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By

Johanna L. Thorpe

December 2016

SELF- REGULATION SKILLS OF STUDENTS ATTENDING A PERSONALIZED, MOBILE MIDDLE SCHOOL

A Dissertation Presented to the
Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Education in
Professional Leadership – Special Populations

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Abstract

In the interest of cultivating a highly skilled 21st century workforce, instructional practices in schools are deviating from more traditional models to student-centered, technology infused practices contingent on intrapersonal skill refinement to self-direct and maximize learning (Stephen & Goldberg, 2013: Murphy et al., 2014; American Institute of Research, 2014). Situated in adult learning theory, self-directed learners identify learning needs, plan a path to knowledge acquisition, time manage, and evaluate progress and resources during learning experiences (Loyens, Magda, & Rikers, 2008). Students can master their own learning process towards self-directedness through the practice of key self-regulated learning (SRL) strategies (Zimmerman, 2013). However, consistent with research in self-regulation, variations in the sophistication and use of SRL skills can be dependent on the presence of certain student characteristics (Zimmerman & Martinez-Pons, 1990; Rudolph, Lambert, Clark, & Kurlakowsky, 2001; Kitsantas & Zimmerman, 2002; Zimmerman, 2013; Raver, 2012; Roy, McCoy, & Raver, 2014). The present study will use mixed methods to investigate 27 middle school students’ self-reported ability self-regulate during student-centered instruction in a personalized, mobile school located in a large Southwestern urban gateway city. Pre and post Learning and Study Strategies Inventory (LASSI) scores reported students’ ability to concentrate, manage time, self-test, and use study aids over a short period of time. Findings indicated the self-testing scale showed a discernible trend in the appropriate direction over a brief period of time though no significance could be found. Implications for the school are

discussed and an action plan to bolster the capacity of teachers to support students' ability to self-regulate learning in a personalized, mobile middle school follows.

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Chapter I

Introduction

As the United States continues to lose ground on global educational attainment and achievement measures (Peterson, Woessmann, Hanushek, & Lastra-Anadon, 2011), evidence of an increasing national skills gap between available jobs in highly skilled technical careers (National Center on Education and the Economy, 2007 and Schwartz, Ferguson, & Symmonds, 2011) which often require key soft skills that frames work habits (Partnership for 21st Century Skill, 2008) is increasingly evident. In particular, life and career skills like adaptability, productivity, accountability, and an ability to self-direct one's work during technological access, creation, and distribution of digital content are paramount for the responsible and effective participation in today's information economy. Students preparing to enter the workforce can develop these skills needed for deep learning in the digital age through the authentic technology use in schools (Toyama, 2015) and by being supported by transformative pedagogies which foster intrapersonal competencies (Herold, 2015). Despite these claims, research proving the effectiveness of students' technological learning experience in traditional schools has yielded – at best- conflicting results. Rather, the inception of technology in classrooms can create false hopes among educators that technology can transform student learning alone (Coughlan, 2015). When, if not integrated effectively, technology can prove to be more of a distraction to learning than an effective tool (Taneja, Fiore, & Fischer, 2014).

Toyama (2015) argues that technology in schools should not be the driver of instruction but should enhance current pedagogical practices to mimic real world work. As also suggested by Herold (2015), there is no evidence to support technology itself is a

transformative learning vehicle, it is technology's capacity to drive deep learning through students' intrapersonal competencies that holds true promise. These intrapersonal skills can include conscientiousness, self-regulation, self-efficacy, a growth mindset, and perseverance during learning**.** However, with no clear plan on how to best develop instruction to support students' self-regulation, student-centered, personalized, tech-driven instruction remains largely underutilized in schools. Thus, limiting the number of practice opportunities needed to maximize student intrapersonal skill development towards post-secondary success in the 21st century.

Rethinking Schools

As such, some school districts are rethinking the use of more traditional educational models in favor of innovative approaches designed to prepare students for the demands of 21st century work. As Groff (2009) contends, traditional reform movements to improve schools have failed to create lasting systemic change. More radical transformational reforms, like the creation of alternate, innovative schools which focus on redesigning how kids learn in our technologically enhanced society, have the potential to support students' cognitive development while still preparing them for work in the 21st century. These innovative approaches blend technological and traditional forms of instruction and radically restructure the teaching-learning dynamics within the classroom to support a more equitable teacher-student partnership.

Charter schools may be an open door to help school districts do this work. According to the Texas Education Agency (2016), open enrollment charters serve a mission *to cultivate, innovate high quality learning opportunities and empower the charter community through leadership, guidance, and support*. Charter schools have

demonstrated the capacity to close academic performance gaps of underrepresented minorities. For instance, a state-wide report developed by Students at Risk entitled *The State of Charter Schools in Texas* (Sanborn, Kimball, McConnell, Tipton, & Carter, 2015), show several charter schools have significantly outperformed state neighboring districts despite serving mostly low-income students who qualify for the National Lunch Program. However, the report also highlights several charter schools across the state with equally low performance measures as their district counterparts. Given these mixed results, much attention has been placed in the careful structuring of innovative charter schools to ensure positive outcomes for all students but especially for those who identify as low-income. Per the Texas Statutes' Education Codes, Subtitle C, Chapter 12, section 0011 (2001), charter schools who perform well have a responsibility to share contextualized best practices and innovations in learning exchanges across districts. Therefore, charter schools are adequately positioned to be able to share best practices which foster and support students' intrapersonal skill development during student-centered, technology-driven instruction.

A Personalized, Mobile Middle School

Background. One charter school is already attempting to advance this goal. In 2013, a personalized, mobile middle school located in a large Southwestern gateway city in the United States launched an innovative 21st century teaching-learning model for 38 diverse adolescent students. Driven by the need to develop the skills necessary to meet the challenges of working in the 21st century, as outlined in Figure 1, this school's model integrates a personalized, mobile, community integrated, teacher-supported approach in preparing students academically, socially, and behaviorally for the information economy.

Mostly low-income as defined by the National School Lunch Program, students are the primary drivers of learning. Guidance in the form of a daily to-do list, known as a playlist, provides developmentally appropriate skill building paths unique to each student. However, students have discretion in the order of tasks, the selection of technological tools, as well as in some cases, the content they want to study. Personalized instruction is developed by teachers and delivered through the school's learning management system (LMS). Support also comes from the community - including seven museum and cultural institutions throughout the city. Together, students, teachers and community members create a system of learning entrenched deeply in personalized instruction and delivered through mobile technologies.

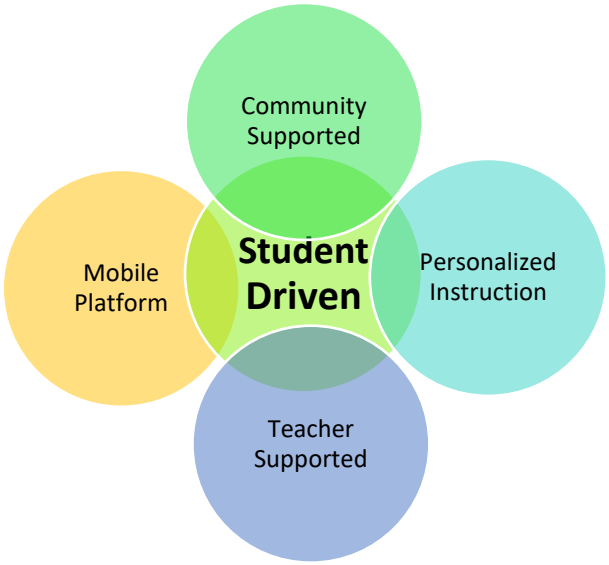


Figure 1. The 21st century teaching-learning model

School imperatives. What does this teaching-learning system look like in practice? On a single day students might research Ancient Egyptian history online in their classrooms while later in the day may visit their local museum to document ancient Egyptian artifacts via mobile technologies such as laptops, tablets, and or smartphones

(Campoy & Harte, 2014). These learning experiences are mostly student led and always learning coach supported. Learning coaches help students advance their learning process and knowledge acquisition through direct feedback, learning coach developed tools, as well as by the supportive tools inherent to technology access. As outlined by the school's charter, guidance by learning coaches is directed by six imperatives:

1. Students must demonstrate growth during learning
2. The approach to learning must be personalized
3. Students must resource their own learning
4. Relevance must be established through community-based learning experiences
5. Parents' engagement is critical to the learning
6. The student-teacher relationship is the foundation to learning

Character trait development. A mobile school in both its seamless and ubiquitous use of technology as well as its physical ability to move around the city, students spend equal time learning in and out of the classroom using multiple technological platforms. As students use technological tools to engage in personalized instruction, their ability to self-direct their process during knowledge acquisition drives learning. As such, the school focuses on certain key character traits during instruction further described in the school's promotion and graduation standards outlined in Figure 2. Students who graduate from the personalized, mobile middle school must be able to demonstrate zest, grit self-control over school work, self-control over social responses, optimism, gratitude, social intelligence during conflict resolution, curiosity, and digital citizenship while learning (Duckworth, 2016).

Personalized, Mobile Middle School's Character Development Rubric

BIG Idea	Learning Target	Meets Standard	Exceeds Standard	Approach Standard	Learning Process	Insufficient Evidence
Zest	• I actively participate • I show enthusiasm					
Grit	• I try very hard even after experiencing failure • I work independently with focus • I use technology including the internet to produce and publish writing and to interact and collaborate with others					
Self-Control School Work	• I come to class prepared • I pay attention and resist distractions • I remember to follow directions • I get to work right away rather than procrastinating					
Self-Control Interpersonal	• I remain calm even when criticized or provoked • I allow others to speak without interruption • I am polite to adults and peers • I keep my temper in check					
Optimism	• I get over frustrations and set backs quickly • I believe that effort will improve my future					
Gratitude	• I recognize and show appreciation for others • I recognize and show appreciation for my opportunities					
Social Intelligence	• I am able to find solutions during conflicts with others • I demonstrate respect for the feelings of others • I know when and how to include others					
Curiosity	• I am eager to explore new things • I ask and answer questions to deepen my understanding • I actively listen to others					
Digital Citizenship	• I am trustworthy and responsible in my ownership of a 21st century device. • I resist digital distractions and use my work time wisely. • I ensure that the information, images, and materials I post online will not put me or any of my community members at risk.					

Source: Personalized, Mobile Middle School's Charter Application (2015). Rooted in the research of Dr. Martin Seligman (University of Pennsylvania), Dr. Chris Peterson (University of Michigan) and made actionable by Dr. Angela Duckworth (University of Pennsylvania).

Figure 2. Personalized, mobile, middle school's character traits rubric

While all components of the rubric in Figure 2 are important for students' academic development, the *grit* and *self-control over school work* threads are considered by the school to be essential and actionable skills which prepare students for lifelong academic success. Grit, per Duckworth's (2007) theory, is a mechanism to guide students towards independence through a combination of perseverance and passion towards the achievement of long-term goals. It unlocks a student's potential through a utilization of a steady work ethic during deliberate practice. Grit (Duckworth, 2016) leverages students' talents by focusing on effort through the consistent combination of many correctly executed ordinary actions, skills, and activities. Students with grit aim towards a high level of performance and productivity and rebound from failure with a growth mindset.

Through continual coaching and relationship building experiences involving the development of grit and self-control, teachers in the personalized, mobile middle school guide students towards self-directed learning during personalized, technology-driven instruction. Instruction is deemed personalized when teachers match students' skill levels, and when possible, interests during lesson planning. For any one unit, teachers may instruct students in a one to one setting or in small groups while tracking progress in the school's learning management system. Because of this tracking, teachers schedule times to individually meet with students for performance coaching sessions. Student progress is analyzed and discussed during these meetings, challenges are supported, and trust among teachers and students is fostered.

Performance measures. The results, thus far, are promising. In 2014, the school averaged more than two years' growth in math and reading scores on the Stanford-10

test. While this academic accomplishment is promising alone, data supporting a positive school culture also suggests the system is working. In 2014, students partook in the Youth Truth Student Survey (2008) developed by the Center for Effective Philanthropy in collaboration with the Bill & Melinda Gates Foundation to determine students' perceptions of the school's functionality. Results indicated students ranked the school in the 95th percentile in their positive perception of their engagement in school, in the school's academic rigor, in the amount of support and personal attention received by teachers, as well as in the school's culture of respect and fairness. These preliminary measures suggest students are academically performing in an environment that supports learning.

In light of this preliminary data, the personalized, mobile middle school has submitted and was granted a charter in 2015. In their charter application, the school included a plan to scale the current campus to include up to 540 more students. However, more information is needed. Specifically, before scaling, the school must determine how self-directed learning is best secured at the student level by analyzing practices which support students' self-directed work. If the school hinges on a student's ability to resource his or her learning, as stated in the school's imperatives, strategies which support student's self-directed development must be secured. To help determine these best practices, an analysis of comparable schools' intrapersonal development towards self-direct learning in technology-based schools will be explored.

Comparable Schools

High Tech High case study. High Tech High (HTH) is an example of one school taking a successful approach to servicing low-income students using a 21st century

learning design. Out of San Diego, California, HTH is often cited as an exemplar of a promising 21st century teaching-learning model (West 2011; Schorr & MdGriff, 2011; Stephen & Goldberg, 2013; and Murphy et. al., 2014). HTH focuses on student-centered, personalized, and project-based learning approaches in blended learning environments designed and guided by teachers (Stephen & Goldberg, 2013). Students engage in thee project-based learning opportunities with the support of local community and businesses in mentorships, internship placements, and or project collaborations. Like the personalized, mobile middle school, students at HTH take shared personal responsibility in learning while teachers coach for performance. However, unlike the personal, mobile, middle school, students develop their intrapersonal in advisory teams. These teams emphasize habits of mind like relevance, connections, supposition, organization, expression, and supporting ideas in their project-based work. Since the school is student-centered, teacher feedback, personal reflection time, and the use of proactive learning strategies drive the work. For example, when students' performance is subpar, through feedback and reflection, students must individually improve upon the project before continuing to another assignment.

Though no quantitative measurements have been made to describe students' ability to self-direct learning, the array of deep learning products made in this learning environment suggests the promotion of intrapersonal development through advisory programs and proactive learning strategies is striking a chord with students. Standardized test results are also promising. Though performance based measures are generally preferred to standardized test scores, HTH students have outperformed other students on the state test in California (Stephen & Goldberg, 2013). In 2009, 95% of students passed

the English Language Arts California High School Exit Exam (CAHSEE), while 90% passed the math CAHSEE. That same year, about 90% of students opted to take the SAT, netting a combined average math and verbal score of 1052. This places HTH's Academic Performance Index ranking as one of the highest achieving public schools in the state. In 2010, 100% of HTH students graduated school and since 2003, 82% have gone on to college. As such, there are five times more student applications than available spaces at HTH.

Yet, HTH recognizes they still have challenges ahead of them. Blending community based experiences with personal experiences that carefully integrate standards takes continual development. Online platforms still require the right design for maximum effectiveness per student (Stephen & Goldberg, 2013). Solutions are currently being developed and tested before adoption into their five high schools, four middle schools, and three elementary school campuses across the city. As such, HTH has made the deliberate decision to keep expansion to a minimum – citing a fear of fidelity issues in delivering effective project based instruction. Similarly, HTH has created its own teacher education program aligned with high leveraged teaching methodologies suitable for technology supported, project-based schools to norm teacher practices throughout the campuses. Lastly, HTH is rethinking how to best support novice students as the learning curve seems to be especially steep for them.

Blended learning study. In a mixed methods study of 137 teachers and 4,191 by Murphy et al., (2014), an analysis of blended learning models among twelve charter schools serving low-income students was performed. Supported by the Michael and Susan Dell Foundation, this study was designed as a response to the lack of rigorous

research in understanding the effectiveness of blended versus traditional models of learning. Blended learning, per this study, has a dual interpretation. It can include a vacillating instructional delivery method between regular classroom instruction and online instruction in a computer lab or an integration of online learning at several stations within a classroom. Data collection methods included teacher surveys, principal and teacher interviews, as well as classroom observations involving student use of technology. All schools but one in the study used online learning as their primary mode of instruction. All students in the study proceeded through assignments at their own skill level and pace using adaptive technologies. For students who needed more help beyond these measures, small group instruction was made available.

The results are described as preliminary but worth noting. Universally, teachers reported blended learning did a good job of instilling basic procedural skills and basic facts but did not alone provide the support necessary for higher order thinking. Some teachers concluded, per interviews, students who could not self-direct and self-manage were not great fits for the blended learning model. While other teachers reported the use of goal setting practices and previous academic performance as predictors of students' ability to self-direct during tasks. Researchers concluded setting a culture of self-directed learning at the onset of school supported by goal-setting could help improve overall student performance in blended learning environments.

Other findings suggested, "lab monitors" or virtual and physical facilitators of online instruction that could include teachers, have the capacity to manage student productivity. Teachers who established academic norms, a healthy culture, and appropriate behavior management practices were reported to lead to more successful

blended learning experiences. However, stumbling blocks were reported. Mainly, teachers felt data was underutilized due to poor dashboards use and data integration capabilities and therefore not integrated into instruction efficiently. Researchers conclude blended learning coordinators could play an important role in helping support teachers' facilitation of instruction by freeing them up to focus on performance coaching instead of data management.

Still, the study concluded even more rigorous research is needed to fully explore the benefits of the blended learning model. For example, an understanding of blended learning coordinator's role in supporting blended instruction is unknown as is a teacher's capacity to establish a productive and self-directed environment. Specifically, the study cites a need to understand how to cultivate students' motivation, persistence, and resourcefulness in their ability to successfully self-direct their own learning online. Having a better grasp of these metacognitive constructs could allow teachers to develop a deeper understanding of why some students succeed while others struggle. Lastly, research is needed to support all students' ability to engage in blended learning environments regardless of their incoming level of academic preparation.

Student-centered, networked schools study. Lastly, a study designed to compare the use of student-centered strategies compared to a students' ability to learn deeply was conducted by the American Institute of Research (2014). In this study funded by the William and Flora Hewlett Foundation, ten well-implemented networked schools were analyzed against comparison schools in New York and California to assess differences in learning. The well-implemented schools were particularly selected for the ability to support deep learning as measured by several key characteristics. Deep

learning is defined by the American Institute of Research (2014) as a combination of a deep understanding of academic content, an ability to generalize knowledge and skills to multiple contexts, the development of inter and intrapersonal competencies including an ability to collaborate, exhibit self-control, and improve on their individual learning process.

Results indicate students in well-implemented networked schools that learn deeply report a higher level of complex problem solving, communication, learning how to learn, collaboration skills, academic engagement, motivation to learn, and self-efficacy. They also reported experiencing more opportunities to engage in deeper content than comparison schools. However, no significant differences between creative thinking skills, perseverance, locus of control, or self-management could be made. Results were consistent between demographic subgroups including levels of achievement and socio-economic status in both conditions. Academic achievement measures were greater in well-implemented networked schools. Specifically, students in deeper learning networks achieved higher scores on PISA-based tests as well as in state mandated English Language Arts and mathematics tests. Students were also more likely to graduate on time and go to four-year, competitive institutions.

Variations in Intrapersonal Development Across 21st Century Schools

While the personalized, mobile middle school uses character development strategies associated with grit (Duckworth, 2016) to help students self-direct and manage their work, as the above studies show, comparable schools have implemented a range of intrapersonal strategies to maximize students' capacity to learn in student-centered, technology-based learning environment. Students at High Tech High (Stephen &

Goldberg, 2013) specifically focus on habits of mind, internal and external feedback, reflection, proactive learning strategies and a growth mindset to perform at the highest levels. In the blended learning study, Murphy et. al (2014) contend some teachers reported students who could not self-direct and self-manage were not good fits for online learning. However, self-regulatory behaviors like goal setting seemed to improve students' ability to perform in these settings. Also, lab monitors demonstrated an ability to help students manage. Lastly, academic measures were paired with a students' ability to develop inter and intrapersonal competencies including an ability to collaborate, exhibit self-control, and improve on their individual learning process (American Institute of Research, 2014). These competencies were found to influence students' ability to understand how to learn, increase academic engagement, be motivated learn, have elf-efficacy, and achieve academically.

Grit, habits of mind, internal and external feedback, proactive learning strategies, securing a growth mindset, goal-setting, active lab monitors, as well as the promotion of self-control and an effortful approach to improving one's learning process were key strategies identified by the 21st century schools highlighted above. While there is not only variation in the nuances of these strategies, there can also be great variation in the manner these strategies are carried out in the classroom. This makes intrapersonal development among schools not only difficult to compare but also difficult to determine what works across contexts. While all schools in these studies are working towards successful self-directed student-centered learning experiences in 21st century settings, an agreed upon path towards this goal in our national setting has yet to be unearthed.

Self-Directed Learning or Something Else?

With the variations in intrapersonal skill development presented above, it is important to deconstruct terms for purpose of clarity and conciseness. What exactly must students in a personalized, mobile middle school do to be considered self-directed? According to Loyens, Magda, and Rikers (2008), self-directed learners identify learning needs, plan a path to knowledge acquisition, time manage, and evaluate progress and resources during natural learning experiences. Situated in adult learning theory, self-directed learning (SDL) is synonymous with independent learning, autonomous learning, self-study, self-teaching, and self-education (Merriam & Bierema, 2014). As Tough (1987) explains, SDL is generally paired with project based work which is both time and thought intensive. Certain learner characteristics help facilitate this work including an ability to independently secure resources before starting a project, set goals and manage time schedules, maintain motivation, self-test knowledge and skills during learning, and reflect on outcomes after project completion (Tough, 1978). Figure 3 outlines how these skills can be supported on a context dependent, developmental continuum.

Self-Directed Learning Continuum

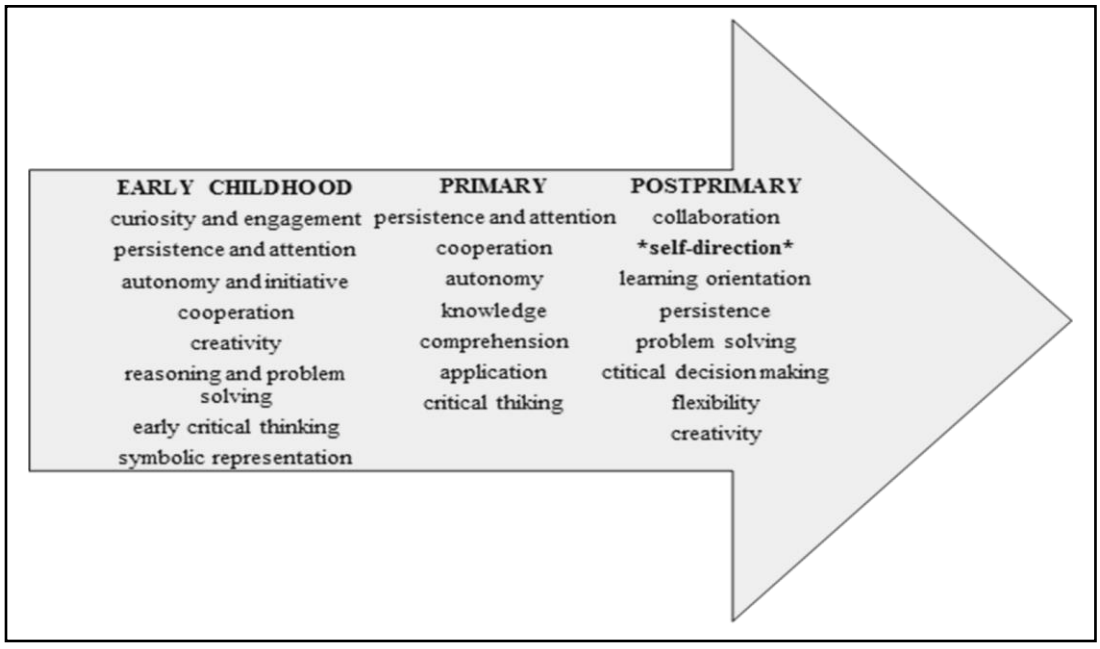
STAGE	LEARNER STATUS	EDUCATOR ROLE	EXAMPLES OF TEACHING STRATEGIES FOR STAGE
1	Dependent	Authority	Direct learning, giving few choices, drilling, lecturing
2	Interested	Motivator	Helping to set goals, guided discussions, inspiring learning
3	Involved	Facilitator	Applying material to real problems, encouraging critical thinking, providing learning strategies
4	SLD Learner	Mentor / Consultant	Encouraging independent projects, providing autonomy

Source: Adapted from Grow, 1991 (Merriam & Bierema, 2014).

Figure 3. Grow's self-directed learning stages

While SDL can be a challenging approach for K-12 students, it's value is largely held in its ability to be transformational (Merriam & Bierema, 2014). Winthrop and McGivney (2016) in conjunction with the Center for Universal Education at Brookings agree creating self-directed learners in K-12 contexts is a desirable goal. They further contend today's society necessitates workers have a breath of skills at their disposal to compete in today's global economy. Most notably for the purposes of this study, workers must have a set of hierarchal learning and cognitive approaches as outlined in Figure 4. In particular, the Brooking's Institute's *Learning Metrics Task Force Global Framework* lists fourteen learning / cognitive approaches students should secure before aspiring to be self-directed. Chief among these are a students' ability to persist, maintain attention, show autonomy and initiative, comprehension, and application in thinking.

Global Learning Approaches and Cognition Framework



Source: Winthrop and McGivney (2016)

Figure 4. Global learning approaches and cognition framework

As such, to ensure students in the personalized mobile middle school have a solid foundation on their way toward becoming self-directed, a developmentally conscious set of learning strategies should be secured. A close cousin to SDL, self-regulated learning (SRL) takes a more explicit approach in actively engaging students in strategic learning strategies that fall into goal-setting, self-monitoring, and self-assessment categories (Loyens, Magda, & Rikers, 2008). SRL is a controlled method of learning supported by teachers as they work to foster students' personal skill development in academic settings. SDL, on the other hand, suggests a broader, organic trial and error process which is motivated and evaluated by the self towards the pursuit of lifelong learning in multiple contexts. While self-regulated learners work to meet academic standards set forth by others, self-directed learners choose what they want to learn, how they want to learn, as well as the evaluation criteria for a good performance. In sum, given students in this study are at the middle school level, the personalized, mobile school may benefit from focusing on students' ability to be self-regulate within more developmentally appropriate parameters than self-directed learning affords.

Problem of Practice

Working to solve the national technical and soft skill shortage among American workers, a personalized, mobile middle school in a gateway city has created an innovative student-centered, coaching-learning approach to deliver 21st century instruction. However, because of technological work's autonomous nature, the effectiveness of this model hinges on students' ability to drive learning. Preliminary studies of technology driven, student-centered instruction show technology can be a powerful tool if students can self-manage learning while being supported by teachers.

Yet, no clear understanding of how to develop the intrapersonal skills needed for student-centered instruction in these learning environments has been universally determined. Research on the relationship between SDL and SRL suggests securing self-regulated learning strategies may be an intermediate pathway to developing independent students who can learn in 21st century learning contexts. Yet the degree to which students' can self-regulate in a personalized, mobile middle school is largely unknown as is the ability of the school to advance SRL skill over time.

