Creating Self-Regulated Student Teachers at the University of Guyana: Strategies to Strengthen Student Teachers' Awareness and Learning Skills

by

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ABSTRACT

It is well documented in literature that student teachers must become self-regulated learners to be effective teachers. As self-regulated learners, teachers can pass these vital skills to their students. The aim of this study is to determine if my self-regulated learning awareness and development (SRLAD) intervention which focuses on teaching student teachers SRL strategies, could impact their academic performance. The literature reviewed shows that SRL strategies can be successfully taught to adult learners through interventions. This practical action research study utilizes a concurrent mixed-method research design. Quantitative data from a pretest/posttest and pre/post MSLQ and qualitative data from student reflective journals were collected simultaneously. The findings were then triangulated to answer the three research questions. Participants were 33 undergraduate teachers reading for their degree in early childhood and primary education at the University of Guyana, Berbice campus (UGBC). Data collected were analyzed using descriptive statistics such as mean and standard deviation and inferential statistics such as the repeated measures t-test and ANOVA. Major findings showed that student teachers were self-motivated and were able to select, assess, evaluate, and use appropriate SRL strategies to suit their learning needs and context. The SRLAD intervention had a meaningful impact on the academic performance of student teachers since they recognized the numerous benefits of incorporating SRL strategies to aid their learning and academic performance. They also realized that by consistently incorporating SRL strategies into their learning, they could become self-regulated learners and, more importantly, teach these skills to their students. As such, the SRLAD intervention should

be a mandatory study skill course for all first-year student teachers at the University of Guyana.

DEDICATION

This dissertation is dedicated to my daughter, Soriah Maykaylee Lashley. Your love, hugs, and girly giggles warm the deepest parts of my heart. Mommy did this for you.

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DISSERTATION OVERVIEW

Problem of Practice

Moon and Moon (2012) pointed out that teacher education training programs are plagued with problems. This is because many student teachers have incomplete and fragmentary knowledge (Ohst et al.,2015). Therefore, it is not surprising that student-teachers at the University of Guyana, Berbice campus, have not performed well in ESC 4103, a science course designed to widen their content knowledge and pedagogical content knowledge to support the science curriculum's effective delivery at the primary level. This low academic performance of student teachers can affect the quality of the education system in Guyana since teachers play a pivotal role in the teaching-learning process. Research studies in teaching and teacher education show that teachers' content knowledge and pedagogical content knowledge are essential predictors of instructional quality, influencing student achievement (Grossman & McDonald, 2008).

To ensure that the education system is equipped with effective teachers, education training institutions like the University of Guyana must ensure that student teachers become effective learners. They can do so by supporting student teachers' autonomy in learning in teacher education programs by enhancing their professional competencies and self-efficacy (Panadero, 2017). Teachers' autonomy in learning includes self-initiated learning activities where student teachers can be taught to be self-regulated learners.

Therefore, this study aims to determine the effects of a self–regulated learning strategies awareness and development (SRLAD) intervention on the academic performance among student teachers in a science course at the University of Guyana, Berbice campus (UGBC).

Structure of Dissertation

This dissertation can be categorized as a practical action research. Practical action research involves educators seeking to investigate a specific problem in their workplace to improve students' learning and their own professional practice (Creswell & Guetterman, 2019). It utilizes a concurrent mixed-method design to provide an overview of the impact of my SRLAD intervention on the academic performance of student teachers in a science course at the university level. A mixed-method research design was selected because "action research studies tend to align better with mixed-method research design" (Mertler, 2020, p.106). Therefore, both quantitative and qualitative data were collected simultaneously. Quantitative data was collected and analyzed to understand the outcomes of the SRLAD intervention, while qualitative data was collected and analyzed to understand students' experiences with the intervention (Creswell & Guetterman, 2019). The results were then triangulated to have a deeper understanding of whether my SRLAD intervention could be a resolution for the low academic performance of student teachers in a science education course at the university level.

To disseminate this research, this dissertation is presented in an alternative format, divergent from the traditional five chapters dissertation. Duke and Beck (1999) argued that traditional dissertations are "ill-suited to the task of training doctoral students

in the communicative aspects of educational research and are largely ineffectual as a means of contributing knowledge to the field" (p. 31). This dissertation presents a mix of chapters and includes the draft of a manuscript intended for publication.

This dissertation is presented in four chapters. This chapter, Chapter One, focuses on the contribution of this dissertation's results to the teacher education and training field. Chapter Two highlights the cycles of learning from the reconnaissance and cycle one phase of action research as I tried to gain a deeper understanding of my problem of practice. Chapter Three is written as an academic manuscript intended to be published by a reputable journal focusing on teacher education. This manuscript was informed by Chapter Two and focused on outlining the impact of my SRLAD intervention on student teachers' academic performance in a science education course at UGBC. The final chapter, Chapter Four, provides a comprehensive conclusion and reflection on the dissertation process.

Contribution to the Field

As the world advances in technological and social innovation in the 21st century, there is greater demand for students to be creative and critical thinkers. Researchers and educators have long recognized that for students to adapt, develop, interact, and navigate modern society, they must know how to take control of their own learning and become self-regulated learners. In fact, some researchers are suggesting that self-regulated learning (SRL) is an important survival tool and skill for learners (Bjork et al., 2013) to be competitive in the 21st-century workforce and global economy (Darling-Hammond, 2009; Robbins & Beuerlein, 2013). To ensure that students are equipped with these

fundamental skills, schools must teach these skills. As such, a vast amount of literature exists on self-regulated learning's influence on students' academic performance at different levels of schooling.

Teachers play a vital role in teaching students these self-regulated learning skills. Research suggests that effective teachers are self-regulated learners capable of modeling these skills to the students (Randi, 2004). In other words, if students are to become self-regulated learners, teachers must also be self-regulated learners. However, few published studies have student teachers or teachers using self-regulated strategies in their own learning. In their research, Saariaho et al. (2016) reported that there is need a for more research on self-regulated learning where teachers are the students, especially in countries that fall under the label of the Global South. Also, the studies published on SRL and teachers' learning are mainly correlation-type (Bembenutty, 2007). Thus, the literature suggests that research on teachers as self-regulated learners is an emerging field of study. Therefore, my concurrent mixed, action research study is needed to advance the body of knowledge in teaching and learning in teacher education in Guyana since there is little to no published data on this area in this local context. Hence, my research takes a holistic approach, allowing me to explore the complex issue of low academic performance in a way that will empower student teachers to feel liberated by taking control of their own learning.

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CHAPTER 2

CYCLES OF LEARNING: UNDERSTANDING THE CHALLENGES STUDENT TEACHERS EXPERIENCE IN A SCIENCE COURSE AT THE UNIVERSITY LEVEL

Introduction

"The heights by great men reached and kept were not attained by sudden flight, but they, while their companions slept, were toiling upward in the night." As a child, this quote from Henry Wadsworth Longfellow's poem, The Ladder of St. Augustine, was continuously echoed by my mother, who placed great value on education in our home. Thus, as I made my way through primary and secondary school, my mother's words echoed in my ears, which I translated into my own motto "*determination is the key to success."* These words led to my academic success in my early years of schooling and later as I continued my educational and personal journey. However, I could not pursue a university education after secondary school because of my family's social-economic standing. Instead, I entered the Cyril Potter College of Education (CPCE) to pursue a certificate in education and began my career as a teacher. Surprisingly, I enjoyed teaching, which was due to my belief in the value of education. As a young teacher, I ensured each student entering my classroom was inspired to learn.

A few years later, with the same determination to succeed, I enrolled at the University of Guyana, pursuing a bachelor's degree in education and graduating with honors. This success led me to pursue graduate studies at the University of Guyana and eventually landed my dream job- a lecturer in the Faculty of Education and Humanities. Thus, pursuing doctoral studies was the next natural step in my professional journey. In the spring of 2020, the University of Guyana offered me a scholarship to pursue doctoral

studies in Leadership and Innovation at the prestigious Arizona State University in the Mary Lou Fulton Teachers College. As I began my studies, I recognized that achieving my academic goals at this level was more difficult than expected.

My doctoral coursework required more than determination, resilience, and hard work, which led me as far as the master's level. Many decisions about readings and assignments required my active attention, which left me overwhelmed and uncertain about proceeding. My academic challenges were combined with the demand for my attention as a mother, wife, and full-time lecturer, responsibilities I did not have at the master's level- I was struggling academically and personally. After many weeks of despair, I knew I had to find ways to help myself, or I would fail.

My story of challenges at the doctoral level is familiar and can be found at all levels of schooling. Many students, like myself, are taught to value education and to have high academic aspirations but are not taught how to achieve these academic goals at home or school. Achieving educational aspirations requires students to be given practical guidance on taking control of their learning and becoming strategic learners. Becoming strategic learners involve students understanding how they learn best. Learning best implies that students will devise strategies to facilitate their learning (Marcy, 2001) and achieve their learning goals. It also involves students knowing how to monitor their learning progress and control their learning behavior (Bjork et al., 2013). The primary learning goal of strategic learners is to enhance their academic performance.

To become a strategic learner and enhance my academic performance in my coursework at the doctoral level, I had to apply learning strategies to my learning. These learning strategies include goal setting (I scheduled each day's activity), help-seeking (I

asked my family members and professors for help, and I was also more open about my feelings and my struggles with them), and the use of positive affirmations (I used positive self-talk and prayers to deal with failures and setbacks). For my weekly readings, I prioritized texts, highlighted phrases and thesis sentences, and reflected on readings before and after to ensure I understood what I was reading. I also gave myself enough time to write my initial thoughts and edit my work. I became less overwhelmed, enjoyed my ASU studies, and improved my academic performance. In other words, I became a self-regulated learner by taking control of my learning and life.

In support, Zimmerman and Schunk (2001) define self-regulated learning as students' ability to take control of their education. Self-regulated learners are aware of their learning strengths and weaknesses and use various strategies to meet the demands of learning tasks (Buzza & Allinotte, 2013). It must be highlighted that using self-regulated learning strategies is not a mental ability or academic performance skill; instead, it is a self-directive process by which students transfer cognitive ability into academic skills, such as setting goals and monitoring and evaluating their learning progress (Zimmerman, 2002, 2008). However, initially, I was unaware that the strategies I was applying to aid my learning were called self-regulated learning (SRL) strategies. In the fall of 2020, when I began working on my dissertation draft, SRL was suggested by one of my professors as a resolution after discussing my own academic and personal challenges. After the conversation with my professor, I dug into the literature on self-regulated learning. I immediately recognized that the strategies I was using to aid my learning were self-regulated learning strategies. I also thought SRL could be a resolution for my adult female student teachers' academic and personal struggles.

Therefore, my research dissertation sought to ascertain the impact of self-regulated learning awareness and development (SRLAD) intervention on the academic performance of student teachers at the University of Guyana, Berbice Campus(UGBC).

Local Context

The University of Guyana employed me for the past seven years to teach undergraduate early childhood and primary school student teachers four courses in science content knowledge and pedagogical content knowledge, one of which is ESC 4103. ESC 4103 is an introductory science course offered to early childhood and primary school teachers accepted to the University with a trained teacher's certificate in education and an associate degree in education from the Cyril Potter College of Education (CPCE). ESC 4103 is a first-semester course that spreads over a thirteen-week semester. It is divided into two modules. Module A is based on science pedagogy and runs for five weeks; for the remaining thirteen weeks, student teachers are taught science content knowledge, including fundamental physics concepts such as force, velocity, speed, and energy. Also, ESC 4103 is a prerequisite to ESC 4203, a second-semester course. Thus, the ESC 4103 course aims to widen student teachers' science content knowledge and support the science curriculum's effective delivery at the early childhood and primary levels.

For the last five years, I have noticed that several student teachers enrolled in my ESC 4103 class could have performed better (Table 1). For example, from the academic year 2015/ 2016 to 2018/2019, over 40% of student teachers gained low grades in ESC

4102, that is, letter grades C-F, except for 2019/2020, which saw some improvement with only 16.6% of student teachers gaining low grades. Nevertheless, a low grade in ESC 4103 may affect students' academic performance in ESC 4203, their overall GPA, and academic success at the university.

Table 1

Descriptive Statistics, Percentage for Student Teachers' Academic Performance in ESC 4103 for the Academic Years 2015/2016- 2019/2020.

Academic Years	Letter Grades					
	A	B	C	D	F	I
2015/2016	00(0%)	13(23.2%)	25(44.6%)	15(26.8%)	02(3.6%)	01(1.8%)
2016/2017	01(1.9%)	10(19.2%)	22(42.3%	15(28.9%	04(7.7%)	
2017/2018	04(6.8%)	10(16.9%)	25(42.4%	16(27.1%	04(6.8%)	
2018/2019	07(10.8%	31(47.7%)	22(33.8%	05(7.7%)		
2019/2020	22(36.7%	28(46.7%)	10(16.6%			

Source: University of Guyana student record management system (SRMS) 2015-2020

The ESC 4103 course, like many other courses offered in the division of Education and Humanities, is held in the evening between 3 pm to 7 pm, Guyana time. Most student teachers attending these classes are adult females, married or committed, and have young children. Therefore, apart from their teaching responsibilities, they have other commitments to families and friends competing for their attention. They are also from rural areas, where women are culturally responsible for traditional roles. These roles include caring for children, parents, or grandparents; and participating in community activities (Kilgore & Rice, 2003). There is limited access to reliable internet and electricity in many rural areas. Apart from personal and environmental challenges, I have observed that many of my student teachers are underprepared in mathematics, problem-solving, and critical thinking skills, which are crucial for completing module B of the ESC 4103 course.

Despite these challenges, student teachers are determined to succeed. As a working mother, I empathize with the student teachers' challenges and admire their resilience and determination. Through the years, I have been unable to find data about the University's (UG) or College's (CPCE) attempt to help student teachers who struggle academically and personally. Thus, I have made several informal attempts to improve student teachers' academic performance by providing support in the form of longer office hours, restructuring my pedagogy by introducing web-based stimulation, multimedia technology, alternative assessment such as group/ peer tests, debates, adding more practical in-class exercises and experiments. I have also tried to mentor my students by sharing my challenges as a student teacher to positively influence their motivation and learning. However, despite my efforts, I have been unable to significantly impact

students' academic performance. However, based on conversations with colleagues, I acknowledged it is time for formal changes if student teachers' are to achieve their educational goals successfully.

Research Guiding this Study

Shulman (1986) suggests that teachers' content knowledge is a predictor of their success in the classroom. Therefore, student teachers achieving a low grade in ESC 4103, an introductory science course at UGBC, can be deemed incompetent since their teaching competencies can be judged by their knowledge of the subject matter (Shulman, 1986). One way of enhancing student teachers' content knowledge and academic performance is by supporting their autonomy in learning in teacher education programs and enhancing their professional competencies and self-efficacy (Rots et al., 2010; Moos & Ringdal, 2012; Panadero, 2017). Educators and education partners must take bold steps to improve training for new and practicing teachers (Azoulay, 2018) by helping them become self-regulated learners. Zimmerman (2008) claimed that self-regulated learning encompasses students' motivational beliefs, their use of learning strategies, and the ability to evaluate particular learning strategies' effectiveness upon performance. Simply put, self-regulated learning is a student's ability to take charge of their own education (Zimmerman & Schuck, 2001). In an excerpt, Jones et al. (1992) noted that:

> *Teachers who do not have... [learning skills] lack both the ability to function as lifelong learners and develop the academic skills of their own students. Insuring that prospective teachers have adequate academic skills must become an accepted the goal of teacher education programs (p. 14)*

Hence, the primary way of enhancing teacher quality and competencies is to base teacher education and training on solid research (Cooney, 1994). However, research on how student teachers regulate their learning is limited worldwide and is mainly correlational studies (Bembenutty, 2007). For example, Taylor and Corrigan's (2005) study of 19 elementary science student teachers involved in a self-regulated learning program reported that student teachers had a more positive attitude to science and science teaching after the program. Senler and Semra-Vural (2014) investigated the relationship between self-regulated learning and academic performance in another correlative study found that student teachers' GPAs were significantly but not strongly associated with self-regulated learning strategies. Nevertheless, White and Bembenutty(2013) noted that self-regulated learning strategies are essential to student teachers' successful academic performance.

Subsequently, I sought to conduct a research study to determine the effects of my SRLAD Intervention on academic performance among student teachers in a science course at the University of Guyana (UG). Kramarski and Kohen (2017) claimed that it is challenging for student teachers to regulate their own learning since SRL is not spontaneously acquired. Therefore, SRL could be developed through programs like my SRLAD intervention, allowing student teachers to control their own learning.

Cycles and Learnings

Cycle Zero: Exploring the Problem

The process of action research, which is cyclical and spiraling in nature (Mertler, 2020), includes four areas of focus: identifying the area of focus, doing reconnaissance, reviewing the literature, and working on the action research plan to guide the research (Creswell & Guetterman, 2019). Reconnaissance or cycle zero is described as self-reflection and descriptive (Creswell & Guetterman, 2019). McNiff and Whitehead (2003) suggest that reconnaissance is a starting point in action research where the researcher determines where they are, what they hope to achieve, and how they will get there. In other words, cycle zero or reconnaissance is a way for me to gather preliminary background information about my problem of practice to gain a deeper understanding of the same. For cycle zero of this study, in the fall semester of 2020, I conducted semi-structured interviews to answer the following research questions:

RQ 1: What is the pedagogical philosophy behind the scope and sequence of ESC 4103?

