THE EFFECTS OF PERSONALIZED LEARNING AND DIGITAL CURRICULAR TOOLS ON SELF-REGULATORY ABILITIES OF SECONDARY STUDENTS

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AUTHORIZATION TO SUBMIT

DISSERTATION

This dissertation of Marc Clendon Gee, submitted for the degree of Doctor of Philosophy in Educational Leadership with a major in Educational Leadership and titled "The Effects of Personalized Learning and Digital Curricular Tools on Self-Regulatory Abilities of Secondary Students," has been reviewed in final form. Permission, as indicated by the signatures and dates given below, is now granted to submit final copies.

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DEDICATION

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ABSTRACT

The effects of personalized learning on the self-regulatory abilities of students has not been fully explored at the secondary level. This mixed-methods, exploratory sequential study, used a post-then-pre approach to determine how secondary students, enrolled in personalized learning programs, in two secondary schools in southeastern Idaho, USA, perceived the changes in their self-regulatory abilities as a result of their participation in the personalized learning program. A small proportion of the student participants were selected to participate in small group interviews to explore the change in a qualitative manner. In addition, the study explored the effect of educational technologies employed in the personalized learning program on the self-regulatory abilities of students. A literature review was conducted in the areas of personalized learning, self-regulation, and adaptive educational technologies. Statistically significant increases to the perceived self-regulatory abilities of students were found ($p \leq .05$) from pre- to post-personalized learning, with small effect sizes. In addition, the qualitative interview data showed that students who showed the highest level of perceived increase in self-regulatory abilities, articulated that there were definite changes to their self-regulatory abilities in their academic and non-academic lives. Qualitative results of interviews demonstrate that educational technologies utilized to support personalized learning programs can have a positive effect. This study provides initial data in a growing field of research surrounding personalized learning and self-regulation and the results prompt additional research in the field.

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Chapter 1

Introduction

The self-regulation of learning in secondary schools (Grades 6-12) is as varied as the students in those schools (DeMink-Carthew, Olofson, LeGeros, & Netcoh, 2017). Self-regulation of learning is the ability of a learner to effectively manage their own learning through conscious control and planning of their habits and actions (Broadbent & Poon, 2015). To address the varied needs of these students multiple types of instructional models are incorporated in the secondary school setting (DeMink-Carthew et al., 2017). Among these models, one model utilized in some secondary environments is personalized learning. Self-regulation of learning can play an important role in the success of students in a personalized learning model, and as such, research into self-regulatory abilities of secondary students is necessary for the continued development of the model (Zimmerman, 2008). In this chapter, the researcher will describe the interaction between personalized learning and self-regulation of learning, the general background of self-regulation, as it pertains to learning in an academic setting, and personalized learning, as well as articulate specific questions to be addressed in this study. Additionally, definitions of key terms used in the study and an overview of the research methods will be described.

Personalized learning has been described as tailoring a student's learning to his/her needs and interests while allowing the student choices in the time, path, pace, and place of their learning (Patrick, Kennedy, & Powell, 2013). With the advent of more responsive and thorough technological educational platforms, personalized learning has expanded in impact on the educational stage (Metcalf, 2017; Roberts-Mahoney, Means, & Garrison, 2016). With an increased focus on the needs of individual students and pacing, personalized learning changes

how schools traditionally use time, space, place, and pace to become more engaging while expanding and improving learning (Olofson, Downes, Smith, LeGeros, & Bishop, 2018).

Within a personalized learning environment, multiple skills are required of students (Basham, Hall, Carter, & Stahl, 2016). These skills include the ability to motivate, self-regulate, and direct one's own behavior (Basham et al., 2016; Murray & Rosanbalm, 2017). Among those listed skills, self-regulation has applicability in both the primary and secondary school setting as well as the post-secondary and career settings (Ivrendi, 2016; Lai & Hwang, 2016; Zimmerman, 2008).

There is a common thread of control between self-regulation of learning and personalized instruction. Self-regulation of learning is the ability of learners to effectively manage their own learning through conscious control and planning of their habits and actions (Broadbent & Poon, 2015) In addition, with personalized learning, students have a greater degree of control over their learning than in a traditional model (Daniela, 2015). For such a system to be successful, a student must be able to successfully self-regulate because of the amount of control delivered to the student in this model (Daniela, 2015). As a result of the necessity of students taking advantage of autonomy in a personalized learning environment, a great deal of focus has been made by school officials on this aspect for learners (Martinek, Hofmann, & Kipman, 2016). It can be challenging for students to find the place, time, and pacing for learning that is ideal for them and maintain those aspects (Kupers, van Dijk, van Geert, & Mcpherson, 2015). This can lead to instructional models relying too heavily on self-regulation and make personalized learning goals more difficult to achieve (Bingham, 2017)

Research based data describing self-regulation, specifically within a personalized learning program, is sparse. Separately, though, self-regulation (Daniela, 2015; Martinek et al.,

2016; Rogers, 2012) and personalized learning (Basham et al., 2016; Metcalf, 2017; Sadovaya, Korshunova, & Nauruzbay, 2016; Waldrip, Yu, & Prain, 2016) have been addressed at the secondary level. However, little has been explored at the secondary level of the intersection between self-regulation and personalized learning. As personalized learning programs continue to develop, attention, specifically to the part that self-regulation plays in the system, becomes increasingly important in order to reach the potential of the program (Basham et al., 2016). Self-regulatory skills incorporated and learned at the secondary level predict better income, stronger examples of financial planning, and success in school, the workplace, and relationships (Murray & Rosanbalm, 2017).

Statement of Problem

Existing research addresses the development of personalized learning systems in recent years (Crosslin, 2018; Fitzgerald et al., 2018; Hao, 2016; Metcalf, 2017) and separately the importance of self-regulated learning in the success of students in post-secondary education and career fields (Ivrendi, 2016; Lai & Hwang, 2016; Zimmerman, 2008). Prior studies regarding self-regulation are focused on elementary or middle school aged students (Boyer, 2012; DeMink-Carthew, Olofson, LeGeros, Netcoh, & Hennessey, 2017; Lichtinger & Kaplan, 2015; Netcoh & Bishop, 2017), with similar studies at the secondary level typically addressing self-regulation of adolescents or secondary school students (Murray & Rosanbalm, 2017; Pranoto, Atieka, Wihardjo, Wibowo, & Nurlaila, 2016). Differing research has been conducted with focus on personalized learning programs at the secondary level (Netcoh & Bishop, 2017; Taylor, 2016). This study will contribute to current research by identifying the degree to which students operating within a personalized learning environment report a change in their self-regulatory abilities while enrolled in personalized learning in secondary school programs. Additionally, it

will contribute by identifying characteristics of digital tools which secondary school students indicate affect their self-regulatory abilities.

Research surrounding personalized learning in K-12 education has increased over the last decade as technological advances have allow school systems to overcome some of the logistical hurdles limiting full implementation of such models without significant human resource expenditures (Basham et al., 2016). The identification of multiple criteria for successful implementation of personalized learning in education has, likewise, increased over the past decade (Basham et al., 2016). Researchers recognize one of those criteria is the ability of students to self-regulate (Broadbent & Poon, 2015; Duckworth & Carlson, 2013; Martinek et al., 2016).

There are multiple characteristics of schools and students utilizing personalized student learning plans (Basham et al., 2016). These personalized learning plans can be correlated with higher levels of academic success among students in secondary education (Lee, 2019). However, researchers have also identified a number of challenges to developing and implementing personalized plans for students (Breunig, 2017; Lee, 2019; Netcoh & Bishop, 2017). One of the primary challenges is the content and structure of the plans and making the change from a pathology-based to an asset-based model (Lee, 2019; Netcoh & Bishop, 2017). The asset-based model is one based on strengths whereas the pathology-based models focus on cause and effect, predominantly in terms of what has gone wrong for the student. The asset-based model assists educators in finding the specific skills and abilities that students have, while respecting how factors such as culture and linguistic barriers might influence the creation of the plan (Lee, 2019).

Studies have been conducted on the role of self-regulation in terms of online learning (Tekin, Braun, & van der Schaar, 2015) and mastery-based learning (Barrett, 2017; Twyman, 2014). Both of these are essential parts of most personalized learning programs, however, these studies do not address self-regulation in personalized learning, beyond mention of its importance in a list of other criteria (Barrett, 2017; Tekin et al., 2015; Twyman, 2014). Additionally, there is a positive correlation between the perspective of willpower being non-limited and increased self-regulation (Job, Walton, Bernecker, & Dweck, 2015). The connection between willpower and self-regulation is often studied, however, research indicates that willpower is a finite resource (Job et al., 2015).

Students who face high self-regulatory demands and have high course or project loads display unique self-regulatory habits. However, regardless of the demands, one of the most influential predictors of success in major life circumstances is the ability to self-regulate (Job et al., 2015). Self-regulation research has been concentrated in three specific areas as it pertains to personalized learning. Those areas are online learning, higher education, and early childhood learning (Crosslin, 2016; Crosslin, Dellinger, Joksimovic, Kovanovic, & Gasevic, 2018; Job et al., 2015; Ivrendi, 2016; Lai & Hwang, 2016; Panadero, 2017). There is a dearth of peer-reviewed information regarding self-regulation within personalized learning in a secondary (grades 6-12) setting. Studies that do exist regarding self-regulation in secondary schools are not specific to personalized learning, but instead are generalized to traditional secondary schools (Daniela, 2015; Karasavvidis, Pieters, & Plomp, 2000). The problem is a clear lack of current literature identifying how self-regulation affects secondary education students operating within a personalized learning environment.

The purpose of this study is to identify to what degree students in a personalized learning environment report a change in their self-regulatory abilities and to recognize the impact that self-regulatory characteristics and technological tools have on learning as identified by secondary students. Despite existing research of personalized learning programs and the importance of self-regulation in post-secondary and career paths, a synthesis of the connection between these aspects of secondary education is lacking.

Background/Purpose of Study

As schools implement various iterations of personalized learning, many continue to run up against obstacles ranging from the philosophical to the logistical (Lee, 2019; Netcoh & Bishop, 2017; Waldrip, Yu, & Prain, 2016). As schools identify and manage these obstacles, several common criteria have emerged for successful programs. Criteria such as creating opportunities to teach self-regulating skills, providing students with continual feedback, holding weekly meetings between teachers and students, both teachers and students utilizing actionable data, and having multiple means of demonstrating understanding help to combat common issues that arise (Basham et al., 2016, Panadero, 2017).

Personalized learning has a researched-based foundation dating back to the 1920s. The Dalton Plan, which focused on the link between a student's skills and talents and the needs of the community, was one of the first programs to associate the need for individual adaptation of instruction (Parkhurst, Bassett, Eades, & Renni, 1924). This included aspects of personalized learning such as tailoring instruction to students' interests, as well as providing students with the opportunity to have a choice in activities in which they participated (Twyman, 2014). This was contemporary to progressive movements which lasted from 1917 to 1940 (Blasco, 2017). The

progressive movement in education had a distinct student-centered viewpoint and was advocated for by John Dewey (Blasco, 2017; Malitowska & Bonecki, 2016).

The progressive educational mindset was followed later by the period of Romantic Radicalism (1968-1974), which was exemplified by waves of anti-establishment feelings and experimentation (Blasco, 2017). In this educational realm, schools such as alternative schools, open classrooms, and elective programs were realized, which recognized the needs of some students required a different approach in order to meet those students' instructional needs (Blasco, 2017). More recently, personalized learning has been looked at through the lens of several different frameworks including new constructivism learning theory, multiple intelligence theory, metacognitive theory, and humanism theory (Li & Chen, 2016) as a means of meeting students' individual needs.

To meet requirements of accountability, school leaders often feel pressure to show the results of programmatic changes, irrespective of whether sufficient time has elapsed to accurately and adequately evaluate the program's viability or lack thereof (Deming & Figlio, 2016). Tools to evaluate the success of current personalized programs are in their developmental infancy, as technology has only recently afforded educational decision-makers the ability to even consider such programs (Basham et al., 2016). Additionally, educators have limited options for the measurement of skills, like self-regulation, which are associated with personalized learning, yet it is imperative that such measures are available to educators and educational decision-makers (Sereno, 2018).

Advances in educational technology have provided more options for creating personalized learning opportunities for students (Basham et al., 2016; Bingham, 2017; Hyll, Schvarcz, & Manninen, 2019). The increase in personalized learning opportunities is linked,

more specifically, to the increased number of adaptive educational technology platforms (Fitzgerald et al., 2018; Thalmann, 2014). These platforms provide teachers and administrators with tools allowing them to personalize instruction for individual student needs in ways which did not previously exist (Roberts-Mahoney et al., 2016). This computer assisted instruction (CAI) allows students to move through instruction at their own pace. The focus of current personalized learning platforms on this pacing provide opportunities to identify self-regulatory behavior in students (Campbell & Cox, 2018; Fitzgerald et al., 2018). Computer adaptive learning also allows for teachers to remove themselves from direct instruction requirements of the traditional instructional model (Bingham, 2017; Tekin et al., 2015).

Specific technologies utilized for computer assisted instruction are varied. However, many utilize online resources to assist student and teachers in the process. Researchers, primarily at the post-secondary level, have identified self-regulatory skills as reliable predictors of success as it relates to scores in online courses (Bradley, Browne, & Kelley, 2017). Additionally, researchers have found that in online courses many students, at the post-secondary level, are not accustomed to the level of self-determination and choice required to be successful in the courses (Crosslin et al., 2018).

A common thread among criteria for student success in a personalized learning environment is the development of self-regulation strategies (Broadbent & Poon, 2015; Hao, 2016; Lai & Hwang, 2016). Self-regulation refers to the ability of learners to effectively manage their own learning through conscious control and planning of their habits and actions. (Broadbent & Poon, 2015). Self-regulation theory suggests that conscious personal management is described by standards of behavior that would be considered desirable, personally recognizing such standards being motivated to meet those standards, monitoring one's own situation within

those standards and, finally, utilizing internal willpower to control desires to break out of standards or to enhance motivation (Baumeister, Vohs, & Tice, 2007). Self-regulation theory is applied to learning models and recognizes the methods for both delivering content and gathering data (Tulis, Steuer, & Dresel, 2016; Zimmerman, 2008). Typically focused on aptitude, online methods of research and reflection have potential to assist in the gathering of data, especially when it relates to the interrelation of processes like goal setting during the self-monitoring stage of learning (Zimmerman, 2008).

Self-regulation can be a product of the environment in which a student is raised and/or a skill that is expressly taught and learned along with content specific materials (Blair & Raver, 2015). Without at least a modicum of self-regulation it is difficult for a student to be successful in a personalized environment without significant outside assistance (Hao, 2016).

Personalized learning and self-regulation have regularly, though separately, been the subject of research in the post-secondary world (Broadbent & Poon, 2015; Crosslin, 2018; Hao, 2016; Panadero, 2017; Zimmerman, 1986). Additionally, research has followed students in high school personalized learning projects (Fitzgerald et al., 2018; Metcalf, 2017). Self-regulation in the elementary and secondary world has been researched as well (Ivrendi, 2016; Lai & Hwang, 2016; Martinek et al., 2016). However, the connection between personalized learning programs in secondary schools and whether or not students enrolled in these programs recognize a change in their self-regulatory abilities has not been extensively researched.

Research at the secondary level exploring self-regulation in personalized learning environments is limited. The purpose of this study is to identify to what degree students in a personalized learning environment report an increase of self-regulatory abilities, as well as identifying the impact that technological tools have on the self-regulatory abilities of secondary

students. These purposes are further articulated in the next section identifying the specific research questions which will be addressed by this mixed methods, explanatory sequential, study.

Research Questions

1. What is the impact of a personalized learning environment on the self-regulatory ability of secondary school students?
2. What is the impact of a personalized learning environment on the level of each of the four sub-components of self-regulatory ability of secondary school students?
3. To what degree do secondary students in personalized learning environments identify computer assisted instruction as assistive to their ability to self-regulate?

To statistically address question 1 and 2 the following null hypotheses were generated:

Null Hypothesis--Question 1

There will be no significant difference ($p \leq .05$) between the pre and post overall scores of study participants on the Self-Regulation Formative Questionnaire (SRFQ).

Null Hypothesis--Question 2

In considering each of the four sub-components separately, there will be no significant difference ($p \leq .05$) between the pre and post scores representing any of the four sub-components of the SRFQ (Plan, Monitor, Adjust, and Reflect).

Description of Terms

In the following section, terms related to the topics of personalized learning and self-regulation in public secondary schools have been listed. These terms are listed as a guide for the reader.

Blended Learning: Education program in which a student learns partially through online learning, with some student control over time, place, path, and/or pace and partially in a supervised classroom environment; and each student's learning path within a course or subject are integrated (Powell, Rabbit, & Kennedy, 2014).

Complex Adaptive Systems Theory: This theory is used by a wide variety of studies when there is a complex social situation that can be both non-linear and dynamic. "Complex adaptive systems are described as being living, open systems that exchange matter, energy, or information across its boundaries and use that exchange of energy to maintain its structure" (Wang, Han, & Yan, 2015, p. 382).

Computer-Assisted Instruction (CAI): Type of instruction in which a teacher utilizes technology as a component to enhance the learning experience for students (Fitzgerald et al., 2018).

Co-regulation: Regulation of learning and behavior where the teacher of a class and the student share responsibility for regulation of the activities (Kupers et al., 2015).

Flexible Assessment System: System of assessment where students receive information regarding their performance on a given assessment or course and take responsibility for learning the material (Ariani, 2016).

Flipped Classroom: Instructional model where students study the lesson outside of the classroom and then spend the majority of their class time in group projects and working directly with their teacher to master the concepts that were reviewed prior to class (Hao, 2016).

Mastery-Based Learning: "Outcome-based approach to education that incorporates modes of instructional delivery and assessment efforts designed to evaluate mastery of learning by students through their demonstration of the knowledge, attitudes, values, skills, and behaviors

required for the degree sought" (Gervais, 2016, p. 99). There is a distinction between general concepts of mastery-based learning as defined here and the more specific instructional model described by Bloom (Guskey, 2007).

Massive Open Online Courses (MOOC): Online courses that are open to anyone. Typically utilizing filmed lecture and automatic scoring of assignments (Crosslin et al., 2018).

Personalized Learning: Tailoring a student's learning to their needs and interests while allowing the student choices in the time, path, pace, and place of their learning (Patrick et al., 2013).

School-within-a-School: Separate but independently operating unit of learning within a larger school, which has its own staff, students, and budget (Dewees, 1999).

Secondary Education: A secondary school builds on knowledge gained in primary school, is typically more subject level driven, and provides preparation for tertiary education and skills associated with employment (UNESCO, Institute for Statistics, 2012).

Secondary School: Secondary schools are schools where secondary education takes place typically at, or around 6th grade in the United States, through high school graduation (UNESCO, Institute for Statistics, 2012).

Self-regulation: Ability of learners to effectively manage their own learning through conscious control and planning of their habits and actions (Broadbent & Poon, 2015).

Self-regulation Theory: Self-regulation theory is described with three phases: forethought, performance, and self-reflection. "Self-regulation theory provides a systematic approach to both understand and provide structured training that is required to enhance learning and performance" (Sandars & Cleary, 2011, p. 883).

Student Centered Learning: A learning model where students are responsible for determining the knowledge required to solve a learning problem and teachers support the process, rather than providing the solutions to the problems (Pedersen & Liu, 2003).

Student Directed Learning: A learning model wherein students evaluate what they need to learn, express their purpose for learning, and then select and apply the appropriate process to investigate their learning process (Zainuddin & Perera, 2018).

Traditional Secondary Instructional Environment: A secondary school environment with a set schedule of subjects and courses where credit is earned upon completion of an established quantity of time and meeting minimal expectations of achievement in the subject (Brawer, 2013).

Significance of Study

The purpose of this study to identify the degree to which students in a personalized learning environment report a change in self-regulatory abilities when enrolled in personalized learning in secondary school programs and to recognize the impact that specific self-regulatory sub-components and technological tools have on self-regulatory ability as identified by secondary students. Personalized learning continues to be attempted at multiple levels of instruction, elementary, secondary, and post-secondary (Crosslin et al., 2018; Daniela, 2015; DeMink-Carthew et al., 2017; Ivrendi, 2016; Netcoh & Bishop, 2017; Panadero, 2017). Because the traditional model and setup of elementary instruction includes many aspects of personalized learning, attention has been predominantly on the secondary efforts as a launching point for high school students into post-secondary and career opportunities.

The importance of self-regulatory behaviors on the part of students in the post-secondary and career aspects of their lives combined with the level of adjustment that must be made at the

secondary level to accommodate personalized learning are a significant part of the educational world in which professionals and students live (Kanar, 2017; Williams, Wall, & Fish, 2019). Because of the relative importance of self-regulation and the money, time, and resources that must be invested into a change away from the traditional towards the more personalized efforts at the secondary level, it is important that research be conducted so that school district leaders, parents, teachers, and students can make informed decisions and know the opportunities and drawbacks to personalized learning programs (Bulger, 2016). This research can provide additional information for educational institutions as they make programmatic changes towards or away from personalized learning environments and provide tools for assessing educational products and services offered to educators as programmatic assistance.

Overview of Research Methods

The researcher selected a mixed-method because personalized learning, by its nature, tends to include both qualitative and quantitative aspects that can be measured as one moves from program to program (Basham et al., 2016). The application of a mixed methods approach allows the use of both quantitative and qualitative methods to create a more extensive description of answers to the research questions (Creswell & Geutterman, 2019). Research question number one can be addressed by a definite quantitative approach in comparing the current self-reported, self-regulatory scores of those involved in personalized learning to their self-reported, self-regulatory scores prior to being involved in that program. This will be measured using the Self-Regulation Formative Questionnaire (SRFQ) (Gaumer Erickson & Noonan, 2020). Research question one, following the quantitative analysis, will be supplemented by the qualitative data collected from interviews. Research question number two also lends itself to a quantitative approach in which current self-reported, self-regulatory scores of study participants will be

compared to their self-reported self-regulatory scores prior to being involved in personalized learning, and analyzed based on the sub-components of self-regulation outlined in the SRFQ (Plan, Monitor, Adjust, and Reflect). Research question number three will be addressed using qualitative methods investigating the degree to which students believe technology assists their ability to self-regulate. This data will be gathered through group interviews after students participate in the SRFQ inventories. In combination, these approaches will provide a sense of the degree that self-regulatory skills play in personalized learning, as well as the way in which students think about and apply self-regulatory skills in personalized learning environments and the technology that facilitates these environments.

For the purposes of this study, the researcher used an explanatory sequential design. In explanatory sequential design quantitative data is collected and analyzed. Based on the quantitative results, qualitative data are collected to further investigate the questions, with the interpretation including how the qualitative data helps explain the quantitative results (Creswell & Geutterman, 2019).

