CHAPTER 5:

DISCUSSION OF RESEARCH FINDINGS AND CONCLUSIONS

The IPI-T data collection team coded 217 observations from January 2018 through April 2018 after increasing technology devices nearly one per student at the high school. Analysis of the data showed only 95 observations were coded in which students were the users of technology. The results of faculty participating in faculty collaborative study sessions within one week of data collection was the focus of this mixed methods study. Data were collected through the IPI-T data collection process for the quantitative portion, and a small group completed a web-based questionnaire for the qualitative portion. The purpose of this explanatory-sequential mixed method study was to assess the impact of the IPI-T process on technology use and student cognitive engagement. The impact was measured by comparing quantitative IPI-T data codes of those faculty that participated in faculty collaborative study sessions with baseline data prior to the implementation of the faculty collaborative study sessions. Data collected using the IPI-T process were examined, analyzed, and presented in Chapter 4. In Chapter 5, a summary of the findings, interpretations of the findings, implications for practice and theory, limitations, recommendations for future research, and a conclusion are provided.

Summary of Findings

An examination of the data revealed that participation in faculty collaborative study sessions had a statistically significant impact on student technology use as well as student cognitive engagement when using technology. While teacher technology use did increase, the expected impact of participating in faculty collaborative study sessions was that teachers' technology use would actually decrease. Descriptive statistics revealed more often students participate in

information searches and word processing when they are the users of technology which are associated with lower-order/surface thinking. Furthermore, results showed that 31% of the codes collected, higher-order/deeper thinking was observed when students were the user of technology. Technology use categories observed at a higher level included media development, collaboration among individuals, and experience-based technology. For the qualitative portion, data were thematically analyzed and interpreted looking for overlapping themes within the open-ended questions, with the goal of providing a greater understanding of the quantitative results and the impact the faculty collaborative study sessions had on technology use and student cognitive engagement. Four key themes emerged: (a) technology integration, (b) implementing new technology, (c) awareness of tech usage, and (d) more time. Of the four themes that emerged from the questionnaire responses, the greatest overlap was regarding awareness. In line with the first order-external barriers discussed within the literature review, all eight of the participants mentioned that more time is necessary. Specifically, participants stated that they need more time to study and analyze the IPI-T data as well as to participate in purposeful professional development.

Interpretation of Results

This section summarizes and interprets the results of the quantitative portion of the study which utilized the IPI-T data collection tool as well as the qualitative portion, a web-based questionnaire.

Research Question 1

To what extent does participation in faculty collaborative study sessions affect faculty's technology use as measured by codes on the Instructional Practices Inventory-Technology (IPI-T)? This research question attempted to determine if participating in faculty collaborative sessions had an impact on teacher technology use, specifically if teacher use of technology would decrease. Research shows when teachers do use technology for instruction, they may not be using it to its fullest potential to promote high levels of student cognitive engagement (Cuban, Kirkpatrick, & Peck, 2001; Gurgenidze, 2018; Pambayun et al., 2019; Prensky, 2015; Russell, Bebell, O'Dwyer, & O'Connor, 2003; Schrum & Levin 2012; Zhao, Pugh, Sheldon, & Byers, 2002). In line with recent studies (Cuban et al., 2001; Russell et al., 2003) despite large expenditures of Chromebooks, baseline data collected at the targeted high

school indicated teachers were the users of technology, rather than students. According to baseline data collected using the IPI-T data collection tool, after 215 observations of 27 high school classrooms, 63 observations were made in which no technology was observed, 59 observations were coded as teachers using technology, and 95 observations were made in which students were the user of technology.