RQ 2: What learning challenges do students face in ESC 4103?

Data Collection

I utilized a qualitative research design for this cycle zero or reconnaissance component of my action research. Participants were three (3) female student teachers pursuing a Bachelor's degree in Early childhood and Primary education in the Division of Education and Humanities, University of Guyana, Berbice Campus. They completed the

ESC 4103 course in the 2019/2020 academic year and were in their final year of study. Two student teachers received a D (45-54%), while one received a B (65-74%) in the ESC 4103 course. The Instrument I used for data collection was 1:1 semi-structured interviews. Student teachers were asked five predetermined questions and appropriate follow-up questions about their challenges in ESC 4103. Each interview lasted 20 minutes and was recorded on the web-based multimedia platform, zoom. The qualitative data collected from the semi-structured interviews were transcribed verbatim. The interview transcripts were read, re-read, and coded using different color highlighters. The data were analyzed using a constant comparative method (Strauss & Corbin, 1998).

Results

The data collected from the semi-structured interviews were used to answer the two research questions in the introduction section above. The data collected were transcribed verbatim.

Themes

In the qualitative data analysis, 30 codes were identified during the open coding process. Using the constant comparative method, the initial codes were compared against each other, modified, and merged with other codes to form categories. After reading the data and reflecting on the categories, they were grouped into three major themes: *Challenges faced*, *self-regulated strategies employed to deal with challenges*, and *benefits of the ESC 4103 course*. The challenges identified by student teachers can be categorized

into four types: *situational barriers, dispositional barriers, academic barriers, and institutional barriers*.

Challenges

Situational Barriers

Some of the initial codes that led to the identification of situational barriers include In Vivo codes "finances," "children," and "personal." These codes were compared, modified, and merged, resulting in four categories emerging. The categories are (a) financial constraints, (b) single mothers, (c) job responsibilities, and (d)personal challenges.

Financial constraints: A student teacher was asked *what support do you need to help cope with these challenges.* The response was, "I need financial help. This is a big one for me. Sometimes I think I have an assignment, but then I have to think that the landlord is coming and the baby has to get milk." (Interview, 11 November 2020)

*Single mothers: S*tudent teachers were asked, *what challenges did you face in ESC 4103 course? One student responded*, "I find it (ESC 4103) challenging because it is only my two children and me. When I get home, instead of studying, I have to work with them" (Interview, 11 November 2020). While another student echoed, "it is just my baby and me" (Interview, 11 November 2020).

Job Responsibilities: A student teacher was asked; *you like how the ESC 4103 course is structured?* The student responded, "you are all drained out after work, and then you have to go do calculations in the afternoon" (Interview, 11 November 2020).

Personal challenges: Students were asked, *what challenges have you faced in ESC 4103 course?* One echoed, "my own personal challenges, my focus was not there" (Interview, 11 November 2020).

Dispositional Barriers

Some of the initial codes that led to the identification of situational barriers include In Vivo codes "finances," "children," and "personal." These codes were compared, modified, and merged. The categories that emerged are: (a) science is challenging, and (b) lack of confidence.

Science is challenging: Student teachers were asked, *what challenges did you face in ESC 4103 course*? A student claimed, "With science especially, I find it very hard, and I had no desire to push myself. I was getting frustrated with science." (Interview, 11 November 2020). Another added that "it (science) was confusing, like you did not know what to do (Interview, 11 November 2020).

Lack of confidence: A student-teacher was asked, *what support you needed to deal with these challenges?* The student responded, "first of all, I need to build confidence in myself. I need to have faith..." (Interview, 11 November, 220).

Academic Barriers

Some initial codes that led to the identification of academic barriers include In Vivo codes such as “knowledge” and “calculation.” These codes were compared, modified, and merged. The following categories emerged (a) lack of previous knowledge about physics, a component of the ESC 4103 course, and (b) lack of mathematical competencies.

Lack of previous knowledge about physics: Student teachers were asked, *what challenges did you face in ESC 4103*? The student responded, “one of the biggest challenges I faced was in terms of the physics aspect that existed in this course. I have zero background knowledge about physics” *(*Interview, 11 November 2020). While another claimed, “it all went back to high school. I really did not have a sound secondary education. So when it comes to some of the topics, I had no clue. So when it comes to science, I had a real challenge because I never went back to do science subjects anywhere” (Interview, 11 November 2020).

Lack of mathematical competencies: Student teachers were asked, *what challenges did you face in ESC 4103*? The first student responded, “the calculation part was one of the most challenging aspects of the course for me” (Interview, 11 November 2020). Another claimed, “when it comes to the calculation, I really did not understand” (Interview, 11 November 2020). While the third student added, “out of all the science courses, I do not like this one. I don’t know if it’s because of the calculation. I don’t like calculation as a whole”. (Interview, 11 November 2020).

Institutional Barriers

Some of the initial codes that led to the identification of institutional barriers include the Vivo codes, “class size,” “time,” “too packed,” and “course outline.” These codes were compared, modified, and merged, and these categories emerged; (a) the class size was too large, (b) the course was too packed, and (c) the time for the class was inappropriate.

*Class size was too large**:*** Student teachers were asked what *challenges they faced in ESC 4103.* One student said, “At the university aspect, the class size was an issue. It was too large. Seating was a competition. It was very uncomfortable. This course should be done with a maximum of 30 students in one class” (Interview, 11 November 2020). The second student echoed, “Another thing is the size of the class. There was no class control. Everybody was doing their own thing. There were disruptions all the time” (Interview, 11 November 2020).

The course was too packed: Student teachers were asked, *what support you needed to cope with these challenges*? Two students’ responses echoed this. The first students claimed, “The content needs to be regulated. The content is very packed. I think more time should be allocated, rather than a two hours course. I think it should be a four-credit course. If we were given more time, we would have been able to actually understand, grasped, and the lecturer could have spent more time explaining” (Interview, 11 November 2020). The second student added, “the course is too fast-paced for me. I did not understand one concept, and the lecturer was going to another concept. I feel like I

was sailing. Most of the time, I go with the tide because I wanted to go along with the others" (Interview, 11 November 2020).

The class's time was inappropriate: A student teacher was asked; *do you like how the ESC 4103 course is structured?* One student responded, "I don't like the timings. You are all drained out after work, and then you have to go and sit in the classroom at that time to do calculations. For me, calculations, which is a bit of math, I prefer to have it before the afternoon session or early morning. In the afternoon, everyone is rushing to get home" (Interview, 11 November 2020).

Self-regulated Strategies

Some of the initial codes that led to identifying the self-regulated learning strategies used by students are "friends," "peers," "colleagues," and "help." These Vivo codes were compared, modified, and merged. The following categories emerged: (a) help-seeking, (b) soliciting feedback from the lecturer, (c) goal-setting, and (d) seeking information.

Help-seeking: Student teachers were asked, *what strategies did you use to cope with the challenges you face?* All three of the students responded, echoing that they sought help. The first student replied, "I seek help from former students" (Interview, 11 November 2020). The second added, "I ask some of my colleagues. I went to a former teacher…" (Interview, 11 November 2020). The third student said, "if I don't understand something, I would ask a friend. I would ask, do you understand this topic, explain it to me. I ask

past students for help if I don't understand. I even asked Mr. Dasilva (another lecturer) for help" (Interview, 11 November 2020).

Seeking information: Student teachers were asked *what strategies they used to cope with their challenges.* The first student reported, "I use google and youtube. Many youtube videos I used to help me understand the calculations" (Interview, 11 November 2020). Another said, "I tried to apply myself. I managed some(calculations), but some I did not get". The third student claimed that she did additional research to aid her understanding of the concepts, "I did some reading, but my reading was not that much. I think more research on my part may have helped the situation" (Interview, 11 November 2020).

Goal setting: Student teachers were asked *what strategies they used to cope with their challenges.* The student responded," I need to focus on my goals and what I want to achieve, and I think I can get there" the student was then asked the follow-up question, do you set goals? She responded, "Sometimes I do, but whenever it is not happening at the moment, I get frustrated. I give up easily" (Interview, 11 November 2020).

Seeking feedback from the lecturer: Student teachers were asked *what strategies they used to cope with the challenges.* The follow-up question was, *do you reach out to your lecturer for help?* The first student said, "the lecturer is very open. So whenever there were any difficulties, we called him. Another student claimed, "I will reach him in the corridors after class and ask him to explain a topic I don't understand." While the third student reported, "No, I don't. I was too scared to ask him for help" (Interview, 11 November 2020).

Benefits of the ESC 4103 Course

Some of the initial codes that led to the identification of the benefits of ESC 4103 to student teachers are "methodology," "content," and "benefits." These codes were compared, modified, and emerged. The categories that emerged were (a) the benefits to the upper primary levels and (b) becoming a better teacher.

*Become a better teacher: S*tudent teachers were asked *if ESC 4103 would benefit their science teaching.* One student said, "it will benefit my teaching. The first module deals with methodology. We did some work on the inductive, deductive, and guided discovery models of teaching. This gives me advanced knowledge in terms of methodology in teaching" (Interview, 11 November 2020). A second student claimed, "yes. It would have been beneficial to me if I had understood some of the concepts" (Interview, 11 November 2020).

Benefits to upper primary levels: Student teachers were asked *if ESC 4103 would benefit their science teaching*. A student responded, "in teaching the content, even though it was challenging, it will benefit me because the topics are taught at grade 5 and 6 levels. Topics like mass and weight" (Interview, 11 November 2020). Another claimed that "it has some benefits. It will work out if you are teaching grades 5 and 6" (Interview, 11 November 2020).

Discussion

From analyzing the data for research question one, two themes emerge; challenges students face and the self-regulated learning strategies they use to cope with

challenges. Student teachers' challenges in ESC 4103 can be grouped into four types: *institutional, situational, academic, and academic barriers.*

Situational Barriers: The three female teachers interviewed reported experiencing financial constraints, being single mothers with young children, and having demanding job responsibilities. In addition, one teacher reported experiencing personal challenges that took her focus away from her studies. These challenges are called situational barriers. Mackerocher et al. (2006) defined situational barriers as life situations that hinder adult students from accessing and pursuing learning. This barrier includes responsibilities at home, family, and children, lack of affordable childcare services, lack of support from others (Habibah, 2006), employment (Osam et al., 2017), parental guilt, financial constraints, and job responsibilities (Fairchild, 2003). Situational barriers affect working women pursuing higher education (Baharudin et al., 2013). This is because women are deemed responsible for children, older people, and domestic chores (White, 2008).

Dispositional Barriers: Dispositional barriers resulted in students feeling that science was challenging, which led to negative feelings such as frustration, confusion, and demotivation. Students also reported lacking confidence in their abilities to succeed at the university level. According to Mackerocher et al. (2006), dispositional barriers relate to adult students' inner feelings about how they perceive themselves as students. Dispositional barriers include self-esteem and negative attitudes about being an adult student. They may also include attitude, self-confidence, beliefs (Comings, 2007), and lack of motivation (Osman et al., 2017).

Academic Barriers: Students reported lacking prerequisite knowledge about Physics, the content knowledge component of the ESC 4103 course. This aspect of the course dealt with mathematical competencies such as calculations, which they found very challenging. These challenges can be called academic barriers. Academic barriers are the crucial skills adult students need to succeed. These include their ability to think critically, access and understand information, and write meaningfully (Mackeracher et al., 2006). Academic barriers may also include students' understanding of fundamental mathematics concepts (Bates & Aston, 2004). De Vito (2009) expressed that if a person is not academically good in the earlier years, this will remain a barrier as they move on to higher studies.

Institutional Barriers: The final category of challenges includes students reporting that the class size was too large, the course was too packed, and the course's scheduled time was inappropriate. These institutional barriers result from the policies and procedures that may hinder an adult student from participating in educational opportunities (Comings, 2007). These include excessive red tape in enrolment procedures, torturous classwork, lack of accessible office hours (Osman et al., 2017), lack of support services and suitable learning space for the adult learner, learning resources, financial support, and a lack of recognition of adult students' previous knowledge or credentials (Mackeracher et al., 2006). These challenges may have resulted in student teachers' low grades in ESC 4103.

Self-regulated Learning Strategies: Student teachers have employed some self-regulated learning strategies to cope with the challenges they face in ESC 4103. These include goal-setting and seeking help from peers, course lecturers, and other adults they

deem capable (former teachers, former students, and another lecturer who is not the course lecturer). On the other hand, one student teacher reported being afraid to ask the lecturer for help. At the same time, another student teacher claimed that she set goals but did not commit to them. Student teachers' use of self-regulated learning strategies may not have been adequate to aid their learning and academic performance. In support, a study by Zimmerman and Martinez- Pons (1986) found that high-achieving students use more self-regulated strategies than low-achieving ones. They use 13 out of 14 of the following self-regulated learning strategies: Self-evaluation, Organizing and transforming, Goal-setting and planning, Seeking information, Keeping records and monitoring, Environmental structuring, Self-consequences, Rehearsing and memorizing, Seeking social assistance, and Reviewing records. Hence, academic achievement heavily depends on students' self-regulated learning strategies (Schunk, 1984).

Benefits of ESC 4103: One theme emerged from the data collected to answer research question two. It must be noted that although student teachers faced many challenges in the ESC 4103 courses, they believed that the course would benefit their science teaching, especially for teaching at the upper primary levels (Grades five and six). Student teachers acknowledged that dividing the course into the methodology and content sections gives them the knowledge and skills they need to be more competent teachers. This course design is supported by Shulman (1986), who posited that two types of knowledge are essential for teachers to acquire in teacher education programs, content knowledge and pedagogical content knowledge. Thus, these two types of knowledge can positively impact educational outcomes (Rice, 2003). However, student teachers reported that they had problems understanding the content knowledge aspect of the course. One

student said, “yes. It would have benefited me if I understood some of the concepts” (Interview, November 11, 2020). This may have led to the low grades they achieved in the course. Student teachers achieving a low grade in an introductory science course can be deemed incompetent since teaching competencies can be judged by teacher knowledge of the subject matter (Shulman, 1986).

Cycle One: Mini Intervention

In cycle one, in the summer 2021 semester, I implemented a small-scale intervention; a prerequisite subject-based mathematics curriculum. This intervention was designed as a result of findings from cycle zero, where student teachers noted that mathematical skills were essential for successfully completing module B of ESC 4103. Module B consists of fundamental physics concepts such as forces and energy. Learning these concepts requires student teachers to have background knowledge and skills in mathematics. Uhden et al. (2011) claimed that mathematics skills are a pre-requisite for learning physics; since mathematics is embedded in physics concepts (Redish, 2006). However, the student teachers have also reported that some mathematical aspect of ESC 4103 was challenging. Thus, in cycle one, I set out to answer these three questions:

RQ1. What are student teachers’ attitudes and feelings about ESC 4103?

RQ2. To what extent does participation in a prerequisite subject-based mathematics curriculum improve student teachers’ academic performance?

RQ3. What are student teachers’ perceptions of the prerequisite subject-based mathematics curriculum?

Data Collection

I used an explanatory mixed-method research design for cycle one of my action research. Quantitative and qualitative data were collected sequentially (Ivankova, 2015). First, quantitative data were collected and analyzed to address whether the intervention impacted students learning. After this, qualitative data was collected and analyzed to assess participants' experiences with the intervention (Creswell & Guetterman, 2019).

The participants were 30 first-year undergraduate, full-time primary school teachers reading for a Bachelor's degree in primary education in the Division of Education and Humanities, UGBC. All the student teachers in this intact ESC 4203 class were exposed to the intervention. An intact group is a type of convenience sampling. Convenience sampling involves selecting participants based on availability (McMillian & Schumacler, 2010). Of the 30 students who participated in the intervention, 21 student teachers responded to the attitudinal survey. Three student teachers were purposefully selected to participate in a 1:1 semi-structured interview.

My intervention was a prerequisite subject-based mathematics curriculum consisting of one three-hour class divided into five thirty (30) minutes lessons on basic mathematical concepts such as unit conversion, scientific notation, the law of indices, and solving algebraic equations. These topics for this intervention were identified after examining previous ESC 4103 test data. A literature review informed this intervention which suggests that the mathematical component of physics has been a concern for physics educators (Monk, 1994) since mathematics models are powerful tools for solving problems in physics (Quale, 2010).

A 20-item objective-type achievement test covering the topic of sound waves and energy was constructed by me and administered to all student teachers virtually via the University of Guyana Moodle platform before and after the intervention. The achievement test was self-instructed and lasted about 30 minutes for the average student. The pretest was administered before the intervention, while the posttest was administered post-intervention and statistically compared to the pretest (Crewell & Guetterman, 2019) to determine if the intervention impacted student academic performance. According to Mertler (2020), this approach is a one-group pretest-posttest design, where the same dependent variable is measured in one group of participants before the intervention(pretest) and after the intervention(posttest) is administered. This approach ensures that all students are exposed to the intervention and is appropriate to fulfill this study's purpose. In support, Mark and Gamble (2009) posited that it is unethical to withhold beneficial treatment from students.