The first portion of the study included quantitative results from the Self-Regulation Formative Questionnaire (see Appendix A) (Gaumer Erickson & Noonan, 2020) gathered twice as a post evaluation and retrospective pre-evaluation. Retrospective post-then-pre design (Bhanji, Gottesman, de Grave, Steiner, & Winer, 2011) allowed for respondents to first reflect on their current state as described by the survey in question and then follow up with the same survey, this time reflecting on their state prior to being involved in the personalized learning program. Results of the questionnaire were used to identify both additional questions for the small group interview, as well as participants in the interviews. The small group interview allowed for assessing the impact that technology had on students' ability to self-regulate. The

researcher selected interview participants randomly from the subgroup of the top 20% of respondents demonstrating the greatest increase in pre- to post-personalized learning scores on the SRFQ.

Participants of this study included students who were currently enrolled in personalized learning programs. Schools were selected based on common aspects of the personalized program to provide more basis for comparison of the effect on self-regulation. Participants took part in questionnaires and interviews as a part of the study. Statistical analysis and coding of interview and open responses has been included.

The researcher conducted the study at two secondary schools in Idaho, USA. Schools were chosen after conducting informal interviews with administrators and teachers at various schools to identify similarities in program design to assist in minimizing extraneous impact on study results. Students were given the opportunity to participate but not required to do so. Students who chose to be engaged in the project with parent permission were given the Self-Regulation Formative Questionnaire (SRFQ) (Gaumer et al., 2018). Following the questionnaire, a small group of students in each school participated in a group interview. The researcher analyzed the student responses and questionnaire scores to provide data to answer research questions listed previously. After gathering the data, the researcher conducted statistical analyses utilizing the Wilcoxon Signed-Rank test due to the non-parametric nature of the data and the pre-post reflective process used to gather the data, wherein the same participants took part in each condition of the SRFQ.

In summary, personalized learning, with the assistance of computer assisted instructional technology, is increasing in scope across the educational landscape. Self-regulation is a key predictor of success in education from elementary through post-secondary courses (Ariani, 2016;

Job et al., 2015; Kim & Ra, 2015). In the secondary school setting, particularly high school as a preparatory step for post-secondary and career work, personalized learning and self-regulation have been viewed as methods for delivering both content and skills necessary for success at the next level. The purpose of this study is to identify to what degree students in a personalized learning environment report a change in their self-regulatory abilities when enrolled in personalized learning in secondary school programs as well as identifying the impact that self-regulatory sub-components (Plan, Monitor, Adjust, Reflect) and technological tools have on secondary students.

Chapter II

Review of Literature

Introduction

This literature review provides the context of the theoretical framework for this study, presents an overview of the history and description of personalized learning programs in secondary schools, as well as a description of self-regulation in secondary schools as a preparation for post-secondary education, and the connection between technological advances and self-regulation in personalized settings. While the primary focus of the review is on programs centered around the secondary level (grades 6-12), the researcher will present studies surrounding elementary and post-secondary as examples of the research available in these groups and the absence of such data at the secondary level. The goal of this review is to establish the rising prominence of personalized learning frameworks within secondary schools, the importance of self-regulation in future success of students, and the lack of meaningful research on the development of self-regulation skills in these personalized learning programs for secondary students. A review of personalized learning and self-regulation in the elementary, middle, and post-secondary education programs is also conducted.

Theoretical Framework

A theoretical framework provides the structure for all the parts of a study and how they are interrelated (Ravitch & Riggan, 2017). Personalized learning is complex and requires the integration of multiple, often individual parts (Basham et al., 2016). Students have control over their education, as do the instructors, and no two learners behave or learn exactly the same (Basham et al., 2016). Additionally, self-regulation is complex and can be affected by multiple stimuli (Daniela, 2015). Connecting this research to the already existing theoretical work,

demonstrating the impact of personalized learning on self-regulation, becomes an important consideration.

In a study where both personalized learning and self-regulation are critical aspects, a theoretical framework that could adapt and assist in the description of complex social phenomenon was important (Wang et al., 2015). Schools are social systems where there are specific management principles governing the inner workings. In a personalized school system, there are multiple agents influencing the outcome of programs. Theories such as complex adaptive systems include an understanding that there is a level of democratic principles working together as decisions are made (Ellis & Herbert, 2011).

To fully discuss and incorporate both personalized learning and self-regulation it is necessary to review multiple theories and how they are incorporated into the framework we will ultimately utilize in this study. The theories which will be described are a modified self-regulation control theory (Morton et al., 2015) and an adaptive learning system theory (Bienkowski, Feng, & Means, 2012). Together, these create a system similar in scope to the complex adaptive systems (CAS) in terms of the complexity and flexibility required to adjust information for a system as complex as a personalized learning program.

Complex adaptive systems (CAS) theories can assist researchers when studying dynamic social systems. Dynamic systems require adaptation to address issues because no single system or organization is exactly the same. The variety of human interactions changes the variety of the systems (Wang et al., 2015). Personalized learning and self-regulation studies require this variety of human experience to be described and analyzed, and, as such, CAS can assist as the natural phenomena of a personalized school system is reviewed (Ellis & Herbert, 2011).

The study of complex adaptive systems theory can run parallel to the studies of self-regulation theory and an adaptive learning model. Basic self-regulation theory has three main sub-components: goal setting, planning, and self-monitoring. Researchers also use the terms forethought phase, performance phase, and self-reflection phase (Zimmerman, 2002). An adapative learning model monitors student results and creates interventions (Bienkowski et al., 2012) Bienkowski et al. also noted these interventions can be created by the teacher/administrator or can be created by the student because in the adaptive learning model both teacher/administrator and student are privy to the student result information via a technological platform or student information system.

Complex Adaptive Systems Theory is used by a wide variety of studies when there is a complex social situation that can be both non-linear and dynamic. These studies are open systems which have exchange of various components (ie matter, energy, information, etc) across the borders to give structure or maintain the structure that already exists (Wang et al., 2015). Complex systems involve a large number of parts that can be evaluated at multiple levels or scales, where all parts or elements are related or affected by all other parts or elements, even if such an interaction is indirect, and the agents change, but the change is not describable by one rule or one scale of explanation (Kaisler & Madey, 2009). These conditions are all applicable to the personalized learning environment.

The adaptive learning model is one that is typical within educational settings where student results are monitored and interventions are created. In Figure 1, the flow of data shown is such that a student received instruction in a particular content and then demonstrates their learning in some fashion (test, quiz, report, etc). The results of the student learning is input into a database where together with information from the educational institutions student information

system (SIS) is processed and creates both a report for instructor, administrator, and student, as well creating an adaptive response for additional review of content based on the needs of that student. In addition, teachers and administrators can create an intervention designed to assist the student with any deficiencies as she/he learned the content (Bienkowski et al., 2012)

Figure 1: Adaptive Learning Model

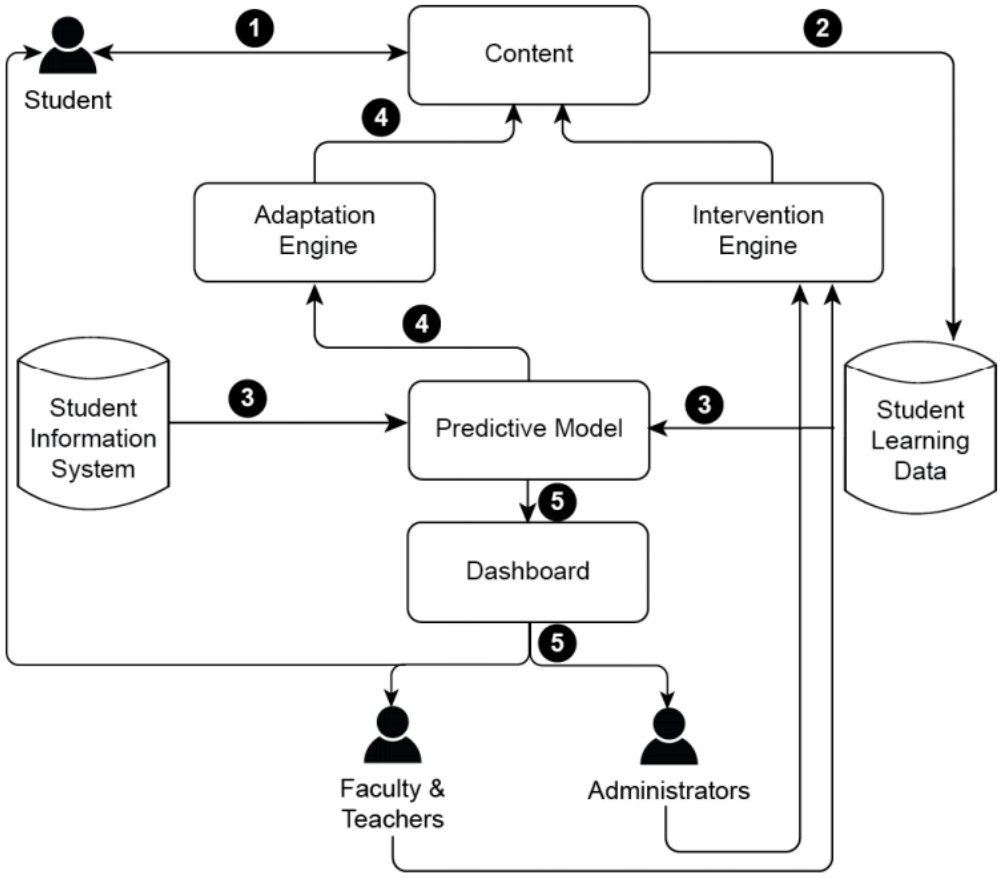

Figure 1. Adaptive Learning Model. Adapted from Enhancing teaching and learning through educational data mining and learning analytics: An issue brief, by T.E.D. Mining, 2012 in *Proceedings of conference on advanced technology for education.*

Basic self-regulation theory has three main components: goal setting, planning, and self-monitoring. These have been describe as a forethought phase, performance phase, and self-reflection phase (Zimmerman, 2002), see Figure 2.

Figure 2: Social Cognitive Model of Self-Regulation

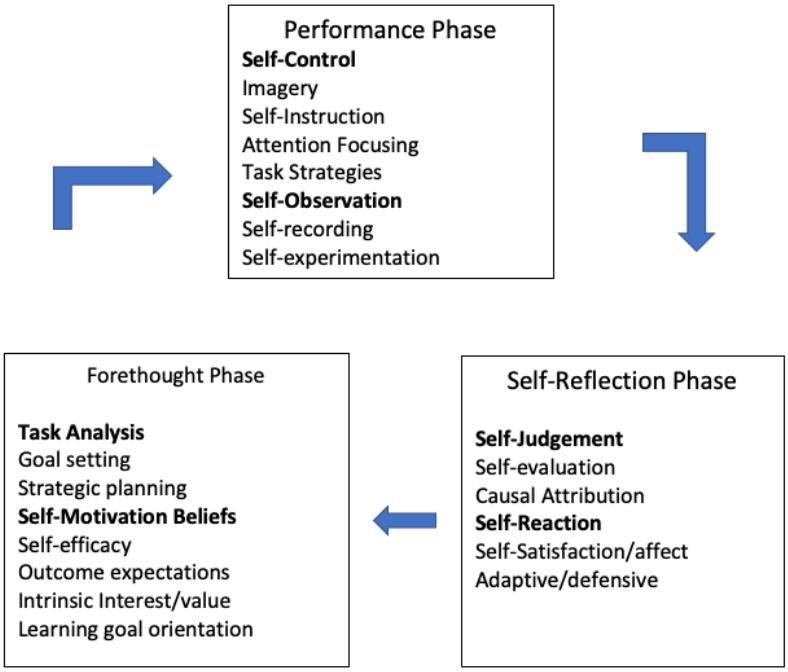

Figure 2 Social Cognitive Model of Self-Regulation. Adapted from "Becoming a Self-Regulated Learner: An Overview," by B. J. Zimmerman, 2002, *Theory Into Practice, 41,* p. 67.

To fully adapt the concepts included in Zimmerman's model of self-regulation to a personalized learning model requires the addition of feedback that is delivered to students outside of themselves, in most cases by an instructor or mentor. In the health science field, this method is sometimes utilized to account for the input from a health coach or other instructional figure (Morton, et al., 2015). Figure 3 illustrates a modified self-regulation control theory that allows for feedback from an instructor/mentor as described by Morton et al. (2015) in a study following subjects with diabetes utilizing pedometers and input from a personalized coach in the forethought stage.

Figure 3: Modified Self-Regulation Control Theory

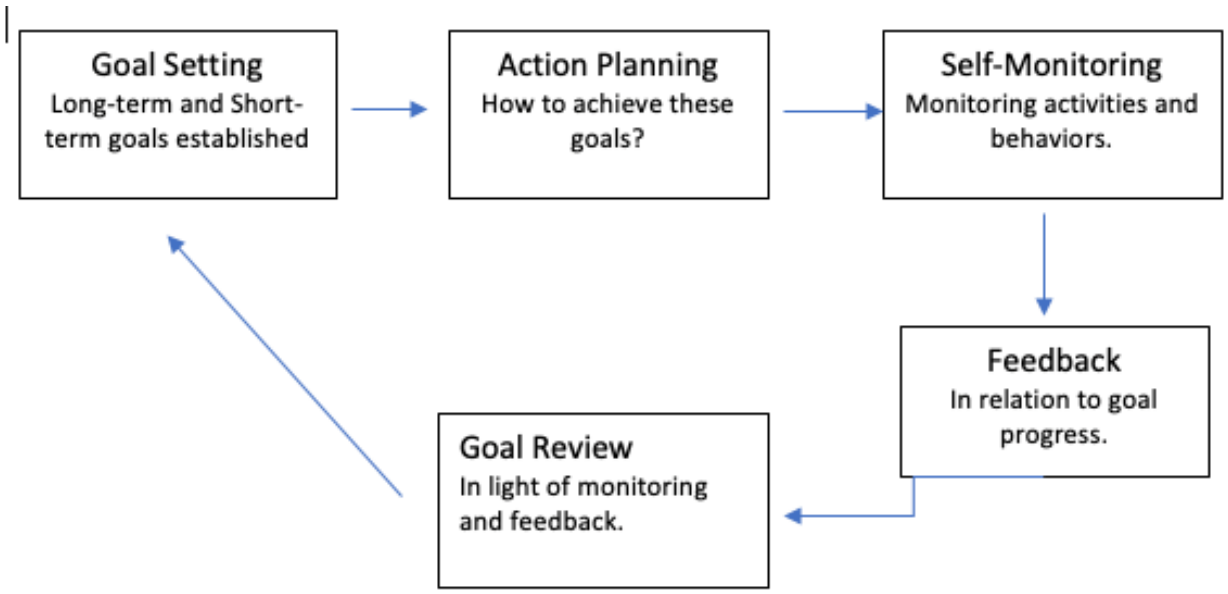

Figure 3. Modified Self-Regulation Control Theory. Adapted from A Text-Messaging and Pedometer Program to Promote Physical Activity in People at High Risk of Type 2 Diabetes: The Development of the PROPELS Follow-on Support Program, by Morton, et al., 2015, *in JMIR mHealth and uHealth, 3*(4), e105.

The inclusion of a coach/mentor in the feedback or self-reflection phase more accurately describes the process that would be utilized within a personalized learning model where the student would still be responsible for setting the goal, developing a plan, and self-monitoring the plan. However, the additional feedback would be provided by an instructor or mentor who has access to how the student has performed on the materials or goals set (Carter et al., 2018).

Other approaches to self-regulatory theory frames self-regulation more as a self-control theory used to describe the relationships between implicit theories and self-regulation. In these situations goal setting, operating, and monitoring take the place of the four stages: 1. Forethought, planning, and activation; 2. Monitoring; 3. Control; and 4. Reaction (Burnette, O'Boyle, Van Epps, Pollack, & Finkel, 2013).

For this study, the framework that assisted to the greatest degree was the modified self-regulation control theory (Morton et al., 2015). In this framework, the areas of self-monitoring,

feedback, and goal review described the self-regulation control theory with an adaptation regarding the feedback aspect. This effectively interprets what occurs in a personalized learning model where both the student and the instructor/mentor/coach/administrator play a part in delivering feedback and adapting the next cycle of learning to the needs of the student. This also allows for a focus on a specific input from a personalized learning standpoint within a self-regulatory process to identify if the addition of this input (personalized learning) has an effect on the self-regulatory ability of a student.

Leading to Personalized Learning: An Historical Perspective

Since the industrial revolution, the history of public education in the United States has been focused on a one-size fits all, industrial model, where students are grouped based on age and the geographical location of their homes (Robinson, 2011). Teachers within schools and districts often teach prescribed lessons that are aligned so as to start and end at the same time to ensure that all students, as they complete a particular grade or course, have been exposed to the same lessons (Robinson, 2011).

Through the 20th century, educators recognized the need for programs that would address the needs of specific students. With the passage of the Elementary and Secondary Education Act of 1965, the federal government of the United States recognized the need for differentiation for specific groups of students (United States, 1965). As a result of that law and subsequent legislation, programs such as special education for students with physical and learning disabilities, gifted and talented for students with exceptional abilities, and Title I for students from economically disadvantaged homes were developed and implemented in schools. In each of these situations, specific needs of groups of students were determined and instruction was modified. In the case of special education, requirements were developed that created the need

for an individualized education plan (IEP) for each student who was a part of that program (Martin, Martin, & Terman, 1996; Osgood, 2008).

The development of the IEP within special education marked the first time requirements had been made that accounted for needs of an individual student in terms of instruction. In this case, the creation of such a plan was required and only specific students qualified based on criteria outlined in the law (Martin et al., 1996; Osgood, 2008). Other programs such as Title I and gifted and talented continued to develop instruction to help students in those situations, however, the programs were generalized and students were placed in discrete groups that most nearly fit their needs, rather than the program being developed for their specific needs as ascribed in the IEP (Osgood, 2008).

A reader should note that descriptions of education are necessarily from a broad view. It is recognized that within any given classroom, course, or school, individual interactions between teachers, students, parents, and administrators occur on a daily basis (Spring, 2017). The distinction that should be made here is that these interactions are made based on the motivation of an individual to create such an interaction within the framework of the school as it is presently constituted, rather than being an integral component expected for all participants (Spring, 2017).

The rationale for the industrialized model of education stems from the sheer numbers of students and limited resources. The historical basis for education in the United States is one which emphasizes the importance of education for all citizens for the continued growth of the republic (Jefferson, 1905). The number of students continued to grow as the population grew and to meet the mandate of free education for all, states, communities, and the nation had to find a way to teach students with limited resources (Robinson, 2011).

The development of the current model of education coincided with the explosion of manufacturing in the United States and the schools mirrored the industrial mindset. Thus, classroom and subjects were organized where students would group together to learn a topic based on their age and that cohort of student would move through grades and classes together so that one teacher could direct the instruction for many students and efficiently deliver information (Spring, 2017). The movement, in secondary schools, as a group from one period to the next based on a clock and schedule is a logistical tool used for the management of large numbers of students, but has little to do with instruction (Robinson, 2011, Spring, 2017).

With the advent of specific types of technology (as will be discussed in later sections of this literature review) new personalized learning approaches to education have begun to emerge (Steiner, Hamilton, Peet, & Pane, 2015). Personalized learning, as a concept, is not new. As far back as the 1920s through the initial rulings on special education, the discussion of the benefits of personalized education have been discussed in education. However, limited resources and tools have hampered the ability of schools to implement such a program throughout their system (Bulger, 2016).

Personalized learning's foundation in the 1920's centered around the Dalton Plan. This plan focused on how students' skills and talents could be incorporated into the needs of the communities. This focus on students' specific specialties and tailoring instruction to those specialties was a first in American education (Parkhurst et al., 1924). In addition to the focus on student interests, student also had a greater degree of choice of their pathway through courses under the Dalton Plan. This plan was a contemporary of progressive movements in education at the time which lasted from 1917 though 1940. John Dewey advocated for this movement which had a clear student-centered viewpoint (Blasco, 2017).

The late 1960s and early 1970s built upon the student centered and progressive mindset in what was described as Romantic Radicalism. This movement was marked by anti-establishment feelings and experimentation and was a realm in which programs such as elective programs, open classrooms, and alternative schools were adopted (Blasco, 2017). These programs saw student needs as being at the forefront of instructional decisions and focused on different approaches to instruction being experimented with to better meet student needs. Since then frameworks such as multiple intelligence theory, humanism theory, metacognitive theory, and new constructivism learning have approached personalized learning as a method of meeting student needs (Li & Chen, 2016).

Personalized Learning

Just as no two students are alike and have the exact same needs, no two systems of personalized learned are exactly alike. Analysis of content of various documents and journals show many schools are experimenting with various forms of personalized learning throughout the United States (Metcalf, 2017). These forms include mastery learning, competency-based learning, and college and career, off-site options. Additionally, Metcalf (2017) found learning could happen anywhere the learner found themselves if the constructs of the school allowed for the content to be learned at their own pace and place.

There are some common elements to personalized learning frameworks, though implementation is varied. Personalized learning can be separated into three points. First "systems and approaches that accelerate and deepen student learning by tailoring instruction to each student's individual needs, skills, and interests" (Steiner et al., 2015, p. 4). Second, "a variety of rich learning experiences that collectively prepare students for success in the college and career of their choice" (Steiner et al., 2015, p. 5) and third "teachers (have) an integral role in

student learning: designing and managing the learning environment, leading instruction, and providing students with expert guidance and support to help them take increasing ownership of their learning" (p. 5).

Personalized learning is described as tailoring learning to each learners' needs and interests as well as allowing choice in how, what, when, and where they learn (Patrick et al., 2013). Another description of personalized learning sometimes used in schools is that the students may choose the time, path, pace, and place of their learning. Additionally, Olofson et al., (2018) emphasize that personalized learning changes the traditional use of time, space, and roles to provide a more engaging learning experience. A personalized learning approach includes a greater degree of student choice than in traditional educational frameworks and that teacher interaction with the students will have a much greater degree of individual understanding (Breunig, 2017; Olofson et al., 2018).

Self-directed learning is similar in concept and philosophy to a personalized learning environment in the aspects of student accountability and responsibility for the pathway of learning (Breunig, 2017). Self-directed learning has also been described as a learning model where students make an evaluation of their learning needs, share their purpose or vision with colleagues or instructors, and then apply the appropriate plan to investigate the learning goals (Zainuddin & Perera, 2018). In such an environment, students report an increase in the level of responsibility and accountability because of their involvement in directing the learning and the project. As a result, students are not able to deflect responsibility as readily (Breunig, 2017). Because of this structure the students could not get out of being responsible for the success of the project and their own learning. There are three specific aspects of learning which are integral to both motivation and self-directed informal learning. Those aspects are freedom and choice,

control, and interest and engagement. These three aspects are interwoven in self-directed learning activities and are why self-directed learning can have such a significant effect in the online environment (Song & Bonk, 2016). The effect on developing technologies for educational self-directed platforms has an important role in future research on the topic, as these programs will continue to develop as research continues to show how integrated self-directed learning and technology is becoming (Song & Bonk, 2016).