Impact

It would behoove the personalized, mobile middle school to ascertain students' current levels of self-regulation during instruction to assess their self-directed development. But also, true to the spirit of the charter school movement, best practices and successful innovations that support this work could be shared among the greater educational community. As more and more schools shift from traditional systems of learning to blended, flexible, technology-based environments, a greater understanding of the student-centered experience as well as the specific metacognitive competencies needed to be successful in this platform serves to advance deep learning. As research on self-regulated learning has demonstrated there is great variation in the sophistication and use of SRL skills dependent on certain student characteristics (Zimmerman & Martinez-Pons, 1990; Rudolph, Lambert, Clark, & Kurlakowsky, 2001; Kitsantas & Zimmerman, 2002; Zimmerman, 2008; Raver, 2012; Roy, McCoy, & Raver, 2014). If a framework to promote self-regulation in a 21st century learning context could be developed, teachers could adapt SRL instruction to fit the needs of students' during skill development. The goal, of course, is to produce a more self-regulated student - one that engages in the

intrapersonal skills necessary to be self-directed for post-secondary success and long term employment. Measuring students' ability to self-regulate instruction in a mobile school towards the development of strategic learners is the firsts step in doing this work.

Research Questions

As such, this study used a mixed-methods, *ex post facto* research design through the analysis of pre and post LASSI measures and Stanford-10 reading and math scores to determine the answers to the following four research questions:

1. What were students' self-reported levels of concentration, ability to manage time, self-test, and use study aids at the start of the school year as measured by the LASSI?
2. To what extent did student self-reported LASSI levels of concentration, ability to manage time, self-test, and use study aids change over the course of a four-month semester?
3. To what extent did a student's family income status moderate the SRL outcomes at the start of the school year and after a four month-semester as measured by LASSI?
4. Were LASSI scales correlated to Stanford 10 math and reading score?

Chapter II

Literature Review

To prepare for work in the 21st century, students in a personalized, mobile middle school have been tasked to self-direct technology-based, student-centered instruction through a series of character development strategies aligned with developing grit. However, self-directed learning is a cognitively advanced learning paradigm situated in adult learning theory (Merriam & Bierema, 2014.) Therefore it can be argued before students can self-direct their work, they must first work to self-regulate it. Schunk (2005) describes self-regulation as a helpful concept in understanding why a student's academic skill and will does not always fully match his or her performance. Students have two options in resolving this learning conflict. They can either increase effort or try a new cognitive, behavioral, or motivational strategy. Students who increase effort while using the same unsuccessful strategies to approach learning often become frustrated and disillusioned by their inability to learn. When in fact, a working smarter not harder approach in pairing the right SRL strategy to the task is a more successful approach.

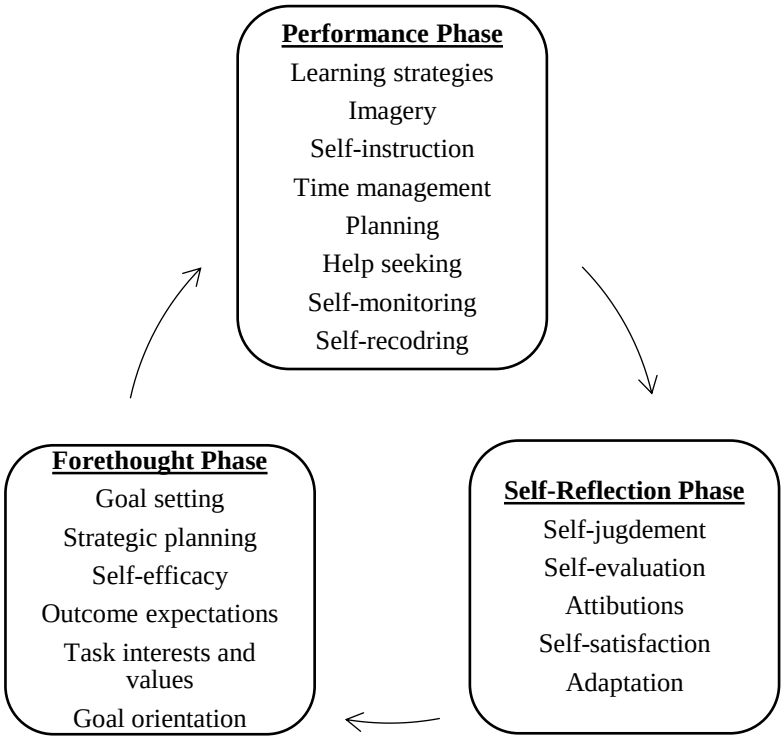
Bandura (1986) adds to this understanding by describing self-regulation as a consistent human behavior which allows students control during learning through self-observation, self-judgment, and self-reaction of their experience. Through the practice of these metacognitive strategies, students grow in their capacity to self-regulate their environment, behavior, and cognition during learning (Zimmerman, 2013). These self-regulated learning (SRL) strategies can be explicitly and strategically practiced before, during, and after a learning experience to improve performance. The following chapter outlines pertinent research and theory describing specific components of SRL, explicit

instructional techniques to bolster SRL strategies, student characteristics as they pertain to one's ability to self-regulate, and research underscoring what is currently known about SRL in technological classroom settings. This comprehensive review of the literature will serve as the foundation in analyzing students' ability to self-regulate at the beginning of the school year, grow over time, and differ by income level while academically performing in the personalized, mobile middle school.

Self-Regulated Learning (SRL)

Zimmerman (2013) states SRL strategies are many and varied but generally fall into one of three interrelated phases: forethought, performance, and self-reflection. When students independently adapt their learning approaches to include specific SRL strategies within each phase of learning, they are self-regulated (Winnie, 1997). While initially SRL involves an effortful and deliberate use of strategies and skills to solve learning challenges as outlined in Figure 5, eventually with practice, SRL becomes an automated process that works to continually refine students' learning process. Through this refinement, students improve metacognitive processes to think critically, solve problems, and transfer skills to different learning contexts.

A Cyclical Phase Model of Self-Regulated Learning



Source: Adapted from Zimmerman (2008)

Figure 5. Cyclical phase model of self-regulated learning

Forethought. Students use current levels of motivation, self-beliefs, and anticipated consequences of their actions to set goals and plan a course of action (Bandura, 1991). These goals reside in a "future state" that require agency, self-reflection, and self-direction among students to complete. While a certain level of motivation drives the initial planning process, goal setting can be a critical strategy in sustaining motivation (American Psychological Association, 2015). The level, type, and scheduled time frame during goal creation matters. Goals can suffer from the goldilocks syndrome. Too easy and they are deemed unimportant. Too challenging and students lose motivation to sustain effort. When students develop moderately challenging mastery

goals over performance goals, they tend to learn more. Mastery goals highlight the need to become experts in the content area being studied and are intrinsic in nature. Performance goals, on the other hand, strive to meet extrinsic rewards. Students who develop mastery goals are more likely to overcome failure through increased persistence to improve their learning process. Conversely, students who work from performance goals are more likely to self-identify with failure. In terms of planning, persistence towards a goal is also more likely to be enhanced when goals are short term. Long term goals without short term markers can be too challenging to sustain motivation.

Winnie (1997) prescribes a five-step process to help students develop goals. First, students must conceptualize the task as being a bottom-up or top-down processing endeavor. Is information being directed by the teacher and reflected by the student or is the student responsible for accessing and processing information? Second, students should try to predict the outcome of the assignment. Having the end learning product in mind helps students backwards map the necessary smaller steps towards goal completion. Third, students must assess their capabilities to do the work. Will students need extra support in the process? If so, they need to plan for the utilization of supports along the way. Fourth, student should take stock of their motivation and agency to learn. Can students articulate the value of mastery in the content area? What is the value of learning this material? Lastly, students should reflect on past successes and failures in the development of positive attributions when goal setting. Did students use SRL strategies during successful moments that should be repeated? Did resiliency in adapting one's learning approach after failure lead to improved results? Taking stock of which strategies in the forethought phase led to success can improve success on future assignments.

Performance. Self-monitoring is another sub function of the SRL process situated in the performance phase of SRL (Bandura, 1991). During learning, students monitor their progress when they pay attention to their own performance, the context in which the performance occurs, as well as the effect or outcome of their performance. Monitoring should be a consistent process through out a learning activity. When student monitor with consistency they develop more accurate personal values about their own learning which can lead to the development of realistic goals. When students inconsistently monitor their performance, they tend to not only selectively attend to their performance in the classroom but also have an unclear picture of who and what is to credit for their successes and failures. Subsequently, students who monitor have a greater capacity to accurately self-diagnose their emotional reactions and behaviors and are more capable of changing conditions when current strategies are not working. While goal setting and monitoring go hand in hand, students can also monitor progress without no real plan to follow (Winnie, 1997). This is generally considered not as effective as having a goal orientated disposition. Monitoring progress without a plan in place makes it difficult for students to see the whole picture during learning, does not support learning as a process, and or makes it more difficult to backtrack missteps along the way.

Students successfully self-monitor through the integration of internal and external feedback against a preconceived standard (Winnie, 1997). For example, students receive internal feedback when they monitor their performance against their expected rate of progress through self-testing and reflection. External feedback can come in the form of teacher feedback and or through social comparison of performance among peers. Feedback is a crucial component of a student's ability to self-regulate (Zimmerman,

2013). When learners gather feedback, they can make changes and adapt to their environment. This dynamic relationship of feedback acquisition and subsequent student adaptation encompasses a single feedback loop. Three types of feedback loops exist in SRL. Behavioral feedback loops allow students to monitor their performance strategically to keep or change a plan of action. Environmental feedback loops allow students to monitor the effects of his or her performance on their social environment. Covert feedback loops allow students to develop attributions about their performance. Feedback loops occur simultaneously during the learning process and are deeply interrelated. As such, clear, explanatory, and timely feedback can support students in making better strategic, social, and emotional decisions during the learning process (American Psychological Association, 2015).

Self-reflection. Students use internal and external feedback to make judgements about their learning performance (Bandura, 1991). As mentioned before, monitoring progress towards pre-prescribed goals is an ideal course of action. Feedback that aligns with specific learning goals not only keeps students on track during the monitoring process but also gives a clear picture of performance (American Psychological Association, 2015). When learning tasks are more complex during monitoring, students identify the task as too difficult (Winnie, 1997). This self-reflection should lead students to develop smaller, more manageable sub goals. To do this work, students must define how many operations are within the task, how much time it will take to carry out these actions, as well as the probability that they will understand each course of action. When students can't self-reflect during learning, they can't identify social and or cognitive supports needed to improve performance. This self-evaluation in judgement of

performance is the critical precursor to the information seeking behavior that advances learning (Zimmerman, 2013).

Closely aligned with a student's ability to make judgements about performance are his or her beliefs about themselves (Bandura, 1991). How students judge themselves plays a critical role in how they self-direct their own learning. Those students who have a strong sense of self-identity tend to self-monitor and self-direct during tasks more strongly than students who have a decreased sense of identity. When students are sure of themselves they are better able to read social cues and modify behavior. A student's sense of identity in a classroom is developed from three sources of information: how people react to their behavior, how they measure up against others, and how they measure up against their own past success and failures. Collectively, these internal comparisons work to form the basis of a student's self-appraisal towards current, past and future learning experiences.

Self-efficacy. Self-regulation in each of the three phases is influenced by students' self-efficacious beliefs about learning (Bandura, 1991). Student's self-efficacy beliefs serve as what is known as "proximal determinants" to their ability to self-regulate. Meaning, over time, students develop a standard set of behaviors and beliefs about the amount of self-control they can exert over their thoughts, feelings, motivations, and self-regulatory actions during learning. If students don't believe they can control learning or understand learning as a process, SRL strategies become counterproductive (Winnie, 1997). Students with high self-efficacy beliefs tend to have higher aspirations, increased effort during learning, greater degrees of perseverance, positive thought patterns, decreased stress, and are less vulnerable to depression (Bandura, 1991). As such, a

student's self-efficacy during the SRL process is highly predictive of goal setting behavior which can in turn positively influence academic achievement (Zimmerman, 2013).

Dweck (2006) theorizes that the mindset students take during work, is the key explanatory variable for their self-efficacious beliefs about work. A dichotomous theory, having a fixed versus growth mindset helps explain a student's reaction to failure. Those students who work under the guise of a performance goal do so to demonstrate competence in relation to others. Students who work to support learning goals do so to master content and skills. Because kids can have alternating mindsets within each learning task, an array of purposes for learning can develop over time. This leads to different patterns of affect, cognition, and behavior for each type of task – making self-efficacy for learning a complex construct. Assessing each student's mindset for learning, as a result, requires an understanding of student's motivation in achieving.

Self-Regulated Learning Strategies

Winne (1997) contends students can inherently learn new forms of SRL strategies in the classroom without explicit instruction. However, this implicit style of learning is a haphazard trial and error process guided by inconsistent social feedback and peer observations. When students naturally observe the environment around them they may observe and emulate strategies used in the home, in school, and in their community. However, this method is generally considered to be a slower, more pain staking process with inconsistent outcomes. These less desirable outcomes are thought to be due to a lack of awareness during self-monitoring and a subsequent inability to reflect on one's overall learning process towards strategy and skill improvement. Winnie (1997), Schunk

(2005); Zimmerman (2013), and the American Psychological Association (2015) suggest the explicit instruction of SRL strategies found in Figure 6 can serve as an effective method in helping students to engage in tasks independently.

Self-Regulated Learning (SRL) Strategies

Categories of Strategies	Definitions
Self-Evaluation	Student driven evaluations of quality of progress in their work
Organizing and Transforming	Students initiate overt or covert rearrangement of instructional materials to improve learning
Goal-setting and Planning	Students initiate setting of educational goals and or sub goals while planning for the sequence, timing, and complementing activities related to those goals
Seeking Information	Students initiate efforts to secure further task information from nonsocial sources when undertaking an assignment
Keeping Records and Monitoring	Student initiate efforts to record events and or learning results
Environmental Structuring	Students initiate efforts to select or arrange physical settings to make learning easier
Self- Consequences	Students understanding or arrangement of rewards and punishments for success and failure
Rehearsing and Memorizing	Student initiated effort to memorize material by overt or covert practices.
Seeking Social Assistance	Students initiated efforts to solicit help from peers, teachers, and or other adults.
Reviewing Records	Student initiated efforts to reread tests, notes, texts, and to prepare for learning or further testing.

Source: Zimmerman (2013)

Figure 6. Self-regulated learning strategies

Deliberate SRL Instruction

Plugging in different instructional interventions not grounded in research or best practices concurrent to the context of the school can lead to mixed results. Therefore, the thoughtful implementation of SRL instruction at the personalized, mobile middle school is necessary to advance students' learning independence. However, research supporting best practices in SRL instruction seemingly asks more questions than addresses answers. The following section highlights some known promising instructional practices in the field of SRL research. Though not context specific to the school within this study, they

are an starting point to addressing the successful integration of SRL instruction in the personalized, mobile middle school.

SRL training through modeling. According to Zimmerman (2013) there are four levels of deliberate self-regulatory training: modeling and observation, emulation, self-control, and self-regulation. During the modeling and observation level, students observe the correct use and form of a strategy and or skill by an expert like a teacher. Motivation to learn can be increased, during this period, if the net result of the instruction leads to an observed, positive outcome. Once students have observed the skill or strategy, they emulate the observed instruction as an attempt to duplicate the same outcome. At the start, students tend to take more general pathways to secure the skill. Feedback from teachers during emulation can help to improve students' initial lack of sophistication in using skills and strategies. Through continued practice and feedback, students gain an increased capacity to use the desired skill. If students do not advance as quickly as expected, one-on-one support should be available through additional deliberate practice opportunities. Once students master deliberate practice opportunities, they are ready to develop self-control over the skill (Zimmerman, 2013). Meaning, students are ready to use the skill across many types of work within the school setting. Only when students can adapt strategies and skills across many contexts and situations while self-monitoring their performance, are the considered self-regulated.

In two studies conducted by Kitsantas, Zimmerman, and Cleary (2000) and Zimmerman and Kitsantas (2002) respectively, Zimmerman's cognitive multilevel training model was tested. In both experiments students received either a verbal description of a skill with no modeling, error free modeling of a skill, or a coping model

of skill development. In the coping model, teachers included error reduction practices and corrective information during instruction. The results were similar for both studies. Both the error free and coping modeling groups significantly improved skill development versus learning from a verbal description alone. However, the coping model group outperformed the error free model group on skill development. The results indicate that modeling a skill while also troubleshooting its integration is a preferred method of instruction. These results indicate that the personalized, mobile middle school may benefit from a using coping modeling instructional practices to support SRL strategy development.

Scaffolding. Zimmerman's (2013) four levels of SRL training involves a scaffolding process individual to each learner within the school. Therefore, in creating an effective plan to deliver appropriate SRL instruction for each student, an understanding of their current skill set must be assessed. This takes a concrete understanding of the student's current level of development as well as the natural developmental progression of each skill being taught. Once this is understood, teachers can place students on an appropriate sequentially learning path largely inclusive of rehearsal and practice opportunities.

It should be the ultimate goal of each teacher to reduce the amount of social guidance and feedback given to students as they progress through their skill development. As Zimmerman (2013) asserts, how comprehensively students initially learn skills goes a long way in reducing future stumbling blocks during more complex skill development. The current mood, commitment, and or interest level of the student can influence the ability of that student to move from one training level to the next. Subsequently, teachers

must have expertise in how skills develop over time and how to navigate the social-emotional variables found within each student. Teachers who can monitor and manage these constructs are more likely to successfully implement the four level cognitive modeling training process among a diverse group of students.

Transfer . As Bransford and Schwartz (1999) contend, the ability for students to transfer acauired skills, like the use of self-regulated learning strategies, to more global contexts is an especially important part of evaluating successful learning. Therefore, understanding the conditions which help students successfully transfer skills is an important consideration in ensuring SRL skill instruction sticks. For example, skills require a certain amount of prior knowledge to anchor current skill instruction. When students do not have access to this basic prior knowledge, their mental retrieval process of the new skill fails. The transfer of the skill subsequently becomes effortful, less reliable, and more frustrating. When students demonstrate a true understanding of the skill versus mimicking the skill, transfer is more likely to occur.

Additionally, the depth of understanding behind a skill or strategy use increases the likelihood the student will use the skill spontaneously and easily in the future. Concrete examples of the skill can help the depth of this understanding if skill training is not over contextualized. If deliberate skill training opportunities are too tightly tied to one another, students have a more difficult time seeing how skills can fit into other contexts. When multiple contexts of the skill are presented, students must be able to abstract the underpinnings of the skill in meeting the needs of the new context. This results in a deeper understanding of the skill. Subsequently, teachers can help students develop students' capacity to self-regulate in the personalized, mobile middle school

through practice, feedback, and reflection (Bransford & Schwartz, 1999) during the use of highly transferable cognitive models of SRL strategies (Zimmerman, 2013).

Embedding supports. Winnie (1997) suggests supportive cues can remind students of already learned SRL strategies during learning and increase their likelihood of use. In a study conducted by Clarebout, Horz, Schnotz, and Elen (2010), supports designed to enhance a student's self-regulation in computer based environment were evaluated. These supports were administered to a group of 60 randomly assigned psychology students at a large university. One set of students engaged in a computer based learning activity with embedded supports while the other group engaged in the same computer based learning activity without embedded support. Students who did not receive embedded support could still access the same supports but had to take an extra step to do so. The results indicated students used support devices significantly less when they were not embedded into the learning activity. In fact, 40% of students in the non-embedded group chose not to access the support devices. On the other hand, the embedded group was found to use supports more frequently and for longer periods of time. The quality of the support use was found to be correlated with student choice. If students chose a specific support for learning out of a series of choices, they were more likely to get the most possible use out of the self-chosen support.

Self-transcendent prompts. Yeager et al., (2014) contend helping students develop a sense of self-transcendence in learning through the engagement of well-designed prompts, can help build students' motivation and self-efficacy to learn. These SRL supported interventions work by connecting learning to a larger social context versus learning for one's own personal gain. Self-transcendent learning opportunities

help students see how exercising hard work and discipline holds value for their future roles in a larger societal context. This claim was tested by four studies conducted by Yeager et al. (2014). The first study surveyed 1,364 seniors in urban public high schools through a 20-minute web based survey. In this sample, students who expressed more of a self-transcendent purpose for learning viewed tasks as more personally meaningful and showed greater academic self-regulation during tedious tasks than students who were given less of a self-transcendent purpose for learning. In the second study, 338 ninth grade students in a middle class suburban high school completed an online 30-minute survey inclusive of self-transcendent writing prompts. The second studied showed self-transcendent writing prompts could affect overall academic achievement even several months after the intervention.

Since the second study only measured a long-term treatment effect, a third study was developed to measure 71 second through fifth year undergraduate psychology students' amount of time spent reviewing for an exam after receiving a self-transcendental prompt. The behaviors of students and time spent reviewing were measured through tracking software. The results showed the self-transcendental prompt was effective in helping students spend more time per question while studying.

Lastly, Yeager et al., (2014), measured the effectiveness of self-transcendent prompts against boring tasks. Researchers were especially interested if students could complete a set of online math and science problems while putting aside more entertaining outlets found online. As boredom increased, researchers wondered if self-transcendent prompts would continue to help students work diligently. To test this claim, 429 participants from an introduction to psychology course at the University of Texas

completed a set of tedious, low level tasks while being tracked online. Before the intervention started, participants were told they could quit at any time. They were also informed of the self-transcendent purpose in completing the task. The results showed that students were more engaged, more persistent, and could overcome the temptation of distraction even as boredom increased. In conclusion, Yeager et al. (2014) state that creating a very general purpose for learning can predict an increased occurrence of academic self-regulation in the near term. However, a more prescriptive self-transcendent purpose has demonstrated the power to help students persist through diligence even in the face of more attractive alternatives. Findings were consistent for all subgroups but were found to be especially true for minority students.

Teacher development in SRL. Supporting students' SRL development requires instructional skills which can be developed by teachers over time. The Self-Regulated Learning Opportunities Questionnaire (SRLOQ), created and piloted by Vrieling, Bastiaens, and Stijnens (2012), was developed to help primary teacher educators assess their student teachers' ability to integrate SRL during their practicum. More specifically, the SLOQ supported student teachers' knowledge building and an awareness of the SRL process as well as their ability to identify factors that may hinder their students' SRL process in the classroom. This is a change from more traditional methods of instruction which tend to primarily focus on the acquisition of content. Researchers who piloted the SRLOQ contend teachers must know how to move control in the classroom from a teacher's regulation to a student's regulation of the learning process. Subsequently, the SRLOQ was designed to measure, improve upon, and secure the transfer of control from teachers to students through SRL development.

During a five-month piloting phase of the SRLOQ, a study of three teacher educators and 136 student teachers at a teacher college in the Netherlands was conducted. Between teacher educators and student teachers, the SRLOQ was administered and quantitatively measured. The study also provided qualitative data via tracked training courses, tutorial conversations, and post experience interviews. Student teachers were administered the SRLOQ at the beginning of the semester. Subsequently, after scores were analyzed, two interventions were established included training courses in SRL instruction after fifth week lesson and an individual tutorial sessions after week six. The SRLOQ was given again after week ten to determine growth. Tutorial sessions to improve student teacher's ability to engage in SRL instruction were offered once again after week eleven based on these results. The final round of the SRLOQ was administered in week eighteen along with a post experience interview.

Qualitative analysis of the pilot study suggested student teachers were more conscious of the five SRL scales through their participation of the study. However, the effective development of SRL teaching strategies required additional trainings supporting the SRL model. Findings indicated one-on-one tutorial sessions bolstered student teachers' use of SRL strategies during instruction. Content of the sessions were based on the on the results of the SRLOQ. When the instrument indicated that the use of a strategy was lacking, teacher educators coached student teachers on the strategy in question.

Vrieling, Bastiaens, and Stijnens (2012) also conducted a single case study demonstrating the usefulness of the SRLOQ to inform practice. The study investigated a single teacher educator named "Anne" at a large public university in the Netherlands. At the time of the study, she had accumulated eight years of working experience and taught

four separate teacher educator groups full time. Along with the SRLOQ, she utilized SRL training courses and individual consulting conversations into her curriculum. During these instructional opportunities, Anne focused on helping her student teachers hone SRL instruction by developing their ability plan and set goals, engage in each student's zone of proximal development, coach, and help students make accurate judgments about themselves. Anne worked on developing these core SRL instructional practices by engaging in practice-based activities. Also, Anne emphasized the importance of building a good working knowledge base of content before engaging in SRL instruction with students.

Through a post experience interview, Anne was able to make few observations worth further consideration. One, she stressed the need to use real-life problems when engaging students in SRL instruction. She believed a match between meaningful work and SRL instruction was paramount to the success of SRL strategy development. Secondly, Anne hoped for a better grasp of SRL development in digital learning environments. Often considered an untapped tool, Anne believed technology could serve as a powerful data tracker to help students keep stock of their own learning. Lastly, Anne noticed an additional academic advantage in improving student teachers' ability to promote SRL instruction in their classrooms. Not only did they improve their students' ability to self-regulate but their own self-regulated learning strategies also improved.

Data accumulated from the pilot study and the individual case study netted preliminary results described by Vrieling, Bastiaens, and Stijnens (2012). Before SRL instruction can be initiated in the classroom, students must have a sufficient level of knowledge to engage with content meaningfully. This knowledge can be acquired

through guided skill development and teacher led scaffolding strategies. One content knowledge is secured, teachers must work to release the locus of control to students through a gradual transfer process. In this way, the teacher has increased the accessibility of the content and diminished students' cognitive load when securing SRL strategies. When SRL skill instruction is presented, it should be linked to teacher designed instruction. Vrieling, Bastiaens, and Stijnens (2012) suggest using Zimmerman's four phases of cognitive modeling to engage students in SRL instruction but recognize competing models also hold value for this work. Finally, researchers propose the SRLOQ can be used as a self-imposed formative assessment to ensure appropriate teacher and student engagement in SRL instruction. Researchers hope teachers and administrators can use the data from the SRLOQ as a platform to guide and advance teacher's SRL instructional strategies.

Student Characteristics and SRL

Though the specific instructional strategies teachers implement in the classroom can be critical to a student's SRL development, certain student characteristics may also influence a student's ability to self-regulate during learning. Characteristics like a student's experience in the school, approach to learning, grade level, and income status may influence their ability to effectively self-manage instruction in the personalized, mobile middle school. Pertinent research in these areas will be discussed.

Experts versus novices. As researched by Kitsantas and Zimmerman (2002), there is evidence to suggest SRL strategies are more likely to be used by experts than novices when learning a new skill. In this study, expert and novice volleyball players were compared during the induction of a new skill. In determining the subtle differences

between how each group approached the task, researchers found expert players to be better at goal setting, strategic planning, enacting a growth mindset, and following a structured practice routine. Novice players, on the other hand, did not set goals or plan strategically during learning. Expert players tended to self-monitoring their performance, choosing various techniques to enhance learning as they practiced new skills. Novice players did not monitor their learning process and only focused on larger performance outcomes. Lastly, expert players reported higher self-evaluations and indicated failures as learning opportunities to adapt current strategies and seek social supports to improve learning. Novice learners, on the other hand, did not monitor their learning progress and therefore could not perform the metacognitive steps to adapt learning strategies or seek social supports when they failed.

Proactive versus reactive learners. Two types of learners tend to emerge during SRL (Zimmerman, 2013). Proactive learners, who have high quality forethought, tend to participate in more purposeful action throughout the learning experience. While reactive learners, who tend to take a discovery approach to learning, heavily rely on self-reflections of learning outcomes post activity to frame their next learning experience. Because proactive learners build upon the totality of past learning processes, their evolution in learning becomes a self-sustaining cycle. Meaning, as proactive learners develop more sophisticated SRL strategies, they continue to adapt their learning process over time with increasing precision during forethought, performance, and self-reflection. While reactive learners tend to rely on post activity outcome measures as their main source of feedback. This means reactive learners do not factor in their forethought or performance strategies when analyzing their results. Subsequently, reactive learners do

not engage in the depth of analysis required to understand the totality of their learning process. Thus, proactive learners tend to demonstrate higher degrees of self-efficacy beliefs, outcome expectancies, mastery learning goals, task interests, self-control, monitoring, self-reflection, and adaptation than reactive learners.