A fifteen-item attitudinal Survey to determine student teachers' perceptions of ESC 4103 was also created by me. The items of the questionnaire were measured on a four-point Likert scale. The scale was as follows: strongly agree (4), agree (3), disagree (2), and strongly disagree (1). An attitudinal survey was created in a google form and emailed to student teachers a week before the intervention. Once the student teachers received the survey, they were asked to record their consent and views, measured on a four-point Likert scale. Their responses were automatically recorded.

The final instrument was a semi-structured interview constructed by me and administered post-intervention. The 1:1 semi-structured interview protocol elicited

responses from three student teachers to determine their perspectives on the prerequisite subject-based mathematics curriculum intervention. An Interview is a good way for participants to describe their personal experiences (Creswell &, Guetterman, 2019). Each interview session lasted 10 minutes and was audio-recorded via Zoom, transcribed verbatim, and stored on my password-secured computer. I kept an audit trail to ensure the trustworthiness of the qualitative data collected. This strategy involves maintaining clear descriptions of the research steps taken and the rationales for decisions made throughout a study (Lietz et al., 2006).

Data Analysis

The quantitative data from the attitudinal survey was analyzed using descriptive data such as the mean and percentages to answer research question one. To answer research question two, descriptive and inferential statistics were used to analyze the quantitative data collected from the pretest/posttest. The descriptive statistics included the mean and the standard deviation, which described the population and students' general performance. The inferential statistic used was the repeated measures t-test. The mean scores of the pretest/posttest were calculated and compared to the p-value of 0.05. Finally, qualitative data collected from the semi-structured interview was transcribed verbatim to answer research question three. The transcripts were then coded using different color highlighters. The data were analyzed using the constant comparative method (Strauss & Corbin, 1998). The constant comparative method "combines systematic data collection, coding, and analysis with theoretical sampling to generate theory that is integrated, close to the data, and expressed in a form clear enough for

further testing" (Conrad et al., 1993, p. 280). This procedure involved data being grouped into several codes and then formed into categories. This led to the development of themes from the data.

Results

Quantitative Data

Table 2

Descriptive Statistics, percentages for student teachers' responses to Attitudinal survey

	Items	Strongly Agree	Agree	Disagree	Strongly Disagree
1	I found ESC 4103 interesting.	11(52.4%)	10(47.6%)	0	0
2	I like participating in this course (ESC 4103).	8(38.1%)	13(61.9%)	0	0
3	I found ESC 4103 difficult.	1(4.8%)	5(23.8%)	13(61.9%)	2(9.5%)
4	I felt confident doing ESC 4103.	7(33.3%)	11(52.4%)	2(9.5%)	1(4.8%)
5	I struggled academically with ESC 4103.	2(9.5%)	3(14.3%)	13(61.9%)	3(14.3%)
6	Having a good grade in ESC 4103 was important to me.	20(95.2%)	1(4.8%)	0	0
7	I don't think I was clever enough to learn ESC 4103.	1(4.8%)	1(4.8%)	11(52.4%)	8(38.1%)
8	ESC 4103 assignments were easy.	1(4.8%)	11(52.4%)	8(38.1%)	1(4.8%)
9	Mathematical knowledge was vital for learning ESC 4103.	8(38.1%)	12(57.1%)	1(4.8%)	
10	I had the pre-requisite mathematical knowledge needed to learn ESC 4103	2(9.5%)	16(72.2%)	2(9.5%)	1(4.8%)
11	A course to enhance my mathematical knowledge would have helped me get a better grade in ESC 4103.	2(9.5%)	17(81%)	2(9.5%)	0
12	I like worded problems.	3(14.3%	8(38.1%)	8(38.1%)	2(9.5%)

13	I have difficulties understanding worded problems.	0	5(23.8%)	15(71.4%)	1(4.8%)
14	I am not sure how to attempt worded problems.	0	3(14.3%)	15(71.4%)	3(14.3%)
15	ESC 4103 will be helpful to my science teaching.	10(47.6%)	10(47.6%)	1(4.8%)	0

Note. The Likert scale used for questionnaire items: Strongly Agree 4, Agree 3, Disagree 2, Strongly Disagree 1.

The student-teachers reported a positive attitude toward ESC 4103(Table 2). All of the student teachers (100%) strongly agreed that ESC 4103 was interesting, and therefore, they liked participating in the course. However, 28.6% of the student teachers reported that they found ESC 4103 difficult; owning to this, 23.8% noted that they struggled academically with the course. Student teachers' academic struggles with the ESC 4103 course may be due to 47.6% of them reporting that they do not like worded problems, and 23.8% responded that they have difficulty understanding worded problems. Worded problems are a key critical component of module B, the physics part of the ESC 4103 course.

Nevertheless, the results indicated that student teachers' positive attitudes toward ESC 4103 might be due to them perceiving the course assignments as easy. Thus, they may have done well on these assignments, which increased their self-efficacy and confidence in the course. However, since the course assignments were not challenging to many students (57.2%), the quality of the course delivery may be questionable.

The data also show that many student teachers reported having the appropriate pre-requisite mathematical knowledge needed to learn ESC 4103(81.7%) since mathematical

knowledge was vital for learning ESC 4103(95.2%). Although many of the student teachers reported having the appropriate pre-requisite to doing well in ESC 4103, 90.5% said that a course to enhance their mathematical knowledge would have helped them get a better grade in ESC 4103. These findings suggest that students may have underestimated their abilities and therefore require assistance understanding basic mathematical concepts needed to do well in ESC 4103.

Table 3

Descriptive Statistics, Mean for Pretest/Posttest

Construct	Pretest M	Posttest M	*T (30)*	p
Intact class	14.67	16.73	3.89	0.0027

Note. n=30

A repeated measures t-test was conducted to determine if student teachers' academic performance differed significantly between the pre and post-intervention. The mean score of the student teachers in the posttest (M=16.73) was higher than their mean score in the pretest (M=4.67). Results showed that student teachers' academic performance in the posttest was significantly better than in the posttest (t30 =3.89 p <.0027). This statistically meaningful difference between student teachers' academic performance post-test may have resulted from the subject-based mathematics pre-requisite curriculum.

Qualitative data

The data collected from the 1:1 semi-structured interviews were used to answer the research question, what are student teachers' perceptions of the pre-skilled mathematics subject-based curriculum? The data were collected from two student teachers and transcribed verbatim. Data were analyzed using the constant comparative method.

Themes

In the qualitative data analysis, 30 codes were identified during the initial coding process. Using the constant comparative method, the initial codes were compared against each other, modified, and merged to form categories. After reading the data and reflecting on the categories, they were grouped into three major themes: *academic challenge, making sense of learning, and benefits of the pre-skilled subject-based curriculum.*

Table 4

Theme-Related Components, Themes, and Assertions

Theme-Related Components	Themes	Assertions
Challenges learning the concept of sound	Academic challenge	Students experience challenges as they learn new or built-on known concepts.
Processing Information	Making sense of learning	Students need time to process the information presented during instructional sessions to make sense of their learning.

Transfer of learning Building on previous knowledge Memory booster	Benefits of pre-skilled subject mathematics curriculum	A pre-skilled subject-based curriculum can aid students' learning.

Academic Challenges

Some of the initial codes that led to identifying the academic challenge's theme include in Vivo codes "the calculation part" and "mix up." These codes were compared, modified, and merged, resulting in the category *"challenges learning the concept of sound."*

Challenges learning the concept of sound: Student teachers were asked, *what was challenging about learning the concept of sound?* One student teacher responded, "the most challenging part for me would be the part where we had to calculate, the calculation part of it." Another student teacher said," I was kind of getting mixed between amplitude, intensity, and pitch."

Making Sense of Learning

Some initial codes that identified *the making sense of learning* theme include In Vivo codes "go back and check" and "time to process. "These codes were compared, modified, and merged, resulting in the category "processing information."

Processing information: Student teachers were asked *what was challenging about learning the concept of sound.* The first student teacher's response was, "even if we had it wrong, time was given for us to go back and check, which we did and end up with the

answer," while the second student claimed, "I had to take a little bit of time to process it. And as the lesson went on, I process it; I fully understand the difference between amplitude and intensity."

Benefits of the Pre-Skilled Subject-Based Mathematics Curriculum

Some of the initial codes that led to the identification of the making benefits of the pre-skilled subject-based curriculum includes In Vivo codes "transition of learning," "transfer it," "smooth flow," "previous knowledge," "build on," "pre-activity," "great help," "using it constantly," "practice," and "refresh my memory." "These codes were compared, modified, and merged, resulting in three categories "transfer of learning," "building on previous knowledge," and "memory booster."

Transfer of learning: Student teachers were asked *whether they would recommend that pre-skilled curriculum to future students*. One student teacher responded, "it (pre-skilled subject-based mathematics curriculum) gives us smooth flow in the transition of learning for me." Another echoed that "you will have an idea of how you were able to use that same knowledge, you would be able to transfer it (pre-skilled subject-based mathematics curriculum) into the concept that will be coming."

Building on previous knowledge: *S*tudent teachers were asked if *the pre-skilled mathematics curriculum would have helped them with ESC 4103.* The first student-teacher claimed, "any pre-activity for me involving mathematics would be an excellent help to any students studying in any aspect because, for me, mathematics is all about practice." The second student teacher claimed, "We built on our previous knowledge, so

you bringing that makes it easier for me to build on the concept that you were presenting."

Memory booster: Student teachers were asked if *the pre-skilled mathematics curriculum would have helped them with ESC 4103.* One student responded, "for me, with mathematics, for certain concepts, if you're not using it constantly, you tend to forget." Another student replied, "You refresh our memory on the calculation when you bring back the formula and stuff like that." She added, "the knowledge that you presented, even though we do it, I did it long before."

Discussion

Based on the findings, it can be concluded that student teachers had positive attitudes and feelings toward ESC 4103. This positive attitude may be due to student teachers perceiving ESC 4103 assignments as easy since many scored well on these assignments (80% of students gained A's and Bs in the course). Hence, a satisfactory grade in ESC 4103 could have increased student teachers' self-efficacy and confidence in the course. However, students' perception of the course assignments as being easy made the course quality questionable.

Studies have shown that pre-requisite knowledge is a vital predictor of student success (Kosiol et al., 2019). Hence, the mean score from the pretest suggests that student teachers may have possessed the pre-requisite mathematics skills since 70% of them gained fourteen out of the twenty items on the pretest correctly, which, when converted to a letter grade, is a B, a satisfactory grade by the University of Guyana standards. These findings supported student teachers' claims on the attitudinal survey that they had the

necessary previous knowledge to learn ESC 4103. Nevertheless, my intervention, the pre-requisite subject-based mathematics curriculum, has improved students' academic performance since the result showed a significant difference between student teachers' academic performance from pre-and post-intervention. This finding is supported by the attitudinal survey where student teachers suggested that a course enhancing their mathematical knowledge would have helped them get a better grade in ESC 4103. Qualitative findings from the 1:1 interview with student teachers also supported these findings. Student teachers claimed that the prerequisite skilled mathematics curriculum aided their learning. Uhden et al. (2011) reported a strong correlation between mathematics and physics education since mathematics skills are a prerequisite for learning physics.

Nevertheless, during the 1:1 interview, student teachers noted that although the prerequisite subject-based mathematics intervention aided their learning, it was just a memory booster since they believed they had the appropriate prerequisite mathematical knowledge to learn ESC 4103. Understanding physics requires learners to be fluent in mathematics since mathematics is embedded in physics concepts (Redish, 2006). Therefore, an intense subject-based mathematics intervention may not be necessary, but the appropriate mathematical skills can be integrated into the ESC 4103 course and instructed throughout the 13-week semester.

I have also learned informally (after the interview recording ended) that some student teachers believe working online and from their homes has been helpful. Thus, they were able to improve their academic performance. At the same time, others believe

that online assessments are much easier and thus have helped them improve their academic performance. Therefore, reflecting on how I can enhance online teaching, learning, and assessments may be necessary as I look toward future cycles. Finally, reviewing the data I collected from the attitudinal survey, I found some contradictory responses. For example, students reported having adequate knowledge to learn ESC 4103 but would welcome a course to enhance their previous knowledge. These findings have made me aware of social desirability biases. Social desirability bias tends to allow students to respond in ways they feel are appropriate or socially acceptable. Hence, to some extent, I believe that the 1:1 interview has helped reduce social desirability bias. However, in the future cycle, I am cognizant that to mitigate social desirability bias, I also need to develop a positive relationship with my students to make them feel more comfortable sharing their opinions and views in a survey or an interview. I also need to learn the art of crafting and using indirect questions and focus on my word choices when asking questions, whether in an interview or survey.

Summary of Research Findings

This action research study was designed to improve my professional practice. Mertler (2020) claimed that the purpose of action research is to" improve one's own performance judgment and give insight into better, more effective means of achieving desired educational outcomes" (p.14). Mertler (2020) also pointed out that action research is cyclic. Therefore, due to the nature of this research model, I have conducted two cycles of action research, cycle zero and cycle one, to explore my problem of

practice, the low academic performance of student teachers in ESC 4103 at the University of Guyana, Berbice campus.

In cycle zero, reconnaissance, I wanted to explore why my student teachers received low academic performance in ESC 4103. Using a qualitative research method, I found that my student teachers were experiencing four barriers to success in my course. These were situational, dispositional, institutional, and academic barriers. Student teachers used very few self-regulated learning strategies to cope with these challenges. For cycle one, I designed a mini-intervention to resolve the academic barriers identified by student teachers in cycle zero. My mini-intervention was a subject-based prerequisite mathematics curriculum that focused on teaching student teachers fundamental mathematics concepts such as unit conversion, the law of indices, and solving algebraic equations. These concepts were identified after examining ESC 4103 exam data. Using an experimental, sequential mixed method research design, I found that my intervention made a meaningful difference in student teachers' academic performance. However, in the 1:1 interview, student teachers pointed out that they had the appropriate prerequisite knowledge to do well in ESC 4103 and that my mini-intervention was just a memory booster.

The lingering question from the cycle one data is, *why are my student teachers gaining low grades in ESC 4103 if they possess the prerequisite mathematical knowledge to do well in ESC 4103*? Reflecting on this question has helped me revisit my research questions and expand my SRLAD intervention for my dissertation.

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CHAPTER 3

CREATING SELF-REGULATED STUDENT TEACHERS AT THE UNIVERSITY OF GUYANA

ABSTRACT

It is well documented in literature that student teachers must become self-regulated learners to be effective teachers. As self-regulated learners, teachers can pass these vital skills to their students. The aim of this study is to determine if my self-regulated learning awareness and development (SRLAD) intervention which focuses on teaching student teachers SRL strategies, could impact their academic performance. The literature reviewed shows that SRL strategies can be successfully taught to adult learners through interventions. This practical action research study utilizes a concurrent mixed-method research design. Quantitative data from a pretest/posttest and pre/post MSLQ and qualitative data from student reflective journals were collected simultaneously. The findings were then triangulated to answer the three research questions. Participants were 33 undergraduate teachers reading for their degree in early childhood and primary education at the University of Guyana, Berbice campus (UGBC). Data collected were analyzed using descriptive statistics such as mean and standard deviation and inferential statistics such as the repeated measures t-test and ANOVA. Major findings showed that student teachers were self-motivated and were able to select, assess, evaluate, and use appropriate SRL strategies to suit their learning needs and context. The SRLAD intervention had a meaningful impact on the academic performance of student teachers since they recognized the numerous benefits of incorporating SRL strategies to aid their learning and academic performance. They also realized that by consistently incorporating

SRL strategies into their learning, they could become self-regulated learners and, more importantly, teach these skills to their students. As such, the SRLAD intervention should be a mandatory study skill course for all first-year student teachers at the University of Guyana.

Keywords: Teacher education, teacher training, student teachers, academic performance, self-regulated learning

Introduction and Background

It is the universal right of every child to receive an education. Education prepares them to be democratic, responsible citizens (Manzoor et al., 2012). Thus, societal advancement depends on the value a nation places on education (Mohanty, 2000). Owing to this, many countries in the Global South spend large portions of their Gross Domestic Product (GDP) on education. However, no country can grow beyond its education sector's quality, which heavily depends on its teachers (Moon & Moon, 2012).

Babalola (2006) posits that teachers are the initiator of the learning process, the learning process's facilitators, the learning sequence's coordinators, the assessors of learning efficiency, and undeniably, the entire educational development. Therefore, understanding the role of teachers is vital to understanding education and the education sector. To become an effective teacher, one must receive a quality teacher education. Teacher education is designed to equip student teachers with the knowledge, attitudes, behavior, and skills required to be effective classroom teachers (Omede & Oguche, 2016). Therefore, teacher education programs must aim to create a pedagogically thinking teacher with adequate theoretical background knowledge and a reflective

attitude toward the education sector's challenges (Kasemsap, 2017). Baumert et al. (2010) posited that teacher knowledge development is essential in teacher education. To ensure quality teacher education, it is crucial to identify factors contributing to its success (Fenollar et al., 2007).

