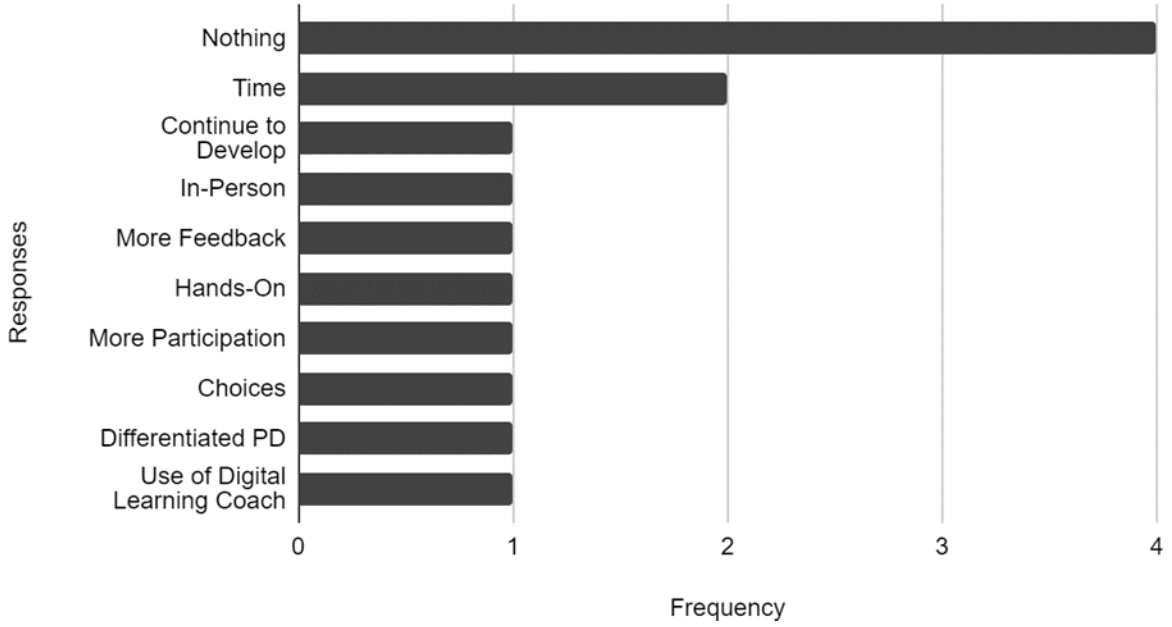


Figure 30. Survey 2 Question 10. Qualitative results from open response question 3 answered by Survey 2 participants.

Q11: What do you think about the focus of the SHS Tech PD?

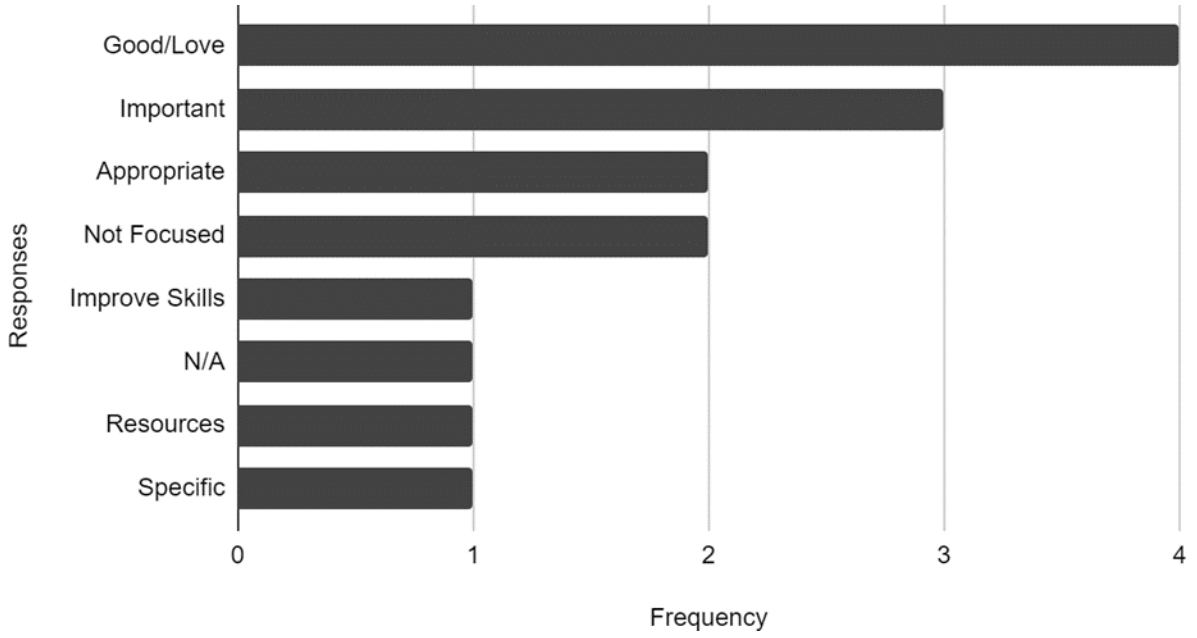


Figure 31. Survey 2 Question 11. Qualitative results from open response question 4 answered by Survey 2 participants.

Q12: ***Optional*** Please add any other comments or information you may want to provide regarding questions on this survey and/or SHS Tech PD.