Missing from the process during the 2017-18 pilot of the IPI-T was the implementation of faculty collaboration sessions. Valentine (2012b) stated, "The greater the implementation integrity to these strategies, the greater the likelihood the school will see positive academic results from their use of the IPI" (p. 1). The sessions provided faculty with time to study the data after each data collection, engaged faculty in a reflection of the data, created collaborative learning experiences that built new knowledge, and allowed faculty voice in the establishment of annual cognitive engagement goals. The results of the quantitative data revealed, despite implementation of faculty collaborative study sessions, teacher technology use increased (Figure 4). While an increase of technology use seems in line with the found alternative hypothesis which stated: *participating in faculty collaborative study sessions does affect faculty's technology use as measured by codes on the Instructional Practices Inventory – Technology (IPI-T),* results show teachers typically used technology in a lower-order/surface manner to assist in the delivery of instruction. Much of the time teachers were observed using their Interactive Whiteboards to project directions or notes as instruction was delivered in a lecture format. According to Valentine (2012), examples of teacher-led instruction includes classroom practices commonly associated with teacher dominated questions and answers, teacher lecture or verbal explanations, teacher direction giving, and teacher demonstrations. Discussions may occur, but instruction and ideas come primarily from the teacher. Student higher-order, deeper learning is not evident.

Research Question 2

To what extent does participation in faculty collaborative study sessions affect student's technology use as measured by codes on the Instructional Practices Inventory-Technology (IPI-T)? This research question attempted to determine if participating in faculty collaborative sessions had an impact on students' technology use. Specifically, if student use of technology would increase as well as student cognitive engagement when using

technology. Coding using the IPI-T data collection tool took place four times during the school year 2017-18 in an effort to gather baseline data. When observed using technology, students were engaged in lower-order surface thinking activities 70.4% of the time. Throughout the initial collection of baseline data, the researcher noticed technology use by the teacher decreased slightly, increasing student use of technology, but disengagement increased dramatically as did the integration of activities that fall within categories 4, 3, and 2 on the IPI-T (Table 13). Again this is not surprising as the researcher and the IPI-T data collection team did not implement the IPI-T process in its entirety, leaving out the faculty collaborative study sessions in the first year. Time was not provided to analyze the data or participate in purposeful professional development that prepared faculty to integrate technology.

The Barrier to Technology model, suggests there are two sets of barriers, external and internal, that influence the integration of technology in teachers' classrooms (Ertmer, 1999; Ertmer and Ottenbreit-Leftwich, 2010; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Sahin & Thompson, 2006; Soparat, Arnold& Klaysom, 2015). First order-external barriers are also known as resource barriers. Sufficient time allowance to prepare for technology-integrated instruction is an example of a resource barrier (Hew & Brush, 2007; Kopcha, 2012; Vongkulluksn, Xie, & Bowman, 2018). According to Valentine (2017), "When IPI/IPI-T data are collected for the purposes of school improvement, all teachers should have the opportunity to study the data and reflect upon their perceptions of effective learning/instructions" (p. 3). Faculty should converse about best practices and the value of the six categories. Once a baseline is established, discussions about how to change the engagement profiles over time should occur to ensure instructional design and teaching practices evolve. Upon collecting data using the IPI-T, a faculty collaborative study session occurred. Faculty was arranged in small table groups to encourage collaborative learning in an effort to build new knowledge. Participants were engaged in both a reflection about the data collection day and a comparison of the data. In addition, examples of higher-order and lower-order activities were presented and faculty had the opportunity to work collaboratively to design the ideal lesson that integrated both technology and higher-order, deeper thinking. Lastly, during the last study session, faculty worked together and established cognitive engagement goals for the upcoming 2019-2020 school year which support higher-order, deeper thinking skills among students. Throughout the process the researcher made a

conscious effort to continuously understand faculty perspectives and progress accordingly (see Appendices D, E, F, and G).

The first data collection profile served as baseline data and subsequent data collections provided longitudinal perspectives of engaged learning for the school. Teacher leaders collected the data. The researcher engaged faculty in studying the data to identify patterns, trends, and changes in each data profile. In addition, she established and delivered purposeful professional development and continuous conversations. Valentine (2017) stated, "To make a difference in student cognitive engagement, the faculty IPI/IPI-T collaborative conversations must progress from merely studying profile percentages to learning discussions that deepen knowledge, build a commitment to refinement of instructional practices, particularly increasing higher-order/deeper thinking time and reducing disengagement during class time" (p. 3). The results of quantitative data analysis of this study, indicated that participation in faculty collaborative study sessions had an effect on students' technology use as measured by codes on the Instructional Practices Inventory – Technology (IPI-T). A One-way ANOVA revealed a significant difference among the baseline, first, second, third, and fourth faculty collaborative sessions, $p = .02$ (Table 15). In addition, when observed using technology, higher-order, deeper cognitive engagement among students increased, lower-order, surface cognitive engagement decreased, and student disengagement decreased (Table 13).