Two types of knowledge essential for teachers to acquire in teacher education programs are content knowledge (CK) and pedagogical content knowledge (PCK) (Shulman, 1986). Content knowledge is a teacher's understanding of the content to be taught (Baumert et al., 2010; Krauss et al., 2008), while pedagogical content knowledge is knowledge teachers need to make the content understandable to learners (Krauss et al., 2008). Research studies in teaching and teacher education show that teachers' content knowledge and pedagogical content knowledge are essential predictors of instructional quality, influencing student achievement (Darling-Hammond & Bransford, 2005; Grossman & McDonald, 2008).

Thus, evidence supports that teacher education is vital to teachers' success (Kennedy & Choi, 2008). However, teacher education programs are plagued with problems (Moon & Moon, 2012). One such issue is the poor academic background of student teachers, which has led to their low academic performance in teacher education programs (Moon & Moon, 2012). In support, Ohst et al. (2015) noted that scholars worldwide have pointed out that student teachers have incomplete and poorly organized knowledge. More specifically, Muwonge and Ssenyonga's (2015) study showed low educational achievements among teacher education students in Uganda. There may also be evidence of low academic performance among student teachers in Guyana.

In a 2020 Guyana Chronicle newspaper article, it was noted that the Caribbean Secondary Examination Certificate (CSEC) did not adequately prepare student teachers for studies at the Cyril Potter College of Education (CPCE)(Guyana Chronicle, June 11, 2020). In the same article, the principal of CPCE acknowledged that some students in the institution struggle to grasp key concepts in introductory courses. Hence, evidence suggests that student teachers have been struggling academically for decades. In 2010, Olato Sam, then Chief Education Officer and Chairman of the Board of Governor of the CPCE, at the launching of the Associate Degree of Education program, told student teachers that "they will be expected to deliver better performance at the College and the University" levels (Kaieteur News, November 3, 2010).

Therefore, it is not surprising that student teachers entering the University of Guyana, upon completing studies at CPCE, were gaining low grades in an introductory science course designed to teach them basic science content knowledge and pedagogical content knowledge. According to Rice (2003), a course in content knowledge and pedagogical content knowledge could positively impact education outcomes. The student teachers who gain a low grade in the introductory science course may be deemed incompetent since teaching competency can be judged by teachers' knowledge of the subject matter (content knowledge and pedagogical content knowledge) (Shulman, 1986; Toriff & Sessions, 2009).

There have been several attempts to improve teacher education and performance in Guyana. The Primary Education Improvement Project (PEIP), funded by a loan from the Inter-American Development Bank, was implemented in 1990, focusing on

developing teacher skills (World Data on Education, 2006-2007). In 2003, the Inter-American Development Bank and UNESCO assisted Guyana with funding under the Education for All- Fast Track Initiative (EFA-ETI); one of the proposed interventions was to improve the quality of teachers by providing training (Ministry of Education, Guyana, 2003). However, in 2008, a review of the 2003-2007 education strategic plan revealed that education quality was still a great concern for education stakeholders in Guyana (Ministry of Education, Guyana, 2017).

Apart from the poor academic background of student teachers being a hurdle in teacher education programs, student teachers are adult learners who may have other responsibilities competing for their attention. Research studies have identified four (4) barriers that adult students, especially female students, encounter. These are situational, institutional, dispositional, and academic barriers. Mackerocher et al. (2006) defined situational barriers as life situations that hinder adult students from accessing and pursuing learning. This barrier includes responsibilities at home, family, and children, lack of affordable childcare services, lack of support from others (Habibah, 2006), employment (Osam et al., 2017), parental guilt, financial constraints, and job responsibilities (Fairchild, 2003). Situational barriers seem to affect working women pursuing higher education (Baharudin et al., 2013). This is because women are deemed responsible for children, older people, and domestic chores (White, 2008). Institutional barriers result from the policies and procedures that may hinder an adult student from participating in educational opportunities (Comings, 2007). These include excessive red tape in enrollment procedures, torturous classwork, lack of accessible office hours (Osam et al., 2017), lack of support services and suitable learning space for the adult learner,

learning resources, financial support, and a lack of recognition of adult students' previous knowledge or credentials (Mackeracher et al., 2006). Mackeracher et al. (2006) claimed that dispositional barriers relate to adult students' inner feelings about how they perceive themselves as students. These include self-esteem and negative attitudes about being an adult student. They may also include attitude, self-confidence, beliefs (Comings, 2007), and lack of motivation (Osam et al., 2017). Finally, academic barriers are the crucial skills adult students need to succeed. These include their ability to think critically, access and understand information, and write meaningfully (Mackeracher et al., 2006). Rogers (2002) suggested that adult learners often exhibit ego defense mechanisms such as compensation, repression, displacement, sublimation, rationalization, identification with others, and projection of their impulses on others when coping with challenges.

Thus, educators and stakeholders have debated what constitutes effective teacher education in Guyana over the years. Klieme et al. (2008) posited that the concept of professional competence might offer an understanding of teachers' success. They defined competence as having skills, knowledge, and motivational variables needed for mastering specific situations. Epstein and Hundert (2002) claimed that skills, knowledge, and motivational characteristics are not innate but learnable and teachable. Thus, effective student teachers must become effective learners. Therefore, the question arises as to how can teacher educators at the University of Guyana teach student teachers to be competent learners and teachers. Desimone (2009) and Tan et al. (2015) suggested that there is evidence from research that self-initiated learning activities can contribute to teacher competence growth. Self-initiated learning activities may include teaching student teachers to be self-regulated learners.

Learners' ability to actively plan and monitor their learning through motivational, behavioral, and cognitive strategies is self-regulated learning (Pintrich, 2004). Self-regulated learning positively correlates with academic success (Pintrich, 2004; Rotagans & Schmidt, 2012). However, research on self-regulated learning has focused mainly on teachers helping their students to become self-regulated learners. There is limited research on self-regulated learning, where teachers are the students (Saariaho et al., 2016), especially in Global South Countries like Guyana. It is crucial to research teachers since effective teachers are self-regulated learners. They are motivated and can employ adaptive strategies to attain teaching objectives and educational goals and promote self-regulated learning among their students (Pintrich, 2000). Therefore, understanding (researching) how student teachers regulate their learning is essential since this can serve as a model for their students to emulate and regulate their own learning (Saariaho et al., 2016).

Against this backdrop, I am determined to find out if my SRLAD intervention could impact student teachers' academic performance in a science course at the UGBC.

The Problem of Practice, Purpose of the Study, and Research Questions

The student-teachers have not performed well in ESC 4103(Teaching of science at the Early childhood and Primary level 3), a science course designed to widen their content knowledge and support the science curriculum's effective delivery at the primary level. Therefore, this study aimed to determine the effects of the SRLAD intervention on

the academic performance among student teachers in the ESC 4103 course at UGBC. The following research questions guided the research:

RQ1: How and to what extent are there significant differences in student teachers' utilization of SRL strategies pre and post the self-regulated learning awareness and development (SRLAD) intervention?

RQ2: How and to what extent are there significant differences in the academic performance of student teachers in ESC 4103 pre and post the self-regulated learning awareness and development (SRLAD) intervention?

RQ3. What are student teachers' perceptions of the self-regulated learning awareness and development (SRLAD) intervention?

Significance of Study

These results will be significant to student teachers and in-service teachers in Global south countries such as Guyana. Teachers must become aware of their own learning by becoming self-regulated learners. As self-regulated learners, they can become effective teachers since they can acquire the necessary skills to learn (Randi, 2004) and apply them to their teaching. Therefore, the more teachers know about self-regulated learning, the more they can make it visible to their students (Paris & Winograd, 2003). Hence, research on self-regulated learning among student teachers is vital since they can serve as models for their students to regulate their learning (Saariaho et al., 2016).

Students learning to regulate their own learning is vital to surviving in the workplace in the 21st century (Darling-Hammond, 2009; Robbins & Beuelin, 2013).

Finally, the results will be of importance to the leaders of teachers' education and training programs. It brings to the forefront the importance of student teachers doing well academically. Effective teachers must exhibit specific knowledge and skills. Two types of knowledge essential for teachers to acquire in teacher education programs are content knowledge (CK) and pedagogical content knowledge (PCK) (Shulman, 1986). Hence, it is established through research that more knowledgeable teachers can influence the academic performance of their students (Grossman & McDonald, 2008). Therefore, student teachers' academic achievement in their teacher education training programs can be a critical factor in shaping policies for the employment of teachers and their promotion to leadership roles. Therefore, teachers' education and training institutions must help their student teachers become self-regulated learners.

Theoretical Perspectives

The theoretical perspective framing this study is Bandura's social cognitive theory. This theory informed my SRLAD intervention design and implementation.

Social Cognitive Theory

Zimmerman (1989), the researcher credited for coining the term self-regulated learning, was adamant that self-regulated learning was rooted in social cognitive theory. Therefore, the social cognitive theory will be the overarching theory guiding my study. Albert Bandura developed social cognitive theory in 1960 to bridge the gap between

cognitive and behavioral learning theories. According to Bandura (1986), "In the social cognitive view, people are neither driven by inner forces nor automatically shaped and controlled by external stimulus" (p.18). Owing to this, Bandura (1989) refutes the claims by scholars that learning is unidirectional, where learning is influenced either by environmental variables or cognitive processes. Hence, he based his social cognitive theory on the fundamental assumption that learning occurs in a social context with a dynamic, bidirectional, triadic reciprocal relationship between a person, their behavior, and the environment (see figure 1) (Bandura, 1986; 1989 & 1999). Bandura (1989) believes "what people think, believe and feels affect how they behave" (p.3), and their "behavior alters environmental conditions and is altered by the very conditions it creates" (p.4); in turn, the environment shapes "human expectations, belief, emotional bents, and cognitive competencies … and activate emotional reaction" (p.3). However, Bandura (1986, 1989) noted that a reciprocal relationship does not mean equal interactions, and the relationship between the three constructs may vary in strength and may not co-occur.

Bandura (1986) further argued in his social cognitive perspectives that people are assumed to have specific capabilities such as symbolizing, forethought, vicarious, self-regulation, and self-reflection, which form the basis of the triadic reciprocal causation. The first capability, symbolizing, involves helping people understand what is happening in their environment and react to these environmental situations. Symbolizing, therefore, allows learners to adapt and alter the environment (Bandura, 1986). The forethought capability helps people anticipate possible consequences of their actions and plan how to avoid the effects and produce desirable outcomes. Therefore, the forethought capability allows learners to set goals that stimulate and sustain their motivation throughout the

learning process (Bandura, 1986; Zimmerman, 1989). Vicarious, the third capability, provides the basis for observational learning (Bandura, 1986). Learners use observational learning to construct and expand their knowledge of the environment. The self-regulatory capability suggests that humans are self-reactors capable of developing self-direction. Hence, self-regulatory capabilities help learners set personal standards to guide their behaviors (Bandura, 1986). The final capability is self-reflective capability, which suggests that humans are agents of actions and self-examiners of those actions. Hence, learners can learn to monitor, act on, predict, judge, and change their behavior (Bandura, 1986).

The five capabilities are also considered self-regulatory mechanisms. Therefore, Bandura's social cognitive theory's fundamental assumption is that individuals are active self-regulatory agents rather than passively influenced by their environment (Bidjerano & Yun Dai, 2007). Hence, being an active self-regulatory agent involves being knowledgeable about learning skills and metacognitive, motivational, and behavioral strategies (Zimmerman, 2002). It is not a personality trait that students possess or lack; it involves the selective use of specific strategies students must adapt to each task to aid their learning (Zimmerman, 2002). In other words, these strategies will help students learn how to learn (Woolfolk et al., 2000). Therefore, self-regulation can be viewed as a skill that can be developed rather than genetically rooted (Zimmerman, 2002).

Although social cognitive theory is deemed the most popular theory to explain learning, some researchers have highlighted several limitations. One of the primary criticisms is that it needs to be a cohesive theory. For example, researchers reported that

they could not find a link between observation learning and self-efficacy within the social cognitive perspectives (Zhou & Brown, 2015). Zhou and Brown (2015) further postulate that the social cognitive theory focuses on learning processes, disregarding biological predispositions that may influence learners' behaviors.

I choose to apply social cognitive theory in my study because it is the foundational framework for many studies conducted in self-regulated learning. For example, Alvi and Gillies (2020) used the social cognitive perspective to frame the study - an in-depth case study of how a Grade 7 teacher supported her students' self-regulated learning (SRL) through her classroom practices. White (2017) also used social cognitive theory to provide evidence in a meta-analysis study of modeling instruction's important role in promoting self-efficacy, motivation, self-regulation, and achievement. Finally, Bembenutty (2016) used the social cognitive theory to frame his study to examine in-service and preservice teacher motivation and self-regulated learning and how gender and educational level are associated with their academic performance during their teaching training program. He noted that the "social–cognitive theory proposes that human agency is a function of self-efficacy beliefs and self-regulatory competencies" (p. 231). Hence, I used social cognitive theory to explain that student teachers can be taught to self-regulate their learning by modeling self-regulated learning strategies—adapting these strategies can influence academic achievement.

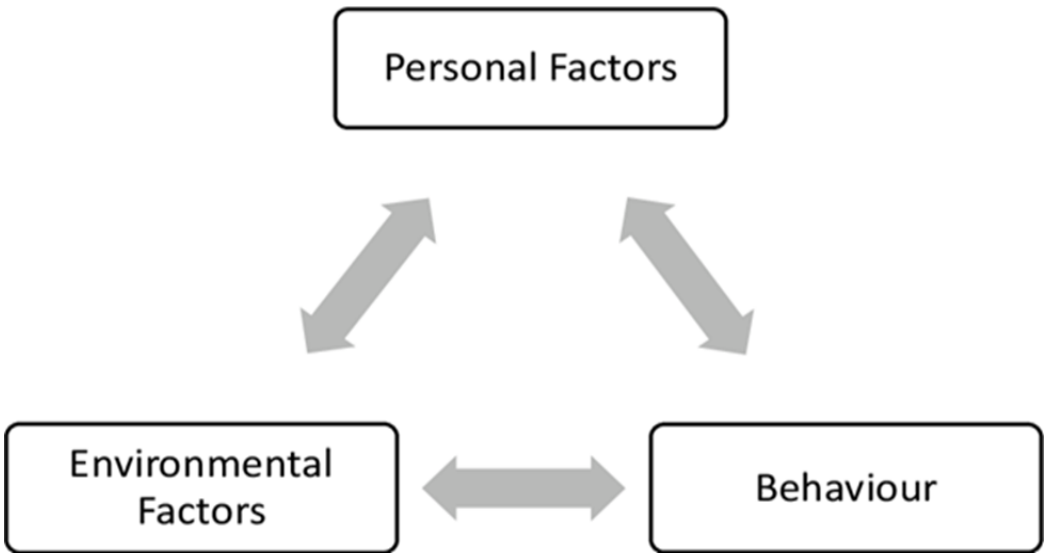

Figure 1. Triadic Reciprocality Model (Bandura, 1986)

Students must become lifelong learners. To do this, students must be taught to regulate their learning by incorporating self-regulated learning strategies (metacognitive, behavioral, and motivational) in learning tasks to aid their understanding. Adult students can be taught to integrate these strategies into their learning because they are active self-regulatory agents. Thus, self-regulatory processes, such as self-reflection, self-evaluation, and self-motivation, can help adult learners become aware of their learning strengths and weaknesses- learning how they learn. Knowing how they learn best or being a self-regulated learner may help improve students' academic performance. To support this assertion, Pritchard (2009) suggested that individual awareness of their thought processes will have a bearing on how they view their learning and likely, with encouragement, lead to recognition of the ways they learn most effectively. Hence, student teachers becoming self–regulated learners have important implications for the teaching and learning process. When student teachers become aware of how they can self-regulate their learning, this

may enhance their academic performance and competencies as teachers. Also, they can serve as a model for their students.

Literature Review

Defining Self-Regulated Learning

For centuries philosophers have pondered how they can help learners enhance their learning. However, in the 20th century, as educational psychology became prominent, educational psychologists began exploring the reasons for individual learning differences in education (Zimmerman, 2002). A new perspective on student learning differences led to metacognition and social cognition research. Researchers concluded that individual learning differences resulted from students not using self-regulation mechanisms to aid their learning (Zimmerman, 2002). Baker and Brown (1984) suggested the term self-regulation because of the need to separate metacognition into the knowledge about cognition and self-regulatory mechanisms. Self-regulation refers to self-generated thoughts, feelings, and behaviors oriented toward attaining goals (Zimmerman, 2000). Self-regulated learning is a domain of self-regulation.