Middle school students. Rudolph, Lambert, Clark, and Kurlakowsky (2001) claim student's transition between elementary and middle school can a be a crucial time for SRL development. To test this claim, a study of 187 adolescents' transition process was compared to an analysis of 142 adolescents without transition from fifth to sixth grade. Each group of participants was pooled from the same urban area and held comparable demographics. For example, about half of each group qualified for the free or reduced lunch program. Researchers distributed two sets of questionnaires to each group, six to seven months apart. The questionnaire was designed to assess participants' self-regulatory beliefs, academic engagement, and depressive symptoms over transition and non-transition periods. Subsequently, two types of self-regulatory behaviors were assessed; perceived control over academic outcomes and actual student investment in work.

Overall, the results indicated maladaptive self-regulatory behaviors, like perceived lack of academic control and little investment among the transition group was more predictive of school related stress and depression than the non-transition group. Rudolph, Lambert, Clark, and Kurlakowsky (2001) hypothesized students who transitioned were less sure in their new environment. They further contend inadequate transitions were a result of students feeling either being ill-prepared or too overwhelmed to meet new demands found in their new context. These findings were especially true for

students who presented maladaptive self-regulatory behaviors even before the transitions process to sixth grade began. These students, who tend to exhibit lower levels of academic engagement and perceived control over academic accomplishments, have a much more direct pathway towards depressive symptoms in newly transitioned environments. Specific to this study, findings also indicated students were more likely to engage in helpless behaviors during challenges, decreased effort, and lower levels of academic achievement. Students with incoming maladaptive self-regulatory behaviors also expressed teacher and parental feedback as being highly correlated to the amount of effort students exhibited on a task and not directly tied to SRL strategy use. Researchers believe these non-specific feedback loops resulted in students feeling shame and discouragement during failure. Rudolph, Lambert, Clark, and Kurlakowsky (2001) conclude that more research is needed to identify how interpersonal relationships between parents, teachers, and students can change the course of these depressive pathways. Also, more research is needed to understand how specific SRL strategies can be introduced to students with incoming maladaptive self-regulatory behaviors and beliefs to build skill sets and confidence in their ability to learn.

Low-income students. Poverty can affect an adolescents' ability to self-regulate (Raver, 2012; Roy, McCoy, & Raver, 2014). As the income gap continues to grow in America's economy, more and more children are being affected by stressors due to poor socio-economic conditions existent in impoverished areas (Roy, McCoy, & Raver, 2014). This can affect a child's individual processes to control their executive function, exhibit effortful control, and regulate emotionally – all primary skills that are the basis to more complex SRL skill development. Students who have poor primary regulation skills, as

contended by Raver (2012), are more likely to have difficulty adapting to educational contexts through their inability to follow goal-directed actions. Two interventions, as prescribed by Roy, McCoy, and Raver (2014), have found some level of success. One, students who move out of impoverished areas by fifth grade in this study exhibited teacher reported lower rates of dysregulation than students who remained in high poverty areas. Two, students who lived in high poverty areas and were exposed to mental health services designed to decrease stress were more likely to improve regulation if the length of services correlated with the length of time lived in poverty. The findings from this study indicate students with a low socio-economic status may be able to engage in SRL instruction if additional supports are in place to help reduce and cope with existent stress levels.

SRL in Traditional Classrooms

What does SRL instruction work in practice? In a study by Eilam and Reiter (2014), 52 Israeli ninth grade students participated in a yearlong self-reported study comparing a self-regulated (SR) condition to a teacher controlled (TC) condition. Both groups held comparable student demographics with no significant differences in content knowledge before intervention. During the intervention, both groups engaged in three weekly hours of biology instruction in the same laboratory with the same curriculum, teacher, textbook, and timeline of instruction. Biology, and more specifically genetics, was chosen for its complexity and need for advanced metacognition to take stock of learning. Researchers wondered if students could adequately construct deep knowledge with a less teacher controlled structure, if there would be changes over time between

groups on the Learning and Study Strategies Inventory (LASSI), and if differences between groups extended to their depth of science knowledge.

In the SR condition, students chose and managed their own learning assignments and methods of engaging in the work. They self-selected topics and worked at their own pace. Challenges were generally overcome on their own through teacher created support instruments and or through a trial and error process. SR students acted on their own interests, capabilities, and beliefs throughout the year but were also guided by feedback to hone learning. The TC environment, on the other hand, while not emphasizing SRL directly did allow students to apply SRL spontaneously and independently when deemed appropriate. The TC group was predominantly led by teacher determined tasks which included modes of learning, pacing, setting, procedures, demonstrations, homework, and experiments. Students in the TC condition followed the learning path set by teachers strictly.

Before the school year began, each group participated in the Learning and Study Strategies Inventory (LASSI) to assess students' baseline self-reported SRL strategy use in the classroom. To assess acquired biology content of both groups, researchers and content experts developed and implemented a series of five tests to analyze genetics knowledge throughout the year. For the SR group only, data assessing students' enacted SRL was collected through the use of three SRL tools; the Yearly Self-Reported Instrument (YSRI), the Weekly Self-Reported Instrument (WSRI), and the Test Self-Report Instrument (TSRI). The SR group used these tools to guide self-determined instruction and make their own decisions in the way they learn. These decisions included which goals to set, the development of learning plans, evaluations of their own

performance, as well as adjustment to current learning strategies. Freedom of choice also extended to where students sat, the type of task assigned, the sequence of tasks, time spent on task, as well as to work collaboratively or independently.

The YSRI, developed by Eilam (unpublished), was created to support students' ability to time manage learning over the course of a full academic year. Highlighted in Figure 7, the YSRI allows students to track learning by comparing progress against a teacher's suggested learning path. To do this work, students in the SR group received 22 teacher suggested sub goals, one for each week, at the beginning of the year. During the yearlong study, students completed the YSRI at the end of each week to reflect and inform subsequent weeks.

The Yearly Self-Reported Instrument

Date	Suggested Plan	Enacted Plan	Size of Gap	Reasons for Gap	Actions to Decrease Gap	Self-Evaluation
1/9	Genetic Inheritance-What is that?					

Source: Eilam, B., & Reiter, S. (2014)

Figure 7. The YSRI: Yearly Self-Reported Instrument

Also developed by Eilam (unpublished), SR students used the WSRI to assess weekly progression compared to teacher suggested learning paths. As indicated in Figure 8, the WSRI included reminders for learning including basic questions to help students describe progress towards a lesson plan. Students in the SR condition set the tone for learning by completing the WSRI at the beginning of each lesson. Students could use teacher input, textbook's presentation of topics, or individualized goals based on past performances to create their plan of action. The development of achievable goals was

emphasized. Students completed the WSRI by listing activities for the week in the correct sequence and with an appropriate timeframe for each task. Additionally, two questions were asked of each activity, will the plan allow you to achieve your weekly goals and will you be *able* to enact this plan?

The Weekly Self-Reported Instrument

Date:						
My Learning Goal this Week:						
	Planning		**Enactment**		**Self-Evaluation**	
Time	Activity	Time Allocation	Activity	Time Allocation	Score (1-10)	Possible Reasons
10:20						
10:30						
10:40						
10:50						
Homework:						
Weekly Feedback: Is there a gap between planning and execution? Yes or No Where is the gap? Time / Type of Activity / Order of Activity Did I reach my weekly goal? Yes or No Did I define the weekly goal well? Yes or No						
What are the actions I need to take to reach my weekly goals next week? Please elaborate.						

Source: Eilam and Reiter (2014)

Figure 8. The WSRI: Weekly Self-Reported Instrument

As students enacted WSRI plans in the SR condition, they adjust plans as they learned more about their individual learning process. When activities were completed, students immediately recorded their experience in their WSRIs. Researchers expected, by engaging in this course of thinking, students would complete subsequent sequences of learning more accurately, with more awareness of the self, and with more sophistication. Each of the learning plans outlined in each weekly WSRI were ultimately rated by students in terms of quality of learning experience using a Likert Scale. Students indicated reasons for failures and successes and suggested strategies to improve achievement in the future.

Lastly, the SR condition engaged in the completion of TSRIs after each testing round. The TSRI is a reflective tool to help students determine their strategies and behaviors during test preparation. The TSRI was distributed to students upon receiving graded tests. On the TSRI students were asked to identify gaps between a teacher's grade and their expected grade, record data from the test, focus on categories of incorrect responses, provide reasons for each learning gap, and develop subsequent strategies to improve the next round of testing to improve performance.

Enacted SRL data, which included the combination of YSRI, WSRI, and TSRI data per each SR student, were coded and analyzed per predetermined criteria. Interrater reliability of coding of activity segments scored at 90%. Pre and post LASSI tests as well as science knowledge tests were analyzed in both conditions. Eilam and Reiter (2014) found LASSI scores in the SR condition to be significantly improved over the TC condition. Meaning, the SR group rated themselves higher in the application of SRL over the course of the year than the TC group. However, enacted SRL scores among the SR group were lower during the first term, significantly increased during the second term, and remained stable during the third term. This indicates a learning curve in SRL instruction which leveled off over time. Researchers observed students in the SR condition repeatedly rearranged their learning environment to fit their needs during different activity types.

However, about 80% of weekly goals were phrased as performance goals while only 20% were mastery goals in the SR condition. SR students tended to select activities that were most familiar to them but often had trouble defining learning activities. Subsequently they often used general phrases that were hard to measure by students and

researchers alike. This made it difficult for students in the SR condition to monitor progress and adapt their strategies based on these goals. They were however, able to gain skills and confidence in their ability to sequence content and allocate appropriate blocks of time to learn. SR students reported staying on task 90% of class time, could identify gaps between planning and enactment, but could not always identify why these gaps existed. More specifically SR students seldom acknowledged a knowledge deficit was at play. Although, students could self-identify their pacing needs through the course of the year.

Further TSRI analysis demonstrated some students could infer the cause of testing errors while others could not. SR students who identified testing errors could make the connection between incorrect answers and the strategies that would have helped them to avoid making mistakes while studying. Lastly, through the analysis of multiple choice and open ended questions on genetics tests, both groups found the genetics concepts challenging. Yet the SR group revealed deeper level of understanding on open ended responses.

SRL Instruction in Technology Based Environments

Many SRL constructs and theories have been developed before the full emergence of the digital age in the classroom. Subsequently, Zimmerman (2013) calls for a resurgence of SRL research in schools who support digital instruction. More specifically, Zimmerman questions the ability of reactive learners to self-regulate in highly individualized, technology-based environments that require less physical supervision by teachers. Zimmerman further questions if feedback from technology alone can sufficiently support students' ability to advance their self-regulatory process. In turn, he

calls for a need to determine best practices within technology supported curriculums. The following section is a review of preliminary evidence of SRL instruction in technology-based settings inclusive of mobile learning, computer-based, and personalized learning environments.

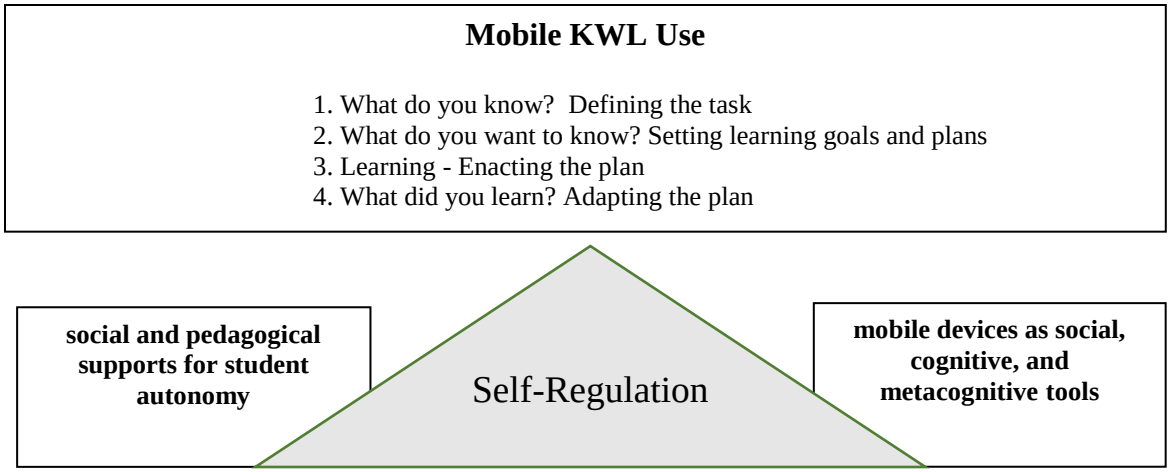
Mobile learning environments (MLEs). Sha, Looi, Cehn, and Zang (2012), define mobile learning as ubiquitous in nature, happening anytime and anywhere in a personalized and student-centered manner. Some schools refer to mobile learning environments (MLEs) as seamless learning environments (SLEs). Wong and Looi (2012), define SLEs as encompassing formal and informal learning experiences, individual and social learning, learning across time, learning across locations, ubiquitous access to learning resources in physical and digital worlds while using multiple devices to collect data and synthesize knowledge. Therefore, both mobile and seamless learning environments work to shift away from more traditional models of learning to applying self-directed, incidental learning opportunities through students' personal use of mobile technologies.

Khaddage et al. (2015), in an analysis of the current state of research in mobile learning environments, suggests a student perspective is most relevant when learning how to best implement mobile technologies in the classroom. After all, how mobile technologies are primarily used by students in and out of school involves an individual, personalized decision making process enacted by students. Understanding how students use mobile technologies has the potential to influence new approaches to instructional design, pedagogy, and instructional management. This information can also be used to

develop training programs, for students and teachers alike, which support the integration of mobile devices during learning.

More prescriptively, the success of authentic mobile learning experiences are considered to be directly tied to the ability of students to exercise agency and control in learning during the self-regulation process (Sha, Looi, Chen, & Zang, 2012; Khaddage,et al., 2015). Understanding how students navigate a mobile learning experience that is ubiquitous in nature and is directly tied to how students make judgements about learning as well as who or what is helping them support these decisions (Sha, Looi, Chen, & Zang, 2012). Subsequently, mobile learning is not only about cognitive development but also strategy development found in the SRL realm. Therefore, the self-regulatory factors that improve and or hinder academic achievement in these environments must be understood empirically.

To test the value of these preliminary claims, Sha, Looi, Chen, and Zang (2012), conducted a ten week MLE study for 68 third and fourth grade students in Singapore as part of an overall three-year study. At the end of ten weeks, a student survey measuring self-efficacy, intrinsic motivation, extrinsic motivation, as well as SRL was administered. A SRL Mobile Model of Learning, modeled after the KWL (Ogle, 1986), is outlined in Figure 9. The implementation of this model was supported by three self-regulation tools available in students' learning management system - a stopwatch, an animated drawing tool, as well as a concept development map tool.



Source: Adapted from Learning Processes as Exercises of Agency (Winnie, 2000)

Figure 9. SRL model for mobile learning

To collect data, a program called Quiet Capture allowed researchers to unobtrusively collect student mobile data. Based on the data extracted from this program, students spent 46% of their time using mobile technologies for reference and 30% of time for data collection. Of the 68 students who were presented a KWL as a tool for learning, 34 completed the KWL and an additional 34 students did not. When comparing this data to survey results, researchers found the higher degrees of extrinsic motivation a student had, the less likely he or she completed the KWL. Students who were driven by grades, researchers hypothesize, opted not to complete the KWL as it did not correspond to improving their score on the project. Researchers found students who were more intrinsically motivated tended to complete the KWL.

Limitations to this study are important to mention. First, the SRL model used was created for elementary students with a different set of cognitive capabilities than middle school students. Subsequently, the tools used to enhance SRL instruction, like a KWL, are more simplistic in nature. While it is reassuring to know often used conceptual maps can be adapted to support SRL instruction, the complexity of this tool would most likely

be increased to support the more advanced cognition of an adolescent. Also, the study was conducted overseas with a vastly different demographic makeup than the personalized, mobile middle school in question. Subsequently, how students respond to SRL instruction in one context cannot be assumed to demonstrate similar results in another.

Wong and Looi (2011), in a case study of seamless learning, investigated how students can move from formal to informal learning settings easily and quickly while using their personal device. To understand this development, Wong and Looi analyzed student movement through formal and informal learning platforms against a framework. Known as the Facilitate Seamless Learning (FSL) process framework, students engage in four formal and informal seamless experiences during learning. First, teachers focus on student engagement through a group experience either face-face in a classroom or in a community experience. Next, learning is personalized in an authentic context through more formal or incidental experiences. After these experiences, students review what they have learned using social platforms as either a discussant or peer reviewer. Lastly, students reshape what they know through an in-class consolidation activity found in their learning management system. Subsequently, products are created based on individual and shared, networked learning experiences.

The effectiveness of this model was measured among 34 ten-year-old Chinese students during an English vocabulary learning experience via smartphones. In total, 853 student generated products created through seamless learning experiences were analyzed in terms of their complexity and connections to previous learned material. Two pertinent findings resulted. First, students improved in quality of thought when the FSL learning

model was spiraled into the curriculum. When objectives, learning activities, and skill sets were built in complexity through different learning cycles, students demonstrated greater complexity and connections between concepts. Secondly, the consolidation process was best engaged by students when it was first modeled by teachers.

Computer-based learning environments (CBLEs). CBLEs, a close cousin to MLEs, are defined as the combination of various aspects of computer technology to assist individuals in learning for a specific educational purpose (Azevedo, 2005). They are like MLEs in their ability to access the dearth of data online but do not specifically address the mobility of learning. Schools that support CBLEs can still support student-centered, personalized approaches to learning. As Lajoie (2008) contends**,** computers can be used to support a student's metacognition and self-regulation towards deep learning. CBLEs have the capacity to provide external guidelines and scaffolds to aid students during learning. CBLEs also have the potential to provide supports, known as cognitive tools, which can be chosen to seek clarity and gain knowledge. These computer-based cognitive tools generally work by lessening the overall degree of processing during work so that students have a greater capacity to engage in higher level thinking. This can be accomplished in several ways including providing strategies for problem solving, and through visualization and collaboration.

Subsequently, in the absence of a plethora of well-aligned MLE studies, a look at CBLE studies designed to assess the ability of the environment to support student's self-regulation is prudent. The highest quality study within this realm is a meta-analytic study developed by Winters, Greene, and Costich (2008). In this study, 33 independent empirical studies on SRL and CBLEs were analyzed. Overall, research suggests that the

driver of academic performance in CBLEs is the quality of students' SRL process. Students tend to struggle while learning in CBLE's for several potential reasons. These reasons can include issues of cognition, motivation, behavior, as well as in a student's ability to adapt to his or her context (Lajoie & Azevdeo, 2006). However, as stated by Winters, Greene, and Costich (2008), preliminary research in CBLEs suggest SRL can be enhanced through prompts, tools, and access to peers and tutors to potentially overcome these challenges.

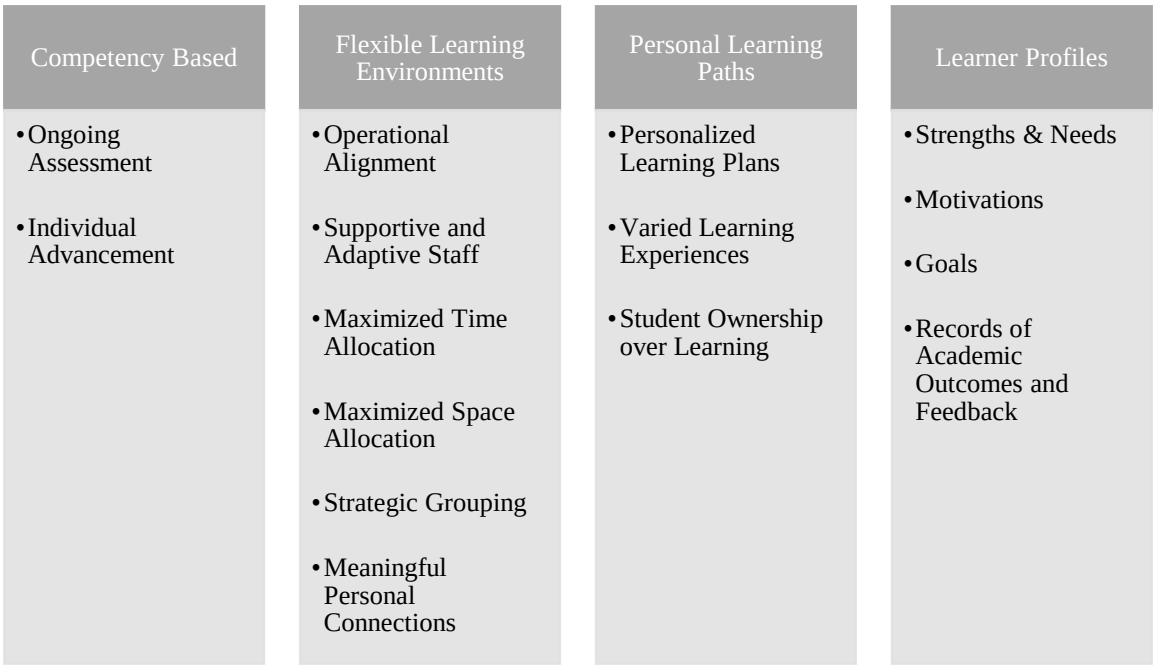
In Winters, Greene, and Costich (2008), empirical and peer reviewed studies exploring the major constructs of SRL in CBLEs were analyzed. Findings from this meta-analytic review identified certain learner and task characteristics associated with effective SRL instruction. Students who are deemed successful in CBLE environments more frequently use SRL strategies towards positive learning gains. In terms of task characteristics, students with higher degrees of prior knowledge tended to use higher degrees of SRL strategies, especially planning and monitoring. Students who were more likely to set goals during a task tended to use SRL strategies more consistently though no effect on learning could be found. Lastly, higher achieving students tended to use more active strategies than students who did not demonstrate as much success in learning.

What role can various SRL supports play in CBLEs? According to Winters, Greene, and Costich (2008), findings indicate students see SRL supports as helpful in regulating their SRL strategies but students do not always opt to use them. Winters theorizes students' inability to calibrate their own learning accurately, is largely responsible for their lack of use. However, planning behaviors were increased when conceptual models used to support SRL strategies were introduced. When teachers used

adaptive scaffolding strategies, students increased planning, monitoring, and effective strategy use to gain effective learning outcomes. Two types of scaffolding were found to be especially effective; the use of one on one personal tutors and specific training of strategy use in CBLEs.

Personalized learning environments (PLEs). The Bill and Melinda Gates Foundation (2014) describes personalized learning environments (PLEs) as consisting of four primary components: they assess progress against competency based outcomes, house flexible learning environments, create personal learning paths individual to each student, and work to continuously refine learner profiles. Figure 10 outlines an adapted, version of the primary and secondary components within PLEs as descried by the Bill and Melinda Gates Foundation (2014)

Personalized Learning Framework



Source: Adapted from the Bill and Melinda Gates Foundation (2014)

Figure 10. Personalized learning framework

West (2011), in conjunction with the Center for Education and Technology at Brookings, examined new models of personalized instruction made possible by various technologies. Primarily interested in finding empirical evidence of effectiveness, West (2011) summarized the scant level of evidence around digital technologies which support current ways of organizing school structures, their instructional designs, and assessment practices in personalized learning. Pertinent for this study, West (2011) uncovered SRL research supporting the use of a one-on-one computer based instructional program, an analysis of a personalized online tutoring program, as well as an analysis of an intelligent tutoring system.

As cited by West (2011) in his analysis, in 2009 the U.S. Institute of Education Sciences examined the math and reading test scores of 3,280 students receiving computer-assisted instruction. While results were not fruitful after the first year of use, the second year demonstrated increased learning engagement, collaboration, and participation. Still, growth in basic skills and higher order thinking as a direct outcome of computer-assisted instruction could not be found even after the second year. Meaning, simply engaging in the computer based instruction without any additional supports did not yield deep learning outcomes. A separate analysis of online tutoring programs by the Metiri Group (2009), demonstrated some effectiveness of intelligent tutoring systems when they were well planned, taught, and matched student needs. When teachers strategically implemented these tutoring systems, students increased their knowledge base. A study conducted by Roll, Aleven, McLaren, and Koedinger (2011) investigated an intelligent geometry tutoring system which was not only well-planned and well-taught but also focused on help-seeking and learning management behavior. Researchers found

students learned geometry more quickly and effectively than comparison students not using the system. Researchers believe it is the development of these key self-regulatory skills, like the promotion of help seeking help behavior, which increased learning.

West (2011) concludes the meta-analysis of personalized learning research by expressing caution about these preliminary findings. The research behind personalized learning tools and environments is still raw and impressionistic. While there is evidence to suggest that certain technological tools can aid in the development of self-regulation, rigorous studies underscoring the conditions in which digital technologies enhance learning are lacking. Specifically, additional research is needed to document how a student's relationship with their personalized learning environment can be enhanced for students of any income level, gender, race, and or intellectual ability. Knowing how to carefully weigh these conditions in establishing programs that allow all students to master their own material at their own pace is worth further exploration.

In another study conducted by Drexler (2010) a teacher facilitated, personalized, networked learning experience among fifteen students in grades ten through twelve in an independent school in the Southeastern United States was explored. Collected data during the nine-week term included a unit plan, teacher lesson plans, researcher field notes, and completed rubrics. After the networked, personalized experience concluded, researchers analyzed results from a student survey designed to reflect on the personalized learning experience. Student outcomes, including personal blogs and a final essay, were also compared.

Findings indicated most students considered their personal, networked learning experience to be a positive. Positive responses highlighted the quality of learning in the

personalized platform as being relevant to their college preparation process. Positive responses also indicated an appreciation for the increasing comfort level exhibited in the PLE as the program continued. Though negative comments were few, they did indicate the process and tools within the PLE were sometimes overwhelming. Also, most students indicated time management as the most difficult component of the learning platform. Yet, researchers found thirteen out of the fifteen students in this study could consistently complete assignments on time. Two students, over the course of the project, expressed frustration over falling behind and not being able to ever catch back up. Finally, almost half of students in the study felt they were self-directed in learning but still felt they needed the support of a guiding teacher in this platform.

Prain et al. (2013), in a study designed to research the benefits of SRL instruction in PLEs, used a case study approach to explore the power of personal learning plans. More specifically, the implementation of personal learning plans among a group of Australian schools serving seventh through tenth grade students was analyzed. Researchers surveyed 2,400 students to determine the constraints and successes found in personalization. Specifically, researchers wanted to know if students could self-directed learning, show personal relevance and shared control, engage in instruction, have authentic learning experiences, demonstrate academic efficacy, develop positive peer relationships, manage their behavior, and develop both socially and personally. The results indicated students overall increased their self-awareness, ability to self-manage, desire to learn, and ability to exhibit self-control after using personalized plans. Students indicated they were least sure about the degree of choice they had within this platform and still very much felt like teachers were still in control of their learning. In the end,

students in the study accrued an average of a 10% gain on the mathematics portion on Australia's national exam (Prain et al., 2013).

Research Needed

As Zimmerman (2013) contends, more research is needed to address how students self-regulate in highly individualized, technology-based environments. Specifically, it is not well understood if feedback from technology alone can sufficiently support students' ability to advance their self-regulatory process. West (2011) additionally questions how a student's relationship with their personalized learning environment can be enhanced for all students regardless of income level, gender, race, and intellectual ability. Technology can be a powerful tool for learning if students can self-manage instruction while being supported by teachers. Yet, no clear understanding of how to develop the skills needed for academic self-regulation has yet determined.