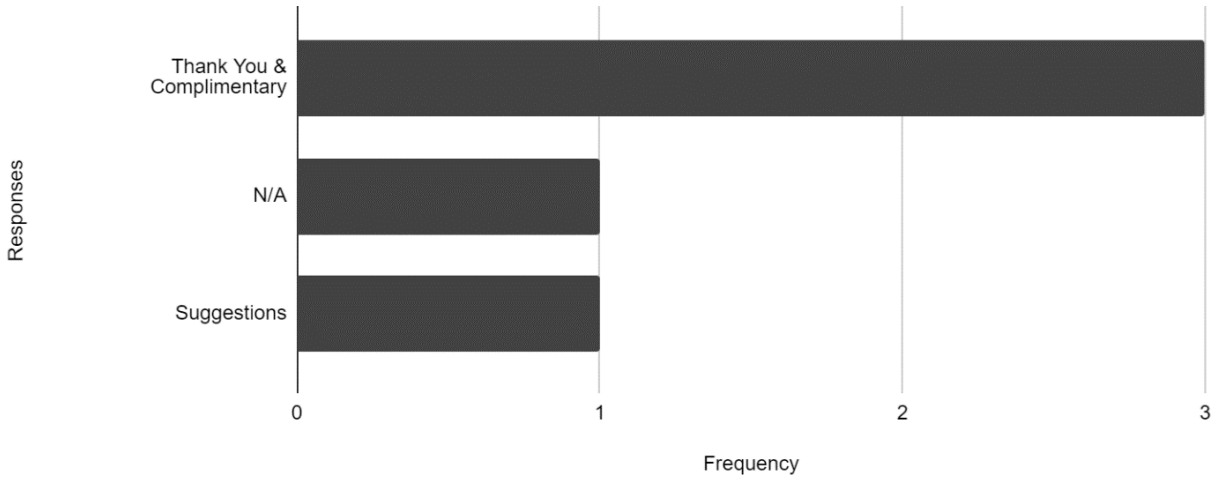


Figure 32. Survey 2 Question 12. Qualitative results from open response question 5 answered by Survey 2 participants.

SECTION 3: EVALUATION

Presented in this section are the findings from the study, an evaluation of the study, and the outcomes of the study. Additionally, this section includes a discussion about how the findings relate to the research questions and the literature reviewed. Included are successes, limitations, next steps, implications for practice, recommendations, and a conclusion.

Findings

The 5 SHS Tech PD modules (Appendix B) reveal positive experiences regarding the use of technology in education. In Module 1, Department/Content Specific PD, all posts are positive. Nine are about sharing technology resources related to teachers area of expertise, six explain how technology is used effectively in classrooms, six are specifically about using Google Suite (2019), five are specifically about using TPACK (Mourlam, 2017), three are specifically about using SAMR (Puentedura, n.d.), and one post is about specific Ed Tech tools a teacher wants to learn. Seven posts included links to additional resources.

In Module 2, New Technology, all of the participants shared their experiences with new technology resources they either recently discovered or are using in their classrooms. Seven posts are about the introduction of new technology to teachers, five are about implementing new technology in classrooms, five are specifically about using Google Suite (2019), and four posts are about new technology resources. One post included a link to a digital resource.

Module 3, Classroom Management, includes participant comments in appreciation of the resources shared more than in any other module. Eleven posts are about classroom management strategies currently in use in classrooms, two posts are about new classroom management strategies, two posts are about using Banqer (2019), one post is about a link error to the module which occurred in emails four and five, and one post is about learning new classroom

management techniques. Participants posted about some of the resources linked in this module, but no new resources were linked.

The posts in Module 4, Strategies for Teaching ELLs, all focus on supporting students who are learning English as a second language in a variety of different formats. Seventeen posts are about resources for teaching English Language Learners (ELLs), twelve posts are about strategies for teaching ELLs, and two posts provide reasons to scaffold for ELLs. Participants posted about some of the resources linked in this module, but no new resources were linked.

Finally, Module 5, Best Practices, includes posts that define and redefined what makes for best practices in teaching. Four posts are about best teaching practices, two posts are about best practices used by other teachers, two are specifically about collaborative study groups, and one post is a suggestion for focusing more on pedagogy and/or theory over best practices. Participants posted about some of the resources linked in this module, but no new resources were linked.

Though twice as many SHS teachers participated in Survey 1 (Appendix A) as participated in the SHS Tech PD Padlet (2019) modules (Appendix B) and Survey 2 (Appendix C), comparing the data collected between Survey 1 and Survey 2 provides insight to the effectiveness and impact of the SHS Tech PD study. According to Survey 2 quantitative data from Likert scale (QuestionPro Survey Software, 2019) questions, the majority of participants, 73.4 %, found the SHS Tech PD to be more effective than average which differs from the 46.9% of Survey 1 participants who found professional development (PD) prior to be above average in effectiveness. 80% of participants had an above-average positive experience engaging in SHS Tech PD, and 80% used a high level of technology during the PD. In Survey 1, only 56% of

participants had positive experiences with prior PD, and 50 % used a high level of technology during PD.

In Survey 2, 46.7 % of SHS Tech PD participants reported having an above-average level of input in developing the professional development (PD), and 25% of participants reported having an above-average level of input in PD prior. 93.4% of participants reported that the SHS Tech PD provided above-average support for using technology in their classrooms. Whereas only 50 % of Survey 1 participants reported above-average PD support for utilizing technology in their classrooms. 37.6 % of Survey 1 participants reported an above-average amount of PD support creating and implementing lessons, and 80% of SHS Tech PD participants reported an above-average amount of PD support creating and implementing lessons in Survey 2.

Finally, 86.7% of SHS Tech PD participants reported that they use technology daily in their classrooms, but only 62.5% of Survey 1 participants use technology daily in their classrooms. Since the surveys recorded all data anonymously and participation was voluntary, it is impossible to tell who participated and if the same participants from Survey 2 also participated in Survey 1. However, the impact of the SHS Tech PD left participants with an above-average experience in all ways questioned compared to the experience's participants had with professional development (PD) prior.

The open response questions from both surveys provide some additional insight into participants' experiences with the surveys, prior professional development (PD), and SHS Tech PD. In both surveys, two participants mention their dislike for the Likert scale (QuestionPro Survey Software, 2019) questions stating that they are too hard to rate and are too simple. It is important to note that the surveys included question variety in both surveys to provide methods of triangulation. The question about the Likert scale (QuestionPro Survey Software, 2019)

questions was added into the survey due to feedback from a Professional Development Design Team (PDDT) member after reviewing Survey 1.

Question 11 on Survey 1 and Question 9 on Survey 2 asked participants how technology was implemented during professional development (PD) to gain an understanding of what they were familiar with as well as what was different between prior PD and the SHS Tech PD. The primary response by more than half the participants in Survey 1 is presentations and projecting material. The primary responses (three tied for top responses) in Survey 2 include Padlet (2019), online discussions, and idea-sharing. The format of SHS Tech PD is different from prior PD because the participants were not "talked at" with the only form of technology provided during PD is a projector with a presentation. Instead, participants are active members of the SHS Tech PD, where the technology used is geared toward sharing and discussing ideas via the Padlet (2019) digital platform.