Since its conceptualization, a diverse body of literature has been established on self-regulated learning (Zimmerman & Schunk, 2001). This led to a multiplicity of ways to define self-regulated learning. Boekaerts (2002) suggested that students who use self-regulated learning strategies pursue their own learning goals by being self-motivated. Winne (2017) described a self-regulated learner as a student who "monitors information about how the learning was enacted using cognitive operations, study tactics, and

learning strategies and changes in the fit of internal and external conditions to various standards" (p. 39). Zimmerman (2008) claimed that self-regulated learning encompasses students' motivational beliefs, their use of learning strategies, and the ability to evaluate particular learning strategies' effectiveness upon performance. I define self-regulated learning as monitoring, assessing, and evaluating one's progress as a student. It also involves students becoming aware of their learning strengths and weaknesses, building on them, and seeking help from knowledgeable others (peers, lecturers) to improve weaknesses. In other words, self-regulated learning is students' ability to take charge of their education (Zimmerman & Schunk, 2001). Although self-regulated learning definitions differ according to theoretical paradigms, they all *boil down* to learners' need to be involved in three primary constructs: motivational, cognitive, and behavioral (Schunk, 2005). Motivation involves adjusting the learning environment and reforming goals and plans (Winne & Hadwin, 2011); cognitive includes strategies needed to memorize and recall information (Zimmerman, 2000); and behavioral strategies include time management and self-regulation of the physical and social environment (Dembo & Seli, 2013).

However, it must be noted that a meta-analysis study done by (Dinsmore et al., 2008) reported that not all present-day researchers were explicitly defining self-regulated learning based on its theoretical and historical roots. The authors were concerned that current literature used self-regulation and self-regulated learning indiscriminately and synonymously. To clarify the terms, Dinsmore et al. (2008) explained that self-regulation emphasizes that the individual's mind is the trigger for subsequent judgment and evaluations. In contrast, self-regulated learning distinguishes itself by focusing on

academic learning. Dembo and Seli (2013) made the distinction clearer by referring to self-regulated learning as "academic self-regulation" (p.3).

Self-Regulated Learning Impacts on Academic Performance

Since its conception in the 1980s, the theory of "self-regulated learning" and its influence on academic performance has been investigated. In fact, self-regulated learning has become the most widespread educational theory used to explain academic achievement by academics (Panadero et al., 2017). Although many scholars accept that self-regulated learning benefits the teaching/learning process, they generally support it at lower education levels. This is because previous research suggested that self-regulated learning is developed from childhood to adolescence. However, in recent studies about self-regulated learning intervention among adult students, where it is argued that self-regulation can be taught successfully to persons of all ages (Bidjerno& Yun Dai, 2007).

According to Rotgans and Schmidt (2012), self-regulated learning has received much attention due to its positive correlation with academic achievement. Thus, an emerging body of literature on self-regulated learning has reported its significant impacts on students' academic achievement (Dent, 2013; Kistner et al., 2015). More specifically, research has shown that students who regulate their learning are more successful academically than those who do not (Zimmerman, 2002; Puzziferro, 2008; Cazan, 2013). Broadbent and Poon (2015) examined studies published from 2004 to 2014 examining the relationship between self-regulated learning and academic performance. They found that self-regulated learning, particularly critical thinking, has led to higher academic performance among students. In more recent meta-analysis studies, Schneider and

Preckel (2017) found that self-regulated learning strategies significantly predict students' academic achievement. In fact, some researchers are suggesting that self-regulated learning is an important survival tool and skill for learners (Bjork et al., (2013) to be competitive in the 21st-century workforce and global economy (Darling-Hammond, 2009; Robbins & Beuerlein, 2013).

Although many studies show the positive impact of SRL on learning, Forest et al. (2017) found that despite having advanced knowledge of SRL strategies, many adult students do not put them to use. The authors reported in their study that students claim they lack time to use SRL strategies, would not benefit from their use or be able to use them effectively, or deem their use demanding.

Zimmerman Model

To effectively incorporate self-regulated learning strategies in their learning, students must be taught how to do so. The Zimmerman model proposed three phases of development that illustrate how students may adopt self-regulated learning strategies into their learning (Zimmerman, 2000, 2002).

The three phases of Zimmerman's (2000; 2002) cyclical model are forethought, performance, and self-reflection. Forethought involves perspective reflection (Reinholz, 2016), where students are taught to regulate their learning through instruction. Self-regulated strategies are acquired through observation, including modeling and receiving guidance and feedback from the teacher (Zimmerman & Kitentes, 2005). Students begin to regulate their learning in the performance phase by performing tasks with limited teacher guidance (Schunk & Zimmerman, 2007). Once students observe success in their

learning, this will motivate them to continue using self-regulated learning strategies (Schunk & Zimmerman, 2007). In the final phase, self-reflection, students are encouraged to use the self-regulated learning strategy with less teacher supervision (Zimmerman, 2002).

In support, Zimmerman and Kitantes(1999) reported academic success among learners who use the three phases in their learning. More recently, DiBenedalto and Zimmerman (2010) studied 51 high school senior students during a science course. They found that higher achievers used more sub-processes from the Zimmerman model. Therefore, through information sharing, modeling, and learning in social settings, students can be taught to self-regulate their learning to influence their academic performance and motivation (Deci & Ryan, 2000).

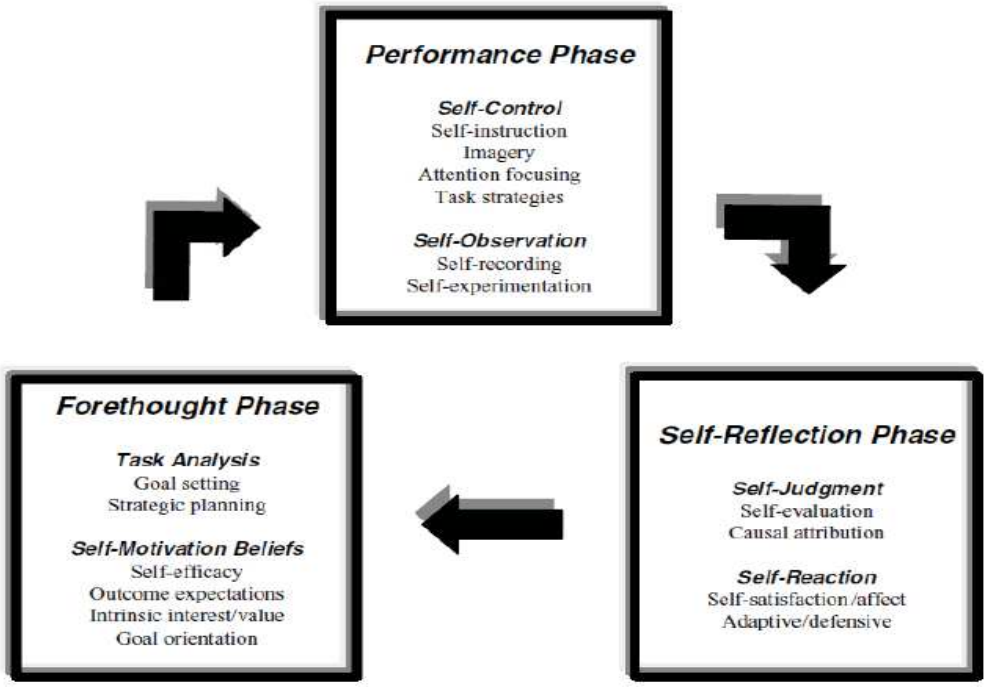

Figure 2. Cyclical Model (Zimmerman, 2000, 2002).

Teachers as Self-Regulated Learners

Over the years, scholars are beginning to realize that effective teachers must be effective learners (Peeters et al., 2013; Tan et al., 2015). "Effective teachers are thoughtful decision-makers and reflective practitioners ready to increase student learning" (Liu et al., 2018a, p. 26). Dembo (2001), Randi (2004), and Gordon et al. (2007) suggested that teachers can benefit from self-regulated learning in their quest to be effective teachers and learners. In fact, effective teachers are self-regulated learners; they are motivated and employ adaptive strategies to attain teaching objectives and promote self-regulated learning (Pintrich, 2000; Zimmerman, 2002, 2008; Kramarski & Khoen, 2017). As self-regulated learners, teachers can acquire the necessary learning skills (Randi, 2004) and apply them to their teaching.

Because of the positive impact of self-regulated learning on learning, teacher training programs must teach student teachers how to regulate their learning (Randi, 2004; Vrieling-Teunter et al., 2018; 2021). The knowledge and understanding of self-regulated learning strategies can give greater insight into their learning, enhancing their academic performance. Also, teachers who know how they learn can better identify their students' learning needs and plan more effective and enjoyable instructions (Randi &Corno, 2000). They are more inclined to promote effective learning strategies they experienced as learners (Gordon et al., 2007). Therefore, the more teachers know about self-regulated learning, the more they can make it visible to their students (Paris & Winograd, 2003). Hence, research on self-regulated learning among student teachers is

vital since they can serve as models for their students to regulate their learning (Saariaho et al., 2016).

Therefore, educators and education partners must take bold steps to improve training for new and practicing teachers (Azoulay, 2018) by helping them become self-regulated learners. The primary way of enhancing teacher quality and competencies is to base teacher education and training on solid research (Cooney, 1994).

Methodology

Research Design

My study can be categorized as practical action research. Practical action research involves educators seeking to investigate a specific problem in their workplace to improve students' learning and their own professional practice (Creswell & Guetterman, 2019). This practical action research study utilized a mixed-method design. According to Mertler (2020), "action research studies tend to align better with mixed-method research design" (p.106). Mixed method design combines qualitative and quantitative data in a single study (Creswell & Guetterman, 2019). Creswell (2005) suggested that considering both types of data may help me better understand my problem of practice.

There are different approaches to mixed-method design (Creswell, 2014). This practical action research falls under the concurrent mixed-method design. Both quantitative and qualitative data are collected simultaneously. While quantitative data is collected and analyzed to address whether the intervention impacted participants learning,

qualitative data is collected and analyzed to assess participants' experiences with the intervention (Creswell & Guetterman, 2019). The inferences from the two study strands (quantitative and qualitative) are synthesized to find collaborative evidence to better understand the research problem and establish well-validated conclusions (Ivankova, 2015). Using a mixed-method research design allows me to harness the strengths of both the quantitative and qualitative methods (Creswell & Guetterman, 2019; Mertler, 2020).

The process of action research, which is cyclical and spiraling in nature (Mertler, 2020), includes four areas of focus: identifying the area of focus, doing reconnaissance, reviewing the literature, and working on the action research plan to guide the research (Creswell & Guetterman, 2019). Reconnaissance or cycle zero is described as self-reflection and descriptive (Creswell & Guetterman, 2019). McNiff and Whitehead. (2003) suggest that reconnaissance is a starting point in action research where the researcher determines where they are, what they hope to achieve, and how they will get there. In other words, cycle zero or reconnaissance is a way for me to gather preliminary background information about my problem of practice to gain a deeper understanding of the same. For cycle zero of this study, I conducted semi-structured interviews to answer the following research questions: What is the pedagogical philosophy behind the scope and sequence of ESC 4103? What learning challenges do students face in ESC 4103? I found that student teachers encountered four barriers adult students face when pursuing higher education. These barriers include situational, dispositional, institutional, and academic. It was also noted that student teachers used very few self-regulated learning strategies to cope with the challenges they faced in their ESC 4103 class. This includes

help-seeking and goal-setting to some extent. The data from cycle zero helped me refine my action research plan as I moved forward with cycle 1 of my dissertation.

In cycle 1, I implemented a small-scale intervention, a prerequisite subject-based mathematics curriculum, since mathematical skills are considered an essential prerequisite for ESC 4103. The mixed-method approach I utilized to collect data revealed that my adult student teachers claimed they possessed the prerequisite mathematical knowledge to do well in ESC 4103. The lingering question from the cycle 1 data is, why are my student teachers gaining low grades in ESC 4103 if they possess the prerequisite mathematical knowledge to do well in ESC 4103? These data have helped me revisit my research questions and expand my SRLAD intervention.

Participants

The participants for this practical action research study were 48 first-year undergraduate, full-time early childhood, and primary school teachers reading for a Bachelor's degree in early childhood and primary education in the Division of Education and Humanities, UGBC. All student teachers in this intact ESC 4103 class were exposed to the intervention, but only 33 participated in the study. An intact group is a type of convenience sampling. Convenience sampling involves selecting participants based on availability (McMillian & Schumacher, 2010).

The student teachers shared similar social, cultural, and socio-economic backgrounds. Most of them are of African and East Indian descent and reside in rural areas

on Guyana's West and East Bank of the Berbice River. In addition, most of the participants are female, 25-45 years of age, each with over five years of teaching experience.

Intervention

My self-regulated learning awareness and development (SRLAD) intervention had two phases. First, the Motivated Strategies for Learning Questionnaire (MSLQ) was administered to student teachers to determine the self-regulated strategies they used before and after the intervention to compare and assess changes in student teachers' behavior. Then, student teachers were taught motivational, behavioral, and cognitive learning strategies and how to incorporate them using the Zimmerman self-regulated learning model to aid their academic performance in the ESC 4103 course. A review of related literature informed this intervention. There are studies about self-regulated learning intervention among adult students, where it is argued that self-regulation can be taught successfully to persons of all ages (Bidjerno & Yun Dai, 2007). More so, researchers suggest that students who self-regulate their learning perform academically better than their counterparts who do not (Dent, 2013; Kistner et al., 2015). The work of Geduld (2017) also informs my intervention. While conducting a qualitative study on teachers' perceptions of how they develop self-regulated learning, she found that although teachers knew that self-regulated learning was essential to academic achievement, many were unsure of what it entailed. She recommended an intervention be conducted to teach teachers and student teachers the importance of self-regulated learning and its development in the classroom. Based on the research findings, I created and implemented an SRLAD intervention. My intervention consisted of nine one-hour sessions where students were taught self-regulated strategies

and how to incorporate them into their learning using the Zimmerman model of self-regulated learning.

Table 5

An Outline of the SRLAD Intervention Scope and Sequence Curriculum.

Period	Focus
Session 1	I administered the MSLQ to determine the self-regulated strategies used by student teachers and discuss self-regulated learning.
Session 2	I conducted an interactive session on motivational strategies, goal setting, e.g., planning SMART goals, Kanban board, and rewards. I modeled the strategies, and students were allowed to practice the same (guided practice), after which error attribution was discussed.
Session 3	I conducted an interactive session on motivational strategies, self-regulation of emotion, e.g., self-talk, inspirational quotes, positive imagery, and self-care. I modeled the strategies, and students were allowed to practice the same (guided practice), after which error attribution was discussed.

Session 4	I conducted an interactive session on behavioral strategies (time management techniques), e.g., prioritizing, Pomodoro Technique, getting things done (GTD) framework, creating a to-do list, and managing distractions. I modeled the strategies, and students were allowed to practice the same (guided practice), after which error attribution was discussed.
Session 5	I conducted an interactive session on Behavioral strategies and self-regulation of the physical and social environment, e.g., Studying alone vs. studying in groups and creating a study space. I modeled the strategies, and students were allowed to practice the same (guided practice), after which error attribution was discussed.
Session 6	I conducted an interactive session on cognitive learning strategies, e.g., learning from textbooks and lectures. I modeled the strategies, and students were allowed to practice the same (guided practice), after which error attribution was discussed.
Session 7	I conducted an interactive session on cognitive learning strategies, e.g., preparing for exams and taking exams from lectures. I modeled strategies, and students were allowed to practice the same (guided practice), after which error attribution was discussed.

Session 8	I conducted an interactive session on cognitive learning strategies, e.g., problem-solving and critical thinking. I modeled strategies, and students were allowed to practice the same (guided practice), after which error attribution was discussed.
Session 9	Students were introduced to the Zimmerman model of self-regulated learning. I modeled how to use Zimmerman's cyclical model (forethought, performance, and self-reflection) to incorporate motivational, behavioral, and cognitive self-regulated learning to aid their learning. Students were allowed to practice the same (guided practice), after which error attribution was discussed.

Data Collection Instruments

This study used a mixed-method design; quantitative and qualitative data collection instruments were used to explore the impact of the SRLAD intervention on student teachers' academic performance. Two quantitative and two qualitative instruments were used to collect data to answer the three research questions of this dissertation study.

Quantitative Phase

Quantitative data was collected from a pretest/posttest and the MSLQ.

Pretest/Posttest

An achievement test was constructed by me to serve as both a pretest and a posttest. This 40-item objective-type test covered the subject matter explored in module B on the ESC 4103 prescribed course outline. Module B consists of the concepts that are considered challenging by student teachers. The test was self-instructed and lasted about 60 minutes for an average student. This test was done online via the UG Moodle platform. An objective test facilitates easy marking, unbiased scoring, and accurate coding and data analysis. Also, an objective test ensures adequate sampling of the subject matter and skills in the cognitive domain.

Validity and Reliability of the Pretest/Posttest

To test for content validity, the pretest/post-test science achievement test was given to lecturers of the division of Natural Sciences at the University of Guyana, Berbice Campus. Also, a specialist in measurement and evaluation from the division of Education and Humanities validated the test for construct validity. Their feedback was used to improve the test.

To test for reliability, the test, re-test approach was used on seven students who have completed the Esc 4103 course in the academic year 2020/2021. The Pearson Product-Moment Coefficient (PPMC) was used to determine reliability. A reliability coefficient of $\geq .7 < .8$ will be considered acceptable for the Pearson Product Moment Coefficient (Salkind & Frey, 2020). Hence, a coefficient of 0.89 was obtained, which is very reliable. In addition, the Cronbach alpha coefficient was used to measure the items' internal

consistency. A Cronbach alpha value of .70 or higher is considered reliable (Salkind & Frey, 2020). A coefficient of 0.94 was obtained, which showed that the items on the pretest/posttest had excellent internal consistency or relatedness.