Research Question 3

What categories of technology use, as defined by the IPI-T, are most frequently used in 9-12 classrooms within the targeted district? This research question attempted to identify the categories of technology use most frequently used in the 9-12 classrooms that were observed. Data was collected using the IPI-T observational tool four times, including the collection of baseline data. Results of the quantitative analysis of data revealed a total of 372 observations were made in which students were using technology (Table 16). Of the 372 observations, students were observed searching for information more frequently than other categories of technology use. According to Valentine (2015), when students are involved in information searches they are using technology to search and/or gather information for their learning task. This category includes the use of the Web and/or other media to access facts, information, and/or insights available through the use of technology. The second most frequently observed

category of technology use was students using an interactive or presentation tech tool to support the learning task. This category includes use of software that supports the transfer of information among students and between students and teachers. The third most frequently observed category of technology use was experience-based immersion learning, or using technology to engage in a tech-driven, immersion learning experience. This category includes the use of technology to engage students in game-based software, intense interactive simulations, and virtual reality associated with classroom learning goals. Very few observations were made when students used technology to collaborate among others or to interact with and/or collaborate with others to accomplish their learning task. This category includes the use technology for all forms of synchronous (same time, usually verbal), communication and many forms of near-synchronous (intermittent or streamed, usually text chat) communication (Figure 5). Valentine (2012c) has collected tens of thousands of codes, educating more than 23,000 educators in the IPI-T data collection process. Results of this study align with Valentine's findings. According to Valentine (2018), experience-based immersion learning and collaboration among individuals are two categories of technology use that are least frequently observed but are most commonly associated with higher-order, deeper thinking. Likewise, information searches are observed most frequently and associated with lower-order, surface thinking.

Research Question 4

What categories of technology use, as defined by the IPI-T, are most frequently coded when student cognitive engagement codes 5 and 6 are recorded? This research question attempted to identify the categories of technology use when Student Cognitive Engagement Codes 5 and 6 were recorded. The IPI-T data collection process was piloted and field tested in 2011-12. The IPI-T is an 'add-on' component designed for schools that have experience with the IPI process and are currently 1:1 (one technology device per student) or planning to soon become 1:1 or high-tech schools. There are six categories associated with student cognitive engagement and eight tech-use categories measured by the IPI-T.

According to Valentine (2012) IPI-T Student Cognitive Engagement Category 1 is associated with disengagement, Categories 2, 3, and 4 are associated with lower-order, surface thinking and Categories 5 and 6 are associated with higher-order, deeper thinking. Tech-use categories include:

1.Word Processing. The students are using technology to produce written documents. This category includes note taking, composing papers, editing, formatting, and printing the written material.

2.Math Computations. The students are using technology to perform mathematical computations. This category includes calculating, charting, and plotting with hand-held calculators, spreadsheets, and statistical formulae.

3.Media Development. The students are using technology to collect, manipulate, and/or create media. This category includes the use of technology to collect, edit, and/or design photo, video, and/or audio data and presentations, as well as programming, writing code, and web development.

4.Information Search. The students are using technology to search and/or gather information for their learning task. This category includes the use of the Web and/or other media to access facts, information, and/or insights available through the use of technology.

5.Collaboration Among Individuals. The students are using technology to interact with and/or collaborate with others to accomplish their learning task. This category includes the use technology for all forms of synchronous (same time, usually verbal), communication and many forms of near-synchronous (intermittent or streamed, usually text chat) communication.

6.Experience-Based Immersion Learning. The students are using technology toengage in a tech-driven, immersion learning experience. This category includes the use of technology to engage students in game-based software, intense interactive simulations, and virtual reality associated with classroom learning goals.

7.Interactive/Presentation Technology. The students and/or teacher are using an interactive or presentation tech tool to support the learning task. This category includes us of software that supports the transfer of information among students and between students and teachers.

8.Other. Occasionally the data collector may determine that none of the seven options adequately describe how students are using technology. This “other” option should be marked if that is the case. However, selection of this “other” option is extremely unusual.