The rest of the Survey 1 questions differ from Survey 2 questions because they were used to create the SHS Tech PD, and the Survey 2 questions were used to evaluate the SHS Tech PD. The top three results to question 9, which inquired about where SHS teachers find out about new technology, are colleagues/other teachers, Internet research, and professional development (PD)/trainings. All three occur in the SHS Tech PD through teacher posts and sharing Internet resources in a digital PD setting.

Question 10 in Survey 1 asked participants about their positive and negative experiences in professional development (PD) prior. The top positive response was obtaining good ideas and strategies. Not having enough time to implement the PD as needed was the top negative response. The SHS Tech PD attempted to increase the sharing of good ideas and strategies

amongst teachers while being respectful of time by providing a digital environment anyone could participate in the entire time the study was occurring.

Question 12 in Survey 1 asked participants what they would change about prior professional development (PD). The top response was “not applicable” which makes one wonder if the participants meant that their opinion about change is not applicable or if there is nothing they felt needed to change. The next highest result was “differentiation and choice.” The design of the SHS Tech PD allowed participants to participate in all 5 PD modules or pick and choose the ones in which they wished to participate. Furthermore, what was shared by participants pertained to the level and relevance of those who shared it. Therefore, it had a natural opportunity for differentiation.

Questions 13 and 15 in Survey 1 had the most significant impact on SHS Tech PD. Question 13 asked participants what they thought professional development (PD) should focus on, by asking for PD requests, and question 15 asked participants what topics they wanted to cover during the PD. The top specific requests from question 13 were the same top choices in question 15, and they became the first four modules in the SHS Tech PD: Department/Content Specific, Classroom Management, Addressing Language Learners, and New Technology. Though differentiated PD received a high number of responses, the format of the SHS Tech PD allows for differentiation. Therefore, it was not an independent topic in the modules. Best Practices became the fifth topic for a module because it received the next highest response rate.

Question 14 was added to Survey 1 at the request of a Professional Development Design Team (PDDT) member. It asked participants which professional development (PD) format they preferred. The majority of participants chose interactive/hands-on followed by digital/remote. The SHS Tech PD was primarily digital/remote. However, the format is as interactive as

participants made it. Padlet (2019) allows participants to post text, links, videos, and audio files. Just about anything can be shared via Padlet (2019), making it a fully interactive program.

The Survey 2 questions designed to evaluate and/or improve SHS Tech PD include question 10, which asked participants what they would change about the professional development (PD). The top response was "nothing" followed by time. Despite being a flexible participation format where participants can participate on their own time, time is still the primary issue plaguing teachers' participation in PD.

Question 11 in Survey 2 asked participants what they thought about SHS Tech PD. The top two responses were that it was good and/or they loved it, followed by expressing its importance. On the other hand, a couple of participants felt that it was not focused. SHS Tech PD was intentionally open-ended to allow for teacher interpretation and conversations to form organically. However, the lack of a specific objective or outcome from the professional development (PD) may make it less focused than other PD. Having a specific objective for each module is something that needs further examination when using this model in the future.

Finally, question 12, an optional question in Survey 2, asked participants for any comments or additional information they may want to provide regarding the survey and the PD. Three participants wrote, "thank you' and/or provided compliments. One person wrote N/A, and one person wrote that they would like to see future professional development (PD) relate to Google Certifications so that they can become Google Certified Educators. Based on the number of responses throughout PD that included information about the use of Google Suite (2019), this request makes sense for future PD at SHS.

Reflections and Critique

As mentioned, the primary concerns that occurred in the implementation of SHS Tech PD were limitations on time and lack of participation, especially in-person participation. Additionally, the questions in Survey 2 could have been more related to the research questions. Yet, the study overall introduced a new professional development (PD) model to Sol High School (SHS) that received positive feedback from participants.

Making a Difference

SHS Tech PD is the first remote professional development (PD) delivered at Sol High School (SHS). Intended to be a hybrid study, the lack of in-person participants further justifies the need for remote PD. Teachers at SHS do not have time to attend lunch or after school PD meetings. Therefore, remote PD options are ideal for teachers at SHS.

Positive change. Teachers engaging in sharing resources and experiences via the SHS Tech PD is a positive change from the sit and get professional development (PD) training of the past. Survey 2 showed that in all ways, SHS Tech PD scored above average at higher rates than prior PD methods. The conversational sharing style of the PD allows teachers to engage in a transformative experience instead of just receiving the information they may already know or have access to receiving. Furthermore, modules for PD following this structure change as teachers' needs change. It is vital to include teacher participants in the planning and development of PD because they know their needs best.

Limitations and challenges. A shorter time frame than anticipated hindered the study the most. Additionally, the study competed with other mandatory professional development (PD). IRB permission from the school district and the need for the administration to plan PD with the instructional coach caused a limited window of time to execute the study. Furthermore, acquiring

teacher participants was challenging due to the demands put on teachers' time during the study. Though the principal promised future PDs would be exempt if teachers participated in SHS Tech PD, PDs occurring at the same time as the study were still mandatory. Therefore, the execution of the initially intended study did not occur according to plan, and staff participation was low.

Implemented again. If this study were implemented again with the same limitations that occurred during the execution of this study, the Professional Development Design Team (PDDT) would better design the Survey 2 questions to reflect the research questions more directly. During in-person meetings, the participants could have answered the questions in more depth, but it became clear that remote professional development (PD) is what Sol High School (SHS) needs. Furthermore, a request for more specific examples of technology integration in the classroom from participants in the modules would have occurred, so evidence of using technology in the classroom would be concrete. Finally, items in some of the modules asked teachers to volunteer to help others or request help from others to foster a mentor-mentee relationship. However, the participants ignored those requests, so no such relationships were cultivated. Again, in-person meetings may have helped to cultivate such relationships, but they did not occur. If done again, there would not be such expectations of the participants.

Implications for Professional Practice

The creation of the SHS Tech PD came from successful action research professional development (PD) studies conducted in similar school settings to discover what is best for the population at Sol High School (SHS). The study revealed that teachers at SHS perceive remote, transformational PD they have a say in creating as beneficial. Changing PD at SHS from past lecture-style methods to adopting a more flexible, participant-oriented PD, one that addresses

topics teachers want to cover, will improve teachers' perceptions of PD. Thus, making PD more useful in guiding their professional practice.