As schools develop personalized learning frameworks around the philosophical definitions, specific criteria and best practices start to develop. There are a number of criteria describing the requirements for operational success in personalized learning (Basham et al., 2016). These criteria are highly self-regulated environments and teaching students specific skills for self-regulation, both teachers and students utilizing transparent, continual, and actionable data, providing students with continual feedback by holding weekly meetings with students, integrating learner voice, and having multiple means of taking action or demonstrating understanding (Basham et al., 2016).

Basham et al. (2016) identified the need for regular interaction with a mentor as a hallmark for success in a personalized learning environment. Dorrington (2018) confirms this with the case study research showing that an academic advisor program provided support to a personalized learning framework which led to a greater degree of involvement and endorsement of the program by parents and students.

There are specific items which, when found together, have a statistically significant effect on student performance within a personalized learning environment. To determine which areas researchers applied qualitative comparative analysis which helped to establish patterns for each of the characteristics in the selected schools. The only results that were used were those that had

a statistically significant treatment effect and effect size larger than 0.2 in both mathematics and reading. These items, student grouping, support from the learning space, and the discussion of data among students, when taken together, were distinguishing factors for those schools with greater student achievement (Steiner et al., 2015).

There is an additional combination of factors necessary to have a successful personalized program (Waldrip et al., 2016; Metsarinne, Kallio, & Verta, 2015). This model of personalized learning includes the following variables: self-directed learning readiness; learning environment; emotional, cognitive, and behavioral engagements; personalized teaching and learning initiatives; curriculum entitlement and choice; and perceptions of assessment tasks/assessment for learning (Waldrip et al., 2016).

These personalized learning variables were measured with their impact on the following outcomes: academic efficacy, academic achievement, and student well-being. The researchers found the learning environment was associated with student well-being through efficacy. This supports the role of efficacy and self-regulation as important for the success of students in a personalized learning environment, which will be investigated more thoroughly in the next section of this review (Waldrip et al., 2016).

A synthesis of the key aspects of personalization includes: assessment for learning, teaching and learning strategies, curriculum entitlement and choice, a student-centered approach to school organization, and a strong partnership beyond the school (Fitzgerald et al., 2018). With these key aspects Fitzgerald et al. set about creating a framework for personalization within a technology-enhanced learning environment. This framework had six parts: intelligent tutoring systems, adaptive assessment, science inquiry learning, gaming and informal learning, learning analytics, and personalized books.

Previously, personalized learning was described as tailoring learning to each learners' needs and interests as well as allowing choice in how, what, when, and where they learn (Patrick et al., 2013). Mastery-based learning has been defined as "an outcome-based approach to education that incorporates modes of instructional delivery and assessment efforts designed to evaluate mastery of learning by students through their demonstration of the knowledge, attitudes, values, skills, and behaviors required for the degree sought" (Gervais, 2016, p. 99). A distinction should be noted in discussing mastery based learning. There is a distinction between general concepts of mastery-based learning as defined in chapter 1 and the more specific instructional model described by Bloom (Guskey, 2007).

Often personalized learning and mastery-based learning are terms used interchangeably. Mastery-based learning is an essential part of personalized learning, however, it is only a part. The essential nature of mastery-based learning is represented in research which states that mastery-based programs support personalization by flexibly allowing learning opportunities with regard to time, place, and pace, while also adapting instruction to each student's particular needs and is reflective of his or her specific interests (Twyman, 2014). Without mastery-based learning it is impossible to fully individualize instruction for a student because they are forced to sit with a cohort of students of varying sizes and skill levels and receive teaching designed to give everyone the same instruction, regardless of past education or prior knowledge held by individual students.

Another system of learning where lines are blurred between mastery-based and personalized learning is blended learning. For clarification of future research, it is important to describe this form of learning. Blended learning is an education program in which a student learns partially through online learning, with some student control over time, place, path, and/or

pace and partially in a supervised classroom environment; and each student's learning path within a course or subject are integrated (Hilliard, 2015; Powell et al., 2014).

Blended learning can therefore be distinguished from mastery-based learning in the same manner as personalized learning, where mastery-based learning can be a part of the learning framework. Unlike personalized learning, however, mastery-based learning is not a necessary component to have a blended program. The distinction between blended learning and personalized learning comes in the necessity of at least two different modes of teaching (online and in-person) for a blended approach, while in personalized learning it is possible that a student could work only in an online platform, or only in-person, depending on the individual needs of that student.

There are a number of factors and criteria which best support success for students in the blended environment. One researcher found that some factors had a greater impact on the ability of students to participate in the learning, while other factors had greater impact on the learning processes of the students (Blieck et al., 2017). Flexibility of the instruction and accessibility of the instruction were the most common factors addressing participation while personalization and productivity were mentioned as predominantly affecting the learning process (Blieck et al., 2017) Additionally there is importance in changing from an instructional model which is time-based and moving more directly to a measurement based in mastery, especially in online blended learning (Blieck et al., 2017).

Another aspect of blended learning is the effect that it has on leadership and faculty development in an educational organization. There is a benefit to having faculty members trained in the technology utilized in the blended learning model and that training should be differentiated. When training is differentiated it can encourage collaboration among departments,

help develop a team approach, and verifies that the balance between direct instruction and instruction via digital resources is appropriate (Hilliard, 2015).

Self-Regulation

One of the first published accepted definitions of self-regulated learning was articulated as "the degree to which students are metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 2008, p. 167). Unlike other mental processes that show specific performance skills, self-regulation focuses on the processes which allow a learner to change those performance skills into an academic skill like goal-setting, choosing specific strategies, and monitoring one's own effectiveness (Zimmerman, 2008). Panadero (2017) refers to self-regulated learning as a core piece of the framework to understand how students think, are motivated, and feel about learning.

A study of undergraduate students found that a student's academic performance was positively influenced by the student's academic motivation and self-regulatory skills (Ariani, 2016; Job et al., 2015; Kim & Ra, 2015). However, there was not a direct influence from the flexible assessment system on student performance. This seems contradictory since it has been established that flexible assessment systems improve self-regulatory behavior and self-regulatory behavior improves academic performance. Job et al. (2015), in their study of 176 university students, were looking specifically for a correlation between the perspective of will power being non-limited and an increase in self-regulation. In the process of their study they found that self-regulation was a significant predictor of major life outcomes. Kim and Ra's (2015) study of 46 Korean university students, on the other hand, looked specifically at student perceptions, and identified that goal orientation, self-control, and time management (all self-regulatory characteristics) were associated with higher levels of success in university studies.

Self-regulation may disguise the effect of specific factors on student performance (Arianai, 2016). The stated goal of this study was to find a correlation between self-regulation, academic motivation, and student performance, as well as looking at how a flexible assessment system (a key aspect of personalized learning) affects student performance. The author shows evidence for self-regulation and motivation having a positive effect on student performance. The author also shows that flexible assessment systems can assist students in learning self-regulatory skills (Ariani, 2016). The study was carried out using a questionnaire that was delivered to undergraduate students to evaluate the degree of flexible assessments, academic motivation, self-regulation, and academic performance.

The results of Ariani's (2016) study indicate that a student's academic performance was positively influenced by the student's academic motivation and self-regulatory skills. However, there was not a direct influence from the flexible assessment system on student performance. Other studies contradict this and seem to show that flexible assessment systems improve self-regulatory behavior and self-regulatory behavior improves academic performance. However, according to the author, "self-regulation may mediate the relationship between individual and contextual factors influencing the student achievement or academic performance" (Ariani, 2016, p. 171).

Meta-analysis of twelve studies regarding self-regulation in online environments indicate that there is also a positive relationship between academic achievement and characteristics of self-regulation. The areas and their associations (significant but weakly associated) are as follows: metacognition (weighted mean correlation r = .06, [95% confidence interval: .03, .06], $z = 4.56$, $p = .00$), time management (weighted mean correlation r = .14 [95% confidence interval: . 12., .16], $z = 13.67$, $p = .00$), effort regulation (weighted mean correlation 4 = .11,

[95% confidence interval: .09, .13], $z = 10.80$, $p = .00$), critical thinking (weighted mean correlation r = .07, [95% confidence interval: .00, .13] $z = 2.00$, $p = .047$) according to the author, (Broadbent & Poon, 2015). This meta-analysis focused on studies that examined how self-regulated learning strategies were applied by students in an online setting with positive academic outcomes. The participants included in Broadbent and Poon's research were limited to university, college or equivalent students. They did not select based on gender, race, age, or type of course.

Other researchers identified five self-regulatory attributes that are predictive of academic performance. These factors are intrinsic goal orientation, self-efficacy for learning and performance, time and study environment management, help seeking, and self-efficacy (Lynch & Dembo, 2004). Utilizing data from the Motivated Strategies for Learning Questionnaire (MLSQ), the researchers performed a regression analysis to identify the relationship between student achievement and these characteristics. The aspect of self-regulation with the strongest positive correlation was the correlation between self-efficacy and course grades (Lynch & Dembo, 2004).

Specific to secondary schools, studies have been conducted demonstrating the effect of self-regulation specifically on secondary students and their academic success (Daniela, 2015; Mornane, 2009). Researchers have shown variables that influence performance in secondary schools include internal control level, intrinsic motivation, and perceived level of self-efficacy. The competence of self-regulation is a transferable skill which can be learned and taught (Daniela, 2015). Daniela's research was gathered from a survey administered to 270 secondary school students between the ages of twelve and fourteen. The academic self-regulation questionnaire was used to support the view that self-regulation is a competence and that aspects

of self-regulation can be acquired. This can have a meaningful effect (*ES = .96)* across ability levels as research has shown that even in students with disabilities self-regulatory skills have a significant effect on student performance (Berkeley & Larsen, 2018).

Meta-analysis of studies involving students with disabilities and reading comprehension strategies were conducted utilizing studies from 1988 through 2018. After identifying specific markers within the 18 studies, the researchers summarized their findings. These studies were narrowed to those that included students in grades 4 to 12 and included students that were classified as having a learning disability. The majority of the studies only included reading comprehension measures. Six studies identified strategy awareness, two for attributions of learning, one for self-efficacy, and one for goal attainment. As they gathered this information, one of the key findings was that the use of specific self-regulatory strategies was sustained and used regularly when the students had received specific instruction in strategies with self-regulatory elements. Additionally, the research showed that the development of self-regulation strategies can have a long lasting effect on the academic performance of students (Berkeley & Larsen, 2018).

Self-regulation manifests in different ways as learners grow (Panadero, 2017; Zimmerman, 1986) and can be affected by their emotional awareness (Arguedas, Daradoumis, & Xhafa Xhafa, 2016; Berkhout et al., 2015). Researchers have identified the effects of self-regulation in early, elementary, secondary, as well as post-secondary learners. In early school readiness there was a positive correlation between school readiness and self-regulation with effect sizes ranging from .34 to .63. In addition, there was an identified link between self-regulation and school readiness having a positive impact on students, even those from a low

socioeconomic background. Additionally, in the same study self-regulation was often less evident in homes from low socio-economic backgrounds (Blair & Raver, 2015).

One of the key areas of self-regulation was the forethought stage, often described as the goal setting stage, in which a student has reflected on their previous experience, work, or production and was planning and setting goals for the next phase. This phase was a key in terms of readiness for self-regulation. The level of responsibility students were given should be determined by the students' readiness to self-regulate (Metsarinne et al., 2015). "Educating towards self-regulated Exploratory Production means that pupils are given an increasing level of responsibility and freedom in the forethought and performance phases of their production as they progress in skill" (Metsarinne et al., 2015, p. 101).

Emotional awareness can affect motivation, engagement, and self-regulation. Arguedas et al. (2016) created a control group and experimental group from a student population. The experimental group incorporated teachers who assisted students, through feedback on assignments, in identifying their emotional state as they worked through portions of the course. Thus, the experimental group was more aware of their emotional state during the course. Control group participants did not receive feedback regarding their emotional states. The researchers found, in this case, that students with low emotional awareness had lower scores in self-regulatory behavior, and, as a result, were not as successful in multiple aspects of their educational experience (Arguedas et al., 2016). Students included in this study were in their fourth year of high school.

Connected to the idea of emotional awareness was the belief that metacognitive awareness in general will change self-regulatory behavior and that tailored learning opportunities for metacognition leading to self-regulatory behavior was essential for the development of

students from level to level (Berkhout et al., 2015). Self-regulatory behaviors and prevalence varies from individual to individual and was affected by personal, contextual, and social criteria. Hence, the importance of metacognition (Berkhout et al., 2015).

These individualized factors played out differently in different age groups. As described above, focus on emotional and metacognitive awareness at the secondary and post-secondary levels had an effect on students' self-regulatory behaviors (Arguedas et al., 2016; Berkhout et al., 2015). Several different characteristics were common with students who exhibited high degrees of self-regulatory behavior and reflections from students on their own behavior helps to correlate specific academic behaviors with the students' academic performance (Colthorpe, Zimbardi, Ainscough, & Anderson, 2015; Mornane, 2009).

Primary meta-cognitive processes associated with self-regulation are self-control and self-observation. Self-control requires attention to, and awareness of, one's actions and how they affect outcomes, while self-observation occurs when students systematically monitor their own performance (Colthorpe et al., 2015). In the Colthorpe et al. study, students were asked to reflect on several meta-learning tasks. Students in this research study, who demonstrated the above mentioned self-regulatory processes in their reflections were statistically more likely ($r = .25$, $p < 0.05$) to be successful in their academic courses.

Additionally, at the elementary and pre-school level, cultural factors can influence the acquisition of self-regulated behaviors. When interviewed, many parents have expressed that their cultural background had an effect on their student's acquisition of specific aspects of self-regulation and emotional regulation (Blair & Raver, 2015; Boyer, 2012). This contributes to the narrative of the need for self-regulation in all levels of learning. Specifically, in this case, pre-school students and the role that parents see themselves taking in the development of self-

regulation. Additionally, it introduced the idea of parents, guardians, and teachers, as mentors for self-regulatory learning in the development of students (Boyer, 2012).

Not only does self-regulation positively correlate with school readiness, but it can be a predictor of future success. Research was conducted to determine whether number sense and self-regulation scores could predict future success in math and Turkish language later in a student's academic career (Ivrendi, 2016). A multiple regression analysis was performed to establish if there was a correlation between number sense/self-regulation and future success in math. All students participating in the study in 5th and 6th grade had, as kindergarteners, had their number sense and self-regulation scored. The results showed that early number sense and self-regulation were indeed predictors of later success. Both were found to be statistically significant predictors (self-regulation, $p = .004$; number sense, $p = .001$) (Ivrendi, 2016).

Additional research attempted to ascertain whether 4th grade students who learn math in a self-regulated, flipped environment achieve greater academic gains than their counterparts in a traditional setting (Lai & Hwang, 2016). In a portion of the review of literature, Lai and Hwang identify three stages of self-regulated learning. The three stages include a forethought stage, a performance stage, and a self-reflection stage which continue in a cycle of learning for the students (Lai & Hwang, 2016).The results of the experiment showed evidence that students can benefit, especially where there are deliberate and effective constructions of knowledge and effective learning strategies (Lai & Hwang, 2016).

At the post-secondary level, a number of studies have been conducted with students in online environments. All show positive correlations between self-regulation and online academic success (Broadbent & Poon, 2015; Crosslin, 2018; Crosslin et al., 2018; Jouhari, Haghani, & Changiz, 2015). Some research has been conducted to measure the difference in

performance of students between online and other more teacher centric methods. Scores of students in their courses at a university who were taught in either an online environment or blended, with more teacher direction, were measured and self-reported data from students in these courses was reviewed (Broadbent, 2017).

The conclusions of the study showed students who learned in an online environment reported using the self-regulated learning strategies more than the students who learned in a blended environment. The difference between the two groups was significant ($p < .05$) for all strategies between the two groups. The two strategies that were positively correlated with increased performance for online learners were time management and effort regulation ($r = .15$ and .17 respectively). In blended learning, the students who utilized elaboration, organization, and metacognition strategies had higher performance in the course (Broadbent, 2017).

Besides the effect on educational processes, self-regulation can also have an effect on a career, even the job search. Researchers found that it is critical that one have self-regulatory abilities as it can determine how a job search ultimately is conducted. The study showed the benefits and detriments of the level of self-regulation and have a strong influence on the success, or lack thereof, of the job search (Kanar, 2017) A job search process is highly influenced by the motivation of the job seeker. The commitment to the search and the engagement of the seeker play a large role in the success and outcomes of the job search (Kanar, 2017). Because self-regulation theory is highly influenced by the ability of the seeker to set goals, the connection between the two (career success and self-regulation) becomes apparent.

Research described the effect of the flipped classroom and its relationship with self-regulation in post-secondary students (Hao, 2016). In a flipped classroom, students study the lesson outside of the classroom and then spend the majority of their class time in group projects

and working directly with their teacher to master the concepts reviewed prior to class. There is a degree of self-regulation which must occur for students to succeed in such an environment. Research suggests that in order to be successful in the flipped classroom students must take responsibility for their learning (Hao, 2016) Additionally, instructors must deliberately create opportunities for developing self-directed or self-regulated learning.

There is some discussion as to how self-regulation can be acquired. While certainly there are natural proclivities towards self-regulation which vary by individual, most researchers conceded that self-regulated learning can be improved through specific instructional models (Pandero, 2017). Zimmerman (2008), Panadero (2017), and Hao (2016) all found that teachers can be trained to teach specific self-regulation skills to students and have emphasized the importance of such instruction in the preparation of students for learning. As an extension of this research, Lai and Hwang (2016) found there was evidence that students in a flipped classroom did not perform as well if they are not overtly instructed in self-regulation strategies.

One example of a strategy teachers can utilize to assist in the development of self-regulatory behaviors is modeling. When teachers used modeling strategies in their teaching the self-efficacy and motivation to work diligently for the students increased. Modeling is an important part of the first two levels of the development of self-regulation. Self-regulation requires that students internalize strategies. Research shows that internalization can be accomplished through overt strategy verbalization (Shunk & Zimmerman, 2007). This research assists in the development of arguments regarding the ability of teachers to overtly teach skills that will increase the level of self-regulation in a personalized learning environment.

When discussing the acquisition of self-regulatory behaviors, researchers look at the relationship between teachers and students in different educational settings, specifically

performance based settings. Researchers describe what they call co-regulation, where the teacher and the student share responsibility for regulation of the activities. It has been found that there is no specific approach to the development of autonomy; what works for one student does not necessarily work for another student (Kupers et al., 2015). Additional research has shown how regulatory behaviors influence a learner presence. The cyclical process of self-regulatory learning (planning, monitoring, and reflection) are included in the learner presence in three phases: self-regulation, co-regulation, and socially shared regulation (Hayes, Smith, & Shea, 2015).

Self-regulation can have both inhibiting and facilitating factors. An understanding of these inhibitors and facilitators by both students and teachers will have a positive impact on the ability of students to succeed in learning environments (Jouhari et al., 2015). Facilitators identified by students are family environment and family support and peers. Students reported that peers can provide motivation and educational support to their friends. Inhibitors noted include: hopelessness, stress, anxiety, and lack of motivation. The critical nature of self-regulation in the success of students in multiple learning environments is stressed by the researchers. A key finding was that the effects of inhibitors of self-regulation can be lessened by counselors being available for students (Jouhari et al., 2015). The emphasis on personalizing instruction to the needs of the student in the development of a skill and the connection between those and self-regulation are important (Kupers et al., 2015).

In additional research on co-regulation, researchers attempted to examine how learning in a group affects co-regulation, the control of learning of the group. Through analysis of students pre and post knowledge and review of verbal, text, and video recordings during the learning sessions, researchers were able to establish a method for analyzing how the group communicated

to gain an understanding of their growth of knowledge and levels of co-regulation within the process. The study provided operational definitions of self-regulation, co-regulation, and knowledge construction (Lee, Lajoie, Poitras, Nkangu, & Doleck, 2017).

The distinction between co-regulation and self-regulation is important. "Learning in any environment requires learners to regulate their learning however learning in small groups requires both self and co-regulation to achieve mutual understanding and collaborative knowledge building" (Lee, Lajoie, Poitras, Nkangu, & Doleck, 2017, p. 1645). This will assist in both the development of aspects of co-regulation, as well as focusing on how different learning environments may require different approaches to regulation in general.

In the same way that self-regulation manifests itself differently at different levels of learning, researchers have found that supports for self-regulation change over time. Autonomy support and differentiation are indicators of a situation that supports self-regulation (Martinek et al., 2016). Through interviews and surveys conducted over 432 students from age 6 – 20, Martinek et al. outlined the difference in student perception of autonomy and differentiation throughout the primary and secondary years of schooling. One of the most revealing results from the study was that as students progressed through primary and secondary schools supports for autonomy decreased. The authors found that autonomy support played a key role in the maintenance and development of self-determined regulation (Martinek et al., 2016).

Often, students' abilities to self-regulate are measured in an individual environment, or if the environment is collaborative, the study ends up being qualitative in nature. Law, Ge, and Eseryel (2016) conducted research to identify a method to measure self-regulation in a collaborative learning environment. To do this, they organized students into small groups and asked them to solve a problem. Each student had a piece of information relevant to solving the

problem, thus requiring collaboration. After the completion of the session, participants were asked to complete a survey regarding their self-regulatory responses. These were focused around three primary areas of self-regulation: cognition monitoring, goal setting, and reflection on problem-solving processes (Law et al., 2016). The result of the process was that the researchers were able to develop a plausible way to measure self-regulation quantitatively in a collaborative environment. Self-regulation when detailed in a collaborative environment involves clarification and resolution, elaboration, refuting, and summarization (Law et al., 2016).

While ample research shows the link between self-regulation and success in self-directed environments, there is little research showing the effect of personalized learning on self-regulation or visa-versa. Additionally, as was noted earlier, there is a drop in support for self-regulation as students progress into the secondary level as self-regulatory instruction has not yet become standard throughout the educational process (Martinek et al., 2016). As a result there is a dearth of information regarding self-regulation in secondary schools.

Role of Technology with Self-Regulation

Technology plays a role in many aspects of the educational system today. From student information management to fully immersive online learning platforms, technology can be found throughout the educational world. In terms of personalized learning the most impactful of recent technological development has come as adaptive and dynamic learning systems have become more developed and readily accessible for students (Basham et al., 2016; Bingham, 2017; Hyll et al., 2019). The ability of digital technology to allow students to move through curriculum at their own pace is significant. The proliferation of personalized learning programs throughout the educational sphere can certainly be linked to the increase in adaptive educational technology

platforms that seek to meet the needs of students, teachers, and administrators (Roberts-Mahoney et al., 2016).