According to Valentine media development is the most likely tech-use category to produce higher-order, deeper thinking at the high school level. Experience-based immersive learning is also highly likely to produce higher-order, deeper thinking at the high school level. Math computations is most commonly used for student skill and drill practice and in high schools, the most common form of collaboration via technology is misuse of the technology for email, blogs, and social media, coded a "1" for disengagement. Information search in high schools is primarily fact finding without higher-order analysis. Valentine (2018) stated with caution, "the volume of data at this time is large enough to provide interesting insights and probable trends, but too small to make firm conclusions about the relationships" (slide 82). Results of this study show that less than half of the total observations, in which students were the users of technology, higher-order, deeper thinking was recorded. However, tech use categories recorded at a higher level, a 5 or a 6, include: Media Development, Experience-Based Immersion Learning, and Collaboration Among Individuals. In contrast, the tech use category most often observed was Information Search. When students used technology to search for information an engagement code was recorded at a low level (2, 3, or 4).

Research Question 5

How do faculty view their participation in faculty collaborative study sessions? Specifically, did participating affect the teacher's use of technology use in the classroom? This research question attempted to determine if faculty viewed their participation in faculty collaborative study sessions as having an impact on their technology use in the classroom. The Instructional Practice Inventory – Technology (IPI-T) is a walkthrough observation tool designed to collect data concerning how often and in what ways teachers are integrating technology as well as how often students are cognitively engaged in higher-order, deeper thinking and can be used to help faculty align technology standards both at grade level and content areas. The baseline data collected during the 2017-18 school year indicated teachers were the user of the technology most of the time, in line with claims that indicate while access to technology in most cases is no longer the major issue (Davis, Preston, & Sahin, 2009; Hilton & Canciello, 2018; Schrum & Levin, 2015; Zhao et al., 2002); computer usage in the classroom among students remains low (Cuban, 1999; Wang, Hsu, Campbell, Coster, Longhurst, 2014; Walters, Green, Goldsby, & Parker, 2018; Zhao et al., 2002). While it was the intend of the faculty collaborative sessions to in fact decrease the use of teacher technology and increase student use, teacher technology use increased.

At the end of the final faculty collaborative study session eight participants were asked to complete a web-based questionnaire. The questionnaire was comprised of closed-ended questions, followed by an open-ended question. Even though teacher technology use increased and much of the time was used to support teacher-led instruction, themes emerged from each open-ended response that supports the integration and implementation of educational technology.

*Theme 1: Technology Integration***.** It is evident from responses that participants recognize and believe that participation in the faculty collaborative study sessions affected or impacted technology integration in their classroom. For example, faculty discussed the new ways in which they integrated technology as a result of participating in the Faculty Collaborative Study Sessions. Participants shared the following, "Working together is essential for implementing higher-order thinking and engagement in the classroom." Also, "After the initial faculty session, I was much more aware of how I was utilizing technology and I was much more aware of the cognitive level I was asking students to work at."

Theme 2: Implementing New Technology. In addition, as a result of participating, faculty shared experiences associated with implementing new technology. Faculty members stated, "I feel like I became more aware of available technology resources that I could use in my classroom." Faculty felt supported by each other and stated, "When talking with coworkers, I was able to learn new apps to use in my classroom. I was able to ask specific questions and receive immediate response".

It seems the eight participants that completed the questionnaire may have not truly understood the question or may have not interpreted the question correctly. The question read, "How do faculty view their participation in faculty collaborative study sessions? Specifically, did participating affect the teacher's use of technology use in the classroom?" When given the opportunity to explain their response one participant stated, "These sessions have helped me learn ways I can have my students use technology that I did not know before." An explanation could be that faculty spent the majority of time analyzing student cognitive engagement when working collaboratively during each session, rather than focusing the deliberate attempt to decrease their own technology use.

Research Question 6

How do faculty view their participation in faculty collaborative study sessions? Specifically, did participating affect students' use of technology use in the classroom? This research question attempted to determine if faculty viewed their participation in faculty collaborative study sessions as having an impact on their students' technology use in the classroom. The small group of participants that responded to the questionnaire share the belief that participation in faculty collaborative student sessions impacted or affected their students' technology use in the classroom. The IPI-T is designed to quantify how often students are cognitively engaged in higher order, deeper thinking while the qualitative portion of this study attempted to seek feedback from the faculty to gain an understanding of their viewpoint. Their responses support the quantitative portion of this study. Two themes arose from their responses to the questionnaire.