Takeaways

The fact that no participants attended in-person SHS Tech PD meetings set up during lunch and after school is telling about the needs of the teacher population. When not mandated to attend professional development (PD) at a physical location by a superior, Sol High School (SHS) staff prefer to either not participate or participate remotely. Therefore, more remote options for PD may allow for truly transformational outcomes because the staff will participate in order to improve their teaching practice, not because they are required to attend.

Additionally, asking teachers to engage in a conversation-style, transformational professional development (PD) led to more teachers ranking the PD in the surveys as above average in all areas over traditional PD. Teachers preferred PD they can contribute to more than PD where their contributions are limited. Therefore, providing more PD where teachers share resources and ideas, over a style where an administrator leads the PD by telling the staff information, will lead to PD teachers will utilize.

Finally, by asking teachers about the professional development (PD) topics they want to cover in a survey and asking for participants in a leadership team to develop the PD, administrators may ensure that the staff value the PD in which they participate. They are part of the process. When teachers become invested in the creation and execution of PD, they are much more likely to have an above-average experience engaging in PD.

New knowledge. As a result of SHS Tech PD, findings show that teachers prefer to participate in remote professional development (PD), and they found all aspects of SHS Tech PD to be above average at a higher rate than prior PD at Sol High School (SHS). Participants also

expressed that the PD was good or loved it, they thought it was important, and/or thought it was appropriate. Additionally, some participants felt that it needed to be more focused. Based on this new knowledge, SHS should look at PD leadership as something all teachers should have an opportunity to participate in developing. Providing more remote PD opportunities will allow teachers to have more flexible time to participate, and teacher-selected PD should focus on areas or outcomes that teachers deem appropriate.

Comparing findings to prior studies. Studies focused on integrating technology in public schools reviewed found that increased technology implementation in classrooms led to increased student engagement (Keengwe, Scheller, & Mills, 2011), that a school librarian is an effective school staff member at providing technology training and technology support (Kuzo, 2015), and that teachers need more technology professional development (PD) to overcome their fear of using technology in their classrooms (Zuniga, 2010). SHS Tech PD increased the amount of technology used during PD, which led to teachers sharing how technology was (or would be) utilized in their classrooms. Though the school librarian was not a participant in the SHS Tech PD, teachers involved in planning, executing, and participating in the SHS Tech PD found it to be above average in all areas assessed. None of the participants expressed fear of using technology in their classrooms, but many participants shared how technology is a tool for improving teaching and learning in their classrooms.

Action research professional development (PD) studies showed that teachers need technology PD (Ottenbreit-Leftwich, Galazewski, Newby, & Ertmer, 2010) and that the implementation of technology PD changes teachers perceptions and attitudes regarding technology integration in education (Tyner, 2018). Similarly, SHS Tech PD provided technology PD through remote means using technology, so teachers received PD about technology using

technology. In more than one SHS Tech PD Padlet (2019), teachers posted how they used Google Suite (2019) products effectively in their classrooms. In Survey 2, a teacher requested additional Google Suite (2019) PD geared toward becoming Google Certified Educators. The SHS Tech PD allowed teachers to experience PD in a different format than any other provided prior at SHS, remotely. Based on the positive feedback received from participants in the SHS Tech Padlets (2019) and Survey 2, teacher perceptions and attitudes were more positive about PD after engaging in SHS Tech PD.

Research on transformative learning reviewed includes changes in teacher perspectives as a result of engaging in discourse instead of being forced to change using a top-down style (Christie, Carey, Robertson, & Granger, 2015). Transformative professional development (TPD) leads to improvements in teaching and learning (Johnson & Fargo, 2010) and acquiring change through open, reflective, and inclusive processes that generate beliefs that justify actions (Mezirow, 2003). SHS Tech PD used a transformative learning model to guide the study. As such, participants planned and executed professional development (PD). It focused on topics teachers requested, and it included resources teachers could engage with as starting points for conversations. Ultimately, the PD focused on teacher conversations and reflective processes. It is such conversations and processes that allow teachers to engage in PD in positive and meaningful ways, thus having an above-average PD experience.

Recommendations

At Sol High School (SHS), professional development (PD) has already changed considerably since the process for this study began in 2018. Implementation of teacher-led PD is occurring in small group classroom settings as opposed to the former large presentation style PD all staff had to attend prior within a single shared space. Yet, the PD is still covering topics the

administrators or district officials determine to be relevant, not teachers. There is still one person who leads the PD, typically using a presentation or lecture format. Furthermore, PD provided during this study focused on technology integration and teacher-selected topics. PD methods at SHS may benefit from the findings of this study, and similar studies may occur as administrators strive to improve PD for teachers.

Next Steps and Changes

Based on teacher participation, feedback received in the SHS Tech PD Padlets (2019), and the Survey 2 results, Sol High School (SHS) should provide more remote professional development (PD) opportunities, conversational-style transformative PD, and PD topics should focus on a goal or specific outcome. In order to achieve such changes, implementation of a similar structure to the remote SHS Tech PD structure may occur with teacher-selected topics. In particular, a transformative PD structure that supports teachers becoming Google Certified Educators would benefit teachers at SHS.

Future action research. Another, more extended, action research professional development (PD) study may reveal more information about PD preferences at Sol High School (SHS). Furthermore, such a study may reach teachers that have a negative view of technology if the staff is required to complete the PD. Since the SHS Tech PD was a voluntary study, it may not have reached those teachers. An action research PD study about conducting action research in classrooms may benefit teachers interested in data-informed instruction or technology integration practices. Regardless of what one wants to study, action research is an effective way to instigate positive change in a school setting.

Conclusion

Designed to improve professional development (PD) strategies and technology integration at Sol High School (SHS), the SHS Tech PD provided a new way to do PD at SHS. Teachers participated in all stages of development. Designed as the first hybrid PD model at SHS, it became a remote PD model due to a lack of participant presence at meetings. A total of 36 out of 100 possible participants at the school site contributed to the SHS Tech PD. All participants chose to participate remotely over participating face-to-face in a classroom setting.