As Fitzgerald et al. (2018) expanded on each of the parts of their framework a key element was flexibility and adaptivity. The tutoring systems, adaptive assessment, and learning analytics particularly carried an adaptive nature which allows for an environment where a student is put in a position to choose which type of learning and data is most important. The authors contend that "the distinction between learning and assessment has become blurred because learning analytics can be used to perform assessments in real time as learners demonstrate mastery of important concepts or ideas" (Fitzgerald et al., 2018, p. 170).

Computer-assisted instruction (CAI) helps shrink the resource gap. As was stated in the discussion of the historical perspective of personalized learning, one of the driving factors that influenced the development of our current system is that of resources. The current state of public education has not relieved the stresses on the human resources available for instruction. However, the addition of adaptive CAI in a classroom allows students to move at their own pace. It also allows for a teacher to remove themselves from the daily expected direct instruction (Fitzgerald et al., 2018; Campbell & Cox, 2018). This frees teachers to work directly with students who are in greatest need, while those that are able, move on in the curriculum (Bingham, 2017; Tekin et al., 2015).

In addition, from a student perspective, the above-mentioned aspects of personalized learning are recognized by students as contributing to a personalized experience. Students have also indicated that it made a difference in their engagement in the assignment and provided a link to the applicability of it in their minds (Campbell & Cox, 2018; Hyll et al., 2019). Students have also noted this type of learning allowed them to own their educational experience and that the

digital presentation provided by the program used was the more superficial part of the learning process (Hyll et al., 2019).

Netflix, Amazon, Overstock, and Pandora are examples of the type of development and growth of this market of technological innovation. (Roberts-Mahoney et al., 2016). Each of these businesses thrive, in part, because of algorithms developed to take as many points of data as possible about each consumer and then cater the experience on their platform to the data the consumer has provided through their purchasing, browsing history, or even their geographical location. Similarly, a personalized learning program with adaptive CAI program can start a student off in a course based on what the student already knows, and, thus, avoid spending time and resources being taught or reviewing material the student already knows (Barrett, 2017; Basham et al., 2016; Sereno, 2018).

Online learning has become an ever-present facet of education in both secondary, post-secondary, and job-based education plans. The online portion of a personalized learning platform offers the flexibility not found in a traditional setting in terms of pace and place of learning (Chou, 2013; Tekin et al., 2015). The researchers also note that online learning does not require a teacher to be present nor does it limit the number of students who can take the course.

One area of online research that can lend additional perspective on personalized learning and self-regulation is the increase over the past years of Massive Open Online Courses (MOOC). Massive Open Online Courses (MOOC) are online courses which are open to anyone, typically utilizing filmed lecture and automatic scoring of assignments. Because of the open nature of the course, participants come to the course from a much broader background than the traditional post-secondary course (Crosslin, 2016; Crosslin et al., 2018). The goal of a MOOC is to allow

users to develop their own pathway to learning in a self-deterministic manner. Because of the personalized nature of the courses and the students taking the course, there can often be contradictory statements offered in a study that utilizes survey data (Crosslin, 2016, 2018). However, in a personalized environment, if there are limited pathways or limited flexibility of the learning platform, the more students from diverse backgrounds that participate, the greater the chance of contradictory experiences. Additionally, the technological aspects of the course must be sufficiently flexible for students to use it in a personalized fashion (Crosslin, 2016, 2018).

Crosslin et al. (2018) focused on the engagement patterns of students in such MOOC courses and the implications of that engagement on the customizable and personalized aspects of the courses. They found that many students are not accustomed to the level of self-regulation and self-determination that are allowed for being a part of an MOOC. This speaks to the level of self-regulating activities and skill building that is incorporated into primary and secondary schooling, though no specific correlation is addressed. The authors indicated that many learners were interested in alternate pathways to learning, but the learners either did not have access to the technological tools necessary or did not have the necessary skills to pursue such a pathway. Additionally, researchers found that within the multimedia environment students felt they could regulate their learning more effectively and learn the concepts better when audio was combined with illustrations and text (Antonietti, Colombo, & Di Nuzzo, 2015).

Another line of research connecting self-regulation and technology, specifically in MOOCs, is that showing how students who use self-regulated learning strategies achieve more than their counterparts in these courses. Utilizing data from the online courses in engineering, computer science, management, transportation, and education, the researchers gathered student

performance data and compared the data to student self-reported regulation activities (Kizilcec, Pérez-Sanagustín, & Maldonado, 2017). The researchers found that students who, through their own reporting on the survey, used the skills of goal setting and strategic planning, were more likely to meet the goals they set for the course (ie earning a certificate). On the opposite end, help-seeking was associated as a negative predictor of meeting the goals they set. Additionally, those that reported high levels of self-regulation were associated with frequent revisiting of course materials, especially assessments (Kizilcec et al., 2017)

Conclusion

This review has conducted an overview of the history and description of personalized learning programs in secondary schools, a description of self-regulation in secondary schools as a preparation for post-secondary education, the role of technology in personalized learning, as well as a discussion of methodology and the theoretical framework that is intended to be used in the process of this study. This clearly identifies the gap in existing research regarding whether or not students in a personalized learning environment have a higher level of self-regulatory abilities than their non-personalized learning counterparts in secondary school programs and as to the level of impact that self-regulatory characteristics and tools have on learning as identified by secondary students.

Chapter III

Research Design and Methodology

Introduction

Personalized learning has been described as allowing a student to have choices in the time, path, pace, and place of their learning while tailoring a student's learning to their needs and interests (Patrick et al., 2013). Personalized learning can be separated into three approaches. First, a school system that tailors instruction to an individual's personal interests and skills. Second, a variety of learning experiences that prepare students for their post-secondary schooling or career, and, third, a system where teachers continue to design the system, but in such a way as to help students take ownership of their educational plans (Steiner et al., 2015).

The purpose of this study is to identify to what degree students in a personalized learning environment report a change in their self-regulatory abilities when enrolled in personalized learning in secondary school programs. Additionally, the study attempts to identify the impact that technological tools have on the sub-components of self-regulation (Plan, Monitor, Adjust, Reflect) for secondary students. The researcher selected a mixed-methods design because personalized learning, by its nature, tends to be different as one moves from program to program (Basham et al., 2016) and that personalization can be challenging to draw conclusions from purely quantitative means. Despite existing research of personalized learning programs and the importance of self-regulation in post-secondary and career paths, a synthesis of the connection between these aspects of secondary education is lacking.

This chapter will describe the research design of the study in question and a description of the participants in the study. This will be followed by a description of the data collection

methods as well as the analytical tools utilized by the researcher. Finally, the role of the researcher in the project, as well as a list of limitations of the study, will be addressed.

Research Design

The researcher used an explanatory sequential design, beginning with quantitative data collected and analyzed in a retrospective post-then-pre design (Bhanji et al., 2011) and then followed up with qualitative process to further investigate the research questions based on the results of the quantitative data (Creswell & Geutterman, 2019). In the retrospective post-then-pre design, participants first give their responses to the survey based on their current conditions, and then are asked to respond to the same survey questions, this time reflecting on their condition prior to being involved in the personalized learning program (Bhanji et al., 2011). The first portion of the study included quantitative results from the Self-Regulation Formative Questionnaire (see Appendix A) (Gaumer Erickson & Noonan, 2020) gathered twice as a post-evaluation and retrospective pre-evaluation. These results were analyzed and interviews were conducted with the results of the questionnaire being used to address questions and identify participants in the interviews.

The questions this study focused on answering were:

1. What is the impact of a personalized learning environment on the self-regulatory ability of secondary school students?
2. What is the impact of a personalized learning environment on the level of each of the four sub-components of self-regulatory ability of secondary school students?
3. To what degree do secondary students in personalized learning environments identify computer assisted instruction as assistive to their ability to self-regulate?

To statistically address question 1 and 2 the following hypotheses were generated:

Null Hypothesis--Question 1

There will be no significant difference ($p \leq .05$) between the pre and post overall scores of study participants on the Self-Regulation Formative Questionnaire (SRFQ).

Null Hypothesis--Question 2

In considering each of the four sub-components separately, there will be no significant difference ($p \leq .05$) between the pre and post scores representing any of the four sub-components of the SRFQ (Plan, Monitor, Adjust, and Reflect).

Participants

The sample of participants for this study were drawn from a population of secondary students located in southeastern Idaho, during the spring semester of the 2020-2021 school year. The group of participants consisted of students who had participated in personalized learning programs in their secondary school for a minimum of one school year.

The researcher identified schools that had made a change in their programming to include personalized aspects of their education. This was accomplished by working with the Idaho State Department of Education, Idaho Mastery Education Network. This department has access to school districts in Idaho which have adopted various versions of mastery and personalized education in their secondary school buildings. Each school selected to participate in the study included common aspects. The first aspect in common was that both had implemented a personalized learning program to operate, in part, separate from the traditional classrooms. The second was that both schools had, at minimum, a subpopulation of 50 students who were participating in a personalized learning program. The third commonality the schools shared was that each had moved to a form of computer assisted instruction in the form of a digital learning management system to assist in the presentation, pacing, and assessment of students during their

instructional periods. Finally, students participating in these programs elected to be a part of the program. Participants in this study were students from two different schools in different school districts, one middle school and one high school. Neither of the schools had implemented training to assist students' directly in the development of self-regulatory abilities independent of implementing personalized learning instructional programs and other instructional methodologies that would have been traditionally taught in non-personalized areas of the school.

The schools are described below.

School #1

School #1 is a rural high school with an enrollment of 800 students in grades 9-12. Students who attend the school live both in a small town (population approximately 4500), and spread out across a large geographic area surrounding the town.

School #1 adopted a personalized learning program in the 2018-2019 school year. They adopted the Summit learning management system and developed a program where a group of 9th and 10th grade students self-selected to participate in the program for their core subject areas (Math, Science, Social Studies, and English). Following the first year of implementation the program switched its learning management system to Odysseyware. Students received instruction in their coursework during specified periods and then had one period per day where they were allowed to work on any of the subjects, as well as collaborate with other students. Participation in the personalized learning program was voluntary and of the 800 students in the school, 80 have consistently volunteered to be a part of the personalized learning program. Twenty-two of these personalized learning students participated in the study. At a maximum, these students have been participating in a personalized learning program for three years. At

minimum, all participants had at least one year of experience in the personalized learning program.

School #2

School #2 is a suburban middle school with an enrollment of 1016 students in grades seven through eight. Most students live in a city of just over 16,000 residents and the remainder live in small towns spread out across a large area, or in country areas and on farms.

School #2 adopted a personalized learning program in the 2016-2017 school year. They adopted the Summit learning management system and developed a school within a school model, with students self-selecting for participation in the personalized learning program. At a maximum, these students had been participating in a personalized learning program for 3 years. At minimum, all study participants had at least one year of experience in the personalized learning program prior to participating in the study. Sixty-five students from school #2 participated in the study.

The total number of study participants was 87 students. Each school had an advisory, or home room, class where students were assigned and attended either once a week, or once each day.

Of the 87 participants in the study, all whose parents had given permission to participate were in grades 7 though 12. Their age ranged from 13 to 18 years. The sample consisted of 38 males and 47 females, with 2 making no gender selection. Ethnicity of the student participants at both schools were similar. The ethnicity, while predominantly white Caucasian, is described in detail in Table 1.

Table 1

Ethnicity of study participants

School	White/ Caucasian	Hispanic or Latino	Two or More Races	Black/African -American	Asian	American Indian or Alaskan Native	Prefer not to Answer
School #1	95.5%	4.5%	0%	0%	0%	0%	0%
School #2	82.7%	7.4%	0%	0%	0%	0%	9.9%
Total	85.4%	6.8%	0%	0%	0%	0%	7.8%

Instrumentation

The researcher elected to use the Self-Regulation Formative Questionnaire (SRFQ) (Gaumer Erickson & Noonan, 2020) to measure the level of self-regulatory ability of students. The researcher received permission from the developers to utilize the instrument in the research (see Appendix B). In addition to an overall self-regulatory score, the SRFQ provided data on four primary sub-components of self-regulation, asking questions that can be categorized into each of the four: Plan, Monitor, Adjust, and Reflect. The instrument was developed by Gaumer Erickson and Noonan, in cooperation with Research Collaboration, an education laboratory developed as a part of the University of Kansas Center for Research on Learning.

The SRFQ is a self-reported measure in which students rate behaviors associated with self-regulatory abilities on a 5-point Likert scale. The scale scores range from 'not very like me' to 'very like me'. The SRFQ was designed specifically for secondary students (grades 6-12) and the questions are written at a sixth-grade reading level as determined by the Flesch-Kincaid (Kincaid, Fishburn, Rogers, & Chissom, 1975) readability score.

The questionnaire was tested between August 2017 and March 2019 for reliability using Cronbach's coefficient alpha. Twelve thousand, eight hundred, eighty-two high school and middle school students were tested. The reliability results found high reliability (all 22 items with an alpha equal to .894) (Gaumer Erickson & Noonan, 2020). Internal consistency was maintained when analysis was completed utilizing the subgroups of gender and grade level.

The developers also conducted reliability testing for each subset of questions with results as follows: Plan sub-component, 5 items, alpha equal to .632; Monitor sub-component, 6 items, alpha equal to .704; Adjust sub-component, 6 items, alpha equal to .744; and Reflect sub-component, 5 items, alpha equal to .682. An alpha level between .6 and .7 is generally understood to be an acceptable range to measure internal reliability (Ursachi, Horodnic, & Zait, 2015).

Several measures of validity were reviewed and measured by the developers of the SRFQ (Gaumer Erickson & Noonan, 2020). The developers conducted tests of content validity, substantive validity, and fairness. Content validity was determined by both a thorough review of literature regarding self-regulation as well as item review by education professionals with doctoral degrees and a licensed clinical social worker specializing in adolescent social-emotional development. Substantive validity was achieved by first testing items with eight adolescents using a think-aloud format, followed by beta testing with 1,354 students. Fairness was analyzed through demographic data collected on the questionnaire. While females reported higher self-regulatory behaviors than males, no significant differences were found among schools with high and low free/reduced lunch rates, diversity levels, or urbanicity classifications (as determined by school level data, not individual student data).

The developers (Gaumer Erickson & Noonan, 2020) have also researched and created a knowledge test that can be used in conjunction with the SRFQ. Additional measures of validity were conducted including this knowledge test, however, as students in this study are participating only in the SRFQ further discussion of this measure, and the validity tests that correspond between the SRFQ and knowledge, were not conducted.

The questions for this questionnaire are as follows and have been grouped in the four critical areas:

Plan

1. I plan out projects that I want to complete.
2. If an important test is coming up, I create a study plan.
3. Before I do something fun, I consider all the things that I need to get done.
4. I can usually estimate how much time my homework will take to complete.
5. I have trouble making plans to help me reach my goals.

Monitor

6. I keep track of how my projects are going.
7. I know when I'm behind on a project.
8. I track my progress for reaching my goal
9. I know what my grades are at any given time.
10. Daily, I identify things I need to get done and track what gets done.
11. I have trouble remembering all the things I need to accomplish.

Adjust

12. I do what it takes to get my homework done on time.
13. I make choices to help me succeed, even when they aren't the most fun right now.
14. As soon as I see things aren't going right, I want to do something about it.
15. I keep trying as many different possibilities as necessary to succeed.
16. I have difficulty maintaining my focus on projects that take a long time to complete.
17. When I get behind on my work, I often give up.

Reflect

18. I think about how well I'm doing on my assignments.
19. I feel a sense of accomplishment when I get everything done on time.
20. I think about how well I've done in the past when I set new goals.
21. When I fail at something, I try to learn from my mistake.
22. I keep making the same mistake over and over again.

As described before, students answered these questions on a five-point Likert Scale ranging from 1: Not very like me to 5: Very like me.

The SRFQ measures how a student perceives themselves over four areas: planning for what a student wants to accomplish, monitoring progress towards that goal, adjusting the environment with specific strategies, and reflecting on what worked and what did not (Gaumer et al., 2020). This enters into the theoretical framework, modified self-regulation/adaptive learning model (see figure 3), at the goal review section.

Results of the questionnaire were delivered on a 100-point scale. Scores were generated for the SRFQ for each of the sub-component areas (Plan, Monitor, Adjust, and Reflect) as well as an overall score. The score for each sub-component was generated by averaging the student responses in the sub-component questions and multiplying the resulting average by 20. The averages require the reversal of the scores for questions 5, 11, 16, 17, and 22. The reversal (1 to 5, 5 to 1, 2 to 4, and 4 to 2) occur automatically in the application. However, raw data reports are not automatically reversed. For the overall score, the same calculation is performed on the whole set of student responses, again accounting for question reversals.

When the data from the post and pre surveys was completed and matched the researcher was able to identify students who had shown the greatest increase in their self-reported self-regulatory abilities. These students were identified so that qualitative questions being asked could be focused to those that showed the greatest self-reported increase in self-regulatory abilities on the SRFQ.

Once students with the greatest self-reported increase were identified, the researcher randomly chose 8-10 students from that list and communicated that choice to the site coordinator for each school site. The site coordinator scheduled a specific time with the students and the research assistant who would conduct the interviews via Zoom.

Questions were generated by the researcher to ascertain the effect students felt personalized learning had on their own self-regulation and learning and how the computer technology used in their program affected their development of self-regulatory skills (See Appendix C).

Construction of the questions for the small group interviews was designed to focus on delivering a greater degree of clarification to research question one regarding the overall impact of personalized learning programs on student self-regulatory abilities as well as research question three regarding the role that a digital learning platform played in the development of self-regulatory abilities. Content validity of the items was addressed first by conducting a thorough review of literature surrounding self-regulatory abilities in secondary students, personalized learning, and personalized learning platforms. After conducting the review of literature, the researcher developed the items. Following the development of the items, the researcher had two educational professionals with doctoral degrees in education review the items. Based on their review the researcher revised the items to better address the alignment to research and the specificity of response data.

Following the review of content validity, the researcher, along with an educational professional with a doctoral degree in education, conducted a pilot test of the interview and interview process. Six secondary student pilot test subjects were led through the interview process and both students and researchers were asked questions about the process and items. Confusing items, vocabulary, and interpretation issues were addressed and revisions were made to the items, again to address response specificity, as well as to better adapt the questions to secondary students.

In addition to the pilot test of the interview questions, the researcher pilot tested the delivery of the SRFQ to a test group of secondary students. Pilot participants were led through the process of the post-then-pre delivery of the SRFQ as outlined in this chapter. This process was conducted by the researcher and an educational professional with a doctoral degree in education. Following the administration of each SRFQ the researcher and educational professional reviewed the process with the students. After reviewing the process with students, revisions to the process were made to remove extraneous or confusing instructions that could have potentially distracted students or altered results.

Following the process, the researcher conducted data analysis as described later in this chapter to ensure that data delivered by the process would provide the necessary data points to conduct the analysis to effectively address the research questions based on the SRFQ data. No data was missing from the process and no significant revisions to the process were made. Statistical analysis (Wilcoxon Signed Rank Test) of pilot SRFQ data was conducted using SPSS. No additional item analysis was performed as the developers of the SRFQ had conducted item analysis prior to utilization in this study.

All of the interviews were conducted in focus groups with the students participating being selected from the group of students who showed the greatest amount of growth in self-reported, self-regulatory abilities. Interviews were conducted via Zoom and Google Meets by a research assistant. All interviews were recorded by the researcher and transcribed by a research assistant. Following the transcription the researcher identified themes and key words associated with research question #1 and research question #3.

Data Collection

After identifying schools that fit the necessary criteria, the following procedures were followed to gather the necessary information to answer the research questions for this study.

For each school site, the researcher informally approached the school district central administration to determine their interest in having students participating in the study. Once permission was granted through district level processes (See Appendices D & E) the researcher secured permission from the Institutional Review Board (IRB) of Northwest Nazarene University to conduct the study (See Appendix F). After securing the IRB permission, the researcher sent an explanatory letter to each site coordinator (usually the building principal) outlining the process that would be followed for the study (See Appendix G). Site coordinators were selected by building administrators. This letter was delivered via email in Spring of 2021.

Plans were made with each school site coordinator to meet with the researcher during the second semester of the 2020-2021 school year. In this meeting the procedures (See Appendix H and Appendix I) were reviewed for the administration of the questionnaire (SRFQ) and questions were answered regarding the process for selection of students for interviews. Dates were selected for the administration of the SRFQ as well as dates for follow up interviews. Demographic information from students was collected as a part of the student consent form.

During the Spring semester of 2021, prior to the prescribed date, permission letters were sent home with students (See Appendix J) for signatures from their parents/guardians. On the prescribed dates, site coordinators were sent a URL that linked to the questionnaire (SRFQ). Students were given a unique ID number prior to logging in to take the questionnaire. The ID numbers were known only to the researcher, site coordinator, and the student. All tracking of data was done utilizing the unique ID number. At no time did the students enter their name on

the form. The students only entered their unique ID number to allow for confidentiality. The survey code for the questionnaire was delivered to all students who had returned acceptable permission forms via email.

Site coordinators provided the students with a URL and survey code. Students then completed the first survey (relating to their current state) by self-rating aspects of self-regulation on a 5-point, Likert-type scale which ranges from 1(Not very like me) to 5 (Very like me). Site coordinators asked students to answer the questionnaire based on how they felt presently. All of the items are written at a reading level appropriate for grades 6 –12. According to the Flesch-Kincaid readability scale, the questions are at a level appropriate for the grade level of participants.

Following the completion of the post SRFQ, site coordinators asked students to complete the questionnaire a second time, with instruction to the students to retrospectively think specifically about how they felt they would have answered the questions at the beginning of their personalized learning experience. Students were given a second survey code, but used the same ID number.

Results from the students' performance on both the post and pre questionnaire were updated in real time to the server address provided by Research Collaboration. Site coordinators addressed make-up or missed questionnaires according to building practice.

The researcher then ran analysis on the resulting data from the SRFQ to identify the top 20% reported differences in pre and post scores. This process was repeated for each site. From those sub-groups the researcher randomly selected 8 to 12 individuals who had permission to be a part of the interviews. Selections were made from the personalized learning group at each school, using a random number generator, to participate in group interviews.

Interviews were conducted on the predetermined date. Interviews were conducted by a research assistant. Questions were generated by the researcher to ascertain the effect students felt personalized learning had on their own self-regulation and learning and how the computer technology used in their program affected their development of self-regulatory skills (See Appendix C). Interviews were conducted separately for each school group. For each site, interviews were in a group setting with all students from each site together to provide students with a more familiar environment since the subjects were not familiar with the research assistant conducting the interview. Because of distance and COVID-19 precautions being taken by schools, the interviews were conducted via Zoom and Google Hangouts and all interactions were recorded.

Following the interview, transcripts from each interview were created and coding performed, identifying to what degree the students in personalized learning environments identified computer assisted instruction as assistive to their ability to self-regulate and follow up in response to students' entries on the SRFQ. For the interview process students were referred to in text (if necessary) as "participant A", "participant B", and so forth. The coding of these participants was known only to the researcher and site coordinator. The research assistant who conducted the interview only knew the screen names of the participants.