Theme 1: Awareness. The first theme was a raised awareness of the necessity to increase student cognitive engagement and the need to integrate technology in a way that promoted higher order, deeper thinking. One participant stated, "I strive to self-monitor and reflect on my teaching to help my students reach the 5 and 6 higher-order thinking and engagement with the use of technology; therefore, I incorporated using Padlet as a way for students to reach the higher levels of engagement. I truly do take the time to self-reflect on how I can enhance the learning environment at a higher level."

Theme 2: More Time. The second theme was the necessity to dedicate more time to study data and participate in purposeful professional development. Valentine (2017) recommends each school collect data four times each school year to achieve optimum impact. Teacher leaders collecting the data should engage faculty in studying the data to identify patterns, trends, and changes in each data profile as well as establish and deliver purposeful professional development and continuous conversations. Valentine (2017) stated, "To make a difference in student cognitive engagement, the faculty IPI/IPI-T collaborative conversations must progress from merely studying profile percentages to learning discussions that deepen knowledge, build a commitment to refinement of instructional practices, particularly increasing higher-order/deeper thinking time and reducing disengagement during class time" (p. 3). After studying baseline data and three other data profiles twenty-seven faculty studied trends and changes. In addition, they participated in continuous conversations about

technology and integration to promote an increase in higher order, deeper thinking among students. The eight participants each shared that more time to study data and participate in purposeful professional development was necessary. This is an indication that they would be in support of continuing data collection using the IPI-T as well as participating in collaborative sessions. In addition, it is the role of the researcher to provide meaningful professional development opportunities that support the inclusion of educational technology. Based on responses faculty are more willing to participate than in the past.

Research Question 7

How does the qualitative follow-up data help us to better understand the quantitative first-phase results? Research Questions 1and 2 are quantitative and ask:

1.To what extent does participation in faculty collaborative study sessions affect faculty's technology use as measured by codes on the Instructional Practices Inventory-Technology (IPI-T)? The null hypothesis stated that participating in faculty collaborative study sessions has no effect on faculty's technology use as measured by codes on the Instructional Practices Inventory – Technology (IPI-T).

2.To what extent does participation in faculty collaborative study sessions affect student's technology use as measured by codes on the Instructional Practices Inventory-Technology (IPI-T)? The null hypothesis stated that participating in faculty collaborative study sessions has no effect on students' technology use as measured by codes on the Instructional Practices Inventory – Technology (IPI-T).

The null hypothesis for Research Question 1 was rejected. Faculty were led in a collaborative discussion about the difference between Cognitive Engagement Codes 6, 5, 4, 3, 2, and 1. Each session a minimum of five minutes was spent reviewing what each category meant, along with classroom examples such as student participating in simple recall or listening to a teacher stand at the front of the row and lead instruction (see Appendices D-G). To understand the results, the researcher included the following qualitative question in the questionnaire: "How do faculty view their participation in faculty collaborative study sessions? Specifically, did participating affect the teacher's use of technology use in the classroom? Despite the collaborative discussions, teacher use of technology increased. It could be said that participation in faculty collaborative study sessions affected teacher use of

technology, just not in terms of frequency, but rather how technology was used. Unfortunately, an IPI-T Category of Tech Use is only recorded when students are using technology so the researcher was not able to record if teachers changed the way they were using technology themselves. Participant responses indicated they may have misinterpreted the question and focused on student use rather than their own use of technology.

Similarly, the null hypothesis for Research Question 2 was rejected. The qualitative phase of this mixed method study not only supported the findings of the quantitative phase but gave way to an understanding of how faculty value their efforts to engage in an analysis of the IPI-T data as well as the trends and patterns they have identified when meeting in small groups during collaborative sessions (see Appendices D-G). Key themes that emerged from the qualitative questions include and awareness of the need to integrate technology but also an awareness of the need to implement technology that encourages higher-order, deeper thinking among students. Additionally, faculty seem to be "breaking down" some of the barriers that have existed when considering the implementation of technology. For example, while time is a factor, there has been an acceptance that time is necessary for growth in the area of technology integration. Faculty believe they should continue to gather IPI-T data into the next school year and study it collaboratively with the intent to continue to establish goals of technology integration. In addition, faculty have gained a willingness to spend time participating in purposeful professional development that supports a change in the way students use technology.