Teachers at Sol High School (SHS) were asked via school email to volunteer as part of the Professional Development Design Team (PDDT) and as participants in the SHS Tech PD surveys and modules. Using results from Survey 1 (Appendix A) data to construct the SHS Tech PD, the PDDT provided input for the five SHS Tech PD modules (Appendix B) delivered via Padlet (2019) and Survey 2 (Appendix C), a post-survey for module participants. The five SHS Tech PD modules revealed positive experiences regarding the use of technology in education, and the surveys showed that SHS Tech PD participants had more above-average experiences engaging in remote PD than teachers had in prior PD. Therefore, SHS should offer more remote, transformative PD that allows teachers to design and participate in PD opportunities they deem relevant.

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Appendix A

Survey 1

Professional Development (PD) at SHS Survey 1

This survey is to be used for the sole purpose of Alexandra Robertson's action research designed in pursuit of obtaining a doctoral degree from Capella University. It will only be used with the utmost confidential and ethical standards. By taking this survey, you are giving Robertson permission to use the results in such context. To maintain confidentiality, your name, email, nor any other personal identification information will be recorded by this survey.

* Required

1. Q1: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of effectiveness of the professional development (PD) you have engaged in thus far in your teaching career. *

   Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

2. Q2: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the positivity level of your experiences with teacher PD. *

   Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

3. Q3: On a scale of 1 to 5 with 1 being little to none and 5 being a significant amount, please rate the level of input you have had in developing PD. *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

4. Q4: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the amount of technology used during PD. *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

5. Q5: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of support you received in creating and implementing lessons via PD. *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

6. Q6: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of support you received in utilizing technology in your classroom via PD. *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

7. Q7: On a scale of 1 to 5 with 1 being once in a while and 5 being daily, how often do you use technology in your classroom? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

8. Q8: *Optional* If you have any comments/thoughts about the "On a scale of 1 to 5" questions, please provide them here.

9. Q9: Where do you usually find out about new technology? *

10. Q10: What are some positive and/or negative experiences you have had while engaging in or implementing PD? *

11. Q11: How was technology implemented during PD? *

12. Q12: What would you change about the PD you have previously participated in? *

13. Q13: What do you think PD should focus on? What requests do you have for PD? *

14. Q14: What PD format do you prefer? Please check all that apply, and add your own if applicable. *

Check all that apply.

- [ ] Presentation/Lecture
- [ ] Interactive/Hands-On
- [ ] Digital/Remote
- [ ] Conference Style/Conversational

Other: [ ] _____

15. Q15: What topics would you like to cover in PD this year? Please check all that apply, and add your own if applicable. *

Check all that apply.

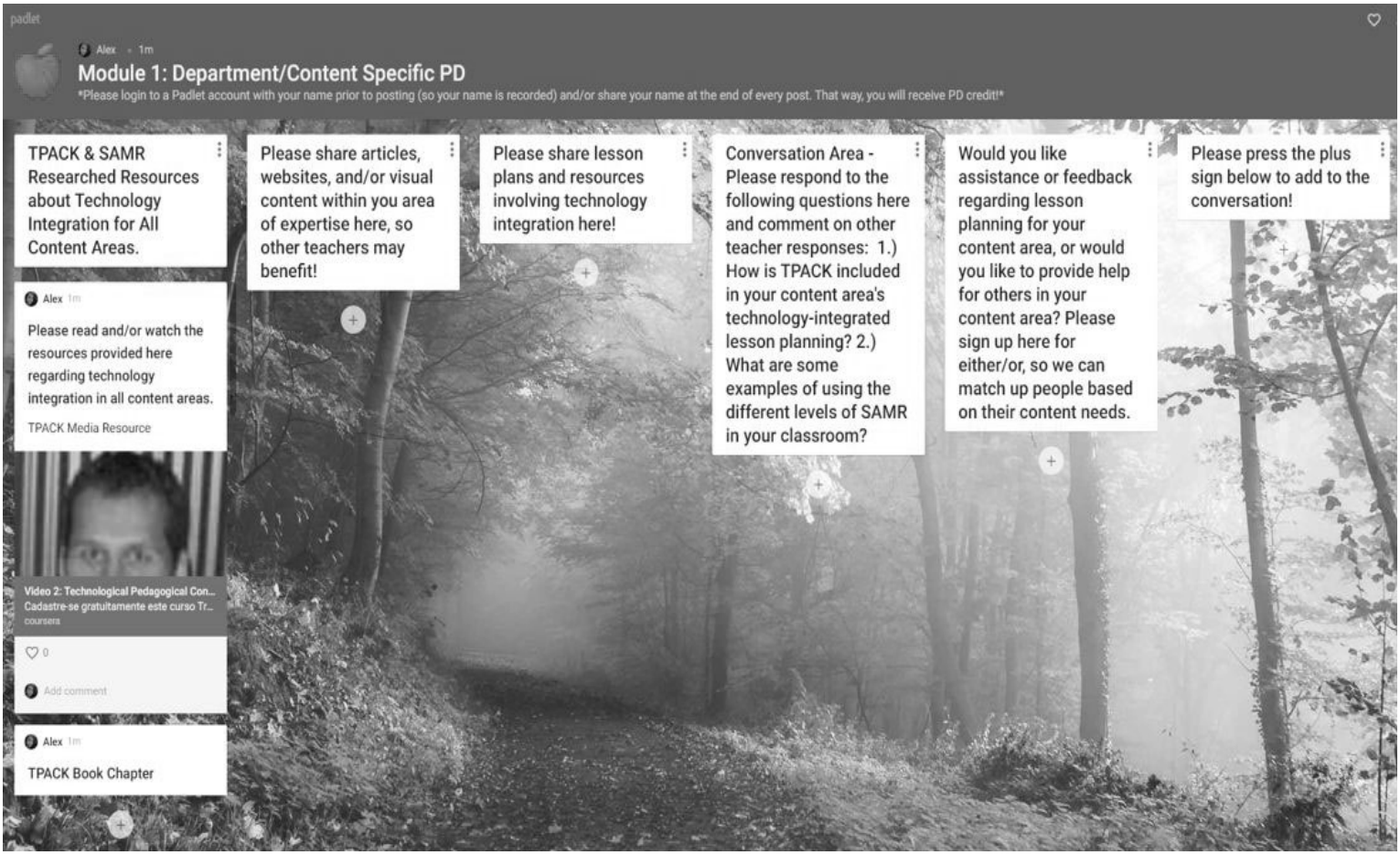
- [ ] Classroom Management
- [ ] Lesson Planning
- [ ] Best Practices
- [ ] Working with English Language Learners (ELLs)
- [ ] Reading Recent Research and/or Professional Literature
- [ ] Working with or Communicating with Colleagues
- [ ] Observing Colleagues
- [ ] Conducting Classroom Research to Inform Instruction
- [ ] Mentorships
- [ ] Course Content
- [ ] Using New Technology
- [ ] Collaborating with Technology I (Face to face interactions enhanced by technology)
- [ ] Collaborating with Technology II (Using technology programs to collaborate, i.e. Shared Docs, Pen Pals, etc.)
- [ ] Hands-On Activities Enhanced with Technology
- [ ] School Required Software and Forms, i.e. Frontline (PDPs, Evaluations, Absent Management), Power School, School Dude, Google Classroom, Google Forms, & G-Mail
- [ ] Tech Resources at School, i.e. Printers, Copiers, Scanners, Fax, Phone, & Computers