A personalized, mobile middle school in a large Southwestern gateway city has created an innovative student-centered, teaching-learning approach which may help to answer some of these questions. However, since the campus is planning to scale, the school must first secure methods to support students' current ability to independently drive learning. Using what has been learned through theory and research detailed in this literature review, an analysis of the students' self-reported ability to self-regulate within the personalized, mobile middle school will be determined. To do this, the self-reported scores of 27 students' level of concentration, ability to manage time, self-test, and use study aids as measured by the Learning and Study Strategies Inventory (LASSI) at the start of school and over a short period of time will be analyzed. Likewise, pre and post data distributed over the course of a semester will be analyzed to determine differences in

performance by income and experience as well as possible relationships to academic performance. These analyses will be used to develop an action plan designed to support teachers as they facilitate self-regulated learning strategies in a personalized, mobile middle school.

Chapter III

Methods

As the United States continues to lose ground on global educational achievement and attainment measures (Peterson, Woessmann, Hanushek, & Lastra-Anadon, 2011), evidence of an increasing national skills gap between available jobs in highly skilled technical careers (National Center on Education and the Economy, 2007; Schwartz, Ferguson, & Symmonds, 2011) which often require key intrapersonal skills that frame work habits (Partnership for 21st Century Skills, 2008) is increasingly evident. Skills like the ability to self-direct one's work during technological access, creation, and distribution of digital content are especially paramount for the responsible and effective participation in today's information economy. Students preparing to enter the workforce can develop the skills needed for the digital age if given opportunities to practice authentic technology use in schools (Toyama, 2015) while being supported by transformative pedagogies focused on interpersonal competencies necessary for deep learning (Herold, 2015).

The Setting

In 2013, a personalized, mobile middle school located in a large southwestern city opened its doors to launch an innovative 21st century teaching-learning model for 33 racially, cognitively, and economically diverse middle school students. The school is led by two teachers, known as learning coaches, and one principal in the creation and implementation of the teaching-learning model. Of the two learning coaches, one serves as the primary humanities instructor with over ten years of teaching experience. The other teacher delivers math and science instruction after having previously served as a technology integration specialist for a private school. The school's principal has accrued

over a decades' worth of experience in both traditional and charter school settings as an instructional leader and program director. Additionally, the teachers and the principal collaborate with community partners in supporting community based, mobile instruction. Additional support in the areas of curriculum and school administration is also received from the personalized, mobile middle school's parent company.

Since 2013, the school has enrolled a total of 59 students spanning sixth through eighth grades. However, the school has experienced a shift in student enrollment since its inception. Enrollment rates increased by 5% from the fall of 2013 to 2014 and decreased by 17% in 2015 (Table 1). Though enrollment increased in 2014, 26% of eligible returning students from 2013 did not do so. This figure was 28% in 2015. Students who returned to the school in 2014 represented 70% of the total student population. While in the fall of 2015, returning students represented 73% of the population. This data would seem to suggest that while the schools' total population is decreasing, there is more stability in the number of students returning to the school from one academic year to the next. Meaning, over the last three academic years, a core group of students has remained with the school from sixth to eighth grade.

Table 1

Enrollment History of School

Group	Total Enrollment (n)	Returned (n)	Dropped by Next Academic Year (n)	Graduated (n)
Fall 2013	38	N/A	10	N/A
Fall 2014	40	28	11	5
Fall 2015	33	24	N/A	N/A

Source*:* Personalized, Mobile Middle School Archival Data (2016)

In terms of student demographics, from the fall of 2013 to the fall of 2015, the school has maintained an even distribution of males and females (Table 2), has

overwhelmingly served minority students (Table 3), and mostly served students of low-income status (Table 4). The only significant change in student demographics is in the percentage of students who required special services (Table 5). From the fall of 2013 to the fall of 2015, students who required either a 504 plan or special education services decreased from 27% to 3% of students.

Table 2

Enrollment by Gender

Group	Male		Female		Total Population
	(n)	(%)	(n)	(%)	(n)
Fall 2013	21	55	17	35	38
Fall 2014	23	58	17	42	40
Fall 2015	19	58	14	42	33

Source: Personalized, Mobile Middle School Archival Data (2016)

Table 3

Enrollment by Race / Ethnicity

Group	Black		Hispanic		White		Hispanic / White		Black / Hispanic		Total Enrollment
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
Fall 2013	17	45	9	23	8	21	2	5	1	3	38
Fall 2014	20	50	10	25	7	18	2	5	1	2	40
Fall 2015	14	43	7	21	7	21	4	12	1	3	33

Source*:* Personalized, Mobile Middle School Archival Data (2016)

Table 4

Enrollment by Student Income Level

Group	Low-Income		Not Low-Income		Total Population
	(n)	(%)	(n)	(%)	(n)
Fall 2013	24	63	14	37	38
Fall 2014	26	65	14	35	40
Fall 2015	21	64	12	36	33

Source: Personalized, Mobile Middle School Archival Data (2016)

Table 5

Enrollment by Special Services

Group	SPED Plan		504 Plan		Total Population
	(n)	(%)	(n)	(%)	(n)
Fall 2013	7	18	3	9	38
Fall 2014	1	3.5	1	3.5	40
Fall 2015	0	0	1	3	33

Source: Personalized, Mobile Middle School Archival Data (2016)

Included in their charter application, the school has plans to grow to 540 students across three campuses over the next five years. To achieve this goal, the school is committed to attracting current and future students from its city's public education system. If so, the school's population would serve students who are overwhelmingly of a minority status, economically disadvantaged, and consistently performing below grade level with a wide variety of social and emotional needs (Center for Houston's Future, 2012).

Through the school's personalization of the curriculum, their character development strategies, and the trusting relationships they hope to build, the personalized, mobile middle school looks to overcome these challenges. In focusing on student growth of content knowledge from free, yet vigorous content found online, teachers support students' intrapersonal skill development in the self-management of student-centered instruction. Students have mobility during learning in both their choice of technological tools used during personalized, self-directed work and in their movement between content anchoring community-based learning experiences across the city. They are the primary drivers of learning and are as such responsible for scheduling and monitoring the completion of teacher developed daily learning tasks. They make choices

on not only where to acquire knowledge from the dearth of data available online but also in the type of products to they want to create.

Justification for the Study

Similar school models that opt to focus on explicit or implicit character development strategies during digital, student-centered instruction have demonstrated varying degrees of success. While schools like High Tech High produce autonomous learners who outperform students state wide (Stephen & Goldberg, 2011), other schools that incorporate technology into classroom instruction report a critical lack of self-management among some students. Teachers in these studies contend this makes a technology driven learning model an ill-suited fit for students who cannot learn independently (Murphy et. al., 2014). However, in a study of ten networked schools, instructional focuses like competency building and the development of more concrete intrapersonal skills has yielded increased deep learning measures (American Institute of Research, 2014). More specifically, in an analysis of several empirical studies supporting personalized, technological instruction, research suggests teaching students how to self-regulate during instruction has the potential to help students learn deeply (West 2011). As such, an opportunity to analyze self-regulation during student led instruction in a personalized, middle school has the potential to shed light on the underpinnings of students' capacity to independently achieve academic success in technology driven schools.

As Winne (1987) and Schunk (2005) contend, SRL strategies are important to explicitly teach and / or incorporate into instruction to improve students' learning processes. However, as Zimmerman (2013) adds, this explicit instruction should follow

appropriately aligned instruments and clearly defined measurements which reflect SRL in context. As such, a mixed method, survey study was conducted by the school to measure the self-regulation processes within a personalized, mobile middle school located in a diverse, gateway city during the 2015-2016 school year. Creswell (2009) describes mixed method research as a collection and analyses of qualitative and quantitative data during the course of a study. By using the strengths of both types of data, mixed methods research is an especially good fit to help dissect complex problems in education which may not align neatly to any single type of research. Consequently, the culmination of survey and academic data was used to analyze student's self-reported ability to self-regulate in a personalized, mobile middle school.

Research Questions

As such, the following four research questions were answered in this study:

1. What were students' self-reported levels of concentration, ability to manage time, self-test, and use study aids at the start of the school year as measured by the LASSI?
2. To what extent did student self-reported LASSI levels of concentration, ability to manage time, self-test, and use study aids change over the course of a four-month semester
3. To what extent did a student's family income status moderate the SRL outcomes at the start of the school year and after a four month-semester as measured by LASSI?
4. Were LASSI scales correlated to Stanford 10 math and reading score?

Instruments

LASSI. To measure participants' ability to self-regulate during instruction in the personalized, mobile middle school, the Learning and Study Strategies Inventory (LASSI) was used. The LASSI is a ten-scale survey designed to measure students' self-reported *skill*, *will*, and ability to *self-regulate* during learning (Weinstein, Schulte, & Palmer, 1987). More specifically, the 80-item survey instrument measures a student's anxiety, attitude, concentration, information processing, motivation during learning, ability to select main ideas, self-testing strategies, test strategies, time management, and use study aids. The Cronbach alphas for the ten scales range from .73 to .89. Appendix B provides a more detailed description of each scale along with a corresponding sample question. While all ten scales on the LASSI were administered and measured, in particular, four self-regulatory scale scores were the basis for analysis**.** These scales are the active strategies found within the LASSI and include the areas of concentration, time management, self-testing, and use of study aids (Weinstein & Palmer, 2002).

The LASSI was chosen for this study because of its' specific connections to the performance phase in SRL. Active SRL strategies, like one's ability to concentrate and self-test, are consistent with Bandura's (1991) monitoring progress component of SRL. For students to be able to monitor knowledge acquisition while learning, they must sustain attention on academic tasks by paying attention to their own performance, the context in which their performance occurred, and the effect it will have on them over time. Without this sustained concentration to monitor performance during knowledge acquisition, students are unable to accurately portray their current skill set level necessary to set realistic goals. Rather they would tend to selectively attend to their performance,

leading to an unclear picture as to why they fail or succeed. In a personalized atmosphere where students are the drivers of their own learning and often must set goals for themselves based on past performances, an accurate self-portrayal of skill sets is necessary to optimally set goals.

Much like levels of concentration and self-testing strategies underpin Bandura's (1991) monitoring progress component of SRL, time management and use of study aids are also active SRL strategies which support students' ability to advance learning. When students time manage, they are supporting goal setting. While goal setting is housed in the forethought component of SRL (Bandura, 1991), the process of carrying out goals is supported by a students'' ability to organize and schedule their work. In this way, time management is mechanism to incrementally measure goal performance. Use of study aids, on the other hand, is the corrective action taken by students during the monitoring of performance.

Each item on the LASSI reflects an SRL statement in which students agree or disagree to using a five point Likert scale, i.e. (1) *Not at all like me* to (5) *Very much like me*. Once students have completed the LASSI, test developers provide standardized scores via percentile score equivalents reflective of national norms for each scale. The LASSI was normed on 1,092 post-secondary students. Of this sample, nearly 8% of participants were seventeen years old or younger while another nearly 58% of students were between the ages of eighteen and nineteen. More specific demographic information including ethnic and GPA distributions of the LASSI norming sample can be found in Appendix C.

Score interpretations as described by Weinstein and Palmer (2002) show students who score between the 0 and 50th percentile rank on a LASSI scale are highly encouraged to improve learning strategies. Students who score between the 50th and75th percentile rank on each scale have a moderate need to improve strategies. While students who score at or above the 75th percentile rank do not exhibit a high need in developing the corresponding scale but should continue to monitor their skill development. When looking at the percentile ranks of students in the personalized, mobile middle school, it is important to remember the LASSI was normed on a college-aged population. However, it can be argued middle school students would benefit from using the LASSI by continually working towards improvement.

Stanford- 10. Results from the Stanford Achievement Test - 10th edition (SAT 10) were used to assess academic progress at the school. Known colloquially as the Stanford 10, this comprehensive standardized achievement test measures reading comprehension, mathematics problem solving, language, spelling, listening comprehension, science, and social sciences as a mechanism to determine a student's level of academic knowledge. There are thirteen levels available for administration, dependent on a student's grade level. Not only is the Stanford 10 intended to show current level of academic knowledge but also, through multiple yearly administrations, growth over time. The publisher of the test, Pearson PLC, reports reading alpha reliability measures as .87, language as .78-.84, and math as .80-.87, making the Stanford -10 a highly reliable, national standardized test of academic knowledge. For the purposes of this study, the results of total reading and math scores from of the 2015 and the 2016

test administration were analyzed towards a determination of the relationship between self-regulation and academic performance among participants.

Participants

Pre and post LASSI scores for 27 of 33 enrolled middle school students within the personalized, mobile middle school was analyzed for the 2015-2016 school year. Demographic tables can be found in chapter four. Students came from a variety of educational settings including their local school district, other charter schools, private schools, and home schooling environments. Transfer data shows almost 19% of students who participated in the study were attending the personalized, mobile middle school for the first time, 33% were in their second year, while 48% were in their third year. Just over half of participants were in eighth grade, a quarter in seventh grade, and the remainder in sixth grade (Table 6). There were slightly more males than females (Table 8). Most participants were of a minority status (Table 9) and identified as low-income (Table 10). No students were eligible to take the STAAR modified test but one student was eligible for a 504 plan.

Methods

Brantlinger, Jiminez, Klingner, Pugach, and Richardson (2005) contend that qualitative approaches can supplement more quantitative measures to grasp what is happening during research. In the study described here, students' ability to self-regulate is difficult to capture using more empirical methods. Subsequently, the LASSI was used to explore students' self-reported use of self-regulated learning strategies during instruction. Survey research, according to Check and Schutt (2012), has the capacity to capture a representative understanding of the conditions within a school through a

dissection of the attitudes and characteristics of a larger population. They further contend, survey research is especially a good fit for contexts that are difficult to measure through their versatility and generalizability to fit many researchers' needs. For this study, it may not be feasible or even possible to observe self-regulatory behaviors and subsequent causal metacognitive actions of students in real time. Therefore, the LASSI survey provided an effective way to reflectively measure a general understanding of the self-regulatory habits of students in the classroom.

In addition to the LASSI, a preliminary comparison of academic data from the 2015 and 2016 administration of the Stanford-10 was analyzed among 23 of the 27 participants within this study. This data set was used in conjunction with LASSI scores to compare student self-reported SRL strategy use in the classroom with students' academic performance. While there is some controversy in a students' ability to self-report self-regulation accurately (Winters, Greene, & Costich, 2008), paired with quantitative academic data, these measures have found to provide improved insights into learning.

Procedures

Teachers reviewed the LASSI publishers' webpage inclusive of scale descriptions, survey questions, and the user manual before survey administration. Additionally, LASSI developer's instructions were reviewed for clarity and appropriateness of content prior to administration of the instrument. No changes were made to either the LASSI or its corresponding instructional materials as a result of this review. Teachers administered the pre-LASSI survey – online version - within the first two weeks of school via the school's learning management system for all students.

Teachers also uploaded the LASSI publisher developed instructions to the school's learning management system for student access. Students received student codes to protect student identities and were provided as much time as they needed to complete the survey. Data was digitally collected via LASSI's developers' administrative web portal and provided to the researcher per an agreement to evaluate the school.

Four months into the school year, teachers administered the post LASSI survey online by providing LASSI developers' instructions in the school's learning management system. Two students who could not complete the post LASSI during this time completed the survey upon their return from their holiday break. All students received the same instructions as they did for the pre LASSI, used the same student codes, and were given unlimited time to complete the survey.

Inclusion criteria for the study consisted of student completion of the pre and post LASSI survey and attendance during the four-month long semester. Any participant who did not meet one of these three criteria was excluded from the study. Excluded participants included two students who cited an inability to access the code necessary to take the pre LASSI survey, one student who opted out of the pre-survey, two students who did not continue attending the school, and one student who did participate in the post LASSI survey. In all, 27 students met the inclusion criteria. Subsequently, the participation rate for this study was 82%.

Data Analysis

Data were obtained from the web-based LASSI administrative portal of the participating school. All analyses for this study were performed using the IBM Statistical Package for the Social Sciences Version 23.0.0 (SPSS-23). Given the overlapping nature

of LASSI scales, to determine students' self-reported levels of concentration, ability to manage time, self-test, and use study aids, descriptive statistics using raw mean scores were generated for all three LASSI latent constructs. Percentile rank frequencies were run to analyze student performance against LASSI developer's normed scoring interpretation guidelines. These analyses were run in order of the following research questions:

1. What were students' self-reported levels of concentration, ability to manage time, self-test, and use study aids at the start of the school year as measured by the LASSI?
2. To what extent did student self-reported LASSI levels of concentration, ability to manage time, self-test, and use study aids change over the course of a four-month semester?
3. To what extent did a student's family income status moderate the SRL outcomes at the start of the school year and after a four month-semester as measured by LASSI?
4. Were LASSI scales correlated to Stanford 10 math and reading score?

In order to determine how participants' level of concentration, ability to manage time, self-test, and use study aids changed over a four-month semester, a comparison of pre and post LASSI data by all three latent constructs was generated. Descriptive statistics using raw scores were run to determine variations in scale performance. A test of between subject effects was conducted to measure change over time within each scale and a general linear model using multivariate testing was performed to analyze the statistical significance of changes between scales.

A determination of the study's main within subject factors, including a students' family income level and number of semesters in the school, was also analyzed. Descriptive statistics in the way of mean scores were generated for each LASSI scale among each income group for pre and post measures. Also, since the 10 scales on the LASSI are correlated, a multivariate analysis was performed to determine how closely each self-regulation scale was correlated and to determine differences by SES and number of semesters attended at the school. Lastly, an analysis of academic performance for 23 of the 27 participants was generated using results from the 2014 and 2015 Stanford-10 tests. From this data, the relationship between students' self-perceived ability to self-regulate during instruction and their academic performance was determined.

Chapter IV

Results

The following chapter provides an analysis of the results of a study examining students' self-reported ability to self-regulate in a personalized, mobile middle school over the course of a semester. Using a mixed-methods, *ex post facto* research design, qualitative and quantitative data were collected and analyzed using pre and post LASSI measures and Stanford-10 reading and math scores. In particular, a determination of students' pre and post self-reported ability to self-regulate during instruction was analyzed using descriptive statistics for the following four LASSI scales: levels of concentration, ability to manage time, self-test, and use study aids. Since the ten sub scales on the LASSI are correlated (Table 6), a descriptive analysis of the *skill* and *will* constructs and their corresponding subscales were also generated. From all three LASSI constructs, *skill*, *will*, and *self-regulation*, the initial status of each scale as well as changes over time were determined. In particular, these outcomes were described in terms of their correlational status between the 10 self-regulation sub-scales at pretest, any significant changes identified from pre to post on four of those measures, and differences between income groups. Differences by number of semesters attended at the school were also explored. Lastly, correlations between self-regulation and academic performance was investigated. Table 1 highlights the LASSI intercorrelations reported by LASSI developers (Weinstein & Palmer, 2002).

Table 6

LASSI Intercorrelations

Sub-scale	Associated Construct	ANX	ATT	CON	INP	MOT	SFT	SMI	STA	TMT	TST
ANX	Will	1.00									
ATT	Will	0.230	1.00								
CON	Self-Reg	0.424	0.547	1.00							
INP	Skill	.174	0.397	0.441	1.00						
MOT	Will	0.212	0.661	0.579	0.504	1.00					
SFT	Self-Reg	0.120	0.449	0.458	0.641	0.555	1.00	0.336			
SMI	Skill	0.584	0.375	0.622	0.408	0.406		1.00			
STA	Self-Reg	0.069	0.400	0.352	0.538	0.433	0.611	0.256	1.00		
TMT	Self-Reg	0.243	0.535	0.670	0.419	0.610	0.570	0.386	0.444	1.00	
TST	Skill	0.633	0.457	0.641	0.393	0.475	0.382	0.794	0.275		1.00

Source: LASSI User's Manual 2nd Edition (Weinstein & Palmer, 2002). ANX= anxiety; ATT=attention; CON=concentration; INP=information processing; MOT=motivation; SFT=self-testing; SMI=selecting main ideas; STA=use of study aids; TMT=time management; TST=test strategies

Participant Demographics

Pre and post LASSI scores for 27 of 33 enrolled middle school students within the personalized, mobile middle school was analyzed for the 2015-2016 school year. Students were recruited from a variety of educational settings including their local school district, other charter schools, private schools, and home schooling environments. Transfer data shows almost 19% of students who participated in the study were attending the personalized, mobile middle school for the first time, 33% were in their second year, while 48% were in their third year at the school. Of the 27 participants who took pre and post LASSI, just over half were in eighth grade, a quarter seventh grade, and the remained in sixth grade (Table 7). At the time of the time of the second LASSI

administration, almost half of participants in the study had been at the school for five semesters (Table 8). There were slightly more males than females (Table 9) and most participants were of a minority status with 64% of students identifying as African American, Hispanic, or a combination of both (Table 10). Also, the majority of participants (63%) identified as low-income as indicated by student eligibility in the free and reduced meal (FARM) program (Table 11). In terms of special services, no students were eligible to take the STAAR modified test but one student was eligible for a 504 plan. Participants reflected the racial and socio-economic diversity of the total population.

Table 7

Participants by Grade

Grade	Participants		Total population	
	(N)	(%)	(N)	(%)
6th	4	15	7	21
7th	7	26	7	21
8th	16	59	19	58
Total	27	100	33	100

Table 8

Participants by Number of Semesters Attended

Semesters	Participants	
	(n)	(%)
1	5	19
3	9	33
5	13	48
Total	27	100

Table 9

Participants by Gender

Gender	Participants		Total Population	
	(n)	(%)	(n)	(%)
Male	15	55	19	58
Female	12	45	14	42
Total	27	100	33	100

Table 10

Participants by Race

Race	Participants		Total Population	
	(n)	(%)	(n)	(%)
Black	11	41	14	43
Hispanic	5	19	7	21
White	6	22	7	21
Black / Hisp	1	4	1	3
Hisp /White	4	14	4	12
Total	27	100	33	100

Table 11

Participants by Income Level

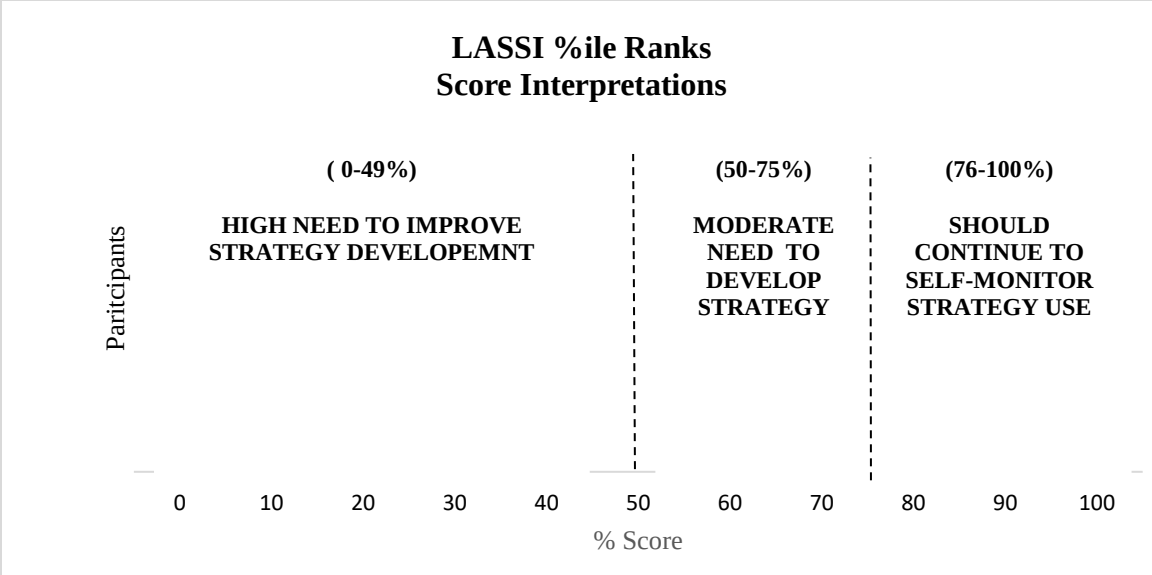
Income Level	Participants		Total Population	
	(n)	(%)	(n)	(%)
Low-Income	17	63	21	64
Not Low-Inc	10	37	12	36
Total	27	100	33	100

LASSI Score Interpretations

Many schools throughout the nation are attempting to ensure students are "college ready" before they graduate from high school. Research suggests college ready students tend to utilize strategic learning strategies in accessing and retaining information, overcoming challenges, and in self-regulating their learning process (Weinstein &

Palmer, 2002). More specifically, students self-regulate their learning process when they can maintain attention on academic tasks, monitor and improve upon comprehension, assess and utilize support systems, and effectively manage time. All skills which generally start to develop as students are granted more autonomy during learning. For many students, this autonomy and initial attempts at self-regulation are first explored during their early teenage years and continue to develop over the course of their lives.

This study primarily focuses on participants' self-reported ability to self-regulate while in a personalized, mobile middle school using a common measure among college-aged students, the LASSI, to assess current levels of ability and changes over a relatively brief period. The LASSI serves as a diagnostic instrument in helping college-aged students identify individual strengths and weaknesses on each scale within the *skill*, *will*, and *self-regulation* constructs. Additionally, the LASSI serves as a prescriptive tool in generating data to support the strategic implementation of targeted interventions aimed at improvement. LASSI cut off scores and their interpretations are described in Figure 11. However, given that cut-off scores were established with a college-aged population in mind, it could be argued middle school students would naturally have a high need to improve skills before being considered college ready. It is expected that middle school students' self-regulatory skills and strategies will continue to grow and develop through the course of their academic lives.



Note: Percentile Rank cut-offs generated from LASSI User's Manual 2nd Edition Score Interpretations (Weinstein & Palmer, 2002).

Figure 11. LASSI percentile ranks score interpretations

Pre-LASSI Results

Self-regulation construct. Participants entering the 2015 academic year scored similarly on their levels of concentration, ability to self-test, manage time, and use study aids (Table 12) on pre-LASSI measures. Standard deviations for raw mean scores fell between 5.8 and 6.6 points indicating students answered consistently across subscales while self-reporting. In cross referencing participants' pre-LASSI raw median scores to publishers' nationally normed percentile rankings (Weinstein & Palmer, 2002), participants ranked highest in time management and use of study aids, ranked slightly below these scales in levels of concentration, and ranked lowest in self-testing. In comparing the median percentile ranks to LASSI publisher cut-offs, all four self-regulatory scales fell between the 20th and 40th percentile mark. This indicates the median middle school participant on each scale came into the school with a high need to improve their ability to concentrate, time manage, self-test, and use study aids.

Table 12

Self-Regulation LASSI Scales Pre Raw Mean Scores and Percentile Ranks

LASSI *Self-Regulation* Scales	Raw Mean Scores				Raw Median Scores & Converted Percentile Ranks	
	min	max	mean	SD	median	%ile
Levels of concentration	15	40	25.0	6.0	25	35
Mange time	16	39	24.3	5.8	25	40
Self-test	11	34	21.4	6.6	20	20
Use of study aids	15	34	24.6	5.0	24	40

Level of concentration pre-LASSI results. Most participants entered the 2015 school year with some degree of needed improvement in directing and maintaining their attention during instruction. As identified on Figure 12, nearly 8% of participants ranked above the 75th percentile mark on the pre-LASSI. These participants started the school year with high levels of concentration but should still monitor strategy use going forward. An additional 22% of participants ranked between the 50th and 75th percentile marks, suggesting a moderate need for strategy development in concentration. Per LASSI cut-off score interpretations, participants who fall below the 50th percentile rank on any scale have a high need to improve. Of participants who took the pre-LASSI, 70% fell at or below this mark on the concentration scale.