Implications of Findings

This mixed method study provides empirical evidence that implementing the IPI-T data collection process in its entirety impacts technology use among faculty and students. Student technology use increased, as did cognitive engagement. However, evidence indicates that most of the time students are asked to search for information, a low-level skill. Less often students were observed creating media, collaborating using technology, or participating in experience-based learning, all associated with higher-order, deeper thinking.

As the most technologically literate group of children enter the classroom, it is necessary to participate in continuous collaborative conversations and to look at current educational practices. Educators should consider "the skills, competencies, values needed on the future

global age, and how generation alpha should be prepared, scholastically" (Culala, 2016). Zhao et al. (2002) claimed that changing current educational practices regarding the use and integration of technology is complex and messy. This study supports that claim. While complex, over time the 27 participants that participated in collaborative conversations progressed from merely studying profile percentages to learning discussions that deepened their knowledge. They came to value the integration of technology and built a commitment to the refinement of instructional practices that increased higher-order, deeper thinking time and reduced disengagement among students when using technology.

The Barrier to Technology model, suggests there are two sets of barriers, external and internal, that influence the integration of technology in teachers' classrooms (Ertmer, 1999; Ertmer and Ottenbreit-Leftwich, 2010; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). First order-external barriers are also known as resource barriers. Sufficient time allowance to prepare for technology-integrated instruction is an example of a resource barrier (Hew & Brush, 2007; Kopcha, 2012; Vongkulluksn, Xie, & Bowman, 2018). In addition, Vongkulluksn et al. (2018) considered the second order-internal barriers, teachers' value beliefs as the "most proximal determinant of technology integration" regarding them most important to using technology for learning (Ertmer, 1999; Ertmer and Ottenbreit-Leftwich, 2010; Ertmer et al., 2012).This study indicates that engaging faculty in a series of collaborative study sessions of the IPI-T data has been shown to have the capacity to remove barriers to technology use by teachers to fulfill instructional goals, increase teachers' ability beliefs, increase student usage of technology, and positively impact student cognitive engagement and academic success.

There is no prescribed training or professional development to date that guarantees an increase in technology use as well as an increase in higher-order, deeper thinking among students. According to Denessen (2000), pedagogical beliefs refer to the understandings about teaching and learning that teachers hold to be true (as cited in Tondeur et al., 2016). Described by Pajares (1992), a teacher's belief system includes beliefs about their roles and responsibilities, the subject matter taught, as well as beliefs about their students (as cited in Tondeur et al., 2016). Complex and multifaceted pedagogical beliefs include core beliefs, those that are most stable and the most difficult to change as they have connections to other beliefs versus beliefs that are peripheral and formed recently are more open to change

(Tondeur et al., 2016). Deng, Chai, Tsai, and Lee, (2014) along with Inan and Lowther, (2010) maintained that personal pedagogical beliefs of teachers "play a key role in their pedagogical decisions" to integrate technology within their classroom practices (as cited in Tondeur et al., 2016). Within the field of education technology teachers' beliefs have been classified into one of two categories: teacher-centered and student centered beliefs. Educational technology best practices are those that promote student-centered learning (Ottenbriet-Leftwich, Glazewski, Newby, and Ertmer, 2010; Tondeur et al, 2016). A clear implication of this study is the need for professional development for both practicing and preservice teachers. The goal should be to create a series of trainings or professional development opportunities that are student-centered and promote the integration of technology as well as a strong knowledge of curriculum activities. The activities should emphasis or promote higher-order, deeper thinking, such as those activities found in Bloom's Digital Taxonomy.