Analytical Methods

The researcher first analyzed whether there was a statistically significant difference in the overall self-regulatory scores between study participants' post SRFQ and their pre SRFQ. The scores were generated by the SRFQ instrumentation. Items 5, 11, 16, 17, 22 reverse the scoring for what was considered a positive self-regulation outcome from the rest of the items on the instrument. However, the SRFQ instrumentation accounts for the change in its calculation of

scores, so no adjustment of analysis needed to be taken when looking at individual score reports. Individual score reports were generated, as well as a spreadsheet with all participant data selection. However, raw data provided in the spreadsheet is not reversed, nor did it generate the sub-component and overall scores as it did on the individual report. Therefore, prior to data analysis spreadsheet data was, first, reversed for items 5, 11, 16, 17, and 22, then calculations for each subgroup and overall score were generated. The score for each sub-component was generated by averaging the student responses in the sub-component questions and multiplying the resulting average by 20. For the overall score, the same calculation was performed on the whole set of student responses, again accounting for question reversals.

The resulting data were then analyzed utilizing non-parametric methods as the data did not meet assumptions required for parametric methods because the data was derived from ordinal responses (ie Likert Scale). The researcher determined a Wilcoxon signed-rank test would be the non-parametric test used to compare the pre and post data for significance. This was used instead of the Mann-Whitney test because in comparing the pre and post scores, the scores came from the same participants (Field, 2013). The Wilcox signed-rank test was performed, using IMB SPSS Statistics, on the pre and post scores of the overall self-regulatory score from the SRFQ. First, to determine statistical significance the p-value was determined. Following the calculation of the p-value, if significance was determined, and the z-score was calculated through the Wilcoxon signed-rank test. To calculate effect size, Field (2013) recommends utilizing Pearson's correlation coefficient as an effect size. Therefore effect size was calculated using *r* as the ratio of *z*-score to the square root of the number of measurements to determine the magnitude of the difference between the two groups with interpretation as follows in Table 2.

Table 2

Effect Size Interpretation for Pearson's Correlation Coefficient

Effect Size Range	*Interpretation*
0.10 – 0.29	Small Effect Size
0.30 – 0.49	Medium Effect Size
0.50 – and above	Large Effect Size

Note. Adapted from A. Field, 2013, *Discovering Statistics Using IBM SPSS Statistics,* p. 82.

The researcher next analyzed which self-regulatory sub-components (Plan, Monitor, Adjust, and Reflect) students identified as changing as a result of participation in a personalized learning environment. Identical calculations were conducted for each sub-component: Plan, Monitor, Adjust, and Reflect to identify if there were significant changes within each subgroup from pre to post at $p \leq .05$ level of significance. Additionally, the researcher reviewed student qualitative responses to identify to what degree secondary students in a personalized learning environment would identify digital curricular tools as assistive to their self-regulatory abilities. In a similar manner, the researcher identified sub-components that had significant changes from the pre SRFQ to the post SRFQ and from the qualitative interview to triangulate findings.

As mentioned, the Wilcoxon signed-rank test was chosen because of the non-parametric aspects of the data set for the study and because the same participants were giving input for both the pre and post-tests. The results for questions #1, the overall self-regulatory scores produced by the SRFQ for each participant, and question #2, the sub-components (Plan, Monitor, Adjust, and Reflect) scores produced by the SRFQ for each component, were evaluated in a similar way, referring to the hypothesis statements for both questions:

Null Hypothesis--Question 1

There will be no significant difference ($p \leq .05$) between the pre and post overall scores of study participants on the Self-Regulation Formative Questionnaire (SRFQ).

Null Hypothesis--Question 2

In considering each of the four sub-components separately, there will be no significant difference ($p \leq .05$) between the pre and post scores representing any of the four sub-components of the SRFQ (Plan, Monitor, Adjust, and Reflect).

After running the Wilcoxon signed-rank test there was asymptotic significance for each area. If the value of the asymptotic significance is less than or equal to .05 then the researcher would reject the null hypotheses listed above and determine that there was a significant difference between the pre-personalized learning score and the post-personalized learning score. If the value of the asymptotic significance was greater than .05, then the researcher would accepted the null hypotheses listed above and determine there was not a significant difference between pre and post scores.

The researcher first reviewed the qualitative interview data utilizing coding techniques looking for common themes from students who were interviewed. Coding of data from these sources occurred as a part of the preliminary exploratory analysis to take the text data from these sources and make sense of them in the larger context of the study (Creswell & Guetterman, 2019). Coding was performed by the researcher with general topics of coding relating to setting and context, perspectives held by participants of self-regulation, self-regulatory processes used by the participants, relationships between self-regulation and aspects of personalized learning, and relationships between technology platforms and the development of self-regulatory skills. Through this process the researcher identified themes related to both research question #1 and

research question #3. After the themes were identified, key words were identified that were associated with each theme.

To report the findings, comparison tables and narrative discussions were performed. Validation of the findings was performed using member checks with the students who participated in the research by frequent follow up questions and statements during the interview such as; “Do I understand you to say…?” or “Are you intending to communicate that…? . The member check was conducted by the interviewer throughout the interviewing process through restatement as well as multiple questions around the same topic giving students an opportunity to answer and confirm previous statements.

Role of the Researcher

Throughout the research process, the researcher provided materials, instructions, and necessary information to participating administrators, teachers, research assistants conducting interviews, and students. The researcher did not have any direct interactions with the participating students from each school. The interviews were conducted using Zoom or Google Meets and were facilitated by a research assistant. Interactions with administrators and site coordinators were limited to emails used to deliver instructions for the delivery of the SRFQ to students, as well as instructions for their participation in the survey. The only interaction between the researcher and participants occurred through administrators from the participating schools and districts and during interviews. The researcher was logged on to the interview sessions, but the researcher’s camera and microphone were off and there was no interaction during the interview.

Additionally, the researcher required, prior to participation by any student, that students and parents sign consent forms and be informed of their rights and how the study was performed

(See Appendix J and Appendix K). The researcher designed the study, prepared the interview questions, analyzed the data and compiled/reported the results. Interviews were conducted by a research assistant to avoid situations wherein the participants might be familiar with the researcher.

Limitations

Creswell and Geutterman (2019) indicated that limitations are potential weaknesses in the study that are identified by the researcher both for the information of those who would read and attempt to replicate the study and as a reference for areas of future development of the research. The time-frame allowed for in this study is the largest limiting factor. Ideally, a study such as this would ask students to take a pre-program survey prior to entering into the program and then ask the same as they completed program. However, as a part of the doctoral process gathering such data is prohibitive. To address the issue the researcher adopted a reflective pre-post reporting aspect rather than collecting the data after multiple years of participating in the program. To add to the conclusions made in this study, conducting a more extensive pre and post range that included an entire school year, as well as spanning the time from 9th grade through 12th grade, might provide greater details.

Another limitation of the study may be the self-selected nature of the personalized programs utilized during the study. Students from the whole school population in both schools, grades 9-12 for school #1 and grades 6-8 for school #2, chose whether or not they would like to participate in the personalized learning program at their school. This may present a self-selected bias to the results. Additionally, only subjects whose parents signed the permission slip were included in the study. This may also indicate that results may not be representative of the entire group.

Another limitation was the researcher served as an administrator in the school district of one of the sites. To ensure procedures were followed in both sites and that interaction between the researcher and participants was similar in both sites, the researcher conducted all communication with participants via either the site coordinators for the quantitative measures or the research assistant for the qualitative measures.

In addition, in the spring of 2020, the COVID-19 outbreak occurred and prior to students participating in this study, students throughout the United States were moved into homed-based learning situations, which may have included online assignments and or homework packets, that may or may not have been appropriately prepared and matched to the instructional needs of the students. Prior to this home-based learning experience, students' experiences with self-directed, self-regulated learning, in an online or digital space was limited to school systems where teachers and school leaders had made the conscious decision to move to models that incorporated these characteristics.

Finally, another limitation is the diversity of the sample of students who participated in the study. As shown in the demographics in Table 1, the predominant ethnicity of the participants was Caucasian. There were very few participants of non-Caucasian ethnicities. As such, it would be difficult to apply results to all ethnicities.

Chapter 4

Results

Introduction

Personalized learning for secondary students in the United States has continued to grow in number and variety of programs (DeMink-Carthew et al., 2017; Olofson et al., 2018). Additionally, self-regulation has consistently shown to be an indicator of future success in post-secondary and career opportunities, across ability levels (Broadbent & Poon, 2015; Daniela, 2015; Martinek et al., 2016; Rogers, 2012; Berkeley & Larsen, 2018). While studies in both of these areas have generated helpful results for secondary school leaders, a review of the literature did not reveal whether personalized learning programs have a positive effect on the self-regulatory abilities of secondary students.

The scope of this mixed-methods study was meant to be a first step in identifying the possible impact of personalized learning programs on the development of self-regulatory abilities and the role that computer assisted instruction may have in that process. This study includes data from two secondary schools in southeastern Idaho. In both schools, students self-selected to be a part of the personalized program available in their school. Additionally they self-selected to participate in the study.

The data was gathered as described previously in the methods section with the objective of answering the following questions:

1. What is the impact of a personalized learning environment on the self-regulatory ability of secondary school students?
2. What is the impact of a personalized learning environment on the level of each of the four sub-components of self-regulatory ability of secondary school students?

3. To what degree do secondary students in personalized learning environments identify computer assisted instruction as assistive to their ability to self-regulate?

To statistically address question 1 and 2 the following null hypotheses were generated:

Null Hypothesis--Question 1

There will be no significant difference ($p \leq .05$) between the pre and post overall scores of study participants on the Self-Regulation Formative Questionnaire (SRFQ).

Null Hypothesis--Question 2

In considering each of the four sub-components separately, there will be no significant difference ($p \leq .05$) between the pre and post scores representing any of the four sub-components of the SRFQ (Plan, Monitor, Adjust, and Reflect).

By addressing the self-regulatory abilities of students involved in personalized learning programs as outlined, a greater degree of understanding of the nature of the relationship between self-regulation and personalized learning in secondary schools can start to materialize.

The Self-Regulation Formative Questionnaire (Gaumer Erickson & Noonan, 2020) was used to measure how students perceive their abilities to self-regulate in an academic setting. In addition to an overall self-regulatory score, the SRFQ provides data on four primary sub-components of self-regulation, asking questions that can be categorized into each of the four: Plan, Monitor, Adjust, and Reflect. The instrument was developed by Gaumer Erickson and Noonan, in cooperation with Research Collaboration, an education laboratory developed as a part of the University of Kansas Center for Research on Learning. The SRFQ is a self-reported measure in which students rate behaviors associated with self-regulatory abilities on a 5-point Likert scale. The scale for each item ranged from ‘not very like me’ to ‘very like me’.

Prior to data analysis for research questions one and two, SRFQ data was, first, reversed for items 5, 11, 16, 17, and 22. Then calculations for each subgroup and overall score were generated. For each of these questions, the behavior or skill in question is written as a negative statement. As such, a student marking a low number is attempting to communicate they do not have that negative attribute. All other questions are positive statements, therefore, to have a consistent score, the reversal (1 to 5, 2 to 4, 3 to 3, 4 to 2 and 5 to 1) must be done prior to calculating the score. Once the reversal was accounted for, the score for each sub-component was generated by averaging the student responses in the sub-component questions and multiplying the resulting average by 20 in order to have all scores on a 100 point scale. For the overall score, the same calculation was performed on the whole set of student responses, again accounting for question reversals.

The explanatory sequential design used in this study was chosen for the approach that allowed the qualitative questions being asked to be focused to those that showed self-reported increase in self-regulatory abilities on the SRFQ. All of the interviews were conducted in focus groups with the students participating being randomly selected from the group of students who showed the greatest amount of growth in self-reported, self-regulatory abilities. Interviews were conducted via Zoom and Google Meets by a research assistant. All interviews were recorded and transcribed by a research assistant. Following the transcription and coding, the researcher identified themes and key words associated with research question #1 and research question #3.

The quantitative and qualitative results of the aforementioned surveys and interviews will be presented in a sequential order, organized by the research question to which they pertain. As there are qualitative and quantitative results that contribute to the understanding and results for research question one, both survey and interview results will be discussed with that question.

Interview questions associated with research question one and research question three will be identified in their respective sections.

Research Question #1: Impact of Personalized Learning on Self-Regulatory Abilities

The first question of this study focuses on the overall impact of personalized learning programs on the secondary school students' self-regulatory behaviors to identify if there is a significant impact. Student participants first reported through the SRFQ how they felt presently in regards to self-regulatory abilities. Following the completion of this post-personalized learning SRFQ, students completed the questionnaire a second time, this time retrospectively, thinking specifically about how they felt they would have answered the questions at the beginning of their personalized learning experience. The data from the SRFQ is listed as an overall score for both pre-personalized learning and post-personalized learning. Scores were matched from pre- and post-survey result with the student so accurate analysis could be performed.

The researcher performed the Wilcox signed-rank test on the matched pre and post scores of the overall self-regulatory score from the SRFQ for all students. The Wilcox signed-rank test was selected as the data was non-parametric, generated from a Likert Scale. The Wilcoxon signed-rank test is based on having two sets of scores from the same participants. These participants, matched with their pre- and post-SRFQ scores form the base data for calculating the test statistic, exact significance, and the effect size of the data.

For secondary students who participated in personalized learning programs within their school day, reported self-regulatory abilities, as measured by the overall SRFQ were significantly higher after having participated in personalized learning (Mdn = 74.5) than before they had participated (Mdn = 69.1), see Table 3 for full statistics. When comparing this data to

the null hypothesis for question #1, the researcher would reject the null hypothesis (p = .002), thus indicating a significant increase in self-reported self-regulatory abilities. The effect size (r = .24) indicates the effect, while significant, is small, (See Table 2) (Field, 2013).

Table 3

Wilcox Signed Rank Test Summary Statistics for Overall Self-Regulatory Score

N	*Test Statistic (T)*	*Standardized Test Statistic (z)*	*Asymptotic Sig.(2 sided)*	*Effect Size*
87	2488.5	3.138	.002	.24

Following the completion of the SRFQ for each school, the researcher identified 10 to 12 participants from each site whose overall scores increased the greatest amount from pre to post test. From these students, 6 to 10 were randomly selected, using a random number generator, to participate in a group interview asking a number of questions related both to question 1 and question 3. All students who participated in the SRFQ surveys agreed to possible participation in the group interview as a part of their agreement to participate in the SRFQ. The interview provided more information regarding how students perceive their self-regulatory abilities.

To avoid differing interpretations of self-regulation no specific questions using the term were included in the group interview. Questions producing responses related to students abilities to self-regulate (ie plan, monitor, adjust, and reflect) were phrased in more general terms. The interview questions which generated responses regarding how students regulate their learning are the following:

- Question #1: Can you tell me how the personalized setting has been different for you from the traditional setting?
- Question #2: Do you feel you learn better or more in a personalized setting or in a traditional setting? Why?

- Question #9: What do you like about personalized learning?
- Question #11: What do you dislike about personalized learning?
- Question #13: Do you feel like you are better at planning and organizing for your school work in the personalized system or in a traditional system? Please explain.
- Question #14: Do you feel that taking classes in this way has changed you as a learner? If so, how?

Interviews from both sites used the same set of questions. All were completed in small focus groups utilizing video conferencing, recording each interview for audio and video documentation (Creswell & Guetterman, 2019). The recording was transcribed by a research assistant and coded by the researcher. To begin the coding process, the researcher read through transcripts of each interview as well as viewed video of each interview (Cresswell & Guetterman, 2019). Transcription of the interviews was performed, and codes and repeated themes were identified (Saldana, 2016). As the researcher reviewed the transcripts of each interview, references to self-regulatory processes (Plan, Monitor, Adjust, and Reflect) were identified as well as general references to personalized learning.

The themes identified, indicating associations students made between their personalized learning program and their self-regulatory abilities, are found in Table 4 along with the code assigned by the researcher to indicate with which self-regulatory sub-component the theme associated.

Table 4

Self-Regulatory Themes Identified in Small-Group Interviews

Theme	Self-Regulatory Coding
I could work ahead	Plan, Adjust
I could work on what I wanted to work on	Plan
It kept me focused	Monitor
I had freedom to do what I wanted to do	Adjust
I could plan my work progressively	Monitor, Adjust
I could collaborate with, help, and receive help from my peers.	Adjust
I could self-direct	Plan
Teachers were there to guide and help	Adjust
It helped me set goals	Plan, Reflect
I was able to be more independent	Reflect
I could own my own education	Reflect
Had to master in order to go on	Monitor
It helped me be more organized	Plan/Monitor

The themes identified in Table 4 and their respective self-regulatory coding was developed by the researcher during the coding process and summarizes multiple statements with similar phrasing. Some of these were mentioned multiple times over the course of the questions identified as being associated with this research question. Table 5 provides a summary of the frequency that each theme was mentioned by the participants.

Table 5

Frequency of Self-Regulatory Themes Identified in Small Group Interviews

Theme	Frequency
I could work ahead	9
I could work on what I wanted to work on	5
It kept me focused	6
I had freedom to do what I wanted to do	5
I could plan my work progressively	1
I could collaborate with, help, and receive help from my peers.	5
I could self-direct	2
Teachers were there to guide and help	4
It helped me set goals	5
I was able to be more independent	2
I could own my own education	1
Had to master in order to go on	1
It helped me be more organized	4

Table 6 provides a summary of the frequency that each coded sub-component was identified by the researcher.

Table 6

Frequency of Sub-component (Plan, Monitor, Adjust, Reflect) Identification for Research Question #1

Sub-Component	Frequency
Plan	15
Monitor	8
Adjust	20
Reflect	8

During the interviews, as shown in Tables 3 through Table 5 students identified specific self-regulatory benefits to their participation in the personalized learning programs, with the sub-components of Plan and Adjust being represented more frequently than Monitor and Reflect. The idea of planning was addressed 15 times as shown in the following representative statements from interview participants:

- "I like it and it's different because it's more self-directed and you don't have to go with the class 'cause if you're already good at it and you don't wanna spend all the time on that subject."
- "For me in some ways [personalized learning] has helped me to work ahead, work ahead when I need to and stay behind in the things that I need to work on so that can work on them later which for me is pretty useful."
- "It's different because you have the freedom to work on what you need to work on and it's just really nice because I finished all of my other core classes except for algebra so I kind of got ahead in all those classes and I'm just working on math."

- "Another way I like having to set my own schedule is because like at the beginning of the day you plan when you make your goals but then being able to collaborate with people and also getting to know their schedule helps a lot with like saying I need help with someone on something."
- "Well, I learned that life is a lot easier when everything else is organized and you can know when things are supposed to be done and you can do it earlier, and stuff like that, so organization has really helped me with everyday life after that."

Themes where students associated monitoring their behavior with personalized learning were mentioned eight times and are represented by the following statements:

- "It's just nice to work on what I want to do; it makes the day just a little bit more easy and enjoyable to work on what I need to and what I want to."
- "I like [personalized learning] because at the beginning of the day in advisory your teacher makes you write down a goal for every hour of the day saying today I'm going to work on this focus area or today I'm gonna try and pass off this project and I really like it because during the day I'll go back on that goal sheet and it helps me stay on track and get done what I need to get done."
- "I like just going into my own bubble and focusing on the lesson instead of having to worry about the kids around me asking questions and like other distractions. It's just focused."
- "I like being able to understand the concept because in traditional you can learn it but not understand it, but in personal you have to actually understand it to move on."

As noted earlier, the concept of a student adjusting his/her learning path as a result participation in personalized learning programs was mentioned more frequently than others by

students in the small group interviews. The following is a representative sample of comments where students showed they associated the ability to adjust their learning path with their personalized learning program:

- "So, what I find different from regular classes is that you have more freedom to do what you want…and [students] can work ahead and get stuff done"
- "I like it in my personalized classroom because, in a traditional classroom if you get behind or something and you need help normally you have to stay at school and get help if you're already ahead on something else you can just work on that for the whole day and you can get personal help with lots of different teachers."
- "If you fall behind then the teacher can help you, but if you go ahead it's much easier to go ahead than in the traditional way."
- "I liked it more 'cause you could talk to people and bounce ideas off people and…there's not somebody telling you exactly what you have to do. You can kind of have more freedom."

Finally, in terms of reflecting on learning and how students associated personalized learning with opportunities to reflect, the following statements are examples of such from the interviews:

- "After setting goals like all of last year and most of this year, everything else in life it's really easy to set a good goal with because it's second nature right now."
- "I think [personalized learning] makes you more independent and it helps you get into the right mindset and it really helps you learn how to stay on track, and it really teachers you how to own your own education and to be responsible and it's changed me a lot. I can see it like in things I do out of school."

- "Where we set goals, it helps us create more goals to accomplish more in our life outside of school and it can help us get so many jobs and just being there and experiencing it has changed a lot in how I do and how I act."

Research Question #2: Impact of Personalized Learning on Four Subgroup Self-Regulatory Abilities

The second question is similar to the first, but focuses on each sub-component (Plan, Monitor, Adjust, Reflect) rather than the overall SRFQ score. Student participants reported through the SRFQ first how they felt presently in regards to self-regulatory abilities. Following the completion of this post SRFQ, students completed the questionnaire a second time, this time retrospectively, thinking specifically about how they felt they would have answered the questions at the beginning of their personalized learning experience. Similar modifications were made to the student data to produce a score for each of the sub-component sections as was described with the overall scores.

The SRFQ has a total of 22 items (see Appendix A). The 22 items are split between each of the sub-components as shown below on Table 7.

Table 7

Breakdown of Items for each SRFQ Sub-component and Respective Item Numbers

Sub-component	*# of Items*	*SRFQ item numbers*
Plan	5	1-5
Monitor	6	6-11
Adjust	6	12-17
Reflect	5	18-22

Using student data, the researcher performed the Wilcoxon signed-rank test on the pre and post scores of the self-regulatory score from each sub-component of the SRFQ. First, to determine statistical significance the p-value for each sub-component was determined. Following the calculation of the p-value, if significance was determined, the z-score was calculated through the Wilcoxon signed rank test and then the researcher used Person's correlation coefficient to determine effect size.

For secondary students who participated in personalized learning programs within their school day, reported self-regulatory abilities in the Plan sub-component, as measured by the SRFQ were significantly higher (p = .004) after having participated in personalized learning (Mdn = 68.0) than before they had participated (Mdn = 64.0), see Table 8 for full statistics. When comparing this data to the null hypothesis for question #2 Plan sub-component, the null hypothesis was rejected, thus indicating a significant increase in self-reported, self-regulatory abilities in the area of planning and organizing their time. The effect size (r = .22) indicates the effect, while significant, is small (see Table 2).