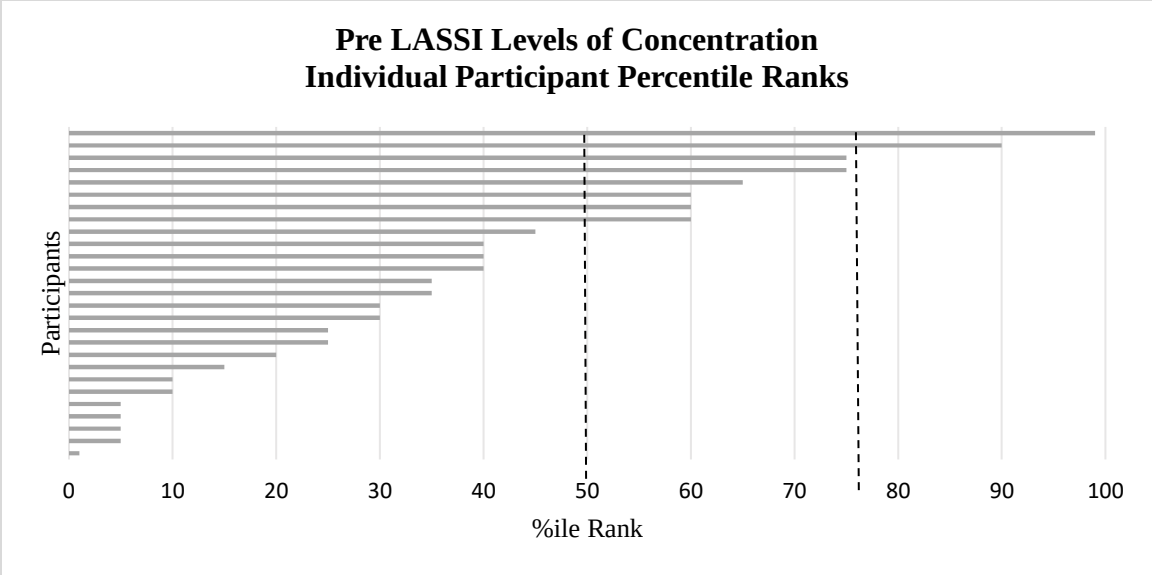


Figure 12. Pre-LASSI levels of concentration individual percentile ranks

Time management pre-LASSI results. Participants who took the pre-LASSI at the start of the 2015 school year self-reported varying degrees of capacity in time management. As identified on Figure 13, 7% of participants ranked above the 75th percentile mark on the time management scale on the pre-LASSI. These participants self-reported a high ability to manage their time during instruction but would continue to benefit from further monitoring of strategy use towards successful learning. An additional 19% of participants ranked between the 50th and 75th percentile mark indicating a moderate need for time management development. Per LASSI cut-off score interpretations, participants who fell below the 50th percentile rank on any scale have a high need to improve. Of participants who took the pre-LASSI, 74% fell below this mark.

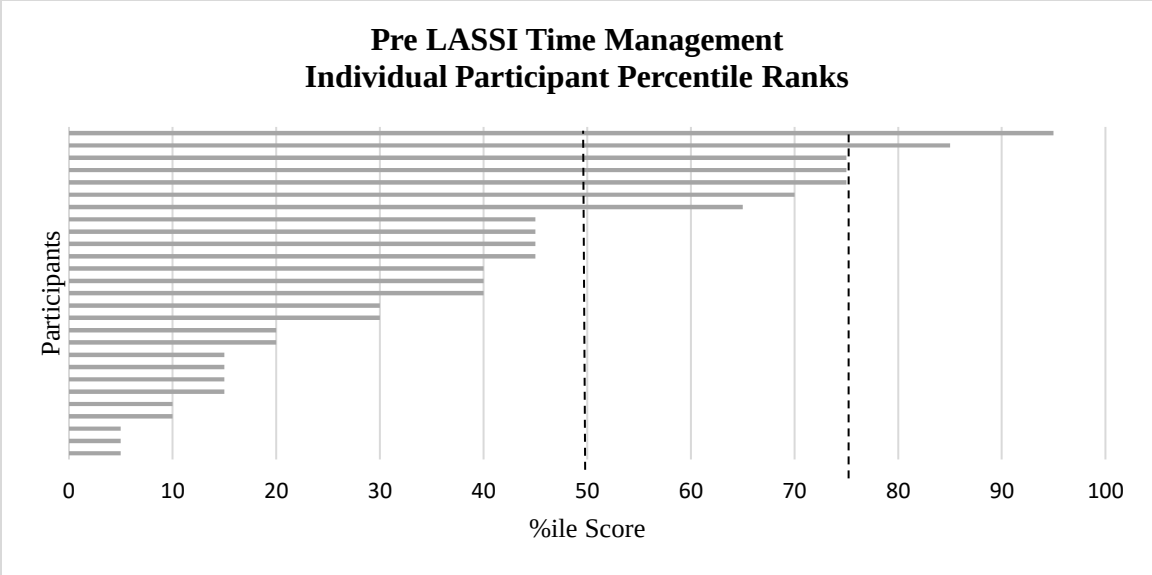


Figure 13. Pre-LASSI time management individual percentile ranks

Self-testing pre-LASSI results. Participants self-reported varying abilities to self-monitor comprehension during instruction. As identified in Figure 14, 15% of participants ranked above the 75th percentile mark indicating a high ability to self-test during instruction. These students should continue to monitor currently used strategies towards personal growth and development. An additional 15% of participants ranked between the 50th and 75th percentile mark indicating a moderate need for improvement in the development of self-testing. Per LASSI cut-off score interpretations, participants who fell below the 50th percentile rank on any scale have a high need to improve. Of participants who took the pre-LASSI, 70% of participants fell at or below this mark in self-testing.

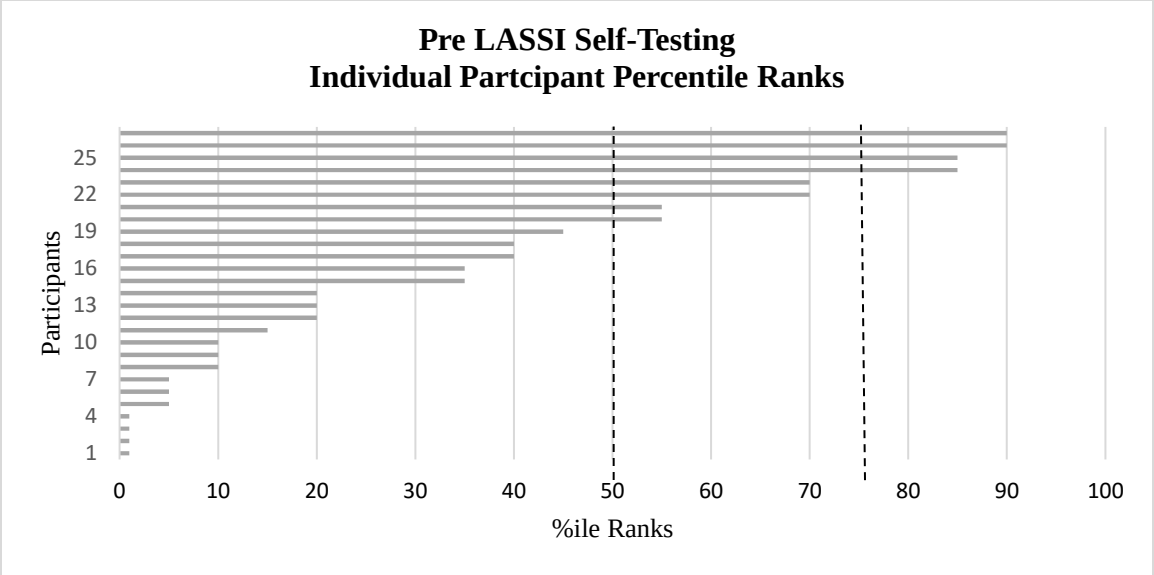


Figure 14. Pre-LASSI self-testing individual percentile ranks

Use of study aids pre-LASSI results. Participants self-reported using different levels of support techniques during instruction. As identified on Figure 15, 22% of participants ranked above the 75th percentile mark in their use of study aids. These participants have self-reported a high ability to use study aids during instruction but would benefit from continual monitoring of current strategy use. An additional 22% of participants ranked between the 50th and 75th percentile marks indicating a moderate need for continual development of study aid use. Per LASSI cut-off score interpretations, participants who fall below the 50th percentile rank on any scale have a high need to improve. Of participants who took the pre-LASSI, 56% fell below this mark on the study aids scale.

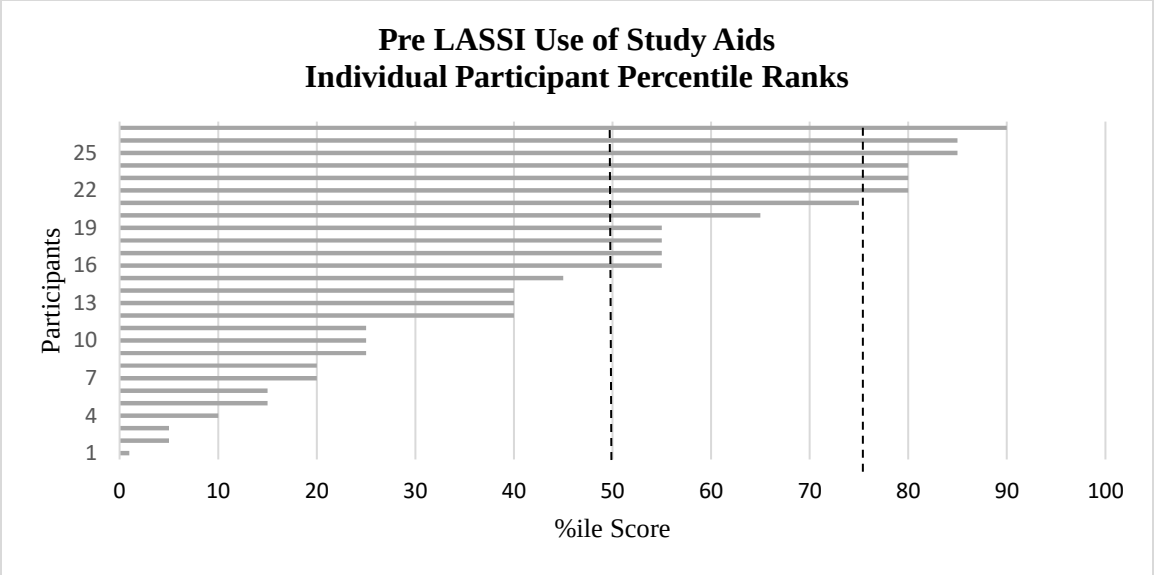


Figure 15. Pre-LASSI use of study aids individual percentile ranks

Self-regulation construct pre-LASSI results by semesters in school. The potential for differences by semester was also explored. Results of the general linear model MANOVA did not identify any difference over time for levels of concentration, self-testing, time management, and use of study aids by the number of semesters enrolled. To demonstrate this outcome, descriptive statistics for the four variables by semesters enrolled are provided (Table 13).

Table 13

Descriptive Outcomes by Semesters Enrolled

Semester(s)		Pre Concentration	Pre Self-Testing	Pre Study Aids	Pre Time Management
1	Mean	27.6000	24.6000	24.4000	26.60000
	N	5	5	5	5
	SD	5.89915	7.53658	4.72229	4.037326
3	Mean	25.2222	20.3333	26.8889	25.33333
	N	9	9	9	9
	SD	8.08977	6.61438	4.01386	7.017834
5	Mean	23.7692	20.9231	23.0000	22.76923
	N	13	13	13	13
	SD	4.22599	6.37000	5.32291	5.479566
Total	Mean	24.9630	21.4074	24.5556	24.33333
	N	27	27	27	27
	SD	5.98383	6.58821	4.95622	5.837544

Skill Construct Pre-LASSI Results

Students entering the 2015 academic year scored similarly on their ability to process information, select main ideas, and engage in test strategies on pre-LASSI raw mean measures (Table 14). In cross referencing participants' raw median score to LASSI publishers' scale norms found in the LASSI User's Manual 2nd Edition (Weinstein & Palmer, 2002), participants ranked highest on the information processing and test strategies scales while ranking slightly lower on the selecting main ideas scale. Standard deviations for the *skill* construct fell between 5.8 and 6.4 points indicating students answered consistently across subscales while self-reporting. When translating raw median scores to percentile ranks per LASSI publisher cut-offs, all three *skill* scales' percentile ranks fell between the 35th and 40th percentile mark. This indicates the median

middle school participant on each *skill* scale came into the school with a high need to improve his or her ability to process information, select main ideas, and engage in test strategies.

Table 14

Skill LASSI Scales Pre Raw Mean Scores and Percentile Ranks

LASSI *Skill* Scales	Raw Mean Scores				Raw Median Scores & Converted Percentile Ranks	
	min	max	mean	SD	median	%ile
Information Processing	16	39	26.4	5.8	26	40
Selecting Main Ideas	17	40	27.0	6.4	26	35
Test Strategies	17	40	27.4	6.1	28	40

Using Figures 16-18, frequencies of individual participants' pre-LASSI percentile ranks were analyzed to determine students' *skill* level in accessing and retaining information. Of the three *skill* scales on the pre-survey, 19% of participants scored above the 75th percentile mark on selecting main ideas scale, 18% performed at this level on the information processing scale, and 15% ranked in this range on the test strategies scale. These students do not have a high need to improve strategies but should still monitor their skill development over time. Students who ranked in the 50th to 75th percentile range have a moderate need to improve their skill development. This included 22% of respondents in both the selecting main ideas and test strategy scales as well as 30% of participants on the information processing scale. Students with the highest need to improve their *skill* development scored below the 50th percentile mark. On the pre-LASSI, participants most frequently scored in this range on the test strategy scale (63%) almost as frequently on the selecting main ideas scale (59%) and least frequently in this range on the information processing scale (52%).

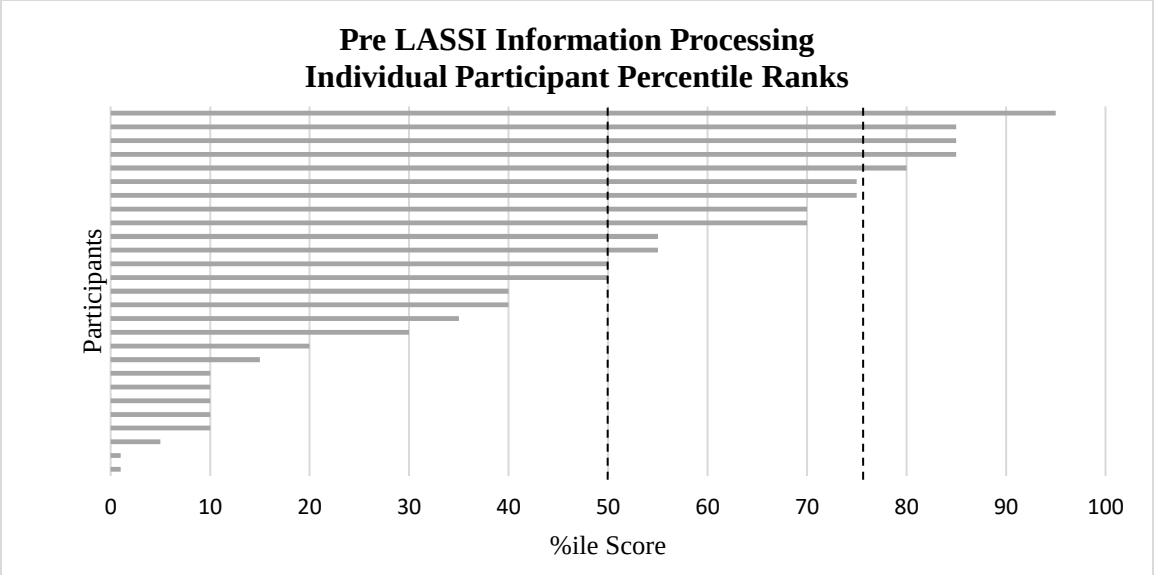


Figure 16. Pre-LASSI information processing individual percentile ranks

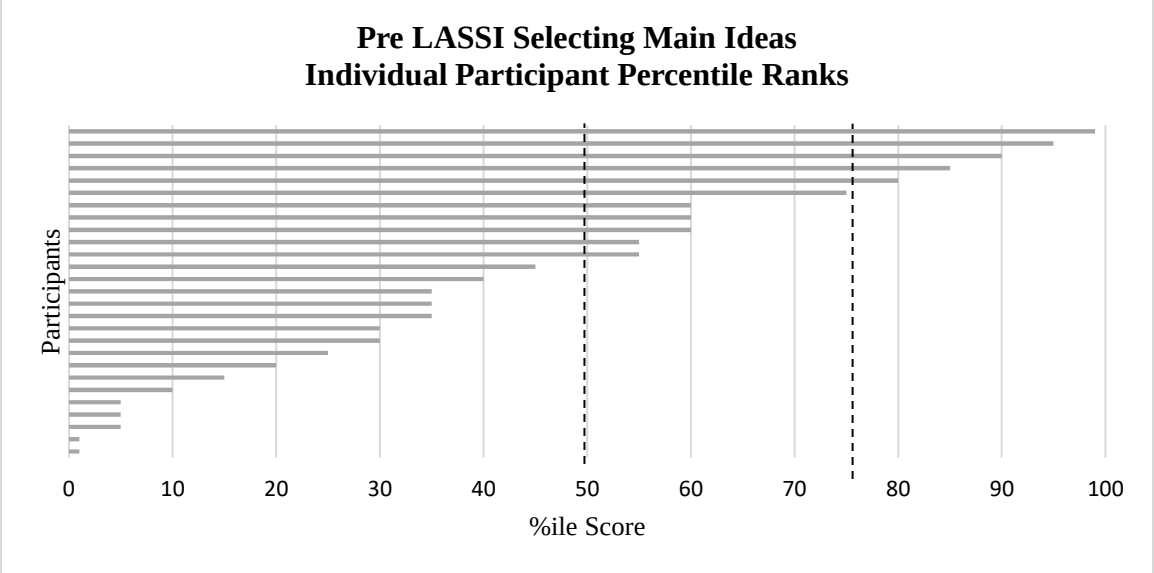


Figure 17. Pre-LASSI selecting main ideas individual percentile ranks

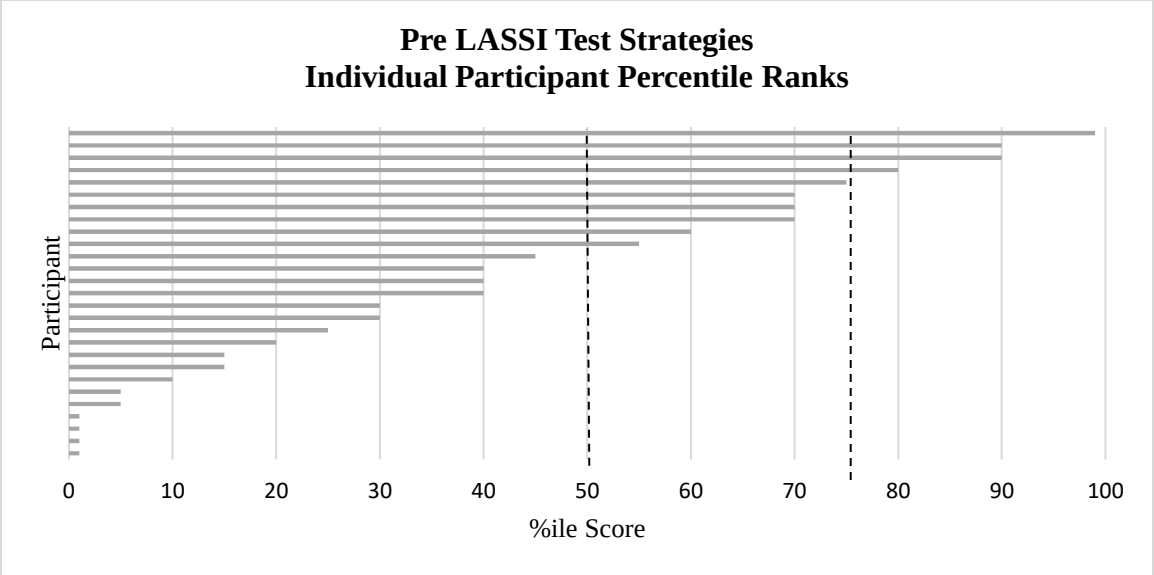


Figure 18. Pre-LASSI test strategies individual percentile ranks

Will **Construct Pre-LASSI Results**

Middle school participants entering the 2015 academic year scored similarly on anxiety, attitude, and motivation scales when analyzing pre-LASSI raw mean scores (Table 15). Standard deviations for the *will* construct fell between 3.6 and 8.0 points. Meaning, students answered consistently across attitude and motivation scales but held greater variation on anxiety scales while self-reporting. In cross referencing participants' raw median score to LASSI publishers' scale norms found in the LASSI User's Manual 2nd Edition (Weinstein & Palmer, 2002), participants ranked highest in attitude, next in anxiety, and slightly lower in motivation. When translating these raw median scores to percentile ranks per LASSI publisher cut-offs, both anxiety and motivation percentile ranks fell below the 50th percentile mark. This would indicate the participant with the median anxiety score came into the school with a high need to improve the degree to which he or she worries about school. Scores indicate the participant with the median motivation score has a high need to improve their effort, self-discipline, and diligence

while in school. Only the attitude median score, across all ten pre-LASSI scales, ranked out of the high need for improvement range. At the 50th percentile rank, this participant held a moderate need to improve their attitude towards achieving academic success.

Table 15

Will LASSI Scales Raw Scores Pre and Post

LASSI *Will* Scales	Raw Mean Scores				Raw Median Scores & Converted Percentile Ranks	
	min	max	mean	SD	median	%ile
Anxiety	10	39	23.0	8.0	24	40
Attitude	25	38	33.1	3.6	34	50
Motivation	19	40	30.1	5.3	30	35

In reviewing each *will* scale found in Figures 19-21, individual percentile ranks for all three scales were analyzed. Participants who ranked as not having a need to improve *will* strategies but should continue to self-monitor development fell at 22% of participants on the anxiety scale, 18% of participants on the motivation scale, and 11% of participants on the attitude scale. Participants who self-reported a moderate need to improve these areas included 41% of participants on the attitude scale, 22% on the motivation scale, and 11% of participants on the anxiety scale. Participants who self-reported a high need to improve these same areas included 67% of participants on both the anxiety and motivation scales and 41% of participants on the attitude scale.

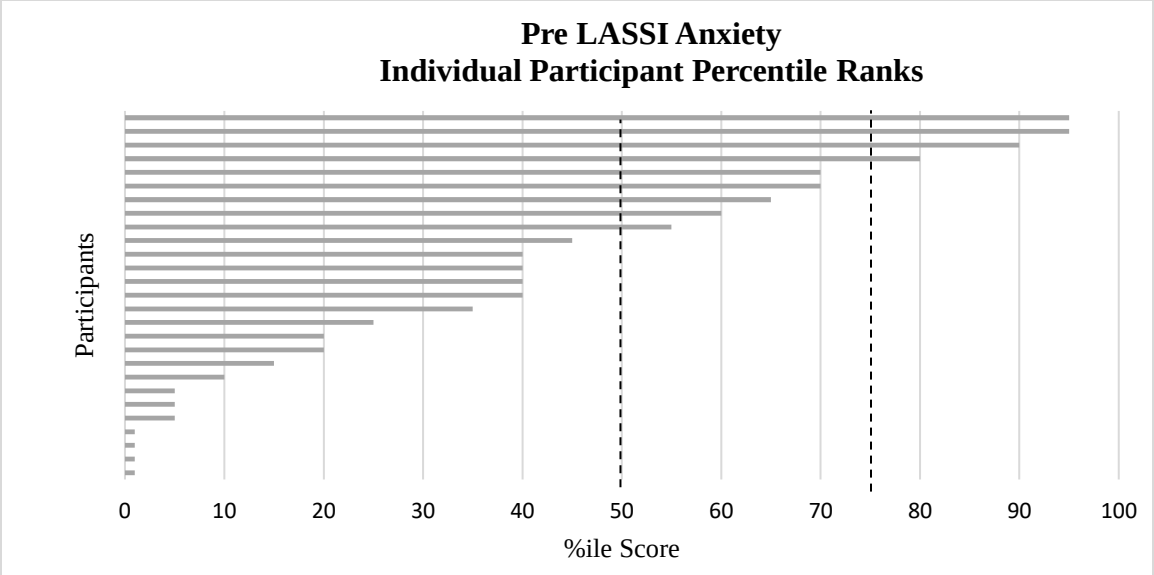


Figure 19. Pre-LASSI anxiety individual percentile ranks

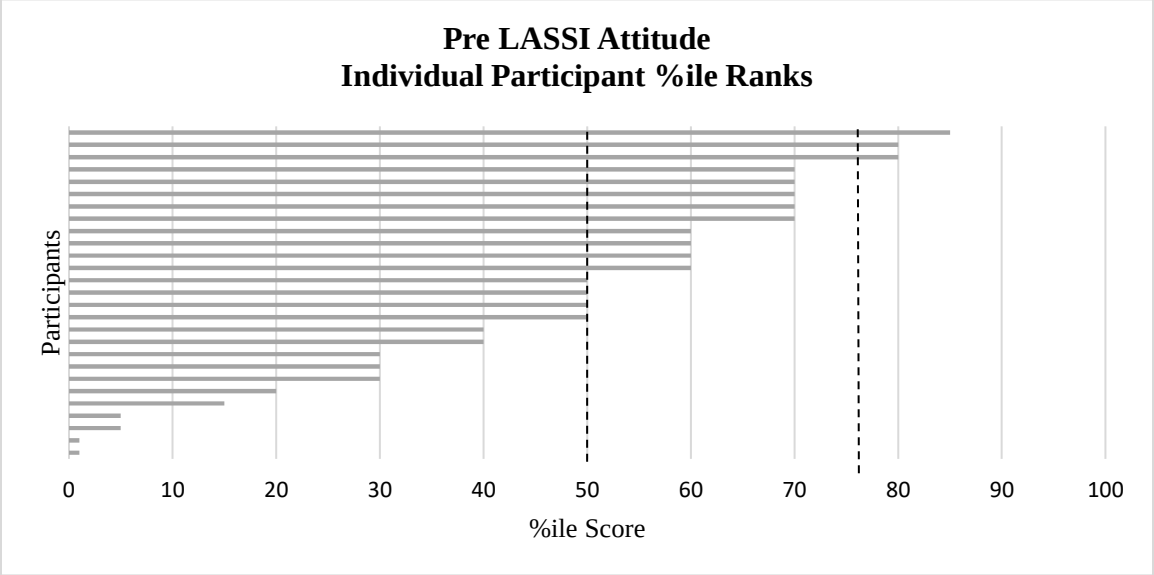


Figure 20. Pre-LASSI attitude individual percentile ranks

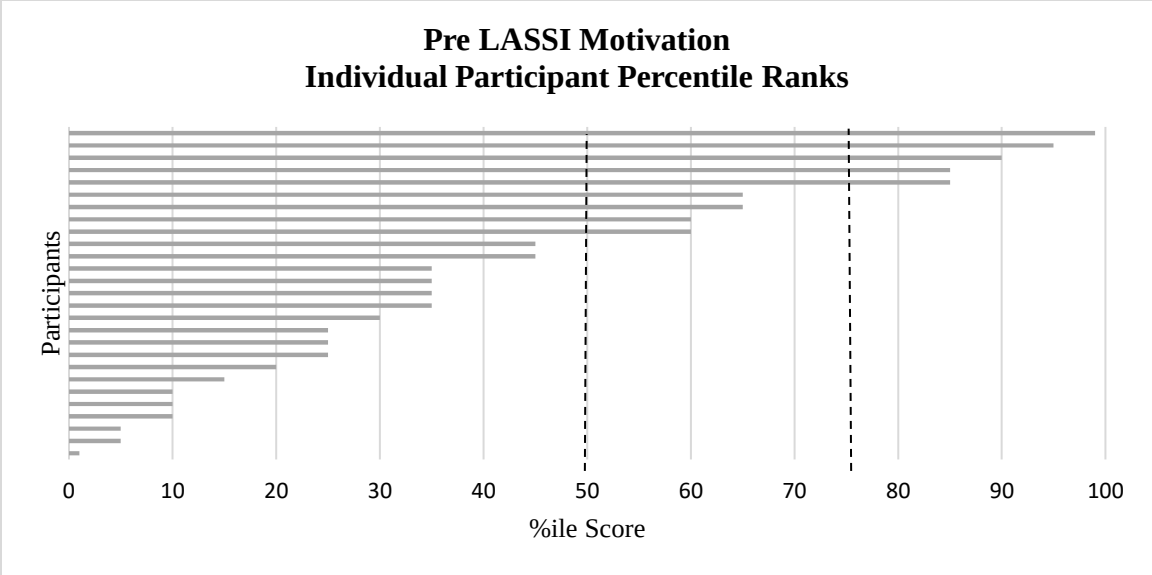


Figure 21. Pre-LASSI motivation individual percentile ranks

Post-LASSI Results

Self-regulation construct post-LASSI results. Post-LASSI raw mean scores reflected similar levels of concentration, ability to self-test, manage time, and use study aids (Table 16). Means increased slightly in levels of concentration, self-testing, and use of study aids from pre to post measures while time management means decreased slightly during this time frame. The self-testing scale does show a discernable trend in the appropriate direction over a brief period of time but the small sample size does not provide sufficient power to detect a significant difference. Standard deviations for post-LASSI self-regulation raw mean scores fell between 5.8 and 7.2 points. Meaning, students answered with some consistency across subscales while self-reporting.