MSLQ

MSLQ is a self-report questionnaire created by Pintrich et al. (1991) to assess three primary constructs of self-regulated learning: Cognition, motivation, and behavior (Pintrich, 2004). According to Zimmerman (2008), the MSLQ is one of the most used self-regulated learning measures.

MSLQ consists of eighty-one (81) items divided into two sections, A and B, and subdivided into fifteen scales (Duncan & McKechnie, 2005). Section A assesses motivation and has 31 items. It is further divided into six (6) subscales:intrinsic goal motivation, extrinsic goal motivation, task value, control of learning beliefs, self-efficacy for learning and performance, and test anxiety. Section B focuses on learning strategies and consists of fifty (50) items. It has nine (9) subscales: rehearsals, elaboration, organization, critical thinking, metacognitive self-regulation, time and study management, effort regulation, peer learning, and help-seeking. However, for this research, section B was divided into two subsections: Behavioral strategies and cognitive behavioral strategies. Therefore, the nine (9) subscales were divided so that time and study management, effort regulation, peer learning, and help-seeking fall under the subsection behavioral strategies. Rehearsal, elaboration, organization, critical thinking, and Metacognitive self-regulation come under the subsection cognitive strategies. All the items on the MSLQ are rated on a 7-point Likert-type scale where 1= not at all true, to 7= is very true to me.

Validity and Reliability of the MSLQ

Many researchers have tested the MSLQ for validity and reliability over the years and proven it valid and reliable. For example, researchers such as Pintrich et al. (1993) and Duncan Mc Keachie(2005) tested the MSLQ on undergraduate college students and found it valid and reliable.

Qualitative Phase

Qualitative data was collected from a 1:1 semi-structured interview and student journal.

Semi-structured Interviews

I created a post-intervention, semi-structured 1:1 interview protocol to elicit responses from student teachers to understand their perspective on the SRLAD intervention and its impact on their academic performance. The data collected from the interview were used to help support my hypothesis that self-regulated learning strategies training would positively influence student teachers' academic performance. Student teachers were asked five pre-determined questions and follow-up questions if further clarification of student responses was needed. Questions included, How has the SRLAD intervention impacted your learning? Which SRL strategies were helpful to you? Would you recommend this intervention to other students?

Student Journal

A student journal was used to elicit students' responses about their feelings using self-regulated learning strategies. Student Journals provide information on students'

thoughts, perceptions, and experiences (Mertler, 2020). The information gathered was used to answer the research question, what are student teachers' perspectives about my SRLAD intervention? These responses included prompts from four constructs: self-regulated learning strategies used weekly, noticeable change in learning, feelings about the self-regulated learning strategies, and recommendations for future inquiry cycles. Although these weekly entries were centered on these prompts, the journal was open and reflective, allowing students to freely share their beliefs, thoughts, and feelings about the SRLAD intervention.

Rigor and Trustworthiness of Qualitative Data

Tracy (2010) suggests that to develop rigor, a qualitative researcher must understand the theoretical construct of qualitative research to make crucial decisions and see connections between complexity and nuances in their study (p.841). Therefore, as a qualitative researcher, I was sincere, credible, and transparent during my analysis by providing thick descriptions of my methods and challenges. I also used multiple data sources (1:1 semi-structured interviews and students' reflective journals) and then triangulated these data to draw valid conclusions about the findings.

Procedures for Data Collection

Approval was sought from the Arizona State University Institutional Review Board (IRB) and the University of Guyana's research and ethics committee to conduct this study. After approval was granted, student teachers were encouraged to participate in research

because of the intended benefits to their learning. I also addressed the ethics governing the research process in the first class, which includes protecting student anonymity.

Pretest/Posttest

The pretest was administered to student teachers in the intact class on the UG Moodle platform on the first day of class before the intervention. Only 33 out of an intact class of forty-eight (48) student teachers opted to complete the test. The test scripts were scored and analyzed. In contrast, the posttest was administered post-intervention on the 13th week of the semester after teaching was concluded to the same group of student teachers under the same conditions. According to Mertler (2020), this approach is a one-group pretest-posttest design, where the same dependent variable is measured in one group of participants before the intervention (pretest) and after the intervention (posttest) is administered. Therefore, this approach ensured that all students were exposed to the intervention and were appropriate for this study's purpose. In support, Mark and Gamble (2009) posited that it is unethical to withhold beneficial treatment from students. After administering the posttest, the test was scored, analyzed, and compared to the pretest data. By comparing the pretest and posttest data, the researcher can know if some change has occurred (Leedy & Ormrod, 2005; Creswell & Guetterman, 2019).

MSLQ

I engaged the student teachers in the intervention on the first day of class, an hour after administering the pretest. A softcopy of MSLQ was constructed as a google form and administered to student teachers on UG's Moodle platform on the first day of class. The

MSLQ was used to determine the self-regulated learning strategies used by student teachers before my intervention. An Informed consent letter was attached to each MSLQ explaining the study's purpose and benefit to student teachers. The informed consent also informed student teachers that their information would be confidential. Students were given five minutes to read the informed consent and decide if they wanted to participate by clicking yes or no on the google form. This was taken as written consent. They were encouraged to ask questions if they needed further clarification. 33 out of 48 students consented to the intervention and were given 45 minutes to complete the MSLQ. Data was analyzed. On the 13th week of the semester, the MSLQ was administered again to the student teachers under the same conditions. This data was tabulated and compared to the data collected at the beginning of the intervention to see changes in the utilization of self-regulated learning strategies among student teachers. After the nine intervention sessions, student teachers were exposed to the 13th week of course material on the ESC 4103 prescribed course outline.

Semi-structured Interviews

A week after the posttest, nine student teachers were purposefully selected to be interviewed by me. According to Creswell and Guetterman (2019), the research term for qualitative sampling is purposeful sampling, where the researcher intentionally selects individuals to understand the central phenomenon (p. 206). These interviews were done over two weeks via multimedia technology, Zoom, at a convenient time for students. Initially, I had many difficulties scheduling these interviews because they clashed with student teachers' schedules since it was the final weeks of the semester. In the interest of

time, each interview lasted no more than 15 minutes, audio-recorded once students consented to it, and then transcribed and tidied by me. The tidy transcripts were stored on my laptop, protected by a password.

Student Journal

Reflective journal entries were collected from 33 student teachers from the UG Moodle platform and were analyzed by me**.** Weekly written responses from student teachers to journal prompts were collected for nine weeks of the 13th week semester. Many student teachers struggled to reflect on their learning experiences; instead, they reflected on what they had learned from the content. Due to this, I found myself tweaking the journal prompts weekly to probe students to think deeper about their learning experiences and the role SRL strategies played in these experiences. Also, though I tried to restrict the word limit to their entries, some students did not adhere to the restrictions.

Each week after submitting their written journal entries, I compiled them in a Microsoft word document. Initially, I read students' weekly entries twice and coded the data for data analysis. To code the data, I highlighted keywords and phrases using different colored pens. I kept track of the codes by inputting them into a Microsoft excel document. These documents were stored on my laptop, protected by a password.

Data Analysis

Research Question One – *How and to what extent are there significant differences in student teachers' utilization of SRL strategies pre and post the self-regulated learning awareness and development (SRLAD) intervention?*

Data collected from pre and post-intervention MSLQ was tabulated and first analyzed using descriptive statistics such as the mean. After this, the groups' mean scores were compared using inferential statistics the repeated measures ANOVA to determine the difference between students' pre and post-utilization of the SRL strategies. Data were compared to a p-value of 0.05. The repeated ANOVA measure is appropriate for examining the differences between groups of one or more variables (Salkind & Frey, 2020). I also applied a post-estimation analysis (post hoc test) to help me identify which groups were different. Analysis was done by SPSS version 28.1.1.

Research Question Two- *How and to what extent are there significant differences in the academic performance of student teachers in ESC 4103 pre and post the self-regulated learning awareness and development (SRLAD) intervention?*

Descriptive and inferential statistics were used to analyze the quantitative data from the pretest/posttest. The descriptive statistics included the mean and the standard deviation, which described the population and students' general performance. The inferential statistic repeated t-test measures were used to determine if there was a significant difference between students' academic performance pre-and post-intervention. This involves the same students being measured twice (Salkind & Frey, 2020). According to Mertler (2020), the repeated measure t-test is appropriate for designs where students are pretested, exposed to some intervention, and post-tested. The mean scores of the pretest/posttest were calculated and compared to the p-value of 0.05. Data were computed via SPSS software version 28.1.1.

Research Question Three: *What are student teachers' perceptions of the SRLAD intervention?*

Qualitative data from the semi-structured interview and student journal were transcribed and tidied. The data were analyzed using the narrative (thematic) inquiry approach. This procedure involves analyzing stories told by participants through an inductive approach to identify the themes of the story (Bhattacharya, 2017). Narrative inquiry is a way of understanding human experiences whose lives are shaped by their experiences within personal, familial, social, institutional, professional, linguistic, cultural, and historical narratives (Caine et al., 2019). Using narrative inquiry is, therefore, a way for me to understand student teachers' personal experiences with my SRLAD intervention.

To analyze the qualitative data I collected, I used a seven-step procedure outlined by Adu (2019) to code the qualitative data using the thematic(narrative) inquiry approach. This included reading transcripts thoroughly before coding data. After this, I identified important words and phrases to be used as codes using different colored pens. I keep track of the codes using a Microsoft excel document. Next, I examined the codes to determine the connections and compile them under their respective narrative components or categories. Categories were created based on the similarities between the codes. I then examined categories to develop a storyline (narrative). Finally, I compared the proposed narrative with the data, adjusting it to represent student stories better.

Results

Results from this action research study are presented in the following three sections of this chapter. First, I present results from the quantitative data. Then, I share the results from the qualitative data in the second section. For the qualitative data, assertions are presented and reinforced with themes, theme-related components, and participant quotes. Finally, I discuss the findings and state the implications of such results on teachers' education and education.

Quantitative Results

Research Question One - *How and to what extent is there a significant difference in the utilization of SRL strategies by student teachers pre and post-self-regulated learning awareness and development (SRLAD) intervention?*

Table 6

Pre/Post-MSLQ Survey Means and Standard Deviations for the Utilization of SRL Strategies

	Time of Testing			
	Pre-Innovation		Post-Innovation	
Construct	M	SD	M	SD
Motivation Strategies	5.17	1.69	5.13	1.92
Behavioral Strategies	4.76	1.81	4.39	2.09
Cognitive strategies	5.40	1.61	4.98	1.90

Note. *n*=33

The table above shows the utilization of SRL (Motivational, Behavioral, and Cognitive) strategies pre and post-intervention among thirty-three student teachers in ESC 4103 course at UGBC. The mean score for the utilization of motivational strategies pre and post-intervention was quite similar (M=5.17, SD=1.69; M=5.13; SD=1.92). However, the mean score for the utilization of the behavioral strategy (M=4.76; SD=1.81) and cognitive strategies (M=5.40; SD=1.61) pre-intervention show a slight decline in the post-intervention utilization (M=4.39, SD=2.08; M =4.98, SD=1.90), respectively. These results indicated that student teachers used less behavioral and cognitive SRL strategies post-intervention.

Table 7

Repeated Measures ANOVA for the Pre/Post utilization of SRL Strategies

Source	*df*	*SS*	*MS*	*F*	*p*
Between the group	5	20.69	4.14	48.65	<.001
Within the group	160	13.60	.09		
Total	165	34.2 9			

Note. Computed at alpha=0.05

A repeated measures ANOVA was conducted to compare the utilization of SRL (Motivational, Behavioral, and Cognitive) strategies among student teachers pre-and post-intervention. The overall model was significant (F (5, 160) =48.685*, p<.001.* The results show that there was a significant difference in the utilization of SRL strategies

pre- and post-intervention at the $p<.05$. A post- hoc pairwise comparison using the Bonferroni correction showed no significant difference between the pre-and post-intervention utilization of the motivational *(*$p= > .05$) SRL strategies among student teachers. However, the results showed significant differences between the pre-and post-intervention utilization of the behavior and cognitive ($p=<.001$) SRL strategies among student teachers. The data suggest that student teachers used motivational strategies before my intervention. However, there was a decline in the utilization of behavioral and cognitive SRL strategies post-intervention. In addition, Cohen's d-test showed that the significant differences in the utilization of the behavioral (0.4) and cognitive (0.3) SRL strategies pre and post-intervention had a medium effect size. These results indicated that although there was a decrease in behavioral and cognitive SRL utilization post-intervention, the differences were moderate.

Research Question Two- *How and to what extent is there a significant difference in the academic performance of student teachers in ESC 4103 pre and post the self-regulated learning awareness and development (SRLAD) intervention?*

Table 8

Pre/posttest Means and Standard Deviations for the academic performance of student teachers

	Pretest		Posttest		*t* (32)	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Intact ESC 4103 Class	16.48	4.11	27.85	4.19	-11.096	<.001	5.9

Note. The t-test was tested at p<.05

A repeated measures t-test was conducted to determine if student teachers' academic performance differed significantly between the pre and post-intervention. The mean score of the student teachers in the posttest (M=27.85, SD=4.19) was higher than their mean score in the pretest (M=16.48, SD=4.11). The results indicated that student teachers' academic performance in the posttest was significantly better than their academic performance in the pretest (t_{32} =-11.096 p <.001). This significance has a very large effect size (d=5.9) when determined by Cohen's d test, suggesting that the difference was meaningful. Hence, this statistically significant difference in student teachers' academic performance post-test may have resulted from the SRLAD intervention received between pre and post-test.

Qualitative Results

Three themes emerged from the qualitative data: *Initial feelings, Recognizing the benefits, and Student teachers' final thoughts.* These themes follow the plot of a story, which usually consists of a beginning, a body, and an ending. These themes were used to answer research question three.

Research Question Three- *What are student teachers' perceptions of the self-regulated learning awareness and development (SRLAD) intervention?*

Table 9

Theme-Related Components, Themes, and Assertions

Theme-Related Components	Themes	Assertions
Feelings about the course Feeling about science Feeling about SRL -positive and negative Challenges experienced Prior success with SRL Academic Goals	Initial feelings	Students had mixed feelings about the course and my SRLAD intervention.
Benefits of SRL strategies Most useful SRL strategies Self-awareness Awareness of learning	Recognizing the benefits	Students found that incorporating SRL strategies into their learning can enhance academic performance.
Feeling about the course Feeling about SRL-positive and negative Challenges experienced	Student teachers' final thoughts	Students felt they had grown as learners and teachers since incorporating SRL into their learning.

Student Teachers' Initial Feelings

This theme focuses on student teachers' initial perspective of the course and the use of SRLAD intervention. The data suggest that student teachers have mixed feeling about the course after reviewing the course outline for the first time. For example, one student claimed, "*After getting an overview of the course, most of the work seemed daunting* (ST 1). While another suggested, "*I really appreciate the different topics and*

the structure of the course outline as I read the listed topics" (ST2). Nevertheless, many were willing to approach the course with an open mind. ST 3 adequately summarized this view,

> *Upon receiving the course outline for ESC 4102, I kept browsing the topics each week and the first thought that crossed my mind was, "Wow, this is a lot to be covered." Getting a clearer picture, I later realized that most of the content in Module B is based on Physics which is something I was never fully exposed to, but I am willing to learn something new from it.*

These feelings may have resulted from past experiences some student teachers had with science at their secondary and teacher college (Cyril Potter College of Education) levels. Reminiscing on her experience with science, ST 3 stated, "*I recognized most of the concepts that will be done during the fifth week onwards, and I began reminiscing about my high school memories whereby experiments were done*." However, while some had fond memories about science, "*I thought to myself that this would have easily become my best course effortlessly as I excelled greatly throughout my high school years in all science-based subjects* (ST 6); others felt otherwise '*To be honest, science was not one of my favorite subjects in secondary school, and as long as the formula is included, that is not my field* (ST 7).

Apart from negative past experiences with science, student teachers also expressed mixed feelings about the course since they were experiencing some perceived personal challenges. ST 9 noted, "*I am all excited to start my journey; however, I am facing a lot of difficulties managing my family, work, and study time*." While others were dealing with other personal struggles, "*I went through a very difficult time in my life after*

the death of my brother exactly a year ago, which seems to be the end of everything for my family" (ST 1).

Nevertheless, after being exposed to my SRLAD intervention, some student teachers were optimistic that SRL would be helpful to them as they pursue this course. ST 24 highlighted her beliefs about SRL and why it may be necessary to use these strategies, "*I realized that I needed to find a way to learn and succeed. Everyone has to design their own learning in a positive and good way".* Others, like ST 8 and 12, agreed and shared some positive thoughts about SRL and the role it can play in the success of this course:

> "*I believe that if one is able to use the strategies in SRL, they will be able to accomplish their goals in learning." (ST 8).*
> *"The strategies outlined are very helpful, so I see myself using them throughout this course (ST 12).*

These positive thoughts about SRL may have arisen from some student teachers claiming that they had used some learning strategies to aid their learning in the past and had success with them but weren't aware they were called SRL strategies. In one lengthy excerpt from ST 15 reflective journal, she expressed her positive experience with SRL in high school:

> *My thoughts about self-regulated learning strategies have a more positive Impact rather than negative because this strategy inspired me since I was a child in primary school. I am the type of learner that is self-motivated and pursue my own learning goals. It does not matter if I have a poor lecturer, the textbook is confusing, the test is difficult, etc. I believe that successful learners*

find a way to excel. I can still remember when I wrote the National Grade Six Assessment (NGSA), I attained marks to attend Berbice High School, but I took a transfer to attend Corentyne Comprehensive High School instead. Everyone told me, "I am making a mistake, a Grade A school is better, and I will succeed better if I attend the Berbice High School." I told my parents that "it is not the school, teachers, friends, or anyone that will make me succeed." I have confidence in myself, I feel motivated on a daily basis, and I will work towards achieving only success at the CSEC exams. With the self-regulated strategy, I was able to gain success at the end of high school.