For secondary students who participated in personalized learning programs within their school day, reported self-regulatory abilities in the Monitor sub-component, as measured by the SRFQ were also significantly higher (p = <.001) after having participated in personalized learning (Mdn = 76.7) than before they had participated (Mdn = 70), see Table 8 for full statistics. When comparing this data to the null hypothesis for question #2 Monitor sub-component, the null hypothesis was rejected, thus indicating a significant increase in self-reported, self-regulatory abilities in the area of monitoring their behavior/performance. The effect size (r = .28) indicates the effect, while significant, is small.

For secondary students who participated in personalized learning programs within their school day, reported self-regulatory abilities in the Adjust sub-component, as measured by the SRFQ were significantly higher (p = .035) after having participated in personalized learning (*Mdn* = 76.7) than before they had participated (*Mdn* = 73.3), see Table 8 for full statistics. When comparing this data to the null hypothesis for question #2 in the Adjust sub-component, the null hypothesis was rejected, thus indicating a significant increase in self-reported self-regulatory abilities in the area of adjusting their process based on their performance. The effect size (r = .16) indicates that there is a small effect (see Table 2) though the results are significant.

For secondary students who participated in personalized learning programs within their school day, reported self-regulatory abilities in the Reflect sub-component, as measured by the SRFQ were significantly higher (p = .002) after having participated in personalized learning (*Mdn* =80.0) than before they had participated (*Mdn* = 72.0), see Table 8 for full statistics. When comparing this data to the null hypothesis for question #2 in the Reflect sub-component, the null hypothesis was rejected, thus indicating a significant increase in self-reported self-regulatory abilities in the area of reflecting on your behavior/performance. The effect size (r =.24) indicates that the effect, while significant, is small (See Table 2).

A summary of the statistical data from each sub-component is listed below (see Table 8). When comparing the four sub-components, the self-reported scores showing the greatest degree of growth from learning prior to the personalized program to after the personalized program was the Monitor sub-component (p < .001, r =.28), followed by Reflect (p = .002, r = .24), and Plan (p = .004, r = .22). With effect sizes ranging from .22 to .28, the practical impact of personalized learning on each of these sub-components, as measured by effect size, is small. The

sub-component Adjust (p = .035, r = .16) while reporting a significant increase, reported a small practical effect (See Table 2).

Table 8

Wilcoxon Signed Rank Test Summary Statistics All Sub-components SRFQ Scores (N = 87)

Subcomponent	*Test Statistic (T)*	*Std. T-Statistic (z)*	*Asymptotic Sig.(p)*	*Effect Size*
Plan	2118.50	2.886	.004	.22
Monitor	2447.50	3.708	<.001	.28
Adjust	1779.00	2.111	.035	.16
Reflect	2120.00	3.155	.002	.24

Research Question #3: Impact of Technology Tools on Students' Self-Regulatory Abilities

Following the completion of the SRFQ for each school, the researcher identified 10-12 participants from each site whose overall scores increased the greatest amount from pre to post test. From these students, 5-8 from each site were selected by a random number generator to participate in a group interview asking a number of questions related both to research question one and research question three. This provided more information regarding how students perceive their self-regulatory abilities and how they were affected by the availability of a technology enhanced platform.

As described in Chapter 3, each participating personalized learning program utilized a learning platform to support students in the program. One school utilized Summit Education as their learning platform, while the other utilized Odysseyware. References to the individual platforms are infrequent as most questions follow generalized patterns, not specific to the specific capabilities of each platform.

Questions that produced responses that related to question number 3, specifically, their reactions to the platform their particular school chose to use and its effect on their ability to regulate are listed below.

- Question #3: Do you regularly interact with the personalized learning teachers during your school day?
- Question #4: Do you regularly interact with a learning platform (Canvas, Summit, Odysseyware etc)?
- Question #5: How do you feel that working on the learning platform (Canvas, Summit, Odysseyware, etc) affects your learning? (Does it make it easier or harder or no change) Why do you think that is?
- Question #6: Are there things you would change about the learning platform that you think would make it better you personally?
- Question #7: What do you like about working with the learning platform?
- Question #8: What do you dislike about working with the learning platform?
- Question #13: Do you feel like you are better at planning and organizing for your school work on this system or in a traditional system?

Interviews from both sites used the same set of questions. The process used to analyze the data and arranged in themes is identical to the process described in this chapter for quantitative results referencing research question one. As the researcher reviewed the transcripts of each interview, references to the effect of a digital learning management system on the participants' self-regulatory abilities was identified.

Question number four of the small group interview, referenced prior, asks students if they regularly interact with a learning platform. Prior to beginning the interview, the research assistant conducting the interview identified the learning platform specific to the group being interviewed and certified the students knew that if a question referenced a learning platform, it

was specifically referring to the platform they used in their personalized programs. All students indicated that they regularly interacted with the learning platform.

The themes identified from the remainder of the questions, which indicated associations students made between their personalized learning program/digital learning platform and their self-regulatory abilities, are found in Table 9 along with the code assigned by the researcher to indicate which self-regulatory sub-component the theme associated with.

Table 9

Self-Regulatory Themes Associated with Learning Platform Use from Participant Interviews

Theme The learning platform helps me….	Associated Self-Regulatory Sub-components
…have more flexibility	Adjust
…pace myself	Plan, Adjust, Monitor
…stay on track	Plan, Adjust, Monitor
…work on whatever I need to do	Monitor, Adjust
…stay motivated	Reflect
…not repeat things I already know	Monitor, Adjust
…have a visual of where I'm at in the class	Reflect
…set goals	Plan
…stay organized	Plan
…remember things better	Monitor

The themes identified in Table 9 and their respective self-regulatory coding was developed by the researcher during the coding process and summarizes multiple statements with similar phrasing. Some of these were mentioned multiple times over the course of the questions

identified as being associated with this research question. Table 10 provides a summary of the frequency that each theme was mentioned by the participants.

Table 10

Frequency of Themes Associated with Learning Platform Use from Participant Interviews

Theme The learning platform helps me….	Frequency
…have more flexibility	1
…pace myself	10
…stay on track	5
…work on whatever I need to do	5
…stay motivated	2
…not repeat things I already know	1
…have a visual of where I'm at in the class	2
…set goals	6
…stay organized	4
…remember things better	1

Table11 provides a summary of the frequency that each coded sub-component was identified by the researcher.

Table 11

Frequency of Sub-component (Plan, Monitor, Adjust, Reflect) Identification Related to Research Question #3

Sub-component	Frequency
Plan	25
Monitor	22
Adjust	21
Reflect	7

During the interviews, as shown in tables 9 through 11, students associated specific self-regulatory benefits to their interactions with the specific learning platform for their personalized learning program, with the sub-components of Plan, Monitor, and Adjust being represented more frequently than Reflect. The sub-component Plan was addressed 25 times as shown in the following representative statements from interview participants:

- "…it helps you stay on track more because of the pacing line that we have and it helps you know what your behind in or what you will be behind in like a day or so and it, like, helps you to stay on track."
- "I think that having the [learning platform] be my main learning platform makes life a lot easier when it comes to learning because I am able to use the pacing lines and they have us set goals everyday which helps me keep on track and get what I need to get done, done that day."
- "Well, the programs that we use are very, very organized, so I could basically knockout a couple of things for the next couple of days and then work on everything else."

Monitor and Adjust learning were paired in many comments dealing with being on track and adjusting learning to meet the changing needs of students. Statements from interview participants in those areas were similar to the following:

- "I like the [learning platform] because it caters to all like learning types, so if you learn a little bit slower it allows you to get help from teachers and keep on that pacing line. But if you're a faster learner then you can just keep getting ahead and you can keep passing off the units you need, and you can even like move grades ahead. And I like that just because I can get more things done and I don't have to sit in a traditional classroom when I've already learned the subject we're working on."
- "I think it definitely makes it easier because like the other two said, that gives you that pacing line but it also gives you a visual of what you have to complete in your year so you can kind of pace yourself based on how fast you learn and you can make a yearly goal to accomplish so many focus areas in that year because [the learning platform] makes it a lot easier to see what all you have to learn."
- "I like the fact that you can see what your whole learning schedule is so you know what you're gonna learn ahead of time instead of just going through it when the teacher has you do it, so I think that's a little easier when you can study ahead."

Reflecting on learning was referred to in several comments made by students in terms of their goal setting and how they would like to set goals, similar to their reactions to personalized learning goals overall seen in the responses for research question one. Some examples of these statements are shown here:

- "I would like to see more goal setting pages because with it right now you only have an option to set daily goals but I would like to have like weekly goals or monthly goals so you can, set yourself a wider time frame to get more done."
- "I kind of want to have more like goal setting pages so that I can see previous goals that I made or make goals ahead of time so that I can keep myself like more on track or more ahead."

As previously stated, each student who participated in the small group interview indicated s/he regularly interacted with the learning platform in their personalized learning program. The preceding summary of the statements from students regarding their use of the learning platform shows students identify specific self-regulatory skills are enabled as a result of their interaction with the learning platform in their school.

Conclusion

In this chapter data collection methods were reviewed and quantitative and qualitative findings were reviewed based on their relevancy to each research question. The design of the study was explanatory sequential mixed methods. This method utilized both qualitative and quantitative analysis where the qualitative analysis was informed by the quantitative analysis and participants in the qualitative portion were determined by responses in the quantitative surveys. The quantitative data were collected via the Self-Regulation Formative Questionnaire (SRFQ) and were then used in a post-then-pre retrospective design. Students first completed the SRFQ reflecting on their present state and then completed the questionnaire again reflecting their state prior to participating in a personalized learning program. The qualitative data were gathered via small group interviews.

The first research question addressed the question of the impact of personalized learning on self-regulatory abilities and was measured from analysis using the post-then-pre data from the SRFQ, as well as data from interviews conducted at each participating site. The scores showed, based on student perceptions noted in the SRFQ there was a significant increase in overall self-regulatory ability at the time the students took the SRFQ, compared to the time prior to their participation in a personalized learning programs, though the practical effect was small. The qualitative data collected from student interviews supported these findings, while showing for some individual students the effect was important.

The second research question addressed the impact of personalized learning on each of the four sub-components (Plan, Monitor, Adjust, and Reflect) individually. This analysis was performed utilizing the data from the SRFQ post-then-pre data. The scores showed, based on student perceptions noted in the SRFQ, there was a significant increase in self-regulatory ability at the time the students took the SRFQ compared to the time prior to their participation in personalized learning programs for each of the four sub-groups.

The third research question addressed the impact of technological tools, specifically the learning platform utilized to support student learning, on students' self-regulatory abilities. This analysis was based on data from the small group interviews. Randomly selected students from the groups of students who demonstrated greater gains from pre-personalized to post-personalized on the SRFQ participated in at each school site. Analysis of student responses indicates students who participated in the interviews saw specific self-regulatory improvements as a result of their use of learning platforms in the personalized learning programs at their schools. Further analysis and discussion of all results will be discussed in detail in Chapter V.

Chapter V

Discussion

Introduction

Self-regulation has long been associated with success in both career and academic pursuits, showing positive influence on grades and performance (Ariani, 2016; Job et al., 2015; Kim & Ra, 2015). As mentioned in Chapter 2, a commonly accepted definition of self-regulated learning is "the degree to which students are metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 2008, p. 167). Additionally, it has been referred to as a core piece of the framework to help educators understand how students think, how they are motivated, and how they feel about learning.

Personalized learning responds to student needs by addressing a key concept that no two students are exactly alike and that the educational system should tailor itself to the specific needs of the learner. Personalized learning allows students more choice than traditional classroom in how, what, where, and when they learn (Breunig, 2017; Olofson et al., 2018; Patrick et al., 2013). As personalized learning increases the focus on the needs of the individual student, the resultant school system changes the use of time, space, place, and pace, and becomes a more engaging learning environment, leading to improvements in learning by students (Olofson et al., 2018).

Research, available at the present time, studying the development of learning systems note a focus on personalized learning (Crosslin, 2018; Metcalf, 2017) and, separately, the importance of self-regulated learning in the success of students in post-secondary education and career fields (Crosslin, 2018; Ivrendi, 2016; Lai & Hwang, 2016; Zimmerman, 2008). Previous research in self-regulation focused primarily on elementary and middle school (Boyer, 2012;

DeMink et al., 2017), with similar studies at the secondary level typically addressing self-regulation of adolescents or secondary school students (Murray & Rosanbalm, 2017; Pranoto et al., 2016). Self-regulatory research at the secondary level has not specifically focused on effects of personalized learning on self-regulatory abilities of students (Netcoh & Bishop, 2017; Taylor, 2016).

Personalized learning programs currently utilize improvements in educational technology to support the shift from a traditional classroom (Roberts-Mahoney at al., 2016). In terms of personalized learning there have been a number of innovations which have impacted the ability of school systems to make changes that personalize the education for their students to a greater degree. One of the most impactful innovations has been the development of adaptive and dynamic learning systems allowing students to both interact with the program, as well as pace themselves as they see fit (Basham et al., 2016, Bingham, 2017; Hyll et al., 2019). Students recognize the part this plays and have commented in several research studies that the technological aspects of a personalized experience played a part in making it successful (Campbell & Cox, 2018; Hyll et al., 2019).

Research at the secondary level exploring self-regulation in personalized learning environments is limited. The purpose of this study is to identify to what degree students in a personalized learning environment report an increase of self-regulatory abilities, as well as identifying the impact that self-regulatory characteristics and technological tools have on secondary students. The research questions that were developed to address this mixed-methods, explanatory sequential study were:

1. What is the impact of a personalized learning environment on the self-regulatory ability of secondary school students.

2. What is the impact of a personalized learning environment on the level of each of the four sub-components of self-regulatory ability of secondary school students?
3. To what degree do secondary students in personalized learning environments identify computer assisted instruction as assistive to their ability to self-regulate?

To statistically address question 1 and 2, the following hypotheses were generated:

Null Hypothesis--Question 1

There will be no significant difference ($p \leq .05$) between the pre and post overall scores of study participants on the Self-Regulation Formative Questionnaire (SRFQ).

Null Hypothesis--Question 2

In considering each of the four sub-components separately, there will be no significant difference ($p \leq .05$) between the pre and post scores representing any of the four sub-components of the SRFQ (Plan, Monitor, Adjust, and Reflect).

Summary of Results

This mixed methods study analyzed the three research questions stated in the previous section. First, the researcher utilized the Self-Regulation Formative Questionnaire (SRFQ) (Gaumer Erickson & Noonan, 2020) designed to present quantitatively the perceptions students have of their own self-regulatory abilities. The SRFQ poses questions to the students (See Appendix A) centering around four sub-components of self-regulation. These sub-components are Plan, Monitor, Adjust, and Reflect. The responses to the SRFQ were given on a 5-point Likert scale. Scale scores range from “not very like me” to “very like me”. Students receive both an overall self-regulatory score as a result of their answers to the posed questions, as well as a score for each sub-component. Scores for each area are listed on a 100 point scale.

Utilizing a post-then-pre design to gather quantitative data referenced for research questions number one and number two, participants were first asked to completed the SRFQ based on how they perceived themselves on that day. Next, in the same session, students were asked to complete the SRFQ again, but this time they were to focus their answers for each question on how they perceived themselves to be prior to participating in the personalized program in their school.

The resultant data from the post-then-pre SRFQ were analyzed using non-parametric methods, specifically, the Wilcoxon signed-rank test. The Wilcoxon signed-rank test compared the pre and post scores from the participants for the overall self-regulatory score as well as each sub-component (Plan, Monitor, Adjust, and Reflect) to determine if there were a significant difference between the pre-personalized learning scores and the post-personalized learning scores. Significance was determined to be at a $p \leq .05$ level. If significance was determined, Person's correlation coefficient was used to determine effect size (Field, 2013).

If a result was determined to be significant, it indicated the change between the two sets of scores was greater than what would be expected to happen by chance. A significant result, by itself, does not totally describe the difference between the two scores. Effect sizes provide additional information as to how important the difference is between the two scores, and, in terms of Pearson's correlational coefficient (r) is based on the scores found in Table 2 (Field, 2013).

Following the completion of the SRFQ for each school, the researcher identified 10 to 12 participants from each site whose overall scores increased the greatest amount from pre to post test. From these students, 5 to 8 individuals from each site were selected by a random number generator to participate in a small group interview.

Participants for the study came from two secondary school sites in Idaho previously described. Twenty-two students from school #1 participated in the study, with sixty-five participating from school #2, for a total of eighty-seven total participants completing the SRFQ for the post-then-pre portion of the study. After reviewing the student scores and selecting the students for the interviews, five students participated in the group interview from school #1 and seven from school #2. Group interviews were conducted using videoconferencing technology (Zoom, Google Meets).

Each interview was recorded and transcribed by a research assistant. After the transcription took place, the researcher identified themes and associated those themes with specific sub-components, as pertaining to each question. Frequency tables were developed for each theme and sub-component.

Research Question #1: Summary of Results and Discussion

Research question #1 centered around the question of whether students who participated in personalized learning programs would develop increased self-regulatory abilities by participating in the personalized program. Self-regulatory behavior has been researched in coordination with personalized learning when dealing specifically with online learning, higher education, and early childhood learning (Crosslin, 2015; Crosslin et al., 2018; Job et al., 2015; Ivrendi, 2016; Lai & Hwang, 2016; Panadero, 2017). This specific research question focuses its research on secondary students and secondary personalized learning plans.

Self-Regulation Formative Questionnaire (SRFQ) scores are reported on a 100 point scale. Research question #1 refers to the SRFQ overall score and compares the scores from the pre-personalized learning experience with the scores from the post-personalized learning experience scores. Results of the Wilcoxon signed-rank test show a significant result ($p = .002$)

suggesting that the increase in SRFQ scores from pre to post is not likely to have happened by chance. The effect size (r = .24) shows a small effect size, though it is on the upper half of the range between small (0.1) and medium (0.3) (See Table 2).

Students who participated in the group interview following their participating in the SRFQ noted there were multiple advantages from participating in the personalized programs and articulated how their self-regulatory abilities had changed as a result of their participation. Comments including phrases such as “has helped me work ahead”, “set my own schedule and goals”, “I have more freedom to direct my learning”, and “setting goals is second nature now”, are representative of the types of responses students shared when considering how their self-regulatory abilities improved.

These comments, combined with the results of the SRFQ support the description of personalized learning described as tailoring learning to each learner’s needs and interests, as well as allowing choice in how, what, when and where they learn (Patrick et al., 2013). Students show examples of seeing their abilities in each of the sub-components, Plan, Monitor, Adjust, and Reflect change as a result of their participation in the personalized learning plan.

Word choices such as “more independent”, “stay on track”, and “setting goals” are all important parts of the self-directed aspects of personalized learning and taking responsibility for their own learning (Breunig, 2017). Additionally, goal orientation, self-control, and time management are all associated with higher levels of success in university students (Kim & Ra, 2015).

Mesarinne et al. (2015) noted that one of the key areas of self-regulation was the forethought stage, often described as the goal setting stage, in which a student has reflected on their previous experience, work, or production and was planning and setting goals for the next

phase. The prevalence of comments related to goal setting and the personalized learning program provide another link between self-regulatory development and secondary student learners.

Research has shown there are specific teaching strategies and programs that can teach self-regulatory skills to students (Hao, 2016; Panadero, 2017; Zimmerman, 2008). One student comment speaks to the idea of skill permanency after leaving the program stating that "After setting goals like all of last year and most of this year, everything else in life it's really easy to set a good goal with because it's second nature right now." Student acknowledgement of something becoming "second nature" supports the research indicating that specific skills can be acquired by students. While the students participating in the interviews were certainly within the group of students that reported (via SRFQ) their abilities had improved after participating in personalized learning programs, it is clear that students did report a statistically significant change in their self-regulatory abilities, and followed that up with clear articulations of those positive changes.

Research Question #2: Summary of Results and Discussion

The second research question focuses on the representation of each of the sub-component (Plan, Monitor, Adjust, Reflect) scores from the SRFQ rather than the overall score. Planning, monitoring, adjusting, and reflecting during the learning process are all associated with self-regulatory learning (Gaumer Erickson & Noonan, 2020). This question provides more specific data regarding the effect that personalized learning might have on students who participate in such a program.

The process students followed regarding the SRFQ is identical since the scores came from the same administration of the test. Sub-components are relatively equally represented

throughout the questionnaire (See Table 7) helping ensure that the breakdown of scores or would not be based on over or under representation in the SRFQ.

After conducting the Wilcoxon signed-rank test for each sub-component *p* values were calculated. These scores (Plan, $p = .22$; Monitor, $p = .28$; Adjust, $p = .16$; Reflect, $p = .24$) indicated that when considering each sub-component and the responses of students to the SRFQ there was a significant increase in the self-regulatory scores of students who participated in the personalized learning program for each sub-component, after they had spent time in the program.

The effect sizes, calculated using Pearson's Correlation Coefficient, varied from 0.16 to 0.28. Utilizing the scale score referred to in Table 2, the effect size shows a small effect size for all sub-components. The effect size of participant responses in the area of Monitor ($r = .28$) shows a small effect size, though it is on the upper half of the range between small (0.1) and medium (0.3) (See Table 2). The effect size of Adjust ($r = .16$) is closer the lower limit of a small effect. While researchers will often describe these areas with different terms, the general areas of Plan, Monitor, Adjust, and Reflect are consistent within the research (Carter et al., 2018; Law et al., 2016; O'Boyle et al., 2013; Zimmerman, 2008).

The results of the post-then-pre administration of the SRFQ with study participants shows a clear finding that, as it pertains to the sample group, these students reported a perceived increase in their overall self-regulatory abilities as discussed in this chapter in reference to research question number one and in each sub-component, with no sub-component reporting insignificant findings or no effect. While effect size is still small, the self-regulatory sub-component of monitoring nearly shows a medium effect size ($r = .28$) (see Table 2). The developers of the SRFQ indicate that the Monitor area indicates that the student "immediately monitor(s) progress and interference regarding your goal" (Gaumer Erickson & Noonan, 2020, p.

1). This is associated with the self-monitoring and feedback portions of the modified self-regulation control theory described in chapter 2 (see figure 3) (Carter et al., 2018).

Research Question #3: Summary of Results and Discussion

The results of the small group interview and the questions seeking to understand how students interacted with the digital platforms and how the computer assisted instruction as assistive to their ability to self-regulate. Student responses to the questions designed to explore aspects of research question #3 showed a clear recognition by student participants that aspects of the technology used in their personalized learning experience assisted them in the utilization and development of their self-regulatory skills. The researcher, upon review of the student responses to the questions regarding the learning platform technology used in their classes identified the following themes:

- …gives me more flexibility
- …helps me pace myself
- …helps me stay on track
- …I can work on whatever I need to do
- …helps me stay motivated
- …doesn't repeat things I already know
- …I have a visual of where I'm at in the class
- …helps me set goals

The themes identified showed the students recognized the learning program technology as supporting their self-regulatory abilities or helping to develop their self-regulatory abilities. With both examples of support and examples of development of self-regulation, the question of whether or not the learning platform is assistive to the students self-regulatory abilities were

answered. Phrases such as “it makes it easier…” or “it helps…” each show the assistive nature of the learning platform in a personalized learning and were connected to specific self-regulatory activities like pacing and goal setting which is associated with the sub-components of self-regulation Plan and Monitor.