In cross referencing participants' raw median scores to LASSI publishers' nationally normed rankings (Weinstein & Palmer, 2002), self-testing ranked highest, study aids and levels of concentration ranked next, while the time management scale ranked lowest. When translating raw median scores to percentile ranks per LASSI

publisher cut-offs, three self-regulatory scales fell between the 25th and 45th percentile rank. This indicates participants falling at the median still have a high need to improve their ability to concentrate, time manage, and use study aids. However, the degree of need over time has improved by 5% in levels of concentration and use of study aid from pre to post-LASSI measures. On the time management scale, this need to improve has regressed by 15%. The biggest gains were found on the self-testing scale from pre to post-LASSI measures. Self-testing's median percentile rank (45%) placed the scale in the moderate need for improvement range. This indicates participants should continue to develop their skills and strategies in self-testing but do not exhibit a high need to do so.

Table 16

LASSI Self-Regulation Scales Raw Scores Pre and Post

Post-LASSI Self-Regulation Scales	Pre-LASSI Raw Mean Scores				Post-LASSI Raw Mean Scores			
	mean	SD	median	median rank %ile	mean	SD	median	median rank %ile
Concentration	25.0	6.0	25	35	25.1	6.3	26	40
Mange time	24.3	5.8	25	40	23.8	6.4	22	25
Self-test	21.4	6.6	20	20	23.4	7.2	27	65
Study aids	24.6	5.0	24	40	24.8	5.8	25	45

Prior to running t-tests to determine any changes over time, the relationship between each scale in the self-regulation construct was determined. The level of concentration was found to positively and significantly correlated with the time management scale ($r = .784$, $p < .01$) while the use of study aids scale was found to be positively and significantly correlated with the self-testing scale ($r = .705$, $p < .01$). All other correlations between self-regulation scales were found to be moderately and

significantly correlated. Since the subscales were clearly correlated, the Bonferroni correction was applied when paired sample t-tests were computed. Each of the four t-tests had an *alpha* level of 0.0125. No significant difference could be found among all four self-regulation sub-scales, however, a trend could be observed for self-testing scale.

Self-regulation construct post-LASSI results by semesters in school. A further analysis by participants' time spent in school by semester was performed (Table 17). Repeated measures general linear models analyses were computed for each of the four variables. No significant interactions for semesters enrolled over time were identified for levels of concentration, self-testing, time management, and use of study aids.

Table 17

Self-Regulation Intervention Effects over Time by Semester

	Type III Sum of Squares	df	Mean Square	F	Sig.
Concentration	53.900	2	26.950	.737	.489
Self-Testing	64.395	2	32.198	.726	.494
Time Management	66.492	2	33.246	.974	.392
Study aids	80.578	2	40.289	1.733	.198

LASSI Results by Income Level

Many of the students who attended the school qualified for Free and Reduced Meals. Prior studies show that scores on the LASSI can differ for students at various income levels. Consequently, a General Linear Models repeated measures MANOVA was run to detect any differences across the ten LASSI subscales over time by income level. No significant interaction between time and income levels for the 10 sub-scales was determined (Wilk's Lambda, F=0.702; df 4.22; p=0.59). Descriptive information for

the two groups at the two points in time for the LASSI outcomes are provided in tables 18 and 19.

Table 18

Pre-LASSI Self-Regulation Scales Raw Scores by Income Level

Pre-LASSI Self-Regulation Scales	Low-Income Pre Raw Mean Scores (n= 17)				Not Low-Income Pre Raw Mean Score (n=10)			
	mean	SD	median	median %ile rank	mean	SD	median	median %ile rank
Concentration	24.4	5.3	24.0	30	26.0	7.1	25.5	35-40
Manage Time	22.7	4.8	23.0	30	27.1	6.6	26.0	45
Self-Test	19.4	6.1	18.0	15	24.7	6.2	23.5	40
Study Aids	22.6	4.4	21.0	20	27.9	4.1	27.5	60-65

Table 19

Post-LASSI Self-Regulation Scales Raw Scores by Income Level

Post-LASSI Self-Regulation Scales	Low-Income Post Raw Mean Scores (n = 17)				Not Low-Income Post Raw Mean Scores (n=10)			
	mean	SD	median	median %ile rank	mean	SD	median	median %ile rank
Concentration	24.8	5.7	25	35	25.7	7.5	26	40
Manage Time	22.5	5.3	21	20	25.9	7.7	25	40
Self-Test	21.0	6.6	19	15	27.5	6.5	27	65
Study Aids	23.3	5.8	22.0	25	27.4	5.1	28.5	65-70

Correlations

Academic and Self-Regulation Correlations. Stanford 10 reading and math scores from the spring of 2016 were paired with LASSI self-regulation scale raw mean scores for 23 of the 27 participants in this study. From this analysis, it was determined that participants' math and reading scores, as would be expected, are strongly and positively correlated ($r = .721$, $p < .01$). Reading scores and the use of study aids scale

scores were moderately and positively correlated ($r = .503$, $p > .01$). All other self-regulation scales held minimal positive correlational values with no statistical significant relation to the academic data. The sample size provided little power to conduct these analyses.

Chapter V

Discussion

The purpose of this study was to analyze a personalized, mobile middle school ability to advance students' self-regulatory skills in the areas of concentration, self-testing, time management, and use of study aids over the course of a semester. Analyses included participants' initial levels of self-regulation, growth over time, and performance by income level. Additional analyses determined possible relationships between self-regulatory scales and math and reading levels. This study used mixed-method, *ex post facto* research design through the analysis of pre and post LASSI measures and Stanford-10 reading and math scores. Using these measures, the following four research questions were answered:

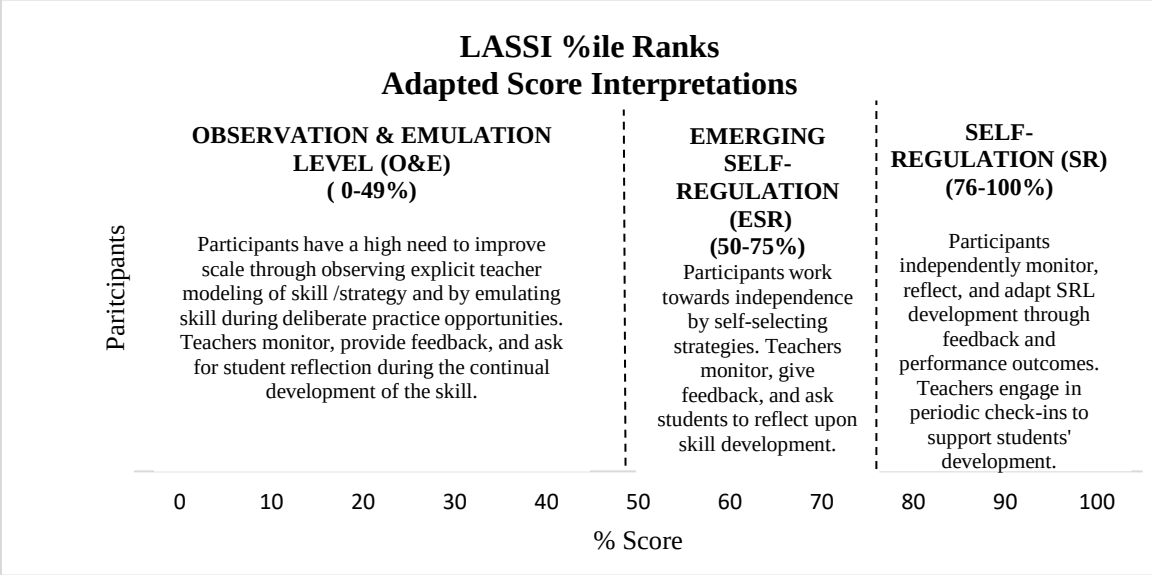
1. What were students' self-reported levels of concentration, ability to manage time, self-test, and use study aids at the start of the school year as measured by the LASSI?
2. To what extent did student self-reported LASSI levels of concentration, ability to manage time, self-test, and use study aids change over the course of a four-month semester?
3. To what extent did a student's family income status moderate the SRL outcomes at the start of the school year and after a four month-semester as measured by LASSI?
4. Were LASSI scales correlated to Stanford 10 math and reading score?

A deeper discussion of each question is presented through the lens of previously presented theory and research-based literature. Research limitations, implications, and a discussion of future research directions follows this discussion.

Social Cognitive Modeling

While the LASSI's User Manual 2nd Edition provides cut-off scores normed on a national college-aged population, developers explain score interpretations may be adapted to fit local contexts. Students at the personalized, mobile middle school are in the early stages of their self-regulatory development. As such, a framework that emphasizes the development of skills from infancy to independence will be used. Figure 22 outlines Zimmerman's (2013) social cognitive modeling theory within the LASSI cut-off score framework. Zimmerman's theory was specifically chosen for its capacity to introduce a skill or strategy, develop it through practice, and transfer it across different contexts. Since it can be argued middle school students are in the initial stages of development towards self-regulation, score interpretations in Figure 22 reflect a path of growth inclusive of actionable steps aimed at student improvement.

Social Cognitive Modeling for Improvement



Note: Percentile Rank cut-offs generated from LASSI User's Manual 2nd Edition Score Interpretation (Weinstein & Palmer, 2002). Cut-off interpretations adapted from Zimmerman's (2013) social cognitive modeling towards self-regulation theory

Figure 22. LASSI percentile rank adapted score interpretations

Initial Self-Regulation Results

In analyzing students' initial self-reported levels of concentration (M= 25.0, SD= 6.0), ability to self-test (M= 21.4, SD= 6.6), manage time (M= 24.3, SD= 5.8), and use study aids (M= 24.6, SD= 5.0) per LASSI score interpretations (Weinstein & Palmer, 2002), participants slightly varied in their ability to self-regulate but generally fell in the high need to improve range on all four self-regulation scales (levels of concentration = 70%, time manage = 74%, self-test = 70%, and use study aids = 56%). Per LASSI developers' Low Score Interpretations Guide (Weinstein & Palmer, 2002) detailed in Appendix D, most students at the beginning of the school year in the personalized, mobile middle school would benefit from the continual development to improve their attention on tasks, scheduling techniques, strategies to limit procrastination, as well as techniques to monitor comprehension. Only the use of study aids was identified as a

more secure strategy among participants; with just over half of students self-reporting a high need to further utilize outside supports.

Why a high need to improve? These results are not surprising. As stated before, students in the middle school are being compared to a college-aged population in their self-reported abilities to self-regulate in this study. Given students have upwards of four to six years before being eligible for post-secondary opportunities like college, it is very much expected they would score in the high need to improve range in their ability to utilize self-regulation strategies as compared to college-aged students. As such, the scores presented here should serve as a baseline to measure progress. Bandura (1991) states one's ability to self-regulate is both a developmental and interrelated process. Middle school students who are just learning how to work independently in school would most likely not have yet developed the appropriate SRL skill level to be fully self-regulated. This process takes time and deliberate effort. Eventually through modeling, practice, reflection, and tweaking of skills and strategies, students can begin to acquire a sophisticated set of tools which advance their ability to drive their own learning process. Current scores should support students' growth, in middle school and beyond, through the creation of developmentally appropriate instructional opportunities towards self-regulation. Also, LASSI self-regulation scales have been found to be highly correlated (Weinstein & Palmer, 2002). If a student needs improvement in their ability to time manage, they most likely need similar levels of support for self-testing, use of study aids, and in improving levels of concentration. Having opportunities to explicitly teach and practice one self-regulatory skill advances the development of others. Therefore, it is not surprising for students to score similarly on all four self-regulation scales.

Why did some students do well? On the other hand, some students in the personalized, mobile middle school self-reported high levels of self-regulation (levels of concentration = 8%, time manage = 7%, self-test = 15%, and use study aids = 22%) at the beginning of the school year. These students, according to Zimmerman's (2013) social cognitive modeling theory are in a position to independently monitor, reflect, and adapt SRL strategies while being continually supported by teachers. Students in this category are possibly better prepared for the self-directed atmosphere the school affords. Consistent with findings from similar school models who do not explicitly teach SRL but do engage in intrapersonal skill development (Murphy et al., 2014), findings suggest some students have developed the necessary proactive disposition to self-mange in 21st century settings. As Winnie (1997) theorizes, these students may have independently and successfully developed SRL strategies through a trial and error process found implicitly while learning. By explicitly paying attention to their learning process, these students may have internalized character development strategies towards an independently developed set of proactive skills aligned with self-regulation. As Zimmerman (2013) describes, students who are proactive in their learning approach most likely have higher degrees of self-efficacy beliefs, outcome expectancies, mastery learning goals, task interests, self-control, monitoring, self-reflection, and adaptation than reactive learners.

What were students' initial skill and will levels? An analysis of students' *skill* and *will* subscales were also performed to determine if initial findings in these areas may influence a students' ability to self-regulate through the course of the semester. *Skill* sub-scale results indicated students scored in the same range in their ability to process information, select main ideas, and use test strategies as they did on *self-regulation* sub-

scales. This indicates at the start of the school year, most students had difficulty identifying important information, determining meaning, and in preparing for and taking tests (Weinstein & Palmer, 2002). Standard deviations for these sub-scales feel between 5.8 and 6.4 indicating students answered consistently and most likely accurately while self-reporting.

In the *will* construct, anxiety and motivation sub-scales also fell in the same range as *self-regulation* sub-scales. This indicates, at the start of the school year, most students had difficulty in using coping techniques to reduce anxiety in school and were less likely to accept responsibility for their academic outcomes. Standard deviations for these scores fell between 3.6 and 5.3 indicating students answered consistently and most likely accurately while self-reporting. Not surprisingly, on all ten sub-scales, students reported highest on their ability to maintain a positive attitude towards a college-going culture. Their scores in this domain indicate students have a solid but emerging level of understanding that college is both relevant and an important step to fulfill their lifelong goals (Weinstein & Palmer, 2002).

Growth Over Time

Results indicated, from pre to post measures, participants self-reported consistently in their ability to concentrate (preM= 25, SD= 6.0; postM=26, SD= 6.3) and use study aids (preM= 24.6, SD= 5.0; postM=24.8, SD= 5.8) and showed moderate improvement in their ability to self-test (preM= 21.4, SD= 6.6; postM=23.4, SD= 7.2). Only the time management scale (preM= 24.3, SD= 5.8; postM=23.8, SD= 6.4), held a decrease from pre to post measures. This finding is consistent with a study conducted by Drexel (2010) in which students reported time management as the most difficult aspect of

engaging in a personalized learning platform. Though some improvement was evident, students predominantly ranked in the high need to improve range in all four *self-regulation* scales on post-survey measures (Weinstein & Palmer, 2002).

Why didn't students grow beyond a high need to improve? For several reasons, the LASSI may have been an inadequate tool to measure middle school students' self-reported ability to self-regulate in the personalized, mobile middle school. Perhaps most crucially, the validity and reliability of the instrument may have been diminished when administered to middle school students. As shown in Appendix C, less than 1% of the norming sample included college students seventeen years of age or younger. When in fact most of the normative sample reflected college students between the ages of eighteen and nineteen. This is still five to seven years older than the students in the personalized, mobile middle school. While the teachers at the school reviewed the sample questions and instruction sheet before LASSI administration, it is unknown if students in this middle school interpret questions as they are intended to be interpreted. Additionally, it is unknown if the LASSI appropriately matches middle school students' emotional/social and metacognitive capacity to self-reflect on their self-regulatory experiences. While the LASSI shows promise for use with this age group, the revised High School version or the more contemporary third addition could provide additional evidence to determine the status of students' current self-regulatory skills.

The lack of growth across scores could also be due to other factors including but not limited to a lack of time to develop skills, a lack of direct alignment between the character development strategies taught and SRL skill development, and/or the presence of certain student characteristics which may moderate self-reported performance. Over

the four-month semester, students may not have had enough time to assimilate to the school's culture and therefore were not able to self-regulate instruction. In a study of a personalized learning environment by Drexler (2010), students expressed having to overcome a learning curve in engaging in PLEs to increase their comfort level in the program over time. Students in this study also expressed feeling overwhelmed at the beginning of the year when many processes and tools were being introduced in to support the PLE. Therefore, it is possible students in the personalized, mobile middle school may have demonstrated more growth over the course of the year as they gained experience in the school. This, of course, can be tested in the future if the school takes a longitudinal approach to this study.

Per the school's charter application (2015), the personalized, mobile middle school outlined several character development strategies like *grit* and *self-control* (Duckworth, 2016) to specifically address the learning characteristics students needed to self-direct learning. As suggested in the literature review, while *grit* and *self-control* are important elements of a students' work ethic to engage in learning strategies, they are not skill sets that show students *how* to engage in and self-manage their learning process. While *grit* and *self-control* provide the perseverance and passion for a student-centered, technology-based environment, they do not yield the internal instruction manual for performance. However, *grit* and *self-control* are not mutually exclusive to SRL instruction. It is possible both frameworks for independent learning could complement and build off each other in a personalized, mobile middle school.

Consistent with research in self-regulation, variations in the sophistication and use of SRL skills can be dependent on the presence of certain student characteristics

(Zimmerman & Martinez-Pons, 1990; Rudolph, Lambert, Clark, & Kurlakowsky, 2001; Kitsantas & Zimmerman, 2002; Zimmerman, 2013; Raver, 2012; Roy, McCoy, & Raver, 2014). For example, in a study of self-regulation at the middle school level (Rudolph, Lambert, Clark, & Kurlakowsky, 2001), researchers hypothesized healthy interpersonal relationships between parents, teachers, and students may improve a student's self-regulatory process. In turn, improved skill may alter depressive pathways during critical transition periods in middle school. While all students who participated in the study were in middle school, they varied in age, gender, ethnicity, experience, educational background, and income levels. Per research, students' level of expertise (Kitsantas & Zimmerman, 2002) in navigating in the school may influence their ability to self-regulate. Of the 27 of 33 enrolled middle school students who participated in this study, 19% of students were in their first semester in the personalized, mobile school, 33% were in their third semester, and 48% were in their fifth semester at the school. While research supports the idea that experts tend to engage in more sophisticated SRL strategy use over novices (Kitsantas and Zimmerman, 2002), no effect by self-reported levels of experience on the pre-LASSI could be found in the personalized, mobile middle school. This lack of finding was most likely due to small comparison groups. Still, it is still advisable to consider different levels of expertise in the school when designing SRL instruction. In particular novice learners tend to monitor performance, adapt learning strategies, and seek social supports less than expert learners (Kitsantas & Zimmerman, 2002).

How do we improve self-regulation?

Zimmerman's (2013) social cognitive modeling theory could provide an effective lens to teach SRL across different contexts. Students who demonstrated a high need to

improve their ability to self-regulate may benefit from the observation and emulation of explicit modeling of SRL strategies. For example, teachers can model what it looks like to concentrate despite distractions, how to schedule work, how and when to perform comprehension checks, and which academic resources to use when challenges arise. This modeling should be closely followed by student practice and reflection opportunities. Reflection of internal and external feedback helps students solidify strategies as being valuable in context or, if unsuccessful, as needing further adaptation and or development to be successful. As Winters, Green, and Costich (2008) contend, students who more frequently use SRL strategies in CBLEs have exhibited increased positive learning gains. However, researchers warn introducing strategies without practice and support does not address students' inability to calibrate performance. Rather, teachers must adaptively scaffold the development of skills during instruction to support students' development.

Adapted score interpretations. Per Zimmerman's (2013) social cognitive modeling approach, students who rank as having a high need to improve (70%) would benefit from observing and emulating (OE) SRL strategies. This structured approach may be necessary for students to adequately define each strategy and successfully implement it in practice. On the other hand, some students have self-reported as having a developing ability to concentrate which requires more practice to improve. More specifically, 19% of participants fell at this emerging level of self-regulated (ESR) concentration. These students should continue to be monitored by teachers as they continue to practice and develop their strategies to sustain adequate levels of concentration. Other participants (11%) self-reported as having advanced, ability to

concentrate in the middle school. These students would benefit from continual self-monitoring and teacher guidance during strategy development.

Using the same logic structure as above, per Zimmerman's (2013) social cognitive modeling theory, participants could also benefit from observing and emulating strategies to improve self-testing (OE=59%, ESR= 19% SR=7%), time management (OE=67%, ESR= 15% SR=11%), and use of study aids (OE=55%, ESR= 15% SR=30%) during instruction. More specifically, students should observe explicit SRL instruction, emulate strategies during deliberate practice opportunities, and independently practice these strategies while being monitored and supported by teachers. As Schunk (2008) states, this explicit instruction has the potential to support students' cognitive processes and strategies to independently encode, store, process, and retrieve information successfully over time.

Improving levels of concentration. Before cognitively modeling how to concentrate, the underpinnings of this skill must first be dissected. What does a student have to do to concentrate while learning? Bandura (1991) describes the following five SRL strategies termed by Zimmerman (2013) in addressing levels of concentration during academic work: goal-setting and planning, implementing self-consequences, self-evaluation, and seeking social supports. Students who can concentrate tend to continually evaluate performance against a standard, or a goal, that is either internally or externally set. Students who pay attention to their performance are more likely to create realistic sub- goals to achieve larger ones. Subsequently, realistic sub-goals can help students improve concentration levels in their ability to decrease frustration and increase motivation. When students are less frustrated they are more likely to correctly prioritize

tasks despite distractions. Having a goal in mind with an attached reward can improve motivation towards a students' increased level of concentration. These rewards can be intrinsic, extrinsic or a combination of both (American Psychological Association, 2015) but should generally be intrinsic in nature when possible (Dweck, 2006).

While the SRL strategies described above can be introduced, taught, and practiced using social cognitive modeling (Zimmerman, 2013), other promising research in SRL development also supports a student's ability to concentrate in school. In particular, self-transcendent prompts during goal setting may help students improve their self-efficacy to learn (Yeager et al., 2014). These prompts are generally embedded in the directions of an assignment to support students' planning. They prompt students to describe how their engagement in the content at hand will better serve society. In other words, what is a *student's* role in society and how can this content support that work? Yeager et al., (2014) contend helping students develop a sense of self-transcendence in learning through the engagement of well-designed prompts can help build students' motivation, self-efficacy to learn, and persistent towards the completion of tasks. This was evident even when the task was deemed boring. Yeager et al. (2014) also found self-transcendent prompts increased the occurrence of academic self-regulation for all groups but most especially for minority students.

Improving self-testing. Self-testing is a complex construct supported by a students' ability to engage in deliberate practices. Bandura (1991) describes the following four SRL strategies termed by Zimmerman (2013) in addressing practices consistent with self-testing during academic work: self-evaluation, reviewing records, rehearsing, and memorizing content. Students who have improved levels of

comprehension due to self-testing are more likely to accurately evaluate their progress during work. Winne (1997) theorizes students successfully self-monitor when they can integrate internal and external feedback against a standard or a goal. To do this work, students must have an accurate, internal portrayal of progress (Bandura, 1991). This portrayal can initially be honed through external feedback inclusive but not limited to teacher appraisals, peer comparisons, and / or through community based mentorships. Eventually, students learn to not only adapt to feedback to improve comprehension but also learn how to generate quality internal feedback for themselves when they self-test. Formal and informal moments of feedback should be tracked when possible. When students can see their path in learning complex concepts, they are better able to see where they have faltered during moments of failure. Rehearsing and memorizing content can also support self-testing and one's ability to self-regulate. In one study of a blended schools (Murphy et al., 2014), students who were deemed academically successful were more likely to self-manage during independent learning opportunities. As a start, securing basic concepts among the student population through rehearsal and memorization provides the knowledge base necessary to be able to self-regulate instruction. When students do not know at least a preliminary level of content, they are less able to engage in self-testing practices.

What does the research say about implementing self-testing strategies in practice? Similarly to levels of concentration, a cost and time effective method to improve students' ability to self-test is to engage students in a social cognitive modeling process (Zimmerman, 2013) with opportunities to practice skills and support development. Given the nature of data collection in technological settings, the personalized, mobile

middle school, through their learning management system, have a distinct advantage in housing and accessing records of feedback over traditional schools. In a study by Wong and Looi (2011) students who used a specific protocol to engage in the assessment of feedback in reviewing the development of objectives, learning activities, and skill sets, demonstrated greater complexity and connections between concepts. This was especially true if the consolidation process of feedback and knowledge was first modeled by teachers. Learning management systems can greatly assist in housing and organizing archived feedback on demand. Reviewing feedback increases the likelihood students will create accurate portrayal of learning which may lead to improved self-testing practices.

However, as concluded in the blended learning study (Murphy et al, 2014) providing students with timely data in blended, student-centered learning environments is important but sometimes difficult. As such, researchers suggest a dedicated professional be responsible for this management. This leaves teachers the time they need to focus on performance coaching. Likewise, the blended learning study (Murphy et al., 2014) indicated teachers thought technology did a great job of instilling basic knowledge but did always support activities that involved higher order thinking skills and content. This assertion was backed up within an investigation of a personalized, learning environment (West, 2011). These findings can potentially help teachers navigate which online activities students' may practice monitoring and self-testing strategies independently and which require more teacher's guidance to secure understanding. One simple strategy which has demonstrated preliminary levels of effectiveness in mobile settings (Sha, Looi, Chen, & Zang, 2012), includes the use of concept maps, like KWLs (Ogle, 1986), to help students' self-monitor comprehension in the moment and during rehearsal. However, as

Sha, Looi, Chen, and Zang (2012) contend, students are more likely to complete concept maps in MLEs when they are intrinsically motivated.