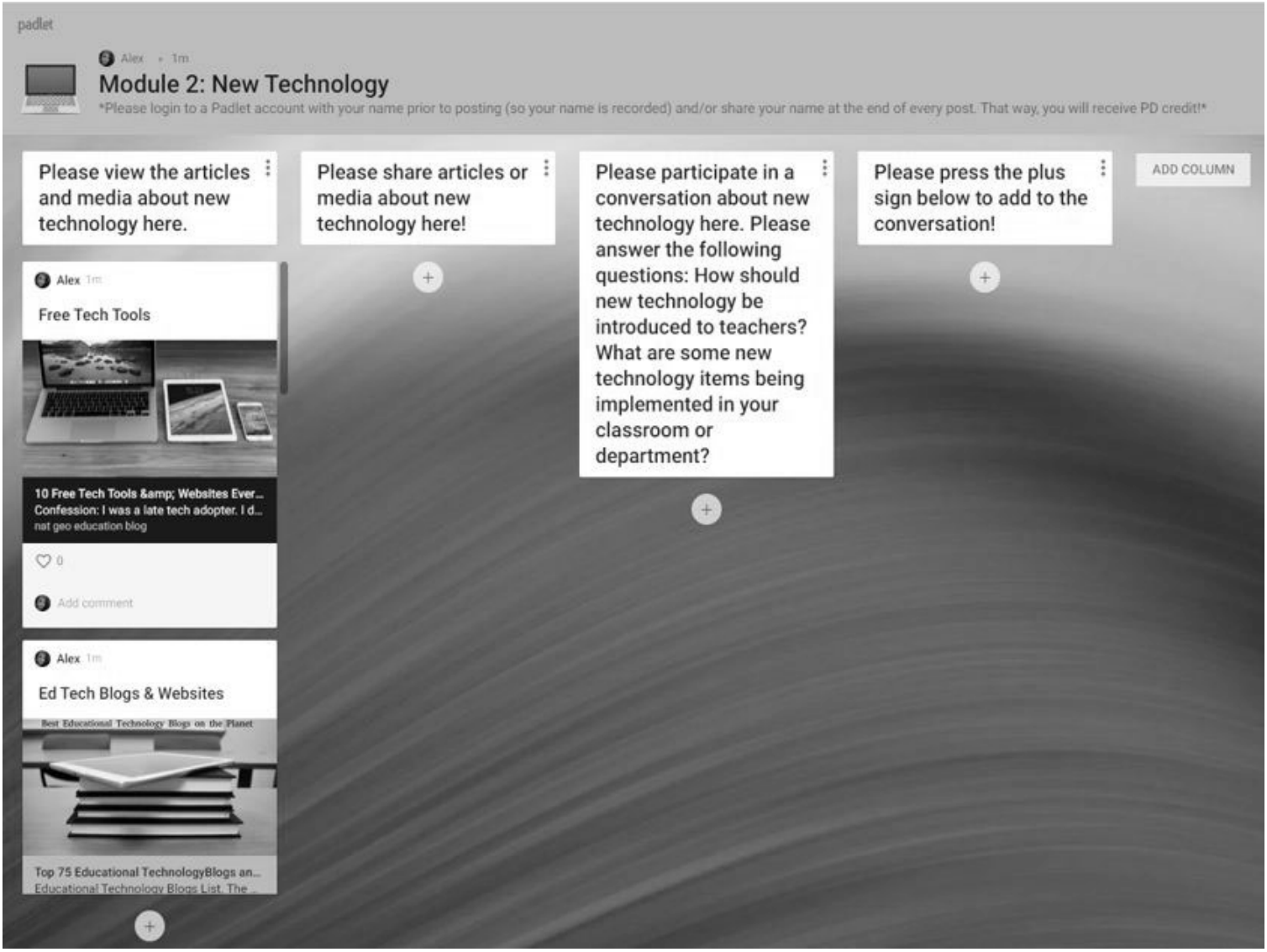
Other: ☐ _____

Appendix B

5 Padlet PD Modules

(Prior to Participation)