Statements such as those referred to in chapter four indicate a change or development of a self-regulatory trait. While not specifically stated, when a student says “…because it’s second nature now” this implies it was not second nature prior to being a part of the personalized learning program.

These comments from students mirror the findings of previous research as to how assistive adaptive learning technologies can be for students in a personalized learning environment (Basham et al., 2016; Bingham, 2017; Hyll et al., 2019). Most of those research studies dealt with students at higher education institutions, while this study focused on secondary students. Students, both in this study, and those for higher education, demonstrate that they see adaptive learning technologies as assistive to their self-regulatory abilities.

The role of technology has become ubiquitous throughout the educational landscape. In terms of personalized learning the aspect of technology which has had the greatest impact and seen an increase in accessibility has been the development of adaptive and dynamic learning systems (Basham et al., 2016; Bingham, 2017) The increase and development of personalized learning programs can be linked to the increase in adaptive educational technology platforms that seek to meet the needs of students, teachers, and administrators (Robert-Mahoney et al., 2016).

In addition to the benefits seen by teachers and administrators of programs (Bingham, 2017; Campbell & Cox, 2018; Fitzgerald et al., 2018) students also recognize the contribution made by technological aspects of their personalized learning experiences. Students who have participated

in research studies in these areas have noted that the adaptive nature of technological platforms used in their programs have had a positive impact on their engagement, provided links for applicability in their minds, as well as noting it allowed them to own their educational experiences (Campbell & Cox, 2018; Hyll et al., 2019).

Conclusions

The stated purpose of this research study was to identify to what degree students in a personalized learning environment reported an increase of self-regulatory abilities as well as identifying the impact that technological tools have on the self-regulatory abilities of secondary students. Published research at the secondary level exploring self-regulation in personalized learning environments is limited. Therefore, as the study developed, the researcher identified secondary school programs that had personalized learning as a part of their program, in a school-within-a-school model.

To address the research questions the researcher developed a mixed methods study to gather, first quantitative data from two secondary school sites via the Self-Regulation Formative Questionnaire (SRFQ), followed by qualitative results coming from small group interviews. The answers to the research questions were informed by both of these processes.

Quantitative data gathered from the SRFQ clearly leads to the conclusion that secondary students who participate in personalized learning programs perceive a statistically significant increase in their self-regulatory abilities, although the practical effect was small. While statistical significance is used to describe that a result of an experiment is not likely to be attributed to chance (Field, 2013), the effect size helps identify the magnitude of the effect, or its relative importance (Field, 2013; Hoy & Adams, 2016). As noted in Chapter 4, for research questions one and two, the researcher found that the increases in median scores for the overall

self-regulatory score and each of the sub-components (Plan, Monitor, Adjust, and Reflect) from the pre-personalized learning to the post-personalized learning time frames were statistically significant ($p \leq .05$). When calculating the effect size for each, all areas showed a small effect size. As such, the conclusions based on quantitative analysis of the data suggest that personalized learning programs have a significant, but small effect on the self-regulatory abilities of secondary students.

Based on the significance of the results and the resultant effect sizes, it can be concluded that study participants who participated in personalized learning perceived that their ability to adjust was least affected positively by involvement in the personalized learning program. At the extremes of the range of effect sizes of the results, Adjust had an effect size of $r = .16$, while monitor had an effect size of $r = .28$, just slightly lower than the threshold required to show a medium result (See Table 2).

The qualitative results of the study show that, among students who showed the greatest overall increase in self-regulatory ability, pre to post, the personalized program itself, as well as the technological learning platform used to facilitate the program, had important effects on their abilities to self-regulate. When discussing personalized learning in general, as addressed in research question number one, students indicated that personalized learning programs and the digital technologies designed to support the program, helped them work ahead, plan their work progressively, self-direct, set goals, be more independent, have freedom to work where they felt they needed to, and collaborate with their peers. Each of these areas can be specifically linked to sub-components of self-regulation.

When discussing the effect of the educational technology used to facilitate the learning, students reported that the educational technologies used in their personalized learning experience

helped them pace themselves, set goals, stay on track with their learning, be flexible, and work where they felt they needed the most help. Each of these addresses different sub-components of self-regulation.

Perhaps the most poignant of the responses was when one student commented the following:

> "I think [personalized learning] makes you more independent and it helps you get into the right mindset and it really helps you learn how to stay on track, and it really teaches you how to own your own education and to be responsible and it's changed me a lot. I can see it like in things I do out of school."

While certainly this is a response of just one of the many participants in this particular study and can not necessarily be generalized for all students who participate in personalized learning, it is indicative of the types of comments shared by students in this study reflecting on how their self-regulatory abilities were impacted by personalized learning. It supports the research that indicates that self-regulation can impact both in the secondary education experience as well as outside (ie career, higher education) (Ivrendi, 2016; Lai & Hwang, 2016; Zimmerman, 2008).

Recommendations for Further Research

The scope of this mixed methods study was necessarily limited to fit within the scope of the researcher's abilities and timeframe for completion. Only two sites were used and under one hundred total participants were included. Those limitations combined with the overall positive results from this study present a number of opportunities for future research to expand the knowledge base regarding the relationship between personalized learning and self-regulation in secondary students.

First, this study was conducted with secondary students in mind. Secondary students present a range of age from 12 to 18 years. Those ages span a time frame when traditionally, many students recognize changes both in their physical abilities and form, as well as their mental, social-emotional, and intellectual states. As such it would be beneficial for further research to be conducted separately with different age groups, or with sufficient participants that data could be effectively (with a large enough *N*) sorted both by age groups, grade groups, or between high school and jr. high school students. Doing so could provide additional information as to the impact participation in personalized learning programs have on the development of self-regulatory abilities of different age levels.

Second, this study was conducted utilizing one measure of self-regulatory ability. The SRFQ provides one approach to measuring the self-regulatory abilities of students. Students taking the SRFQ, as a post-then-pre administration, are self-reporting how they perceive themselves in various areas that give indication of self-regulatory practice. However, there are other methods that could be employed, such as tracking the self-regulatory abilities of students with more quantifiable data points (ie goal setting, tracking progress, etc).

Connected with this line of research would be the potential to track student performance both before and after participating in personalized learning and linking that with self-regulatory actions. Researchers have documented that self-regulatory abilities positively impact academic success (Ivrendi, 2016) tracking both self-regulatory increases and measuring those increases against the levels of academic performance for students in personalized learning programs could provide important context for administrators and teachers attempting to make decisions regarding the applicability of personalized learning in their school systems.

Similar research could be conducted over a longer time frame. Conducting longitudinal studies over several years on whether or not self-regulatory abilities continue to increase in students who participate in personalized learning programs have the potential to add to the results of this study. Such a study could provide insight as to whether or not the self-regulatory effects of personalized learning continue to grow over time, whether they are more concentrated as students begin their experience, or if participation at certain grade/age levels plays a role in the development of self-regulatory activity. Additionally, a possible future study could be a longitudinal study that would follow students who experienced personalized learning through post-secondary education and into careers. The study could identify the permanence of self-regulatory skills acquired at different developmental levels and relate them to different measures of success.

Finally, it would be worthwhile to conduct research that compares the development of self-regulatory skills of students in traditional learning programs with those in personalized learning programs. Such comparison would be useful for school administrators and communities as they contemplate potential changes to educational programing in their schools.

Implications for Professional Practice

The results of this study have a number of implications for the education profession and students in general. Implications center around the effectiveness of personalized learning programs and the difficulty sometimes encountered during implementation. Challenges with the development and implementation of such programs have been prevalent, specifically a change to the content and structure of the plans (Breunig, 2017; Lee, 2019; Netcoh & Bishop, 2017). As such challenges are faced by school stakeholders, knowledge of how personalized learning can

impact students' self-regulatory abilities is an important metric to consider, especially if the development of self-regulatory abilities is a primary motivation for making the change.

This study shows that, while the effect was small, self-regulatory skills of students participating in personalized learning programs improved. Zimmerman (2008) found that self-regulatory skills allow a learner to change performance skills into academic skills. Those skills are important for students as they grow and mature, moving through primary education, secondary education, post-secondary education, and careers (Ivrendi, 2016). The findings of this study that self-regulatory abilities can increase as a result of being a part of a personalized learning program is one that should inform decision making on the part of school administrators as they seek for methods of better preparing their students for future educational and career activities. Additionally, as school administrators are looking at educational technological tools to assist students, recognition that those that provide adaptive learning processes for the students have the potential to increase the self-regulatory abilities of the students who participate.

Finally, the identification of a link, albeit small effect size as measured in this study, between personalized learning and self-regulatory skills in secondary students should inform the decision-making process for parents. In a world increasingly giving choices to students and parents in the educational field they choose to follow, knowledge of how personalized learning programs can assist in the development of self-regulatory abilities provides another option for parents to investigate in meeting the individual needs of their students.

References

Antonietti, A., Colombo, B., & Di Nuzzo, C. (2015). Metacognition in self-regulated multimedia learning: Integrating behavioural, psychophysiological and introspective measures. *Learning, Media and Technology*, *40*(2), 187-209.

Arguedas, M., Daradoumis, A., & Xhafa Xhafa, F. (2016). Analyzing how emotion awareness influences students' motivation, engagement, self-regulation and learning outcome. *Educational Technology and Society*, *19*(2), 87-103.

Ariani, D. W. (2016). Why do I study? The mediating effect of motivation and self-regulation on student performance. *Business, Management and Education, 14*(2), 153-178.

Barrett, D. D. (2017). *A mixed methods study to measure the impact of mastery-based, personalized learning on at-risk student achievement* (Doctoral dissertation, Northwest Nazarene University).

Basham, J. D., Hall, T. E., Carter Jr, R. A., & Stahl, W. M. (2016). An operationalized understanding of personalized learning. *Journal of Special Education Technology*, *31*(3), 126-136.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*(6), 351–355.

Berkhout, J. J., Helmich, E., Teunissen, P. W., Berg, J. W., Bleuten, C.P.M, & Jaarsma, A. D. C. (2015). Exploring the factors influencing clinical students' self-regulated learning. *Medical Education, 49*(6), 589-600.

Berkeley, S., & Larsen, A. (2018). Fostering self-regulation of students with learning disabilities: Insights from 30 years of reading comprehension intervention research. *Learning Disabilities Research & Practice (Wiley-Blackwell),33*(2), 75-86.

Bhanji, F., Gottesman, R., de Grave, W., Steinert, Y., & Winer, L. R. (2012). The retrospective pre–post: a practical method to evaluate learning from an educational program. *Academic emergency medicine*, *19*(2), 189-194.

Bienkowski, M., Feng, M., Means, B. (2012). *Enhancing teaching and learning through educational data mining and learning analytics: An issue brief.* Retrieved from U.S. Department of Education, Office of Educational Technology website: tech.ed.gov/wp-content/uploads/2014/03/edm-la-brief.pdf

Bingham, A. J. (2017). Personalized learning in high technology charter schools. *Journal of Educational Change*, *18*(4), 521-549.

Blair, C., & Raver, C. C. (2015). School readiness and self-regulation: A developmental psychobiological approach. *Annual Review of Psychology*, *66*, 711-731.

Blasco, B. (2017). Personalized learning: A claim to 100-year-old roots. *Delta Kappa Gamma Bulletin, 83*(4), 32-33.

Blieck, Y., Ooghe, I., Zhu, C., Depryck, K., Struyven, K., Pynoo, B., & Hilde, V. L. (2017). Validation of a conceptual quality framework for online and blended learning with success factors and indicators in adult education: A qualitative study. *The Turkish Online Journal of Educational Technology, 16*(3), 162-182.

Boyer, W. (2012). Cultural factors influencing preschoolers' acquisition of self-regulated and emotion regulation. *Journal of Research in Childhood Education, 26*(2), 169-186.

Bradley, R. L., Browne, B. L., & Kelley, H. M. (2017). Examining the influence of self-efficacy and self-regulation in online learning. *College Student Journal*, *51*(4), 518-530.

Brawer, B. J. (2013). Defining and requiring academic achievement: Carnegie units, MCAS, and the meaning of a high school education. *The National Classroom, Inc.* Retrieved from: thenationalclassroom.com/DefiningRequiringAcademicAchievement.pdf

Breunig, M. (2017). Experientially learning and teaching in a student-directed classroom. *Journal of Experiential Education*, *40*(3), 213-230.

Broadbent, J. (2017). Comparing online and blended learner's self-regulated learning strategies and academic performance. *The Internet and Higher Education*, *33*, 24-32.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education*, *27*, 1-13.

Bulger, M. (2016). Personalized learning: The conversations we're not having. *Data and Society*, *22*.

Burnette, J. L., O'Boyle, E. H., Van Epps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mind-sets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological bulletin*, *139*(3), 655-660.

Campbell, L. O., & Cox, T. D. (2018). Digital video as a personalized learning assignment: A qualitative study of student authored video using the ICSDR Model. *Journal of the Scholarship of Teaching & Learning, 18*(1), 11-24.

Carter, A. et al. (2018) *The science of summit.* Summit Public Schools. Retrieved from https://summitps.org/wp-content/uploads/2018/09/The-Science-of-Summit-by-Summit-Public-Schools_08072017-1.pdf

Chou, P. N. (2013). Students' perceptions of success in the online graduate-level classes: A self-directed learning perspective. *Contemporary Issues in Education Research*, *6*(1), 115-122.

Colthorpe, K., Zimbardi, K., Ainscough, L., & Anderson, S. (2015). Know thy student! Combining learning analytics and critical reflections to increase understanding of students' self-regulated learning in an authentic setting. *Journal of Learning Analytics*, *2*(1), 134-155.

Creswell, J.W. & Guetterman, T. C. (2019). *Educational Research: Planning, conducting, and evaluating quantitative and qualitative research*. Upper Saddle River, NJ: Pearson Education, Inc..

Crosslin, M. B. (2016). *Customizable modality pathway learning design: Exploring personalized learning choices through a lens of self-regulated learning* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database.

Crosslin, M. (2018). Exploring self-regulated learning choices in a customizable learning pathway MOOC. *Australian Journal of Educational Technology,* 34(1), 131-144.

Crosslin, M., Dellinger, J. T., Joksimovic, S., Kovanovic, V., & Gasevic, D. (2018). Customizable modalities for individualized learning: Examining patterns of engagements in dual-layer MOOCs. *Online Learning,* 22(1), 19-38.

Daniela, P. (2015). The relationship between self-regulation, motivation and performance at secondary school students. *Procedia-Social and Behavioral Sciences*, *191*, 2549-2553.

Deming, D. J., & Figlio, D. (2016). Accountability in US education: Applying lessons from K-12 experience to higher education. *Journal of Economic Perspectives*, *30*(3), 33-56.

DeMink-Carthew, J., Olofson, M. W., LeGeros, L., Netcoh, S., & Hennessey, S. (2017). An analysis of approaches to goal setting in middle grades personalized learning environments. *RMLE Online*, *40*(10), 1-11.

Dewees, S. (1999). The school-within-a-school model. *ERIC Digest*. ED438147 1999-12-00.

Dorrington, J. (2018). An organizational architecture to support personalized learning: Parent's perspectives on the academic advisers. *Issues in Educational Research,* 28(2), 349-366.

Duckworth, A. L., & Carlson, S. M. (2013). Self-regulation and school success. In B.W. Sokol, F.M.E. Grouzet, & U. Miller (Eds.), *Self-regulstion and autonomy: Social and developmental dimensions of human conduct,* (pp. 208-230). New York: Cambridge University Press.

Ellis, B., & Herbert, S. I. (2011). Complex adaptive systems (CAS): An overview of key elements, characteristics and application to management theory. *Informatics in Primary Care, 19*(1), 33-37.

Field, A. (2013). *Discovering statistics using IMB SPSS statistics (*4th ed.). SAGE Publications.

Fitzgerald, E., Kucirkova, N., Jones, A., Cross, S., Ferguson, R., Herodotou, C., . . . Scanlon, E. (2018). Dimensions of personalization in technology-enhanced learning: A framework and implications for design. *British Journal of Educational Technology,* 49(1), 165-181.

Gaumer Erickson, A.S. & Noonan, P.M. (2018). Self-regulation formative questionnaire. In *The skills that matter: Teaching interpersonal and intrapersonal competencies in any classroom* (pp. 177-178). Thousand Oaks, CA: Corwin.

Gervais, J. (2016). The operational definition of competency-based education. *The Journal of Competency-Based Education*, *1*(2), 98-106.

Guskey, T. R. (2007). Closing achievement gaps: Revisiting Benjamin S. Bloom's "Learning for Mastery". *Journal of Advanced Academics, 19*(1), 8-31.

Hao, Y. (2016). Exploring undergraduates' perspectives and flipped learning readiness in their flipped classrooms. *Computers in Human Behavior*, *59*, 82-92.

Hayes, S., Smith, S. U., & Shea, P. (2015). Expanding learning presence to account for the direction of regulative intent: Self-, co-and shared regulation in online learning. *Online Learning*, *19*(3), 15-31.

Hilliard, A. T. (2015). Global blended learning practices for teaching and learning, leadership, and professional development. *Journal of International Education Research, 11*(3), 179-188.

Hoy, W. K. & Adams, C. M. (2016). *Quantitative research in education: A primer, 2nd edition.* Thousand Oaks, CA: Sage Publications, Inc..

Hyll, M., Schvarcz, R., & Manninen, K. (2019). Exploring how medical students learn with the help of a digital presentation: A qualitative study. *BMC Medical Education, 19:* 1-8.

Ivrendi, A. (2016). Investigating kindergarteners' number sense and self-regulation scores in relation to their mathematics and turkish scores in middle school. *Mathematics Education Research Journal, 28*(3), 405-420.

Jefferson, T. (1905) *The works of Thomas Jefferson, vol. 5.* New York and London: G. P. Putnam's Sons.

Job, V., Walton, G. M., Bernecker, K., & Dweck, C. S. (2015). Implicit theories about willpower predict self-regulation and grades in everyday life. *Journal of Personality and Social Psychology*, *108*(4), 637.

Jouhari, Z., Haghani, F., & Changiz, T. (2015). Factors affecting self-regulated learning in medical students: a qualitative study. *Medical Education Online*, 20(1).

Kaisler, S. H. & Madey, G. (2009). *Complex adaptive systems: Emergence and self-organization.* Tutorial presented at HICSS-42, Big Island, HI. Retrieved from https://www3.nd.edu/~gmadey/Activities/CAS-Briefing.pdf

Kanar, A. (2017). Employment goal commitment moderates the impact of job search goal orientation on the job search process. *Career Development International, 22*(6), 659-682.

Karasavvidis, I., Pieters, J. M., & Plomp, T. (2000). Investigating how secondary school students learn to solve correlational problems: quantitative and qualitative discourse approaches to the development of self-regulation. *Learning and Instruction*, *10*(3), 267-292.

Kim, D., & Ra, Y.-A. (2015). What impacts success in college? Findings from the perceptions of Korean students. *College Student Journal, 49(1),* 161-168.

Kincaid, J. P., Fishburne, R.P., Rogers, R.L., & Chissom, B.S. (1975). Derivation of new readability formulas (automated readability index, fog count, and flesch reading ease formula) for Navy enlisted personnel. Research Branch Report 8-75. Chief of Naval Technical Training: Naval Air Station Memphis.

Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in massive open online courses. *Computers & education*, *104*, 18-33.

Kupers, E., van Dijk, M., van Geert, P., & McPherson, G. E. (2015). A mixed-methods approach to studying co-regulation of student autonomy through teacher–student interactions in music lessons. *Psychology of Music*, *43*(3), 333-358.

Lai, C. L., & Hwang, G. J. (2016). A self-regulated flipped classroom approach to improving students' learning performance in a mathematics course. *Computers & Education*, *100*, 126-140.

Law, V., Ge, X., & Eseryel, D. (2016). The development of a self-regulation in a collaborative context scale. *Technology, Knowledge and Learning, 21*(2), 243-253.

Lee, L., Lajoie, S. P., Poitras, E. G., Nkangu, M., & Doleck, T. (2017). Co-regulation and knowledge construction in an online synchronous problem-based learning . *Education and Information Technologies, 22*(4), 1623-1650.

Lee, S. D. (2019). *Success plans: Promising tools for customizing student supports and opportunities.* EdRedesign: The Education Redesign Lab. 1-84. Retrieved from https://edredesign.org/press/HarvERLreportfDigital.pdf

Li, J., & Chen, S. (2016). Analysis on the current study about personalized learning system within domestic research: Based on the content analysis of the research literature from 2002 to 2015. In *2nd International Conference on Electronics, Network and Computer Engineering (ICENCE 2016)*. Atlantis Press. Retrieved from https://www.atlantis-press.com/proceedings/icence-16/25860903

Lichtinger, E., & Kaplan, A. (2015). Employing a case study approach to capture motivation and self-regulation of young students with learning disabilities in authentic educational contexts. *Metacognition and learning*, *10*(1), 119-149.

Lynch, R., & Dembo, M. (2004). The relationship between self-regulation and online learning in a blended learning context. *The International Review of Research in Open and Distributed Learning*, *5*(2).

Malitowska, A. & Bonecki, M. (2016). *Common sense and scientific inquiry: Remarks on John Dewey's philosophy of educational progressivism.* Retrieved from repozytorium.amu.edu.pl/bitstream/10593/23815/1/13%20Anna%Malitowska%20Bonecki.pdf

Martin, E., Martin, R., & Terman, D. (1996). The Legislative and litigation history of special education. *The Future of Children,6*(1), 25-39. doi:10.2307/1602492

Martinek, D., Hofmann, F., & Kipman, U. (2016). Academic self-regulation as a function of age: The mediating role of the autonomy support and differentiation in school. *Social Psychology of Education,* 19(4), 729-748.

Metcalf, S. E. (2017). *Redesigning high school through a personalized learning model* (Order No. 10742972). (Doctoral dissertation, William Woods University) Retrieved from https://search-proquest-com.nnu.idm.oclc.org/docview/2024598213?accountid=36492

Metsarinne, M., Kallio, M., & Virta, K. (2015). Pupils' readiness for self-regulated learning in the forethought phase of exploratory production. *International Journal of Technology and Design Education, 25(*1), 85-108.

Mornane, A. (2009). The adolescent students views of factors influencing their learning. *Internationl Journal of Learning, 16(5),* 221-229.

Morton, K., Sutton, S., Hardeman, W., Troughton, J., Yates, T., Griffin, S., ... & Eborall, H. (2015). A text-messaging and pedometer program to promote physical activity in people at high risk of type 2 diabetes: The development of the PROPELS follow-on support program. *JMIR mHealth and uHealth*, *3*(4), e105.