Improving time management. Bandura (1991) describes the following four SRL strategies termed by Zimmerman (2013) in addressing time management practices which support academic work: goal setting, planning, organizing, as well as keeping and monitoring records. Goal setting is an essential component of successful student-centered, blended instruction (Murphy et al, 2014). All strategic learning decisions that lead to self-regulation are weighted against goals (Bandura, 1991). As Winnie (1997) contends, a goal orientated disposition inclusive of SRL strategies is preferable over working without such a plan. Indiscriminate self-regulatory progress monitoring checks made by students make it difficult for them to see the whole picture during learning, support learning as a process, and or to backtrack missteps along the way. When planning goals, students should deconstruct large goals into smaller ones (American Psychological Association, 2015) to make the work more manageable and to help students determine task length. This allows students to plan their time correctly, keep track of progress, and monitor performance. It is also important to convey to students; time allotments are not stagnant indicators. If a student needs more time completing a task - all is not lost. Rather, students should adapt their plan accordingly.

Teachers are busy professionals. What better way to teach goal setting and time management strategies than to socially and cognitively model (Zimmerman, 2013) the work teachers do to support students? Students would not only develop the strategies they need to manage time but they could also perhaps grow deeper in appreciation for the work teachers do. While the institution of learning plans have been found to increase

self-awareness, self-management, and a desire to exhibit self-control (Prain et al., 2013), other supports can also be used. For example, when modeling goal setting and planning, teachers should provide students with a template to keep track of performance. Eilam and Reiter (2014) provide such a tool in their study of self-regulated learning capacities of ninth grade science students. These goal setting templates can be found in Figure 8 and Figure 9. The first template, the YSRI, breaks down a set of no more than twenty goals for the year while the second template, the WSRI, breaks up one or two goals by day. Students use the WSRI to create a daily agenda outlined by ten minute increments. To support a student's ability to develop organizational and planning skills even further, each template asks guiding comprehension and reflection questions during task completion. This information is used to inform the next day's planning session as well as a student's learning process. While goal setting may help students stay on task, according to Eliam and Reiter (2014), when students create performance instead of mastery goals, they are less likely to define learning activities associated with the goal. This means teachers must ensure students create mastery goals during planning so they can monitor their own performance.

Improving use of study aids. Zimmerman (2013) addresses the following four SRL strategies associated with a student's use study aids during academic work: self-evaluation, seeking information, self-consequences, and seeking social assistance. Using study aids to improve learning involves a self-evaluative process which involves students' ability to indicate current resources or strategies for learning are not working. After this self-evaluation, students should initiate efforts to seek further information either through online resources or social supports. Since teachers in the school

personalize instruction for all but may not always be available to support students one-on-one, students may need to expand their definition of social supports to include peers and community members already selected by the school to support instruction. As with any SRL strategy, students are motivated to do this work through intrinsic and extrinsic rewards they have or others have created for them. Goal setting also serves as a mechanism to help students self-identify when they need help. When students fall short of a goal, they should be encouraged to seek social supports as well as online resources available to them.

Social cognitive modeling (Zimmerman, 2013), like for all other self-regulation scales, could be an asset to help students learn to authentically use study aids while learning online. As previously stated, teachers are busy and often must find creative ways to deliver high quality instruction to all. It can take a village. Modeling this thought process can demonstrate to students it is not only important to evaluate progress against a standard but also it is okay to admit help is needed, especially when there are so many social and digital supports available to students online.

In a study by Clarebout, Horz, Schnotz, and Elen (2010), students who used support devices significantly less when they were not embedded into the learning activity. Students who used embedded supports were found to use these supports more frequently and for longer periods of time. If students chose a specific support for learning out of a series of choices, they were more likely to get the most possible use out of the self-chosen support. If it not possible to embed supports into an assignment, it may be prudent to create a troubleshooting handbook to highlight what resources are available for the most common learning challenges present in the school. This would give students

an entry level opportunity to learn how to help themselves before immediately relying on teachers for support.

Results by Semesters in School and Income Status

Income status, more specifically poverty, can affect students' ability to self-regulate during instruction (Raver, 2012; Roy, McCoy, & Raver, 2014). Because 63% of the school's population identified as low-income, attempts were made to decipher differences between income groups on all four self-regulation measures. From pre to post results on all four scales, students who identified as low-income scored lower than their counterparts. More specifically, on post-survey measures, a six-point gap was evident between low-income (postM= 21.0) and not low-income (postM= 27.5) students' ability to self-test. However, no significant interaction between time and income levels for any of the sub-scales could be determined. Meaning, there isn't enough power in this study to state weather or not poverty influenced a low-income students' ability to self-regulate. However, research shows low-income students can reduce anxiety levels that can prohibit success in school when they engage in supportive guidance (Raver, 2012). Reducing students' stressors due to poverty through counseling has been found to not only improve self-regulation but also academic performance. (Roy, McCoy, & Raver, 2014).

Academic Correlations

As studied by the American Institute of Research (2014), well-implemented schools that focus on intrapersonal development skills, like learning how to learn, have generated deep learning measures. Similarly, in an empirical review of technologies used to personalize instruction, West (2011) found a computer-assisted geometry program that

focused on self-regulation skills, like help seeking behavior, improved learning outcomes. In pairing the four self-regulation scores with Stanford 10 reading and math scores, reading scores and the use of study aids were moderately and positively correlated ($r = .503$, $p > .01$). All other self-regulation scales held minimal positive correlational values with no statistical significant relation to the academic data. One possible explanation may be that the sample size provided little power to conduct these analyses.

Research Limitations

Though some limitations to the study have already been discussed, other limitations associated with this study should be mentioned before implications and final conclusions are made. First, students' growth was measured over a short period of time with a small population. While students did demonstrate small, incremental levels of growth during the four-month semester for three of the four self-regulation scales, extending the study could have demonstrated greater degrees of school impact on students' ability to self-regulate. Secondly, the LASSI 2nd edition was an imperfect measure for this context. As Zimmerman (2013) states, explicit instruction should follow appropriately aligned instruments and clearly defined measurements which reflect SRL in context. Measuring SRL instruction removed from the actual instructional moment students are using SRL strategies in context does not always give researchers a full picture of instructional tendencies. As Winnie (1997) contends, students do not always give accurate portrayals of performance, leading self-reported data to be analyzed with some a degree of caution. Additionally, the LASSI 2nd Edition was created in 1987, some 28 years after the study was performed and with a college-aged population in mind. Ideally, a more contemporary instrument inclusive of a middle school norming

population would have been used. Also, questions on the LASSI included words like *textbooks* and *lectures* to determine students' self-reported SRL strategy use. While students certainly read text and watch lectures online, they may or may not have not made the crosswalk between terms.

Implications

While some limitations were present in the study, encouraging implications found in this work can be made. First, many of the strategies suggested in the discussion section are cost-effective and time permissive practices. Implementing SRL strategies into the personalized, mobile middle school's teaching and learning system could serve to not only help students to become more independent and learn deeply but also has the potential to allow teachers more *time* to personalize instruction for every student. While this might not be a large benefit in a small school with 33 students, as the school plans to grow to 540 students, a plan to ensure students are self-regulated and working towards being self-directed is desirable. The benefits do not only extend to the personalized, mobile middle school but also to similar schools who are also trying to redesign education to fit a 21st century context. By sharing best practices in this work, the school has the potential to help a generation of kids develop the strategies necessary to sustain the work ethic needed to succeed in post-secondary settings.

Future Research Needs

While the implications for this work are exciting, more research is needed before teachers can implement this work at scale. First, the school may benefit from research opportunities that provide more qualitative measures to support evidence of SRL learning in context and in real time. Observing what decisions students are making as they are

making them would be invaluable. Technology could support this work. Technological applications which report on students' search tendencies, for example, could provide information on how many times students engaged in help-seeking behavior while online. Also, as addressed by Zimmerman (2013), more research is needed to show how certain student populations differ in their ability to self-regulate in CBLEs. The personalized, mobile school, while small, exhibits great diversity. If the school could support a longitudinal approach to this study, there is a great opportunity to significantly add to our understanding of 21st century learning environments. More specifically, a greater understanding of which instructional models and supports best advance all students in digital settings could be secured.

Conclusions

Schools who are working hard to reimagine what it means to educate children in a 21st century context are new and exciting environments. However, much more work is needed to fully grasp how schools can help students foster the intrapersonal skills necessary to succeed from student-centered middle school environments to eventual post-secondary settings. While the personalized, mobile middle school is working to create a self-directed student population via character development strategies like grit into their daily instruction, research shows a student's ability to self-regulate is a likely precursor to this self-directedness. Likewise, research suggests that the driver of academic performance in digital learning is the quality of students' SRL process (Winters, Greene, & Costich, 2008). Preliminary studies in these settings suggest SRL can be enhanced through prompts, tools, access to peers, and through the guidance of supportive adults in overcoming challenges in technological learning environments. As such, a plan to

support SRL instruction in the personalized, mobile middle school will be outlined in an action plan provided in the next chapter. By continuing to track self-regulation strategies at the school as well as best practices to support SRL instruction, a standard process of SRL instruction can be developed and supported. This standard process has the potential to support the school's healthy growth at scale, the evolution of a national 21st century school community, and -most importantly - generations of highly skilled and employable students to come.

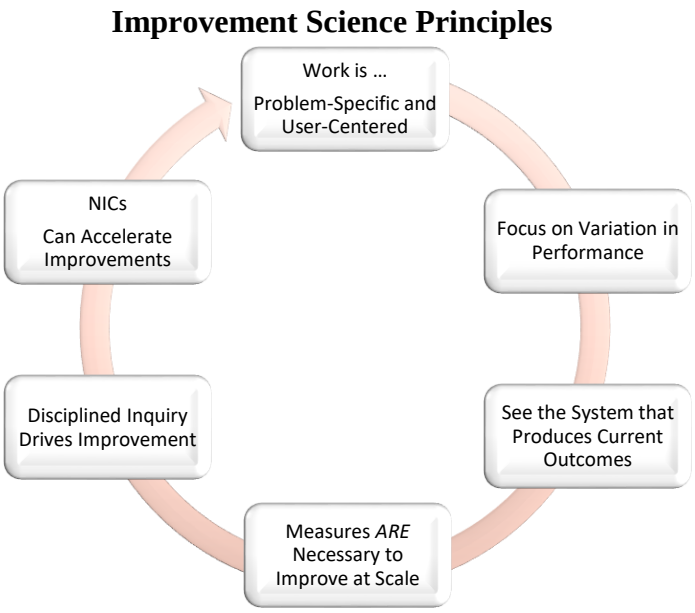
Chapter VI

Action Plan

In their book *Learning to Improve*, Bryk, Gomez, Grunow, and LeMahieu (2015) describe improvement science as a methodological approach to strategically improve practice over time. It demands a systematic approach to integrating new solutions into complex systems through a series of questions and analyses. Through the course of this study, it has been determined students in the personalized, mobile middle school should improve their ability to self-regulate instruction towards self-directedness. Likewise, this study has unearthed an understanding of SRL approaches that may or may not be appropriate for this learning context. Testing, revising, and adapting these strategies to fit student and teacher's needs is of great importance to the school in its current state, the campus as it expands, and to other schools with similar teaching-learning models. However, simply asking teachers to teach self-regulated learning (SRL) strategies in the existing teaching and learning system could de-value and de-construct much of the high quality work the school is already doing. The purpose of using improvement science to introduce a new practice should not to be to disrupt current systems of learning but to enhance them. As such, improvements can be thoughtfully integrated, according to Bryk, Gomez, Grunow, and LeMahieu (2015), through the implementation of the six principles listed in Figure 23.

Using these six improvement science principles, the following action plan serves as a plan for the personalized, middle school to organize, refine, and transform SRL instruction carefully and slowly in context. This work begins in one classroom, next across many classrooms, then across one campus, and eventually through all campuses in

the school. Through each step of the way, the strategy for improvement is analyzed, revised, and developed into a standard process to be followed with integrity by all users in the system. By focusing on one classroom and then one campus to start, the school is making a commitment to learn fast in a controlled setting. This allows those implementing SRL strategies within the school to limit many complications from extraneous variables that could potentially derail the learning to improve process.



Source: Bryk, Gomez, Grunow, and LeMahieu (2015)

Figure 23. Improvement Science Principles

Work is Problem-Specific and User-Centered

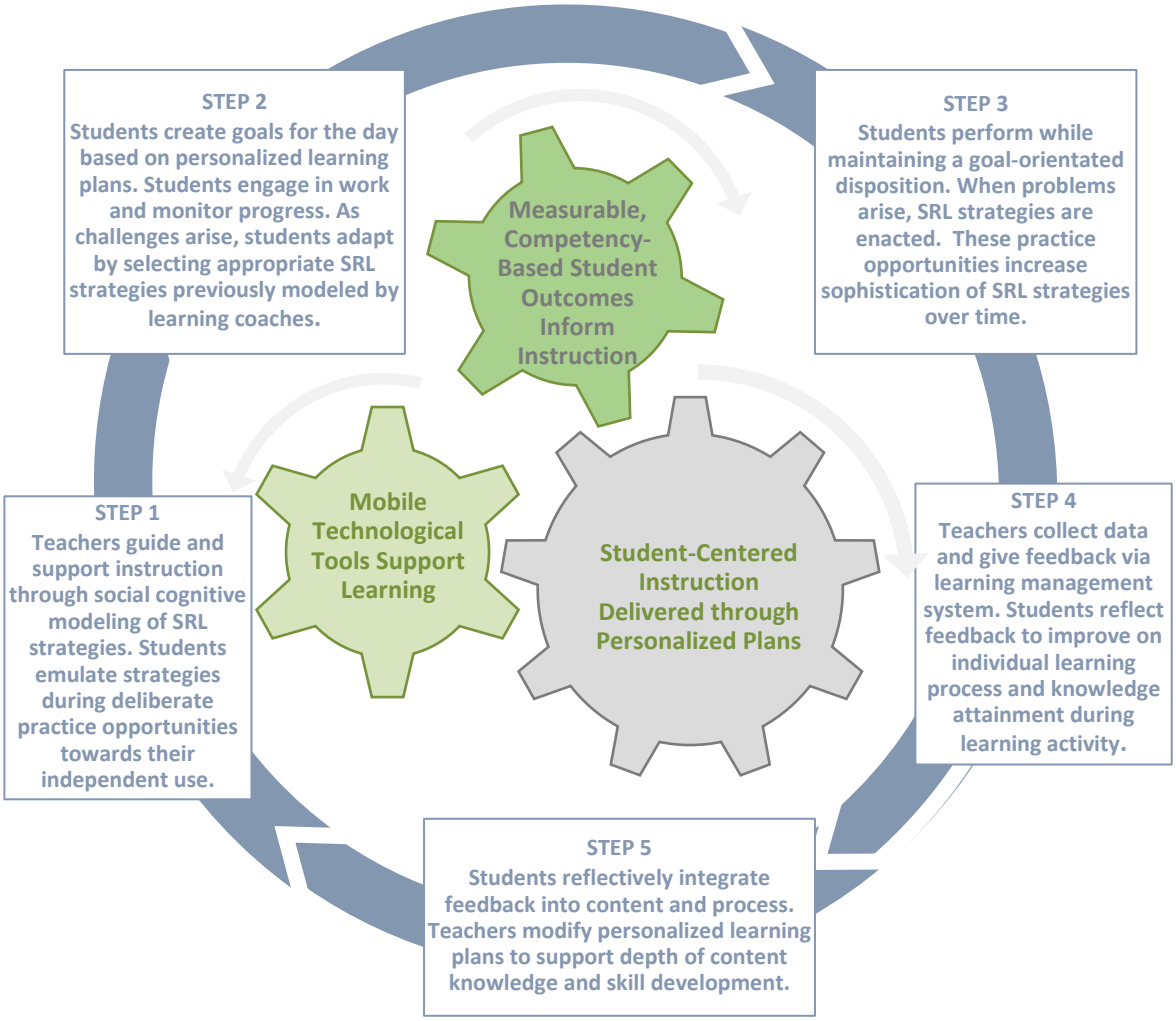
The teaching and student relationship in the personalized, mobile middle school is at the center of the user experience. How students and teachers interact with each other in the learning system has great impact on learning outcomes. Figure 24 illustrates the theorized relationship between teachers and students when SRL instruction is appropriately utilized. This relationship is one of give and take. While students are

expected to be self-directed while using mobile technologies, they rely on teacher feedback and personalized instruction to advance thought process towards the sophistication of SRL development. Likewise, teachers rely on a student's ability to advance learning through metacognitive competencies consistent with monitoring one's own learning process. Per research existent in the literature, the explicit instruction of SRL can foster productive independence if strategically taught (Lajoie &Azevedo, 2006; Eliam & Reiter, 2014). Yet, as discovered in this study, no clear understanding of how to teach SRL in this context has yet to be understood. If the school could create a standard measurement tool to support teacher development of SRL instruction which accurately reflects a teacher's capacity to engage students in SRL, a clearer understanding of the state of SRL instruction in the personalized, mobile middle school could be ascertained. Pairing data from this evaluative tool with student LASSI scores could help the school indicate where teachers need more support, as well as which strategies are or are not most effective in teaching SRL in context. This understanding not only serves to improve the teaching-learning system within the school but could also improve the teaching-learning relationship among other schools who use similar models.

What evidence have researchers used to support the need for 21st century based instructional support among the educational community? As contended by Herold (2015), *Education Week's* K-12 technology analyst, national and regional studies suggest teachers are more apt to use technology tools to enhance teacher-centered rather than student-centered instruction. This is troubling for much of the way deep learning occurs can be linked to the skill development that occurs during technology based, personalized, student driven instruction (Moeller & Reitzes, 2011). The good news is the National

Center for Education Statistics (2010) reports teachers are more likely than ever to use technology in their classrooms. While this sounds promising, having access to and effectively utilizing technology are not always synonymous concepts. The Pew Research Center (2014) deemed the quality of technology integration highly dependent on the perceived comfortability and expertise of use by each teacher. While most teachers agree that technologies are useful instructional tools in classrooms, they also report feeling inept in knowing how to drive instruction in this platform. Herold (2015) proposes that this technological fear is often manifested through the type of classroom instruction being utilized by technology. For example, many teachers still rely on basic internet searches to help students conduct research and prepare written text (Pew Research Center, 2014). Herold (2015) contends the power of promising technological innovations is generally being thwarted to support the management of one's teacher-centric practice. Subsequently, there lies an exorbitant missed opportunity to use technology to develop personalized, student-centered instruction. Adapting to this approach would take a reevaluation of a teacher's role; one of a learning facilitator and not of an instructional leader, an understanding of the power of technology to personalize learning, as well as a commitment to student-centered instruction. This study and the subsequent implementation of this action plan supports traditional teachers' transition to 21st century teaching-learning environments through the creation of a standard process to support SRL instruction

The SRL Driven Teaching-Learning System



Source: Adapted from Bandura (1991); Zimmerman (2013)

Figure 24. The SRL driven teaching-learning system

Assessing Variations in Performance: SRLOQ and LASSI

As supported by the Association for Supervision and Curriculum Development (2015), district leaders must reassess the emphasis placed on being a *highly qualified* teacher. Instead, district leaders should focus on a teacher's individual growth and development towards becoming *highly effective* in their classrooms. While research and

theory support can support best practices towards being a *highly-effective* teacher, implementing best practices with integrity takes a persistent and thoughtful approach inclusive of practice, timely feedback, and reflection while being supported by mentors, instructional coaches, and/or administrators. Improvement science allows teachers and administrators in a school the space to do this work by thoughtfully and scientifically measuring teacher practices against student outcomes.

Through the investigation of a personalized, mobile middle school, it was revealed students may benefit from instruction that supports a strategic learning process towards self-regulation. More specifically, teachers should provide explicit instruction in fostering a students' ability to self-regulate instruction. Subsequently, a teacher survey developed by Vrieling, Bastiaens, and Stijnens, (2012) links theoretical principles of self-regulated learning (SRL) to address instructional practices which foster strategic learners who work independently. Known as the Self-Regulated Learning Opportunities Questionnaire (SRLOQ), this instrument measures the extent to which teachers explicitly and authentically promote SRL strategies in their classrooms. More prescriptively, Vrieling, Bastiaens, and Stijnens (2012) suggest implementing Zimmerman's four phases of social cognitive modeling to engage in SRL instruction. Through the interplay of social cognitive modeling and instructional assessment via the SRLOQ, researchers propose a process to assess and support teacher and student engagement in SRL instruction. Along with data from the LASSI, data from the SRLOQ can help to determine the effectiveness of SRL strategy development in the classroom. Teachers can then use the results as a mentoring tool to improve their capacity to teach SRL in context.

Implementing the SRLOQ. As mentioned previously, the SRLOQ in its current form, may not directly align to the needs of the school. As such, the instrument should be piloted and adapted with the help of an experienced teacher and administrator within the school. These modifications may include: changes in language, the length of administration, the times during the week in which the SRLOQ is administered, a specification of response terms like *almost* and *sometimes*, and/or the inclusion of questions highlighting missing but relevant teaching strategies. Lastly, teacher-administrator team who pilots the SRLOQ should determine if results correctly link to LASSI findings.

Once the SRLOQ has been piloted at the teacher level, it should be then be rolled out to other classrooms within the school. It is important the instrument is utilized by teachers with different levels of experience, across different disciplines, and different student age groups within the school. If implementation differences are discovered between teachers, they should be noted and discussed. While following a standard process of SRLOQ implementation is highly recommended, improvement science offers teachers in the system some degree of flexibility. Ideally the parameters of this flexibility have been tested in the early piloting and testing phases. Once the SRLOQ has been piloted among one user and tested among many classrooms, it is ready to be strategically rolled out across campus wide and implemented with integrity.

See the System

According to improvement research, before one can deconstruct, change, or adapt a system to a new context, the specific and interrelated components that drive the work must be well understood. Bryk, Gomez, Grunow, and LeMahieu (2015) recognize

schools must address an increasing complexity in learning in a 21st century. The task society is asking students to be able to do upon graduation looks vastly different than before the dawn of the information age. Yet plugging in innovative components into an existing learning system spells failure if not clearly defined by current instructional designers and understood by the teachers who are carrying out the work. Only when components are operationalized can an intervention, such as implementing a self-regulated learning (SRL) instructional assessment, be understood, carried out, and measured towards an analysis of successful implementation. Figure 25 highlights standard elements often found in the literature when describing the components of 21st century schools.

Initial challenges. Taking a systems approach in learning how to embed SRL instruction in the personalized, mobile middle school, it would be advisable to dedicate much of the time at the beginning of the school year to social cognitive modeling of SRL strategies across all teachers and content within the school. Since, SRL is deeply connected to metacognition, self-efficacy, motivation, and academic performance, securing a students' path towards self-regulation on the onset of the school year would increase the likelihood of student functionality throughout the year. Sacrifices would have to be made initially, as teachers would have to put content on hold in favor of a heavy emphasis on SRL strategy implementation. However, the benefits of developing students' ability to self-regulate during instruction could potentially more than make up for the time lost at the beginning of the school year. By not having to divert as much energy and attnetion on the management of students, teachers would have more time to coach for performance, track and analyze data, give feedback, design personalized

instruction, and foster healthy relationships. In other words, when students can do more for themselves, teachers can do more for them.

Variations in performance. Even with the heavy emphasis on explicit SRL instruction at the beginning of the school year, some students will still need more support than others. Given teachers can house an unlimited amount of content in learning management systems, teachers should have dedicated instructional videos with follow up practice sessions in the areas of concentration, time management, self-testing and use of study aids for unlimited students use. These videos should be mandatory for students to watch if key SRL strategies are deemed lacking. If students still are missing critical components of self-regulation, students can still meet one-on-one with teachers for further support. Students who have emerging levels these skills can share strategies and success stories using social media platforms. The goal is to create a culture within the system to support student ownership and pride in their ability to learn independently.

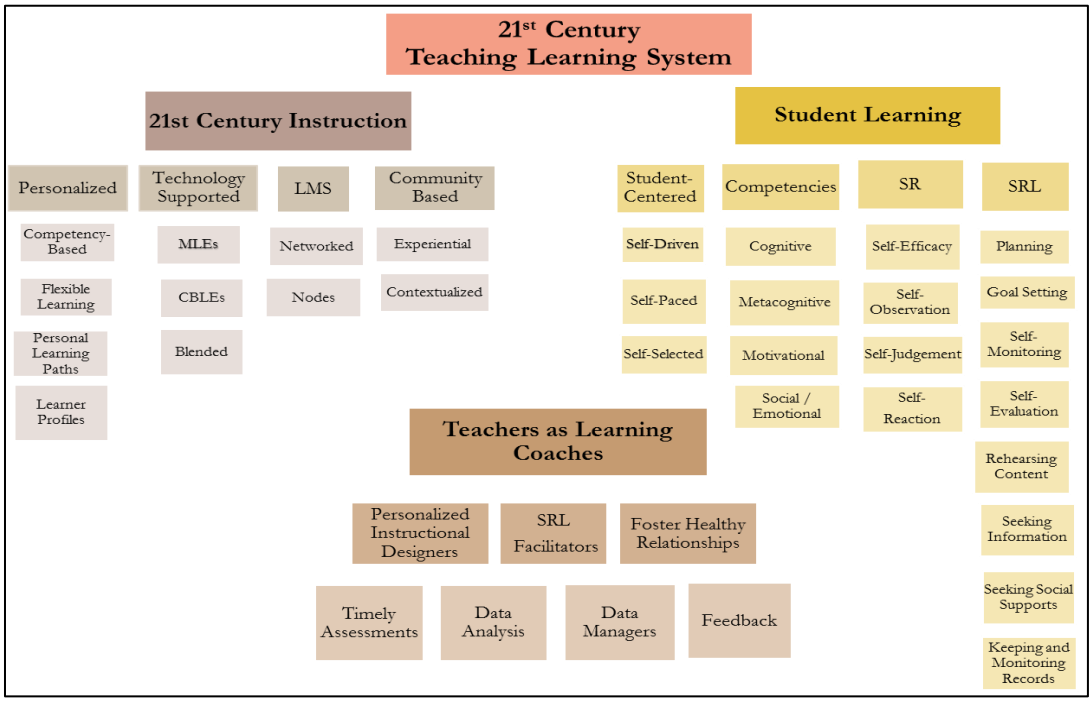


Figure 25. Components of 21st century teaching-learning systems

Measures are Necessary to Improve at Scale

Even with the use of the LASSI and the SRLOQ as important improvement measures, other measures are needed to determine if SRL instruction within the personalized, mobile middle school is effective. To test academic performance against an appropriately normed population, the school should continue to use the STARR and Stanford-10 exams. If teachers and students are successfully engaging in SRL instruction, academic performance should reflect students' ability to self-regulate learning. However, the school does not have to wait solely for the administration of end of the year standardized tests to determine effectiveness of SRL instruction. Teacher performance reviews, the Youth Truth Survey results, how quickly students move from skill to skill on personalized learning plans, the number of times students access outside support, the number of disciplinary infractions given, student grades, etc. all are indicators of successes and/or failures toward the creation of self-regulated students.