padlet
Alex • 1m
Module 2: New Technology
Please login to a Padlet account with your name prior to posting (so your name is recorded) and/or share your name at the end of every post. That way, you will receive PD credit!
Please view the articles and media about new technology here.
Please share articles or media about new technology here!
Please participate in a conversation about new technology here. Please answer the following questions: How should new technology be introduced to teachers? What are some new technology items being implemented in your classroom or department?
Please press the plus sign below to add to the conversation!
ADD COLUMN
Alex 1m
Free Tech Tools
10 Free Tech Tools & Websites Ever...
Confession: I was a late tech adopter. I d...
nat geo education blog
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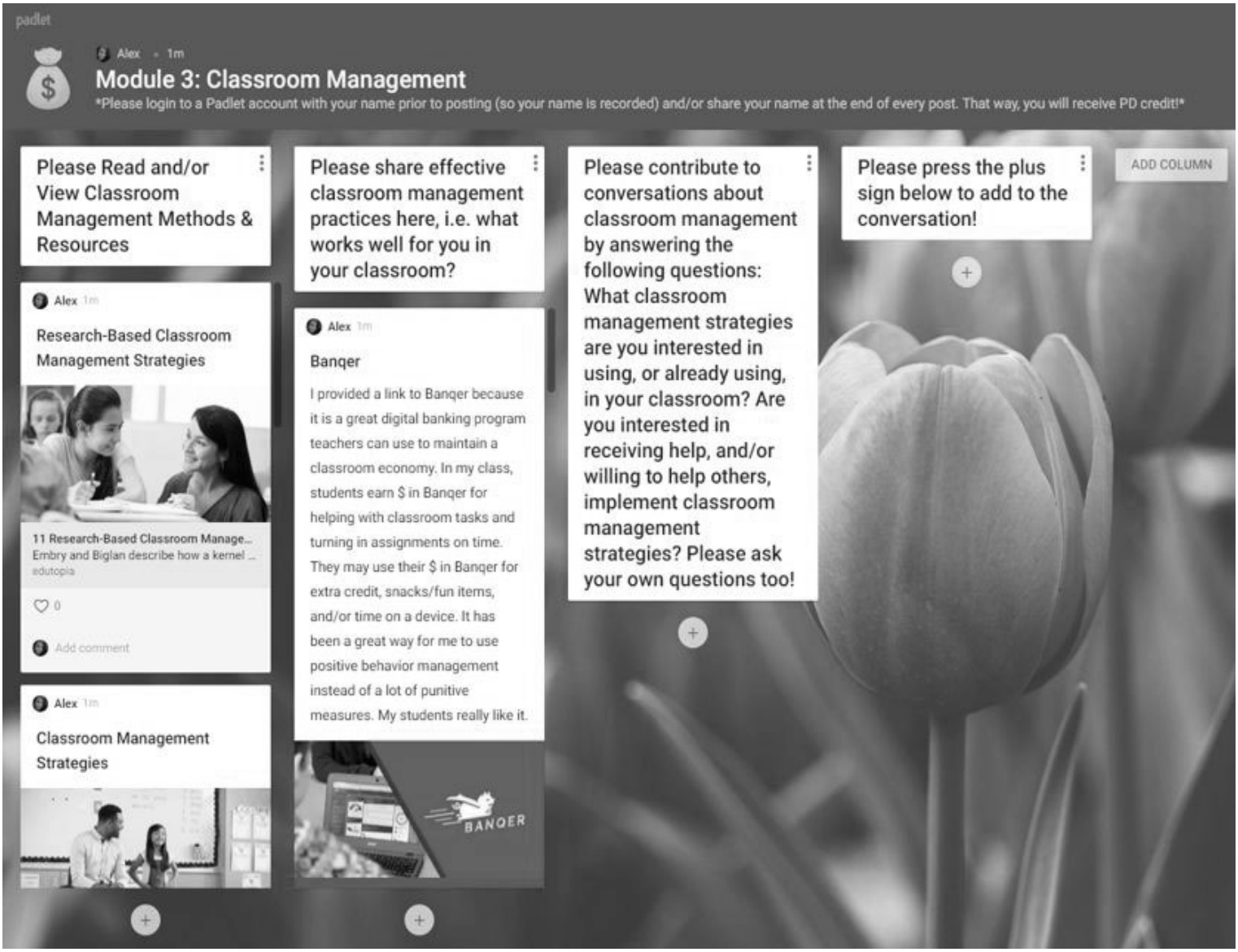
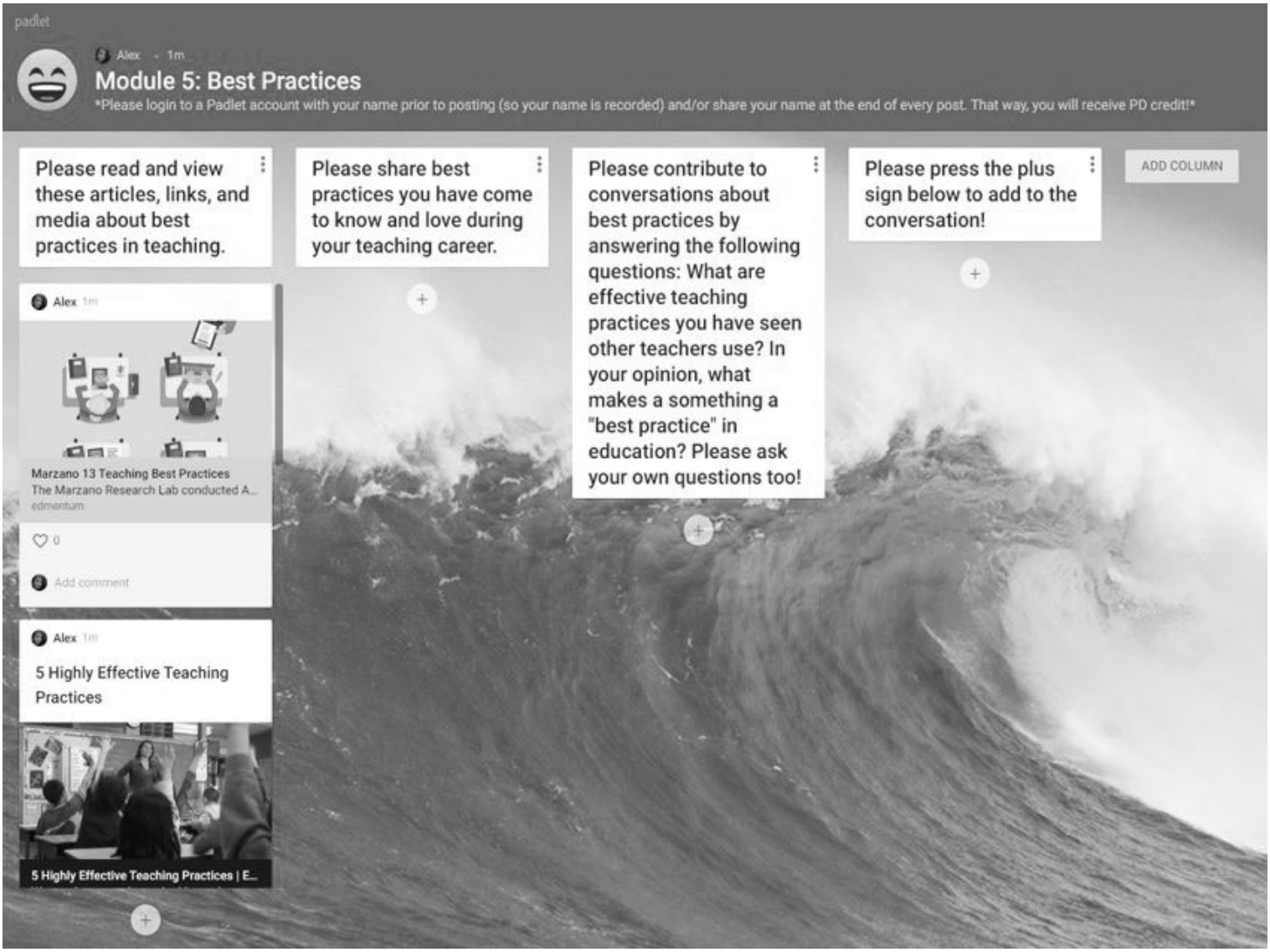
Add comment
Alex 1m
Ed Tech Blogs & Websites
Best Educational Technology Blogs on the Planet
Top 75 Educational TechnologyBlogs an...
Educational Technology Blogs List. The ...