Murray, D. W. & Rosanbalm, K. (2017). Promoting self-regulation in adolescents and young adults: A practice brief. OPRE Report #2015-82.

Netcoh, S., & Bishop, P. A. (2017). Personalized learning in the middle grades: A case study of one team's successes and challenges. *Middle Grades Research Journal, 11*(2), 33-48.

Olofson, M. W., Downes, J. M., Smith, C. P., LeGeros, L., & Bishop, P. A. (2018). An instrument to measure teacher practices to support personalized learning in the middle grades. *Research in Middle Level Education Online*, *41*(7), 1-21.

Osgood, R. L. (2008). *The history of special education: A struggle for equality in American public schools*. Greenwood Publishing Group.

Panadero, E. (2017). A review of self-regulated learning: six models and four directions for research. *Frontiers in psychology*, *8*, 422.

Parkhurst, H., Bassett, R., Eades, J., & Rennie, B. (1924) *Education on the Dalton plan.* Bell.

Patrick, S., Kennedy, K., & Powell, A. (2013). *Mean what you say: Defining and integrating personalized, blended and competency education.* Vienna, VA: International Association for K-12 Online Learning.

Pedersen, S., & Liu, M. (2003). Teachers' beliefs about issues in the implementation of a student-centered learning environment. *Educational Technology Research and Development*, *51*(2), 57.

Powell, A., Rabbitt, B., & Kennedy, K. (2014). iNACOL blended learning teacher competency framework. *International Association for K-12 Online Learning*.

Pranoto, H., Atieka, N., Wihardjo, S. D., Wibowo, A., & Nurlaila, S. (2016). Group guidance services with self-regulation technique to improve student learning motivation in junior high school. *Educational Research and Reviews*, *11*(24), 2146-2154.

Ravitch, S. M. & Riggan, M. (2017). *Reason & rigor: How conceptual frameworks guide research (2nd Ed).* Los Angeles: Sage.

Roberts-Mahoney, H., Means, A. J., & Garrison, M. J. (2016). Netflixing human capital development: personalized learning technology and the corporatization of K-12 education. *Journal of Education Policy*, *31*(4), 405-420.

Robinson, K. (2011). *Out of our minds.* Hoboken, NJ: Capstone

Rogers, C. (2012). Transition, self-regulation, independent learning and goal theory. *Psychology of Education Review, 36*(2), 26-31.

Sadovaya, V. V., Korshunova, O. V., & Nauruzbay, Z. Z. (2016). Personalized education strategies. *International Electronic Journal of Mathematics Education*, *11*(1), 199-209.

Sandars, J., & Cleary, T. J. (2011). Self-regulation theory: Applications to medical education: AMEE guide no. 58. *Medical teacher*, *33*(11), 875-886.

Schunk, D. H., & Zimmerman, B. J. (2007). Influencing children's self-efficacy and self-regulation of reading and writing through modeling. *Reading & writing quarterly*, *23*(1), 7-25.

Sereno, M. A. (2018). *The impact of a personalized learning framework on student achievement* (Order No. 10975724). Available from ProQuest Dissertations & Theses Global. (2157983676).

Song, D., & Bonk, C. J. (2016). Motivational factors in self-directed informal learning from online learning resources. *Cogent Education, 3*(1).

Spring, J. (2017). *American education*. Routledge.

Steiner, E. D., Hamilton, L. S., Peet, E., & Pane, J. F. (2015). Continued progress: Promising evidence on personalized learning.

Taylor, B. E. (2016). *A case study of middle school teachers' experiences with personalized learning* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database.

Tekin, C., Braun, J., & van der Schaar, M. (2015). eTutor: Online learning for personalized education. In *Acoustics, Speech and Signal Processing (ICASSP), 2015 IEEE International Conference on* (pp. 5545-5549). IEEE.

Thalmann, S. (2014). Adaptation criteria for the personalized delivery of learning materials: A multi-stage empirical investigation. *Australasian Journal of Educational Technology, 30*(1) 45-60.

Tulis, M., Steuer, G., & Dresel, M. (2016). Learning from errors: A model of individual processes. *Frontline Learning Research, 4*(2), 12-26.

Twyman, J. S. (2014). Competency-based education: Supporting personalized learning. Connect: Making learning personal. *Center on Innovations in Learning, Temple University*.

UNESCO, Institute for Statistics. (2012). *International Standard Classification of Education.* Retrieved from uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf

United States (1965). Elementary and secondary education act of 1965 : H. R. 2362, 89th Cong., 1st sess., Public law 89-10. Reports, bills, debate and act. [Washington] :[U.S. Govt. Print. Off.]

Ursachi, Horodnic, & Zait, (2015) How reliable are measurement scales? External factors with indirect influence on reliability estimators. *Procedia Economics and Finance 20* 679-686.

Waldrip, B., Yu, J. J., & Prain, V. (2016). Validation of a model of personalised learning. *Learning Environments Research, 19*(2), 169-180.

Wang, Y., Han, X., & Yan, J. (2015). Revisiting the blended learning literature: Using a complex adaptive systems framework. *Educational Technology & Society, 18*(2), 380-393.

Williams, P. E., Wall, N., & Fish, W. (2019). Mid-career adult learners in an online doctoral program and the drivers of their academic self-regulation: The importance of social support and parent education level. *International Review of Research in Open and Distributed Learning, 20*(1) 63-78.

Zainuddin, Z. & Perera, C. J. (2018). Supporting students' self-directed learning in the flipped classroom through the LMS TES BlendSpace. *On the Horizon, 26*(4), 281-290.

Zimmerman, B. J. (1986). Development of self-regulated learning: Which are the key subprocesses? *Contemporary Educational Psychology*, 11, 307–313.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice, 41,* 67.

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal*, *45*(1), 166–183.

Appendix A

Self-Regulation Formative Questionnaire

Please **CHECK ONE** response that best describes you. Be honest, since the information will be used to help you in school and also help you become more prepared for college and careers. There are no right or wrong answers!

Student ID_____ **Date** _____

	Not very like me → Very like me				
	1	2	3	4	5
1. I plan out projects that I want to complete.	☐	☐	☐	☐	☐
2. If an important test is coming up, I create a study plan.	☐	☐	☐	☐	☐
3. Before I do something fun, I consider all the things that I need to get done.	☐	☐	☐	☐	☐
4. I can usually estimate how much time my homework will take to complete.	☐	☐	☐	☐	☐
5. I have trouble making plans to help me reach my goals.	☐	☐	☐	☐	☐
6. I keep track of how my projects are going.	☐	☐	☐	☐	☐
7. I know when I'm behind on a project.	☐	☐	☐	☐	☐
8. I track my progress for reaching my goal.	☐	☐	☐	☐	☐
9. I know what my grades are at any given time.	☐	☐	☐	☐	☐
10. Daily, I identify things I need to get done and track what gets done.	☐	☐	☐	☐	☐
11. I have trouble remembering all the things I need to accomplish.	☐	☐	☐	☐	☐
12. I do what it takes to get my homework done on time.	☐	☐	☐	☐	☐
13. I make choices to help me succeed, even when they aren't the most fun right now.	☐	☐	☐	☐	☐
14. As soon as I see things aren't going right, I want to do something about it.	☐	☐	☐	☐	☐
15. I keep trying as many different possibilities as necessary to succeed.	☐	☐	☐	☐	☐
16. I have difficulty maintaining my focus on projects that take a long time to complete.	☐	☐	☐	☐	☐
17. When I get behind on my work, I often give up.	☐	☐	☐	☐	☐
18. I think about how well I'm doing on my assignments.	☐	☐	☐	☐	☐
19. I feel a sense of accomplishment when I get everything done on time.	☐	☐	☐	☐	☐
20. I think about how well I've done in the past when I set new goals.	☐	☐	☐	☐	☐
21. When I fail at something, I try to learn from my mistakes.	☐	☐	☐	☐	☐
22. I keep making the same mistakes over and over again.	☐	☐	☐	☐	☐

Gaumer Erickson, A.S. & Noonan, P.M. (2018). Self-regulation formative questionnaire. In *The skills that matter: Teaching interpersonal and intrapersonal competencies in any classroom* (pp. 177-178). Thousand Oaks, CA: Corwin.

Appendix B

Permission to use SRFQ from Research Collaboration

Marc Gee <mgee@nnu.edu>

Fw: Use of SRFQ for research

1 message

Marc Gee <marc.gee@psd201.org> Wed, Jun 3, 2020 at 8:56 AM
To: "mgee@nnu.edu" <mgee@nnu.edu>

From: Gaumer Erickson, Amy <agaumer@ku.edu>
Sent: Monday, June 1, 2020 1:24 PM
To: Marc Gee <marc.gee@psd201.org>
Subject: RE: Use of SRFQ for research

Hi Marc,
Yes, you may use and/or adapt the Self-Regulation Formative Questionnaire with an appropriate citation. Please note that we have not yet developed any peer-reviewed publications on the survey and it is not normed. We use it primarily as a student reflection tool and teacher planning tool. The technical and scoring information is available at http://researchcollaborationsurveys.org/. If you launch the survey through http://researchcollaborationsurveys.org/ it will automatically create a summary report for each student and provide you with composite data (in a summary report and excel download). In the next couple months, an update technical document will be available that includes reliability and validity evidence.

We also have a recently developed knowledge / situational judgement assessment that may add even more value to your research. This test includes the questionnaire, multiple choice, and short answer items. I haven't published the research yet, but based on data from one high school, we were able to predict 29.88% of the variance in GPA based on 3 variable (composite self-report questionnaire, knowledge test, and gender).

If you managed to get to the questionnaire without going through our main website, http://cccframework.org/resources.html, check out the teacher guides (which are actually literature reviews). We also have a book, *The Skills that Matter* (https://us.corwin.com/en-us/nam/the-skills-that-matter/book255639), and lessons available for purchase through our website.

Your research sound meaningful and interesting. If possible, we'd love to see the results of your study if you are willing to share.

Best of luck and thanks for reaching out to us,

Amy

Appendix C

Student Interview Questions

Group Interview Questions and Script
Self-Regulation Questionnaire Follow-Up

Thank you all for taking the time in your homeroom to take the Self-Regulation Formative Questionnaire. I appreciate that and it will help significantly with my research and doctoral dissertation. Today I would like to follow up with you as a group. Each of you here today scored similarly on the SRFQ. There is no right or wrong on the questionnaire, nor is there any high or low scores. However, there are additional questions we'd like to answer to see if we can gain more insight into how students regulate their own learning.

During this interview I will be recording my questions and your responses. Any reference to names will be omitted from the research that I perform. Each of you will be given a reference tag within the research as necessary if distinction between your answers is required. You may, at any time choose not to answer any questions that I ask. Additionally, you may choose at any time to leave the interview. While I do not anticipate that the questions will be difficult or sensitive, please do not feel any pressure to answer in a certain way. Your authentic responses are what we are looking for.

I anticipate that our meeting will last approximately 15-20 minutes. Do any of you have any questions before we begin?

I will start the recording now.

Question #1: I am assuming each of you has had an opportunity to be students in a traditional setting as well as this personalized setting. Can you tell me how you see this setting being different from the traditional setting?

Question #2: Do you feel you learn better or more in a personalized setting or in a traditional setting? Why?

Question #3: Do you regularly interact with teachers during your school day?

Question #4: Do you regularly interact with a learning platform (Canvas, Summit, etc)?

Question #5: What do you like about personalized learning?

Question #6: What do you like about traditional learning?

Question #7: What do you dislike about personalized learning?

Question #8: What do you dislike about traditional learning?

Question #9: What do you like about working with the learning platform?

Question #10: What do you dislike about working with the learning platform?

Question #11: Do you feel like you are better at planning and organizing for your school work on this system or in a traditional system?

Appendix D

Permission from School #1

November 23, 2020

To Whom It May Concern:

I am writing this letter to grant permission for Marc Gee, a doctoral student at Northwest Nazarene University, to conduct a portion of his research study surrounding personalized learning and mastery based education at [redacted]

Mr. Gee has shared the purpose of the research involved and the assurances of privacy of data and student safety and we do not have any concerns with the study parameters as a school.

We are happy to cooperate with Marc and Northwest Nazarene University and look forward to seeing the research in personalized learning and mastery based education upon the completion of his study. Please reach out to me if you have any questions.

Sincerely,

[redacted]

Appendix E

Permission from School #2

November 11, 2020

To Whom It May Concern:

I am writing this letter to grant permission for Marc Gee, a doctoral student at Northwest Nazarene University, to conduct a portion of his research study surrounding personalized learning and mastery based education at [redacted]

Mr. Gee has shared the purpose of the research involved and the assurances of privacy of data and student safety and we do not have any concerns with the study parameters as a school.

We are happy to cooperate with Marc and Northwest Nazarene University and look forward to seeing the research in personalized learning and mastery based education upon the completion of his study. Please reach out to me if you have any questions.

Sincerely,

[redacted]

Appendix F

IRB Permission Documentation

Marc Gee <mgee@nnu.edu>

Status update from Northwest Nazarene University

Northwest Nazarene University <reply-to+a07c336e-fd66-4d97-90a4-299ea6541c24@email.submittable.com> Tue, Dec 8, 2020 at 1:44 PM
To: mgee@nnu.edu

Submittable

Dear Marc,

The IRB has reviewed your protocol: 8012020 - THE EFFECTS OF PERSONALIZED LEARNING AND DIGITAL CURRICULAR TOOLS ON SELF-REGULATORY BEHAVIOR OF SECONDARY STUDENTS. You received "Full Approval" for two of your three sites. Congratulations, you may begin your research for these two sites.

Once you have obtained written permission from your third location, please email the documentation to hrrc@nnu.edu and jjhill@nnu.edu so we have the necessary documentation. It will not be necessary to re-upload it to your application.

If you have any questions, let me know. Good luck on your research!

Northwest Nazarene University

Dr. Jennifer Hill

Appendix G

Letter to Site Coordinators

Procedure for Personalized Learning Research Study Participants

Thank you for being willing to participate in this study. What follows is a step-by-step outline of the process that we will be working through with this study, with some examples of what the documentation will look like once we have the list of student participants.

In short, this will entail

1. Describing the research to students that fit the criteria for participation.
2. Getting parent permission and student consent to participate
3. Allowing time for students to complete the Self-Regulation Formative Questionnaire (twice in the same sitting).
4. Arranging a time (on a separate day from the questionnaire) for 10-12 of your students to participate in a Zoom meeting as a follow up.

Eligibility for Participation
Any student in your personalized learning program who has participated in the program for a year or more.

1. Study Description

Documentation will be provided for a teacher to read directly to the students describing the research they would be participating in and the process that needs to be implemented. See attached document.

2. Permission and Consent

Students will be required to consent to participation in the study, as well as obtaining permission from their parents. Both parental permission and student consent will be completed a survey link. A letter will be prepared for parents describing the process and how they can access the permission link.

3. Management of Student Participants

After the permission and consent has been obtained, the researcher will generate a list of student participants and a student code number will be assigned to each student. This list will be delivered to the site coordinator for the study and will only be available for the site coordinator and the researcher. (example attached)

4. Delivery of Self-Regulation Formative Questionnaire (SRFQ)

On the prescribed day, students will need to have access to their computers and participants should plan on about 30 minutes to deliver student codes, access the site, and take the questionnaire two separate times (5-10 minutes per survey). Directions for delivery of the SRFQ are attached. Results will automatically be delivered to the researcher.

5. **Follow-up Zoom Meeting**

Depending on student results and willingness to participate in the study, some students will be asked to participate in a follow up Zoom meeting. The zoom meeting will take approximately 45 minutes and can be done at any time that is convenient for the schools and students. The site coordinator will be asked to be present during the Zoom meeting, but the meeting will be conducted by the researcher.

Results

When students complete the survey they will see a summary of their scores. If you or your students would like to see your results, you or they just need to contact me via email to request it. Additionally, a summary of the results will be delivered to each school at the end of the research project.

Appendix H

Written Procedures for School Administration

This year, Marc Gee has an opportunity to conduct a research study with students from {School} as a part of his graduate program at Northwest Nazarene University. The study has been reviewed by the Research Review Committee at Northwest Nazarene University and has been approved by both that committee and your local school board.

This study is focused on personalized learning and the effect that personalized learning has on the ability of students to self-regulate.

The procedures of this project are as follows:

1. The research project will take place over 2 months, but will only require a maximum of an hour of your students time over those two months.
2. Students will participate in at the end of the time frame.
3. Some students may be asked to participate in a short (no more than 20 minutes) group interview where they will be asked about their experiences in personalized learning classes. The interviews will be conducted by Mr. Gee here at your school.

We anticipate that there will be minimal risk involved for your learning over the course of the study. Participation in the survey and interview will take place during school time and always in the presence of a school teacher or other school staff.

Your participation in this project is completely voluntary. In addition to your permission, students' parents will also be asked to give permission for their students to take part in this project. Any student may stop taking part at any time. The choice to participate or not will not impact your grades or status at the school.

All information obtain during this project will be kept secure and will not become a part of your school record. The results of this study may be used for a research paper or presentation. Pseudonyms or codes will be substituted for the names of students and the school in order to maintain confidentiality. At no time will your private, personal information be shared beyond the researcher.

Appendix I

Written Procedures and Script for Proctor

Students:

Today we will be participating in a research study for Marc Gee, as a part of his graduate program at Northwest Nazarene University.

You have previously indicated that you would be willing to participate and I have a signed verification from you and each of your parents indicating that you and they have given their permission to participate in the research. If any of you would prefer, at this point, not to participate you may indicate such by raising your hand.

We anticipate that this will take no longer than 20 minutes to complete this portion of the research. Please follow the directions I give you at this point.

1. I will give you a slip of paper with your name and an ID number that is unique to you. Please don't copy or share your ID with any other student.
2. Please log in on your computers to {website}
3. Once there you will be asked to enter a code which will grant you access to the questionnaire.
4. The questions will ask you to rate yourself on a 5 point scale that ranges from 1 (Not Very Like Me) to 5 (Very Like Me). There is no right or wrong answer to these questions. Just your own assessment of how you feel you would rate yourself in each area.
5. When you are finished you may hit "submit" and exit out of the browser.

This will complete this portion of the research project. A small group of you may be asked to participate in a group discussion later on based on these responses. You will be contacted by me if you are asked to participate.

If you have any questions or would like any of the instructions repeat now would be the appropriate time.

****If student asks not to participate on the day of the administration of the questionnaire, upon receiving the signal from the student simply ask the student to sit quietly while the other students participate. If the student would like to return to his/her classroom please allow for that if appropriate (as determined by each school).

Appendix J

Informed Consent Dissertation Research Project Participation:
High School Personalized Learning Participants

Dear {School} Parent:

This year, I have the opportunity to conduct a research study with students from {School} as a part of my graduate program at Northwest Nazarene University. The study has been reviewed by the Research Review Committee at Northwest Nazarene University and has been approved by both that committee and your local school board.

This study is focused on personalized learning and the effect that personalized learning has on the ability of students to self-regulate.

The procedures of this project are as follows:

1. The research project will take place over 6 months, but will only require a maximum of an hour of your students time over those six months.
2. Students will participate in a survey at the end of the time frame.
3. Some students may be asked to participate in a short (no more than 20 minutes) interview as part of a group where they will be asked about their experiences in the class. The interviews will be conducted by myself, in the presence of a school employee.
4. Students test score data from the 2019 and 2020 ISATs will be used as comparison.

I anticipate that there will be minimal risk involved for your child's learning over the course of the study. Participation in the survey and interview will take place during school time and always in the presence of a school teacher or other school staff.

Your child's participation in this project is completely voluntary. In addition to your permission, your child will also be asked if he/she would like to take part in this project. Any student may stop taking part at any time. The choice to participate or not will not impact your child's grades or status at the school.

All information obtain during this project will be kept secure and will not become a part of your student's school record. The results of this study may be used for a research paper or presentation. Pseudonyms or codes will be substituted for the names of children and the school in order to protect confidentiality. At no time will your students private, personal information be shared beyond the researcher.

I thank you for your time and appreciate your willingness to consider allowing your student to participate in this research study. If you have any questions or concerns about the scope or specific parts of the study, please do not hesitate to contact me via my email address: mgee@nnu.edu.

Sincerely,

Marc C. Gee
NNU Doctoral Student

Student Research Study Permission

I have read the above letter and this form. I understand that there will be no negative impacts to my student if I choose to deny participation to my student and I realize that either I or my student can stop their participation at any time. I voluntarily agree to let my student participate in the study as follows:

- ☐ YES _____ may participate in this study.
  (student name)
- ☐ NO_____ may NOT participate in this study.
  (student name)

Child's Printed Name:_____

Parent/Guardian Printed Name:_____

Parent/Guardian Signature:_____

Date: _____

Appendix K

Student Assent Form

Research Student Assent Form
Jr. High/High School Personalized Learning Participants

Dear {School} Student

This year, I have the opportunity to conduct a research study with students from {School} as a part of my graduate program at Northwest Nazarene University. The study has been reviewed by the Research Review Committee at Northwest Nazarene University and has been approved by both that committee and your local school board.

This study is focused on personalized learning and the effect that personalized learning has on the ability of students to self-regulate. This letter gives you a few answers as to what to expect if you choose to participate in the study and some additional information about the study itself.

Important Things to Know
You get to decide if you want to take part in the study.
There is no ramification for the study or your grade in your classes if you decide not to participate.

What are the procedures for this study?
The procedures of this project are as follows:

1. The research project will take place over 6 months, but will only require a maximum of an hour of your time over those six months.
2. Students will participate in a survey at the beginning of the time frame. This survey will only take about 20 minutes, at the most, to complete. Most complete the survey in less than 10 minutes.
3. Some students may be asked to participate in a short (no more than 20 minutes) interview where they will be asked about their experiences in personalized learning classes. The interviews will be conducted by myself at the school.

Will the results be kept confidential?

Yes. Before you participate in the online questionnaire you will be given a unique number that will be used as your identification. Only I, as the researcher, will know which students correspond with which number. Additionally, in the research that is written regarding the results no numbers or names will be used.

Will I get to see my "score" on the questionnaire?

Unfortunately, no. There will not be individual reports delivered to students.

Student Research Study Assent

I have read the information above. I understand that there will be no negative impacts to me or my grade if I choose to participate or if I choose not to participate. I realize that I can stop my participation at any time.

I voluntarily agree to participate in this study:

_____ Yes

_____ No

Student Signature:_____

Please Check Your Grade Level: 6th___ 7th___ 8th___ 9th___ 10th___ 11th___ 12th____

Please Indicate Your Race/Ethnicity:
___Asian or Asian American
___American Indian or Alaska Native
___ Black or African American
___Native Hawaiian or other Pacific Islander
___Hispanic or Latino
___Another Race
___White or Caucasian
___Prefer Not to Say