While in a shorter post, another student teacher, ST 5, mentioned her success with SRL strategies at CPCE, "*I used some of these before at CPCE, and it was successful*." However, a few students were initially skeptical about SRL strategies and how they could aid their learning. ST 22, 28, 13, and 15 posited:

"Some individuals feel overwhelmed in the planning stage of self-regulated learning" (ST22).

"A disadvantage of this would be having all the pictures and ideas and feeling pressured, you won't achieve these goals" (ST 13).

"On the flip side, these learning strategies can hardly be practiced if there is no self-discipline (ST 15).

"A disadvantage of self-regulating strategies is having a high expectation of something, and when it is not met, it can pose a challenge or discourage someone from moving on" (ST 28).

As the weeks progressed, student teachers reported a new challenge- an academic barrier. They were struggling with module B, the physics aspect of the course, which

required them to use fundamental mathematics knowledge. For example, ST 24 summed up her peers' views: "As *the week goes on, I have to admit that this course has become increasingly difficult as we dive into the calculations."*

However, many student teachers credited SRL strategies for helping them to stay motivated, focused, and to work harder to overcome these challenges as they arose:

> *Since I'm not strong and versed in calculations, I must set a target goal, as it relates to calculating' (ST 15).*
> *My understanding has been improving since practice makes perfect, and at the beginning of the week's topic, I was a blank slate as it relates to the conversion of units, but I learned and practiced; I have grasped the concept fairly, I am responsible for my own education, and so I am taking charge. (ST 13).*
> *For a long time, I have had in my thoughts that anything based on conversion and units are some things that I simply cannot do, and I placed a negative barrier towards it. I had to regulate my emotions towards this topic in order to face my studies in a positive way (ST 20).*

These student teachers hoped that by applying SRL strategies, they would become successful in their academic journey. While some hoped that SRL strategies would aid their performance in ESC 4103, "*For me, completing the course with an excellent grade by following the discussed strategies is my main goal*" (ST 9), others hoped that it would help them finish their degree successfully "*With the help of them I will succeed in completing my two years at the University of Guyana and knowing my results will be fruitful* (ST 21)."

Recognizing the Benefits

This theme focuses on the many benefits of my SRLAD intervention identified by student teachers. As student teachers began to incorporate SRL strategies in their learning throughout the post-intervention period, they have identified in the reflective journal and interviews several benefits of SRL strategies to their learning, teaching, and academic performance. More importantly, using SRL strategies has created self-awareness of who they are as a person, learner, and teacher.

There were numerous benefits of incorporating SRL strategies into their learning that student teachers identified. Throughout the research, student teachers focused on how specific strategies benefited them and also drew conclusions about the benefit of SRL to learning in general. ST 17, 5, and 10 noted how specific strategies had helped them:

> "*To eliminate distraction and improve my concentration, I would turn off all the notifications on my phone from social media (ST 17),*
> *My Kanban cards help me keep abreast with all my assignments, and when they are to be submitted (ST 5).*
> *The study group has been amazing, and the help is off the hook (ST 10).*

Generalized statements about the benefits of SRL to learning included: "*These strategies have allowed me to assess myself, work to achieve my goals, and become a proactive learner*" (ST 1) and "*since I have started to incorporate SRL into my learning, I'm better able to understand the concepts taught in class* (ST 4).

Student teachers have also revealed that the teaching process was also enhanced with the use of SRL. According to ST 20, "*the SMART goals also help me to monitor my progress as I teach my lesson and help me to evaluate myself to see how well I plan for and cater to the children's needs in the classroom."* ST 6 also weighed in on the benefit of SRL to her teaching, "*At times, the workload will indeed feel pressure, but we must be able to motivate ourselves through self-talk and inspirational quotes. Our children solely look upon us as their role model; therefore, we need to appear strong for them and motivate ourselves in a timely manner*."

Apart from the benefits of SRL strategies to learning and teaching, student teachers claimed that using them has positively impacted their lives since they can better balance their responsibilities between work, study, and family. ST 23 wrote, "*Since I'm working five days every week, it can be challenging. Doing all my classes and taking care of my family is not easy, but with SRL strategies, I am able to overcome my challenges.*". Hence, ST 26 gave a common reason identified by many student teachers as to why they were able to balance life better using SRL, "*I was able to set goals and achieve most of them using proper time management skills and also be able to manage my time so that I can have a balance within social, spiritual, professional, and educational life*."

More importantly, for student teachers, using these strategies as a guide or tool has helped them achieve academic success. As ST 3 indicated, "*SRL has helped me become the best version of myself academically*." Other student teachers like ST 11 and 15 also include how being successful made them feel. For example, "*using SRL strategies as a guide, I would see improvement and feel good as a student* (ST 11) and "*Using SRL*

strategies has helped me to score great on many of my assessments, and I am really proud of my outcomes" (ST 15). These proud moments seem to make student teachers aware of their role as learners,

> *"I feel satisfied in being able to be self-aware. It helps you see where you are in your learning and how your learning can be improved (ST 28).*
> *"Employing SRL strategies help me become a more independent learner, as I am able to realize which strategies are effective or not as I navigate my own learning (ST 1)."*

and their responsibilities as teachers, "*I come to the realization that we as teachers can teach students to become self-regulated learners by being role models* (ST 2).

I must mention that the data suggest that many student teachers recognize that for SRL strategies to aid their learning, they had to make some necessary changes to their behavior. ST 20 said, "*My knowledge about SRL has definitely changed how I study."* While some student teachers recognized they had to change their behaviors, others admitted they needed to change their mindset about studying and learning. ST 18 claimed, "*I realized that their (SRL strategies) effectiveness has changed my mindset about the outlook of my studying and life at large*": Another student even took it a bit further by saying, "*this whole thing (SRL) like basically slowly become who I am*" (ST10)

However, some student teachers were concerned that their successes with using SRL strategies would have led to them being either anxious or overconfident in their abilities, which may, in turn, negatively impacts their learning. "*It impacted me negatively by telling myself I know too much and being overconfident and not taking time*

to go through steps or listen to my colleague, " reported ST 5. While ST 1 expressed, "*When I decided to set a task to finish within a specific time, I realized that I kept focusing on finishing within the set time than actually getting the work done*." Nevertheless, many student teachers have recognized that not all strategies are equally beneficial. They had to assess which strategy would be helpful based on the context. ST 15 noted,

> "*My perception of self-regulated learning strategies is that it all depends on you, the learner, as an individual. Choosing a strategy that suits you and works for you in order to help you learn is a skill not easily managed by everyone. On the other side, different courses may lead to you using different strategies, and it may be difficult to adjust to each as you go along."*

Interestingly, motivational strategies are one of the SRL strategies that student teachers seem to use more frequently throughout the study when a tally chart was created. While for some student teachers, it helped them achieve their academic goals, "*after using the three different strategies, I would have found the motivational strategies to be my favorite because it helped me to be positive in motivating myself; as a result, to achieve my goals*" (ST18). Others believe that it encouraged them to explore the other SRL strategies, "*my favorite SRL strategies are the motivational strategies (positive talk) because I find that when I start speaking positively, it keeps me in a good mood and gives me the confidence to try other SRL strategies* (ST 2). In addition, motivational strategies were recognized as the SRL strategies student teachers used before my SRLAD intervention. For example, ST 2 claimed that "*goal setting is one of many self-regulated learning strategies I have used repeatedly throughout the years as it helps me minimize*

the workload I am given." Goal setting is a motivational strategy where students set academic goals they want to achieve. Nevertheless, student teachers seem to understand the benefits of using SRL strategies and the importance of consistently using the strategies that work for them to improve their learning. ST 8 stated, "*the consistent use of SRL strategies has been a major help in my academic journey thus far.*"

Student Teachers' Final Thoughts

This theme focuses on student teachers, further reiterating the benefits of my SRLAD intervention to their learning, teaching, and academic performance. It also highlights recommendations made by students about the intervention.

In their final reflective journal and interviews, some student teachers quickly emphasized that they hesitated to use SRL strategies because they did not immediately recognize the benefits. ST 22 noted '*At first, I was perplexed as to why I should use these strategies and had little to no intentions using them because for a moment I didn't understand the concept behind them*". This decision led to some student teachers struggling academically, "*At first, I wasn't using the strategies, and my performance was poor; I started to get frustrated and depressed* (ST 9)". However, experiencing these challenges have forced some student teachers to the decision of incorporating SRL strategies into their learning, "*I didn't have an open mind towards them, but by slowly implementing the strategies in my everyday life they helped me and my thoughts about it changed as the weeks progressed*" (ST 13). Others had to have a nudge from their peers, "*As time went on and I became aware of my struggles with learning effectively, my*

batchmate encouraged me to try revising the strategies and spend some time understanding each, and it was successful (ST22).

In addition, I must mention that some student teachers also reported that they experienced challenges penning their weekly journals since they did not know what it meant by a learning journal. ST 12 noted, "*When I originally started keeping a journal, I had no idea of anything like that, as can be seen by looking back at my first entry*." In the weeks following my intervention, I kept altering the weekly prompt and reiterating in my class that student teachers needed to think more deeply about their learning and the role of SRL strategies. ST 1 noted my effort, "*once Miss virtually arrived to class and urged us to apply the prompt and concentrate on how the SRL has been useful rather than the course material, eventually things improved in some respects.*" Hence, once student teachers understood the purpose of the journals, their entries became more reflective, "*From my first journal to this one, I have seen massive improvement; it took me a while to realize how I should write my journal; I think I did an amazing job in terms of improvement (S*T 1). Interestingly, one student teacher mentioned that journaling impacted her learning, giving me a new perspective on journaling and my SRLAD intervention. She noted, "*In my final Journal, I realized that this is also a form of SRL strategy itself-reflection, and to be honest, I will miss making a reflective journal. thus, I will continue to make reflective journals throughout my university period*." (ST 11).

Despite the hesitation to try SRL strategies and challenges with journaling, the data showed that over the 13-week semester, student teachers boldly reiterated how their experiences with my SRLAD intervention had positively changed their life and learning.

ST 18 noted the change to her learning, "*As mentioned several times, self-regulated strategies have positively impacted my view of myself and my learning. Comparing the way I approached situations three months ago is much more constructive presently.*" While ST 11 recognized the change to self, "*Looking back from my first journal to now, I noticed that I had grown more as well as become more confident in myself and in what I can accomplish once I put my mind to it.*" This is because SRL strategies were recognized as more than just academic skills that can be used to aid one's learning. ST 6 noted, "*believe this course (SRL strategies) has taught me life-changing skills and not just skills for studying for exams*." However, student teachers have reiterated the importance of recognizing which strategies that not all strategies work for them, "I went through some of the strategies, and yes, I am not going to lie, some of them did not work for me" (ST 10).

These positive feelings for SRLAD intervention were translated to student teachers' new attitudes and feelings about the ESC 4103 course and science as a whole, "*Over the past few weeks, I've grown to like and enjoy Science with a different attitude and a different atmosphere* (ST 1). In addition, student teachers have promised to share their knowledge and experiences with SRLAD with their colleagues, "*My perspective and the way I used to look at things have significantly altered, I've noticed. I will definitely go and tell my fellow coworkers and even friends about these self-regulated learning strategies*" (ST 22) and, more importantly, continue using and teaching them to their students. *"I am happy to report that I will continue to use these techniques throughout my academic and personal life and continue to teach my students how to apply them (*ST 26). They also have recommended my SRLAD intervention to future

students of this course and the university, "*Self-regulated learning tools have tremendously benefited my learning, and I will strongly urge others to utilize them. They have shown to be quite helpful because they helped me to control my thoughts, behaviors, and emotions so I can successfully navigate my learning experiences*" (ST 33).

Finally, and most importantly, student teachers' have recognized that my SRLAD will not solve all their academic challenges overnight. As ST 11 noted, *I am not yet at the place where I hope to be, but by incorporating a little consistency and discipline into my daily life, I am optimistic as to where that will take me.*

Discussion and Implication

This section discusses the study results in relation to both theory and related research. This discussion is organized around the study's three original research questions.

Research Question 1: Utilization of SRL Strategies. The results from the repeated measures ANOVA suggest a decrease in the utilization of SRL strategies post-intervention. Further analysis using Bonferroni correction post- hoc pairwise comparison showed mixed results. The findings suggest no significant difference between the pre-and post-intervention utilization of the motivational SRL strategies among student teachers. This means that student teachers used motivational strategies before my SRLAD intervention. Findings from qualitative data support this since student teachers claimed that they used motivational strategies, such as goal setting, at their high school and teacher-college level (CPCE), which had proven successful. Schunk and Zimmerman (2007) noted that once students observe success in their learning, this will motivate them

to continue using self-regulated learning strategies. The success with this motivational strategy before my SRLAD intervention could explain why students were open-minded to my course, although many perceived science as challenging initially because of negative past experiences. In other words, student open-mindedness can be deemed as being self-motivated.

Qualitative data also suggest that because student teachers have had success with motivational strategies such as goal setting in the past, it is not surprising that they have set goals for themselves for this course and their academic journey at the university. Bandura (1986) and Zimmerman (1989) claimed that learners have the forethought capability, which allows them to set goals that stimulate and sustain their motivation throughout the learning process. These goals include achieving academic success. Hence, these learners also possess self-regulatory capabilities where they set standards to guide their behavior (Bandura, 1986). These goals and standards have kept them motivated as they work through challenges in this course.

However, the post- hoc pairwise test by the Bonferroni correction also showed significant differences between the pre-and post-intervention utilization of the behavior and cognitive SRL strategies among student teachers. The finding indicated that the differences resulted from a moderate decline in using these strategies post-intervention. Conversely, qualitative data suggested that student teachers did not necessarily decline in their use of behavioral and cognitive strategies but only used some strategies in particular learning situations. Student teachers claimed these strategies were contextual, meaning they chose to use specific SRL learning strategies in different learning situations,

especially the ones they had success with in the past. Zimmerman (2008) agreed that self-regulated learning involves students' ability to selectively use specific strategies which they must adapt to each task to aid their learning, evaluating this particular learning strategy's effectiveness upon performance (Zimmerman, 2002). Hence, student teachers believe that successful students can assess and evaluate which strategies are effective and use them to suit their abilities and learning styles.

Another reason for the moderate decline in the behavioral and cognitive strategies could be explained by qualitative data, which found that some students initially chose not to use SRL strategies because they did not understand the rationale behind using them or found their use tiring. In support, research by Forest et al. (2017) found that despite having advanced knowledge of SRL strategies, many adult students do not put them to use. The authors reported that students claim they lack time to use SRL strategies, would not benefit from their use or be able to use them effectively or deem their use demanding.

Research Question 2: Academic Performance. A repeated measure t-test suggested that my SRLAD intervention significantly impacted student teachers' academic performance. Qualitative data support this, indicating that student teachers agree that my SRLAD intervention has improved their academic performance. This finding aligns with previous scholars who reported SRL's significant impacts on students' academic achievement (Dent, 2013; Kistner et al., 2015). More specifically, research has shown that students who regulate their learning are more successful academically than those who do not (Zimmerman, 2002; Puzziferro, 2008; Cazan, 2013). Hence this finding proved that adult students could be taught to self-regulate their learning using

interventions. Bandura (1986) reported that human beings have self-regulatory capability, making them self-reactors capable of developing self-direction (Bandura, 1986). As such, studies about the impact of self-regulated learning intervention among adult students showed that self-regulation could be taught successfully to persons of all ages (Bidjerno & Yun Dai, 2007).

In addition, the qualitative findings support that student teachers' academic performance may have improved because many student teachers recognize that if SRL strategies were to aid their learning, they had to change their study behaviors and mindset toward their learning. Bandura (1986) claimed that humans have self-reflective capabilities, which suggests that they are agents of actions and self-examiners of those actions. Hence, learners can learn to monitor, act on, predict, judge, and change their behavior. Therefore, by assessing their learning behavior and recognizing the role of SRL strategies in their learning, student teachers were able to learn how they learn (Woolfolk et al., 2000) best. Learning best involves students knowing how to monitor their learning progress and control their learning behavior (Bjork et al., 2013).