padlet
Alex · 1m
Module 3: Classroom Management
Please login to a Padlet account with your name prior to posting (so your name is recorded) and/or share your name at the end of every post. That way, you will receive PD credit!
Please Read and/or View Classroom Management Methods & Resources
Please share effective classroom management practices here, i.e. what works well for you in your classroom?
Please contribute to conversations about classroom management by answering the following questions: What classroom management strategies are you interested in using, or already using, in your classroom? Are you interested in receiving help, and/or willing to help others, implement classroom management strategies? Please ask your own questions too!
Please press the plus sign below to add to the conversation!
ADD COLUMN
Alex 1m
Research-Based Classroom Management Strategies
11 Research-Based Classroom Manage...
Embry and Biglan describe how a kernel ...
edutopia
0
Add comment
Alex 1m
Classroom Management Strategies
Alex 1m
Banqer
I provided a link to Banqer because it is a great digital banking program teachers can use to maintain a classroom economy. In my class, students earn $ in Banqer for helping with classroom tasks and turning in assignments on time. They may use their $ in Banqer for extra credit, snacks/fun items, and/or time on a device. It has been a great way for me to use positive behavior management instead of a lot of punitive measures. My students really like it.
BANQER


padlet
Alex · 1m
Module 4: Strategies for Teaching ELLs
Please login to a Padlet account with your name prior to posting (so your name is recorded) and/or share your name at the end of every post. That way, you will receive PD credit!
Please read and view these articles, links, and media about teaching ELLs based on relevancy for your classroom.
Please share effective strategies for teaching ELLs here, i.e. what works well for you in your classroom?
Please contribute to conversations about teaching ELLs by answering the following questions: What are effective strategies for teaching ELLs in your content area? Are you interested in receiving help, and/or willing to help others, implement strategies for teaching ELLs? Please ask your own questions too!
Please press the plus sign below to add to the conversation!
ADD COLUMN
Alex 1m
6 Strategies for Teaching ELLs
6 Essential Strategies for Teaching Engli...
Over 10 percent of students in the United...
edutopia
0
Add comment
Alex 1m
ELL Strategies from SIOP
Alex 1m
Pen-Pal Schools
Last year, I used Pen-Pal Schools in my Business Computer Applications class. All students enjoyed it and benefited from the conversations they had with students all over the world. My ELLs especially benefited as they really wanted to cultivate their academic English language skills, so they sounded intelligent when they wrote to their pen-pals. It was also very easy for me to grade their submissions. Pen-Pal Schools offer a wide variety of topics to choose from, so there is usually something for almost every content area.


padlet
Alex · 1m
Module 5: Best Practices
Please login to a Padlet account with your name prior to posting (so your name is recorded) and/or share your name at the end of every post. That way, you will receive PD credit!
Please read and view these articles, links, and media about best practices in teaching.
Please share best practices you have come to know and love during your teaching career.
Please contribute to conversations about best practices by answering the following questions: What are effective teaching practices you have seen other teachers use? In your opinion, what makes a something a "best practice" in education? Please ask your own questions too!
Please press the plus sign below to add to the conversation!
ADD COLUMN
Alex 1m
Marzano 13 Teaching Best Practices
The Marzano Research Lab conducted A...
edmentum
0
Add comment
Alex 1m
5 Highly Effective Teaching Practices
5 Highly Effective Teaching Practices | E...

Appendix C

Survey 2

Professional Development (PD) at SHS Survey 2

This survey is to be used for the sole purpose of Alexandra Robertson's action research designed in pursuit of obtaining a doctoral degree from Capella University. It will only be used with the up most confidential and ethical standards. By taking this survey, you are giving Robertson permission to use the results in such context. To maintain confidentiality, your name, email, nor any other personal identification information will be recorded by this survey.

* Required

1. **Q1: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of effectiveness of the SHS Tech PD.**
   Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

2. **Q2: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the positivity level of your experiences with SHS Tech PD.**
   Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

3. **Q3: On a scale of 1 to 5 with 1 being little to none and 5 being a significant amount, please rate the level of input you had in developing SHS Tech PD.***
   Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

4. **Q4: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the amount of technology you used to engage in SHS Tech PD.**
   Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

5. **Q5: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of support you received in creating and implementing lessons as a part of SHS Tech PD.**
   Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

6. **Q6: On a scale of 1 to 5 with 1 being the least and 5 being the most, please rate the level of support you received in utilizing technology in your classroom via the SHS Tech PD.** *
Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

7. **Q7: On a scale of 1 to 5 with 1 being once in a while and 5 being daily, how often do you currently use technology in your classroom?** *
Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

8. **Q8: What are some positive and/or negative experiences you have had while engaging in SHS Tech PD?** *

9. **Q9: How was technology implemented during SHS Tech PD??** *

10. **Q10: What would you change about SHS Tech PD?** *

11. **Q11: What do you think about the focus of SHS Tech PD?** *

12. **Q12: ***Optional*** Please add any other comments or information you may want to provid regarding questions on this survey and/or SHS Tech PD.**