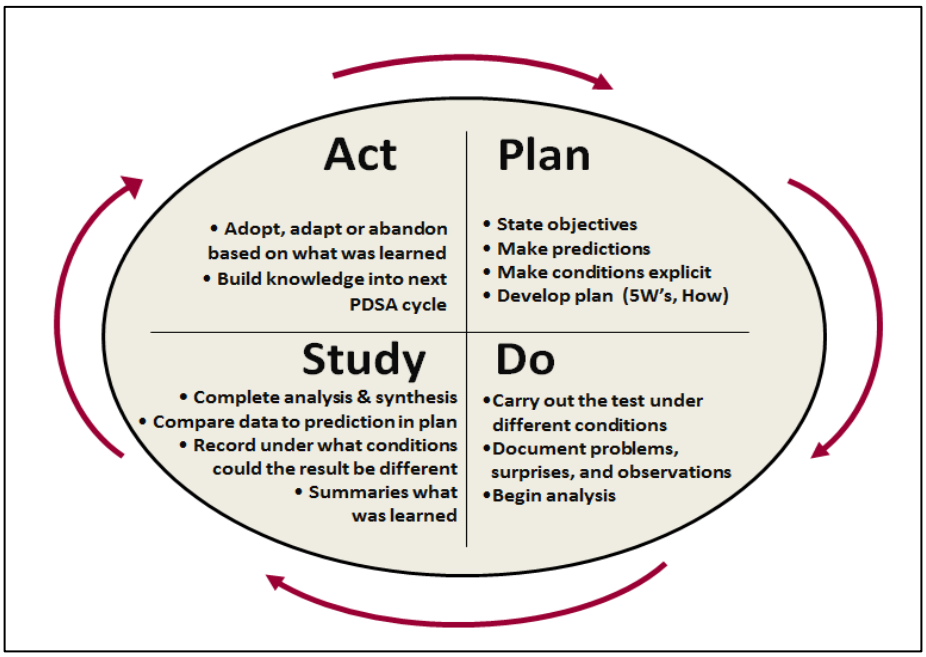
Disciplined Inquiry Drives Improvement

As the SRLOQ continues to develop and reshape itself over the course of multiple testing cycles, the school should implement a plan-do-study-act cycle highlighted in Figure 26. This cycle is designed to ensure the instrument maintains its authenticity towards its ultimate aim even through several iterations of change via the plan-do-study-act cycle. According to Bryk, Gomez, Grunow, and LeMahieu (2015), the plan-do-study-act cycle is guided by three questions:

1. What is the school trying to accomplish?
2. What is the change asking teachers to do and why?
3. How will we know the change is an improvement?

As adults in the system navigate the SRLOQ against individual goals and aims, these questions can solidify the broader intent of the instrument while keeping the teaching-learning system in balance. For example, administrators may *plan* to implement the SRLOQ on a weekly basis to monitor teacher and student performance during SRL opportunities. However, when they *do* this, they find teachers do not have adequate time to measure the scope of SRL skills identified in the SRLOQ on a weekly basis. Through further *study*, it was determined the amount of data acquired from the instrument cannot give sufficient evidence to support the school's final aim – the creation of self-regulated learners. Administrators, *act* on this finding by changing the SRLOQ implementation schedule to a monthly basis. As a result, teachers and students are given more time to authentically teach and use the multitude of SRL appropriate for a personalized, mobile middle school.

Learning to Improve: Disciplined Inquiry Cycle



Source: Bryk, Gomez, Grunow, and LeMahieu (2015)

Figure 26. Improvement science plan-do-study-act cycle

NIC's Can Accelerate Improvement

Plan-do-study-act cycles should occur at every level of the SRLOQ implementation process. While data from a single teacher would be easy to manage, when the implementation of the SRLOQ goes system-wide across all campuses, data tracking and management can become more difficult. As such, Bryk, Gomez, Grunow, and LeMahieu (2015), recommend creating a network improvement community (NIC) to ensure the SRLOQ is being utilized with integrity among all users, to provide clarity in implementation, and to track and analyze data towards the realization of the instruments' aim – to improve students' ability to self-regulate in the school. As such, the NIC should reflect a diverse group of stakeholders including but not limited to experienced teachers, novice teachers, teachers across disciplines, administrators, board members, students, parents, and / or community supporters.

Conclusions

In conclusion, with the help of improvement science, the personalized, mobile middle school has the potential to develop and refine a standard process to assess and support teacher's capacity to deliver effective SRL instruction. While teachers' instruction will certainly benefit from these improvement cycle, students will be the ultimate benefactors of strategic SRL implementation. Improved skills, as a result of highly tested teaching strategies, increase students' chances of succeeding in secondary and post-secondary settings. If proven to be an effective model of SRL integration, the personalized, mobile middle school can fulfill a gap among 21st century schools – maximizing the intrapersonal potential of students through a realization of a refined set of learning strategies aimed at successful independence while learning. The personalized,

mobile middle school, with an innovative model of learning and a responsive teaching community, is in prime position to lead this work.

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Appendix A

Grit and Character Development Rubric

Character Development Rubric

	Not at all like me	Not much like me	Somewhat like me	Mostly like me	Very much like me
1. New ideas and projects sometimes distract me from previous ones.					
2. Setbacks don't discourage me. I don't give up easily					
3. I often set a goal but later choose to pursue a different one.					
4. I am a hard worker.					
5. I have difficulty maintaining my focus on projects that take more than a few months to complete.					
6. I finish whatever I begin.					
7. My interests change from year to year.					
8. I am diligent. I never give up.					
9. I have been obsessed with a certain idea or project for a short period of time but later lost interest.					
10. I have overcome setbacks to conquer an important challenge.					

Source: Duckworth (2016)

Appendix B

LASSI Scale Descriptions and Sample Questions

LASSI Low Score Descriptions
(Weinstein, Schulte, & Palmer, 2002)

	LASSI SCALE DESCRIPTIONS	SAMPLE ITEM
TMT	The **Time Management Scale** assesses students' application of time management principles to academic situations.	I only study when there is the pressure of a test
SFT	The **Self-Testing Scale** assesses students' use of reviewing and comprehension monitoring techniques to determine their level of understanding of the information to be learned.	I stop periodically while reading and mentally go over or review what was said
TST	The **Test Strategies Scale** assesses students' use of test preparation and test taking strategies.	In taking tests, writing themes, etc., I find I have misunderstood what is wanted and lose points because of it.
INP	The **Information Processing** Scale assesses how well students' can use imagery, verbal elaboration, organization strategies, and reasoning skills as learning strategies to help build bridges between what they already know and what they are trying to learn and remember, i.e., knowledge acquisition, retention and future application.	I translate what I am studying into my own words.
ANX	The **Anxiety Scale** assesses the degree to which students worry about school and their academic performance. Students who score low on this scale are experiencing high levels of anxiety associated with school. High levels of anxiety can help direct attention away from completing academic tasks.	Worrying about doing poorly interferes with my concentration on tests.
ATT	The **Attitude Scale** assesses students' attitudes and interest in college and academic success. It examines how facilitative or debilitative their approach to college and academics is for helping them get their work done and succeeding in college.	I feel confused and undecided as to what my educational goals should be.
CON	The **Concentration Scale** assesses students' ability to direct and maintain attention on academic tasks.	I find that during lectures I think of other things and don't really listen to what is being said.
SMI	The **Selecting Main Ideas** Scale assesses students' skill at identifying important information for further study from among less important information and supporting details.	Often when studying I seem to get lost in details and can't see the forest for the trees.
MOT	The **Motivation Scale** assesses students' diligence, self-discipline, and willingness to exert the effort necessary to successfully complete academic requirements.	When work is difficult I either give up or study only the easy parts.
STA	The **Study Aids Scale** assesses students' use of support techniques, materials or resources to help them learn and remember new information. Do students complete practice exercises? Do they create or use organizational aids?	My underlining is helpful when I review text material.

Appendix C

LASSI Norming Sample Demographics

Table 1C

Demographics of the LASSI Norming Sample: Sample Size by Type of Institution

Type of Institution	Number of Schools	Number of Students
University	3	201
Community College	5	495
State College	3	348
Technical Institute	1	48
Total	12	1,092

Source: Weinstein and Palmer (2002)

Table 2C

Demographics of the LASSI Norming Sample: Ethnicity by Gender

Ethnicity	Male	Female	Total
White, non-Hispanic	235	474	709
African-American	58	95	153
Hispanic	54	95	149
Asian or Pacific Islander	7	9	16
Other	23	42	65
Grand Total	377	715	1092

Source: Weinstein and Palmer (2002)

Table 3C

Demographics of the LASSI Norming Sample: Age by Gender

Age	Male	Female	Total
17 or younger	32	52	84
18-19	225	403	628
20-21	45	56	101
22-23	16	37	53
24-25	12	31	43
26 or older	47	136	183
Total	377	715	1092

Source: Weinstein and Palmer (2002)

Table 4C

Demographics of the LASSI Norming Sample: GPA by Age

GPA	17 or younger	18-19	20-21	22-23	24-25	26 or older
Below 2.0	1	9	5	2	5	4
2.0-2.5	7	80	22	13	8	16
2.5-3.0	26	177	27	16	8	48
3.0-3.5	35	237	32	16	9	62
3.5-4.0	15	125	15	6	13	53
Total	84	628	101	53	43	183

Source: Weinstein and Palmer (2002)

Appendix D

Post LASSI Descriptive Statistics

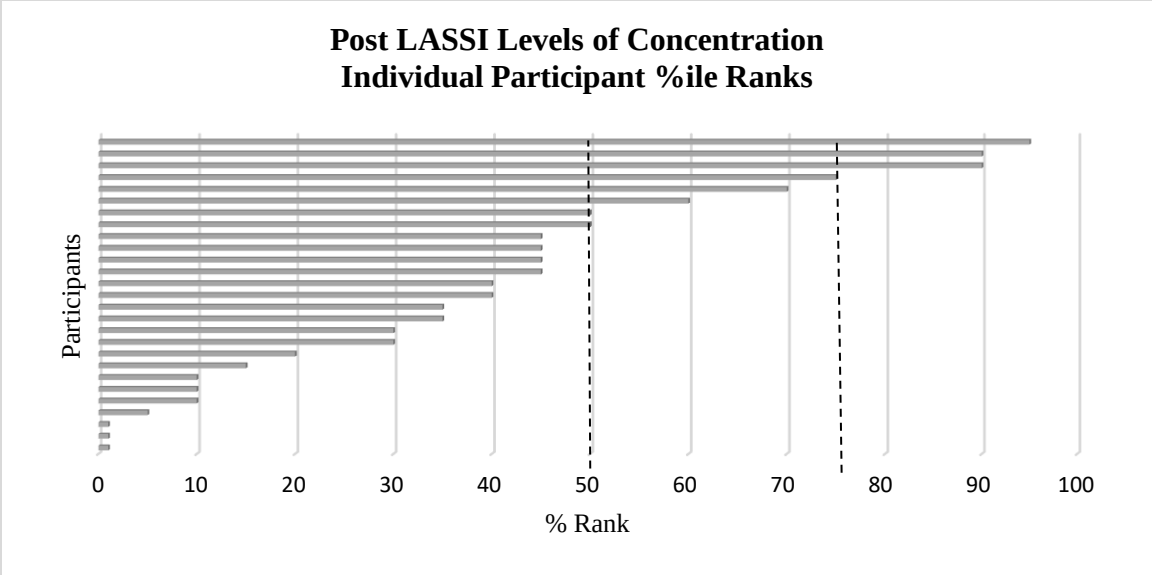

Figure 1D. Post LASSI levels of concentration

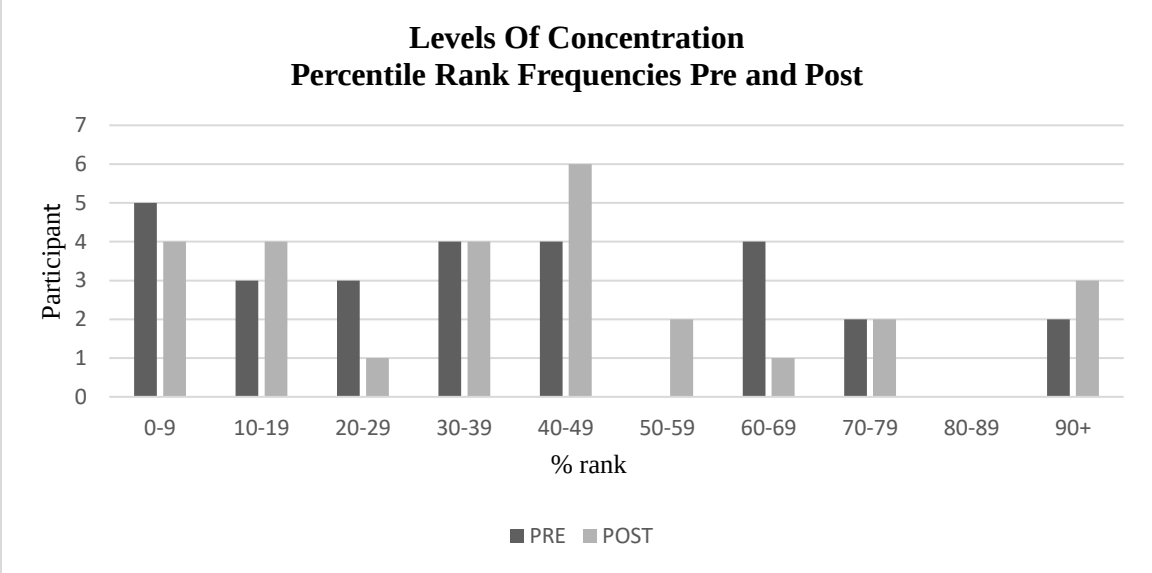

Figure 2D. Levels of concentration pre and post comparison

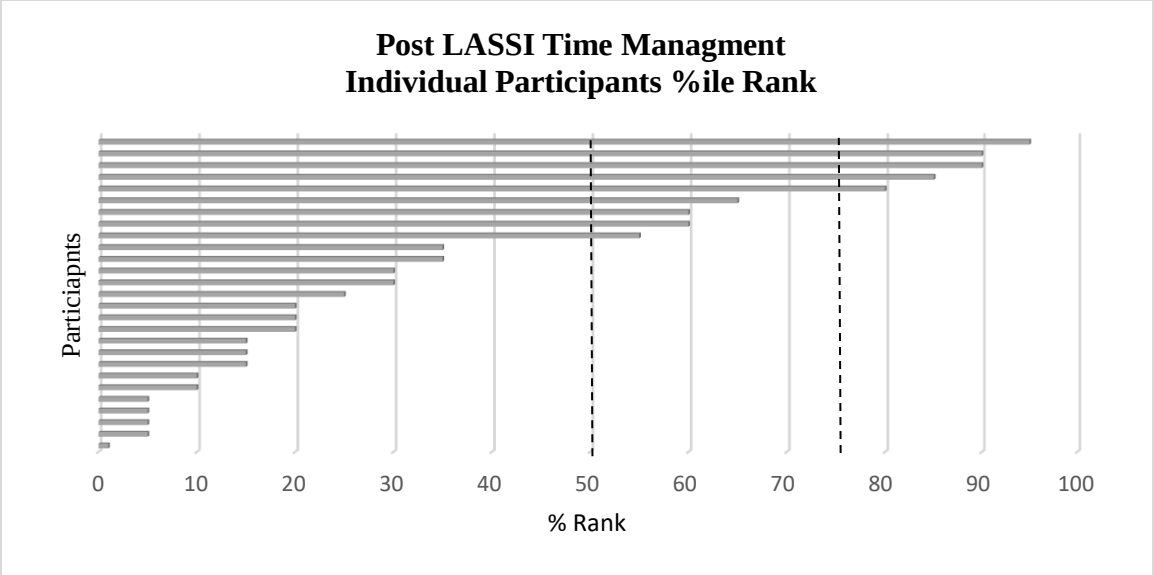

Figure 3D. Post LASSI time management

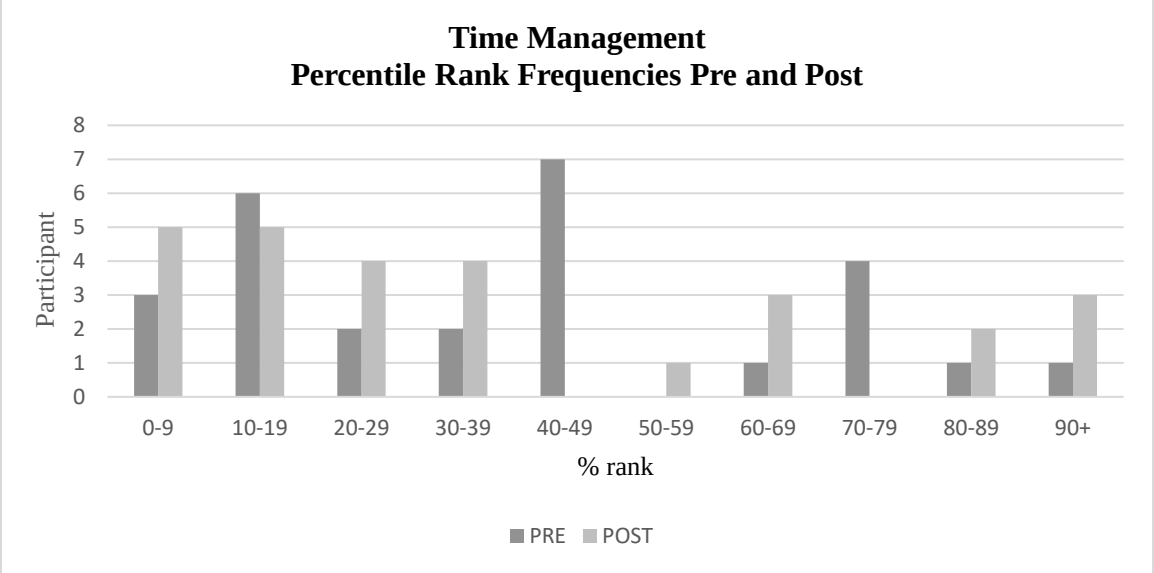

Figure 4D. Time management pre and post comparisons

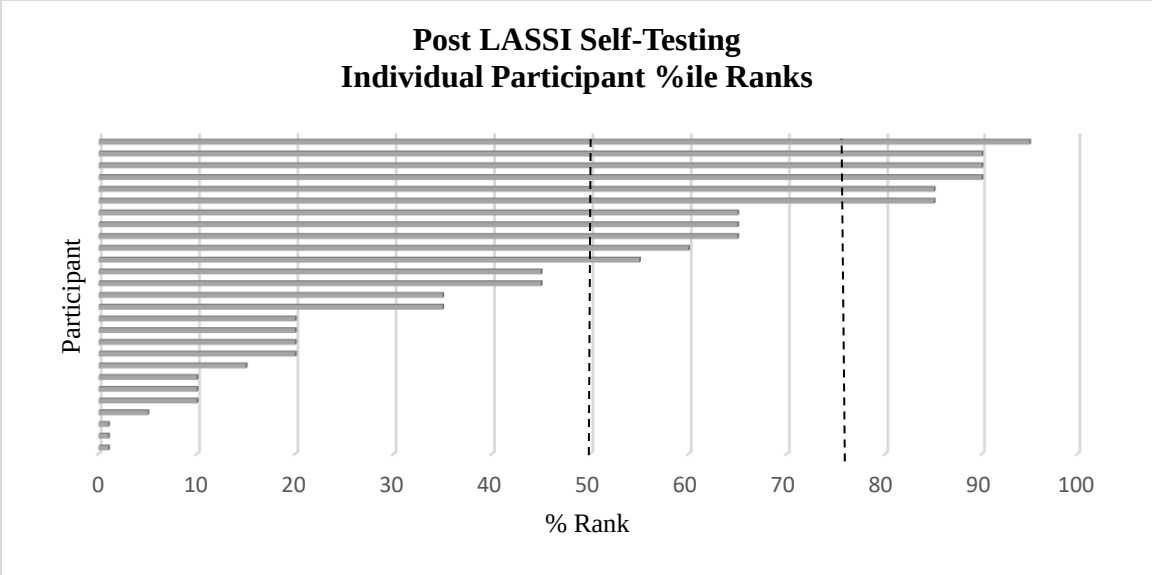

Figure 5D. Post-LASSI self-testing

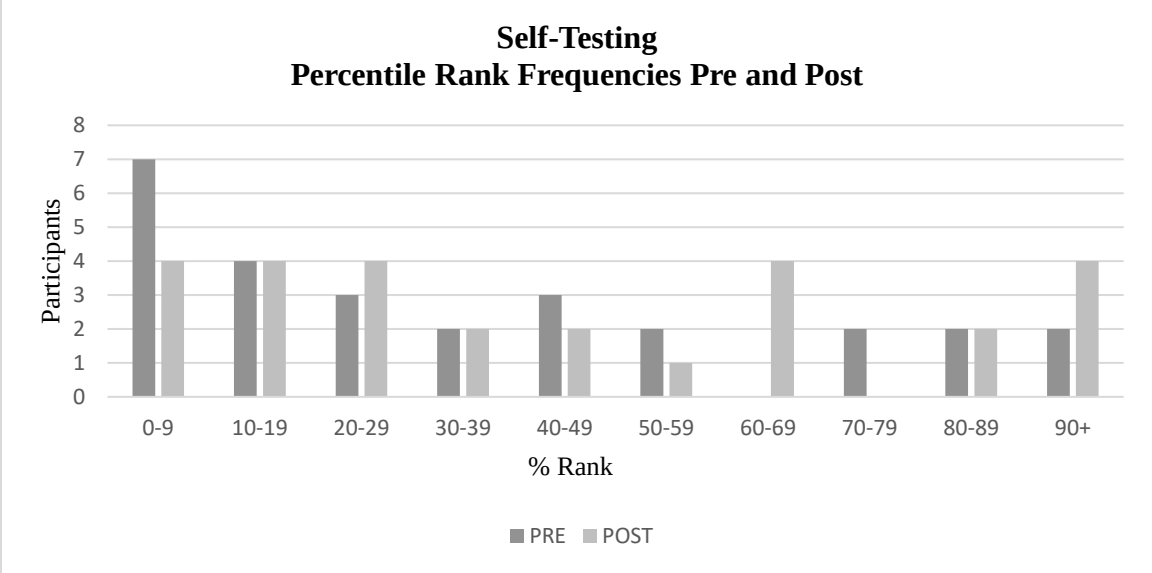

Figure 6D. Self-testing pre and post comparisons

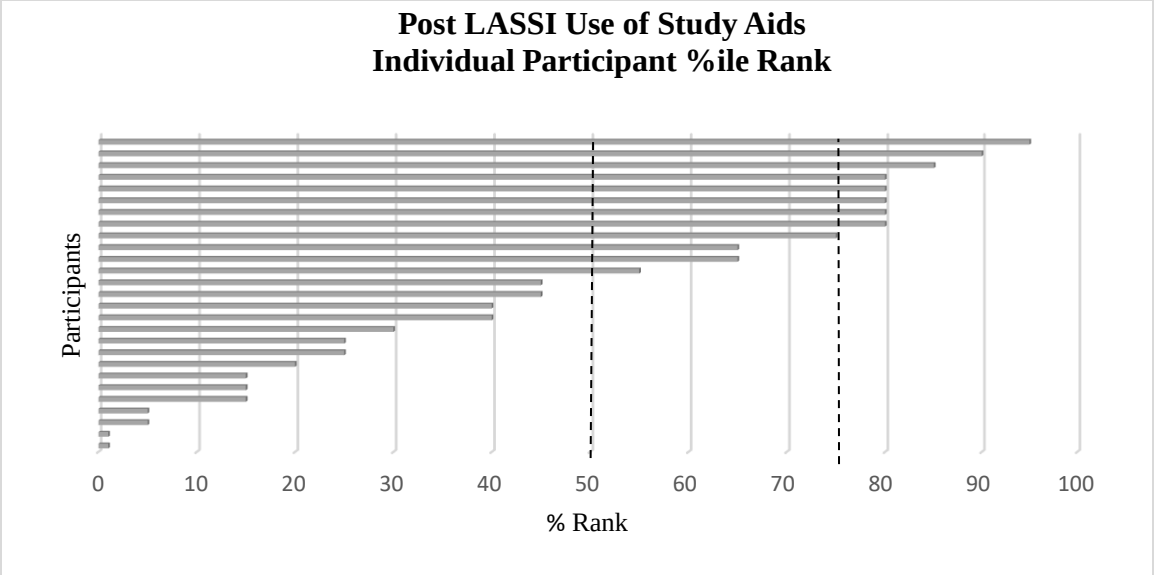

Figure 7D. Post-LASSI use of study aids

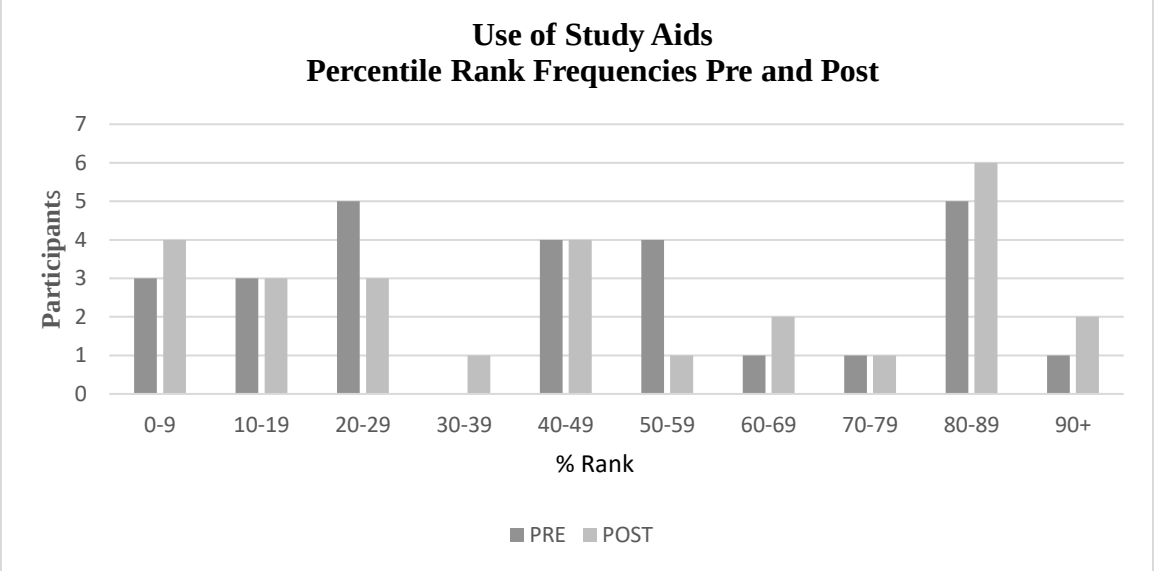

Figure 8D. Use of study aids pre and post comparisons

Appendix E LASSI

Low LASSI Score Interpretations

Scales	What does a low score mean on the following LASSI scales?
TMT	Students who score low on this scale may need to develop effective scheduling and monitoring techniques in order to assure timely completion of academic tasks and to avoid procrastination while realistically including non-academic activities in their schedule.
SFT	Low scoring students may need to develop an appreciation for the importance of self-testing, and learn effective techniques for reviewing information and monitoring their level of understanding or ability to apply what they are learning.
TST	Low scoring students may need to learn more effective techniques for preparing for and taking tests so that they are able to effectively demonstrate their knowledge of the subject matter.
INP	Students who score low on this scale may have difficulty making information meaningful and storing it in memory in a way that will help them recall it in the future.
ANX	Students who score low on this scale may need to develop techniques for coping with anxiety and reducing worry so that attention can be focused on the task at hand.
ATT	Students who score low on this scale may not believe college is relevant or important to them and may need to develop a better understanding of how college and their academic performance relates to their future life goals.
CON	Low scoring students may need to learn to monitor their level of concentration and develop techniques to redirect attention and eliminate interfering thoughts or feelings so that they can be more effective and efficient learners.
SMI	Students who score low on this scale may need to develop their skill at separating out critical information on which to focus their attention. Tasks such as reading a textbook can be overwhelming if students focus on every detail presented.
MOT	Students who score low on this scale need to accept more responsibility for their academic outcomes and learn how to set and use goals to help accomplish specific tasks.
STA	Students who score low on this scale may need help identifying and effectively using resources as the need for learning assistance becomes apparent.

Source: Weinstein and Palmer (2002)