Limitations of the Study

The researcher chose to employ a quasi-experimental within-subjects approach utilizing a pretest and posttest design. One group participated in this study. A convenience sampling strategy was employed for the quantitative strand of the study because participants were willing and available to participate. The sample of teachers chosen from the population of teachers in the district was relatively small. Participants from the small subgroup had the potential to provide useful information for answering questions and hypotheses, however, it is difficult for the researcher to say with confidence that the individuals represented the entire teacher population. Additional disadvantages to this approach were threats to internal validity which include maturation and history because the study took place over the course of several months. Further, an assumption is observations represented typical school days, and that teachers did not alter instruction when the IPI-T data collection team was present. While the possibility of observer bias exists, training was provided to all teacher leaders who collected codes in an effort to standardize data collection. It is important to know that the process for developing the data collector's validity, reliability, and inter-rater reliability during was the central focus during both IPI Level I Basic Workshop and the IPI-T Component Workshop. Upon the conclusion of each IPI-T workshop participants were required to complete a Reliability Assessment and a reliability score of .90 or higher was necessary for permission to

use the IPI-T Process for research purposes. The researcher earned a reliability score of .95 on the IPI assessment and .98 on the IPI-T assessment.

Recommendations for Future Research

This mixed methods study contributes to the overall understanding of the capacity of removing barriers to technology use when faculty engage collaboratively in the analysis of data and instructional practices on a regular basis to fulfill instructional goals, increase student usage of technology, and positively impact student cognitive engagement and academic success. Future research should extend these findings by replicating this study with faculty from the same school district in different grade levels or with the same faculty, grades 9-12, to gather longitudinal data. Findings from future research, examining the impact of participating in faculty collaborative study sessions at multiple grade levels, could be used to inform district initiatives, school improvement, and the development of professional development to integrate technology. The IPI and IPI-T encourages faculty members to work towards a balance of higher and lower levels of student cognitive engagement through incremental changes in instructional practice (Dennis, 2013). Gathering longitudinal data could be used to inform change in instructional practices over time. Additionally, future studies should include an examination of the change in technology instructional practices when faculty participate in faculty collaborative study sessions over a period of time.

In an effort to increase student use of technology and align current teaching practices with the integration of technology, the IPI-T process assisted in the collection of data to get an insight into how students were cognitively engaged in the learning during the instructional activity. Implementing the IPI-T process in its entirety encouraged faculty members to study the data and think collaboratively about ways to work towards a balance of higher and lower levels of student cognitive engagement through incremental changes in instructional practice (Dennis, 2013). Categories 6 and 5 include learning activities that fall within the higher-order/deeper thinking spectrum of Bloom’s Taxonomy and Bloom’s Digital Taxonomy such as media development, collaboration among others, and experience or problem based learning. This study identified a relationship between specific technology-use categories and specific IPI-T student cognitive engagement codes. Studies should be done to identify engaging activities designed for specific technology-use categories that promote higher-order thinking.

Summary and Conclusions

The purpose of this explanatory-sequential mixed method study was to assess the impact of the IPI-T process on technology use and student cognitive engagement. The goal was to implement all strategies, including faculty collaborative sessions four times per year to support teacher implementation of new technology to increase higher-order, deeper thinking by students and increase student use of technology. The impact was measured by comparing quantitative IPI-T data codes of those faculty that participated in the intervention group with baseline data prior to the implementation of the faculty collaborative study sessions. Data collected during the quantitative phase was the emphasis of this study. Qualitative data was gathered from one participant from each core and non-core area, a total of eight participants. Each were asked to answer questions on a web-based questionnaire during the final faculty collaborative session. Four key themes emerged and each was associated with the quantitative portion of the study.

Findings from this mixed methods study confirm that implementing the IPI-T process in its entirety increases both technology use and student cognitive engagement. The IPI-T process was created in 2012 by Valentine and a team of specialists. The IPI-T is an 'add-on' component designed for schools that have experience with the IPI process and are currently 1:1 (one technology device per student) or planning to soon become 1:1 or high-tech schools. Implementing the entire IPI-T process with fidelity has been shown to have a positive influence on student technology use and student cognitive engagement. School board members in the targeted district have already purchased $250,000 worth of Chromebooks and have committed to additional purchases in the upcoming school year. As they move toward a 1:1 environment, longitudinal data can be studied and the IPI-T process can drive collaborative discussions among teachers and leaders to ensure a successful adoption of technology.

Citation

Wallace-Spurgin, M. (2019). Discussion of research findings and conclusions. In I. Sahin & V. Akerson (Eds.), *Measuring student cognitive engagement when using technology* (pp. 65-80). Monument, CO, USA: ISTES Organization.