Research Question 3: Student Perspectives. The data suggest that most student teachers positively perceived my SRLAD intervention. Incorporating the SRL strategies into their learning allowed them to recognize the numerous benefits of these strategies to their learning. Some of these benefits included balancing their lives, completing assignments on time, eliminating distractions, and having a better understanding of concepts taught in class. Hence, seeing positive outcomes in their learning has made students proud and happy about their academic achievements. Bandura (1989) believes

"what people think, believe and feels affect how they behave" (p.3), and their "behavior alters environmental conditions and is altered by the very conditions it creates" (p.4); in turn, the environment shapes "human expectations, belief, emotional bents, and cognitive competencies … and activate emotional reaction" (p.3). Therefore, these positive feelings and beliefs have encouraged students to stay motivated and work harder to achieve their academic goals.

Nevertheless, student teachers recognize that there is still more to be done. They realized that the consistent use of SRL strategies is necessary to aid their learning and academic performance. Zimmerman (2002) noted that self-regulated learning is not an academic performance skill; but a self-directive process by which learners transform their mental abilities into academic skills. Therefore, student teachers must consistently apply SRL strategies to their learning to become self-regulated learners.

Becoming self-regulated learners is vital for student teachers to become effective teachers. As self-regulated learners, student teachers can acquire the necessary learning skills (Randi, 2004) and apply them to their teaching. Therefore, student teachers recognizing that they can teach SRL strategies to the student through modeling and promising to continue teaching their student SRL after the intervention is vital to the teaching-learning process. Therefore, the more teachers know about self-regulated learning, the more they can make it visible to their students (Paris & Winograd, 2003). In fact, some researchers are suggesting that self-regulated learning is an important survival tool and skill for learners (Bjork et al., 2013) to be competitive in the 21st-century workforce and global economy (Darling-Hammond, 2009; Robbins & Beuerlein, 2013).

Therefore, student-teachers must keep their promise to continue using SRL strategies to aid their learning and to become self-regulated learners and pass these skills on to their students.

Conclusion and Recommendation

My SRLAD intervention is a holistic approach to resolving one of the wicked problems in education, low academic performance. This study found that student teachers were self-motivated since they had used SRL motivational strategies before my SRLAD intervention and found them successful in aiding their learning. This encouraged them to be open-minded to the course despite the perceived challenges. In addition, what seemed like the underutilization of behavioral and cognitive SRL strategies among student teachers is more about them being selective in identifying and using the strategies that work best for them.

Nevertheless, my SRLAD intervention has enhanced student teachers' learning and academic performance because they have recognized the numerous benefits of incorporating SRL strategies in their learning. The success of these SRL strategies has motivated students to work harder to achieve academic success and growth as learners and teachers. Therefore, these SRL strategies must continuously be used by students to aid their learning and to become self-regulated learners.

Finally, student teachers' perspectives of my SRLAD are not only positive because it enhances their learning and academic performance but because they recognize its importance to their teaching. As student teachers continue to incorporate SRL strategies

into their own learning and teaching and model them to their students, this will enhance the teaching/ learning process. Incorporating SRL strategies in teaching and learning is vital for students of all levels of schooling to adapt and navigate in this modern society.

However, this study has strengths and limitations. The relationship I developed with my student teachers can be considered a strength. Because of this interaction, student teachers were honest and transparent during their MSLQ responses, reflective journal entries, and 1:1 Interviews about their experiences with my SRLAD intervention, thus, reducing social desirability biases. Also, by using multiple data sources and triangulating data from these sources, I enhanced the quality of my data interpretation. In support, Creswell (2015) claimed that the combined qualitative and quantitative findings lead to additional insights not gleaned from the quantitative or qualitative results alone. Hence, a mixed-method approach provided a richer understanding of my student teachers' experiences with my SRLAD intervention.

On the other hand, because I am the lecturer and the researcher, I have encouraged my students to participate in my SRLAD intervention. This interaction may have influenced my student teachers' motivation to do so and, therefore, introduced my own biases to the study. Nevertheless, I stuck to the ethical principles guiding this research, which included ensuring students know they are not obligated to participate and can opt out at any time**.**

Another limitation of this study is the duration of my SRLAD intervention. Because my intervention was done for the first time during this study, I underestimated how many weeks were necessary to adequately implement the SRLAD intervention's

curriculum. Although I did nine, forty-five minutes presentations using the Zimmerman model, where I modeled the SRL strategies and then students practiced the same, specific SRL skills needed more time for students to practice these skills. Nevertheless, students were given resources to reference if they needed a better understanding of a particular SRL strategy.

Based on my findings, I recommend that:

1. My SRLAD intervention should be introduced as a mandatory study skill course for all first-year student teachers at the University of Guyana. Student teachers becoming aware of SRL strategies and consistently incorporating them into their learning are more likely to teach these vital strategies to their own students, enhancing the teaching-learning process.
2. Teacher educators should also incorporate SRL strategies in their teaching by modeling and altering their instructions accordingly to include peer teaching, critical thinking, and problem-solving SRL strategies to help student teachers be more reflective in their learning.
3. Teacher education institutions should emphasize SRL strategies as part of their curriculum or classroom. This will help student teachers to reflect not only on "how they learn" but "what they learn." This will result in student teachers becoming self-regulated learners.
4. Reflective writing or learning journals should be used as a form of assessment in teacher education institutions to allow student teachers to be reflective, assessing and evaluating their learning strengths and weaknesses. They must build on their

learning strengths and use appropriate SRL strategies to address their learning weaknesses.

5. Many students entering the university level are often underprepared for the rigor of academic studies at this level. Therefore, my SRLAD interventional can be a transitional course between high school and university education. My SRLAD intervention should also be introduced as a compulsory course for all first-year undergraduate students.
6. Counseling should be more readily available to students at the University of Guyana, where students can share personal and academic challenges.
7. The University of Guyana must start an aggressive campaign to challenge the taboo and stigma of people seeking counseling.
8. There is a need for more academic advisors at the University of Guyana who continuously monitors student teachers' academic progress, identify those at risk of failing, and refer them for counseling.
9. Peer mentoring programs should be established at the University of Guyana. Senior students can be a great source of knowledge and support for their first-year counterparts.
10. In the future, longitudinal studies should be conducted to track student-teachers progress on how SRL strategies have impacted them throughout their stay at the University of Guyana, Berbice campus.

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CHAPTER 4

CONCLUSION AND REFLECTION

Conclusion

When I began my dissertation process, I recognized that my problem of practice, low academic performance was a wicked problem in education since there are many causes and solutions to this problem (Rittel & Webber,1973). Thus, because of the wickedity of wicked problems, they are not solvable but resolvable (Jordan, Kleinsasser & Rowe,2014). Resolutions are tentative and require continuous monitoring, reflecting, discussing, and sense-making (Jordan, Kleinsasser & Rowe, 2014; Mertler, 2020). Merlter (2020) suggested that action research which is cyclic and reflective in nature, can be used to resolve wicked problems and improve educators' professional practice. Hence, my action research began with cycle zero to help me better understand my problem of practice. My main focus was determining the challenges student teachers were experiencing in my ESC 4103 course. Using a qualitative approach, I found out that student teachers experience four barriers to learning: situational, dispositional, institutional, and academic barriers. These barriers are challenges adult students often face when pursuing higher education. I also found that student teachers used very few SRL strategies, goal setting, and help-seeking to cope with these challenges and aid their learning. Zimmerman and Martinez- Pons (1986) suggested that successful students use more SRL strategies in their learning than unsuccessful students.

In the next cycle, cycle one, I designed a mini-intervention; a subject-based prerequisite mathematics curriculum, to help students to combat the academic challenges identified in cycle zero. These challenges include students needing help mastering the

calculations or mathematics aspects of module B, the physics component of the ESC 4103 course, which was integral to their success. Redish (2006) acknowledged that understanding physics requires learners to be knowledgeable of mathematics since mathematics is an essential part of physics. The data collected from a mixed method approach found that my mini-intervention improved students' academic performance. However, students suggested that they had the prerequisite mathematical knowledge to do well in my course, and therefore, they viewed my mini-intervention as a memory booster.

The outcome of cycle one left me wondering if student teachers had the appropriate mathematical knowledge to succeed *in my course, then why are they gaining low grades in my course*? Upon reflection, I recognized I needed to find a holistic approach to resolving this wicked problem of low academic performance. Therefore, I expanded my self-regulated learning awareness and development intervention (SRLAD) for my dissertation. I aimed to teach student teachers SRL strategies to empower them to take control of their own learning and aid their academic performance. I found from the mixed-method data that some students used SRL strategies, such as motivational strategies, before my intervention. Also, the underutilization of behavioral and cognitive strategies meant that student teachers did not use all of the SRL strategies in every learning situation but chose specific strategies to suit their learning needs and context.

Nevertheless, my SRLAD intervention did improve student teachers' academic performance despite initially being met with some reservations from some student teachers since they did not recognize the immediate benefits of using SRL strategies to

aid their learning. However, most students had a positive perspective of the SRLAD intervention, recognizing its importance to their learning and their student's learning. Hence, I hope that student teachers keep their promise to continue using SRL strategies to aid their learning and academic performance so that they become self-regulated learners and pass these vital skills on to their students. Therefore, future cycles can focus on a longitudinal study to determine if my SRLAD intervention impacted student teachers' academic journey at UGBC and their classroom practices.

Reflecting on the overall action research process, I agree with Mertler (2020) that action research aligns better with a mixed-method approach. My findings would have been incomplete if I had used a mono-research method. Collecting both quantitative and qualitative data allowed each data to complement the other. For example, while the quantitative data told me how impactful my SRLAD intervention was to student teachers learning, the qualitative data explained the reasons for my SRLAD intervention being impactful. Also, by adding qualitative data to a quantitative research design, I could determine future itineraries of action research cycles. In support, Greene (2007) noted that mixed methods design could be used to discern overall trends and patterns and afford a more nuanced understanding of how participants experienced the process.

Reflection

Undoubtedly, there is a need for teacher training institutions to reimagine the role of teachers in developing students learning autonomy. This means that teacher training institutions must redress the type of training student teachers receive at these institutions. Changes can include larger curriculum reform incorporating SRL strategies into the

curriculum or low-level reform where teacher educators can promote SRL uses in their classrooms. Nevertheless, these institutions need to provide opportunities for student teachers to become aware of SRL strategies and the role they can play in their learning and teaching. The lack of these educational opportunities will likely defeat the purpose of training student teachers to be competent, self-regulated learners capable of preparing their students for the 21st-century workforce.

However, this dissertation does not claim to provide all the answers but can be used as a catalyst for transdisciplinary discussions about the wicked problem of low academic performance. To start the conversation, I would like to outline the lessons learned, the implication to practice and research, and the recommendation I came up with based on the results of my action research cycles.

Lessons Learned

The results of this action research have reinforced that change is a process and not an event. People do not change because they are told that a change agent would have a positive outcome. Despite hearing the positives, some people seemed wired to resist change. This means that real change cannot be forced; people must be given time to come to their own realization of the benefits that would result from the change agent.

This study's results also have reinforced that learning results from a change in behavior. Therefore, an essential part of becoming a self-regulated learner requires that students become aware of their learning strengths and weaknesses, recognizing that they need to change their behavior or mindset about learning to improve their academic performance.

The final lesson learned is that more than motivation is needed to enhance learning outcomes. Students need other learning strategies, such as behavioral and cognitive, to aid their learning. However, motivation is a starting point because once students are motivated, they are willing to try new approaches to help their learning.

The Implication to Practice

The results of this action research have made me realize that as a teacher educator and leader, I must constantly reflect on my professional practice to ensure I meet the standards necessary to prepare competent teachers. Improving my professional practice would require conducting cycles of action research to find appropriate resolutions when necessary. Thus, conducting this action research has improved my self-efficacy since I feel confident that I am actively contributing to resolving a wicked problem in education.

The action research results also emphasize the need to include reflective writing in my course. Many student teachers struggled to articulate their thoughts in the weekly reflective journal because they were not adequately taught to do so. Therefore, incorporating reflective writing in the form of a learning journal can help students think deeper about what they learn and how they learn.

Lastly, students, even adult students, need to know that their lecturers and learning institutions care about their academic success. This can influence their motivation and academic success. Participating in my SRLAD intervention made students feel I cared about their learning.

The Implication to Research

Action research is cyclic, where there is continuous reflection, data collection, and analysis, and as such, this action research does not end with this dissertation report. Future action research cycles can include an improved version of my SRLAD intervention where more time is given for the SRL strategies to be modeled by the researcher/ educator and practiced by students. In addition, large-scale longitudinal research could be done where all students entering the university are exposed to the SRLAD intervention as a mandatory transitional course. Data was collected and analyzed to understand its impact on students' overall GPA at the end of their academic journey.

Also, because of the COVID-19 pandemic, there has been an increased use of online platforms. Also, many student teachers opted to use the internet as their study buddies instead of being a part of study groups. This suggests that many students are replacing face-to-face social interaction with technology. Therefore, future action research cycles can address the role SRL strategies play in online learning, how students seek help in this virtual learning world, and if students require different SRL strategies for online learning versus face-to-face learning.

Finally, because of the collaborative nature of action research, I recognize the importance of sharing the findings of this study and future cycles with my colleagues, student teachers, and education stakeholders to influence their professional practice and ignite their own reflections and cycles of action research. Therefore, action research is a vital learning and teaching tool.

Recommendations

Student teachers often face many barriers that can affect their learning at UG. Although my SRLAD intervention is a resolution to help student teachers cope with challenges, I recommend that student teachers receive additional support, such as counseling. Counseling at UG should be made more accessible to student teachers so they can freely and confidentially discuss the challenges they are experiencing. It is important to highlight that students are *whole* human beings and should be treated as such. Their academic life should not be compartmentalized from other aspects. Therefore, counseling should tackle all aspects of a student's life. There is also the need for UG to challenge the status quo in Guyana by campaigning aggressively to remove the stigma attached to seeking counseling and mental health checks.

In addition, there is a need for more academic advisors at UG who constantly monitor students' academic progress and identify students at risk of failing. These students can be referred for counseling to get the help they need to cope with challenges. Peer mentoring programs can also be an excellent way for students to navigate the challenges of pursuing higher education. Students who are further along their academic journey can be a great source of knowledge and support for students now entering the university.

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APPENDIX A

RECRUITMENT LETTER

Dear Student teachers:

My name is Yassanne Garraway, and I am a doctoral candidate in the Mary Lou Fulton Teachers College (MLFTC) at Arizona State University (ASU). I am working under the direction of Dr. Stephanie Smith, a faculty member in MLFTC. We are conducting a research study on the effects of self–regulated learning (SRL) strategies training on the academic performance among student teachers in the ESC 4103 course at the University of Guyana. The purpose of this research is to better understand your perspectives on the self-regulated learning awareness and development (SRLAD) intervention's impact on your academic performance in ESC 4103 course.

We are asking for your help, which will involve your participation in an interview, a survey, a weekly reflective journal, and a test. These measures will ask you to share your knowledge, experiences, attitudes, and beliefs about your academic performance in the ESC 4103 course with respect to the SRLAD intervention. We anticipate this interview to take 30 minutes in total. I would like to audio record this interview. The interview will not be recorded without your permission. Please let me know if you do not want the interview to be recorded; you also can change your mind after the interview starts, just let me know. The survey will take about 40 minutes to complete and will be done via a google quiz. The google quiz link will be shared on the University of Guyana Moodle platform. The test will be an achievement science test and will cover content on the prescribed ESC 4103 course outline. It will serve as a pretest/ posttest and will be completed in 40 minutes on the University of Guyana Moodle platform. Finally, a weekly reflective journal entry will be made to the ESC 4103 group WhatsApp which we anticipate taking five minutes to complete.
Your participation in this study is voluntary and based on your written consent. If you choose not to participate, you can withdraw from the study at any time; there will be no penalty whatsoever. You must be 18 years of age or older to participate.

The benefit of participation is the opportunity for you to reflect on and think more about your academic performance in ESC 4103. The results from this research will also inform future iterations of the study and policies. Thus, there is potential to enhance the experiences of our colleagues and /or students. There are no foreseeable risks or discomforts to your participation.

Your USI will be collected to link your responses from the survey, test, and reflective journal. However, your information and responses to these measures will be kept confidential. Results from this study may be used in reports, presentations, or publications, but your name or USI will not be used. Audio recordings will be deleted from the original recording device upon transfer to a password-protected computer and then deleted from computer/cloud technologies once transcribed.
All participants' information will be stored as protected word documents on a password-protected computer where the Co-PI will be the only one who will have access to the password.

If you have any questions concerning the research study, please contact the research team – Stephanie Smith at Steph.smith@asu.edu +1 (480)-720-2382 or Yassanne Garraway at ygarrawa@asu.edu or 592-577-1510.

Thank you,
Yassanne Garraway, Doctoral Candidate
Stephanie Smith, Clinical Assistant Professor
Please let me know if you wish to be part of the study, and will let me audio record your responses by verbally indicating your consent.

If you have any questions about your rights as a participant in this research, or if you feel you have been placed at risk, you can contact Stephanie Smith at +1 (480)-720-2382 or the Chair of Human Subjects Institutional Review Board through the ASU Office of Research Integrity and Assurance at +1 (480) 965-6788.

Because I will be collecting your USI as part of this study, I need your written consent. By signing below, you are agreeing to be part of the study.

Name……..

Signature…….

Date…….

APPENDIX B

[MSLQ]

Part A. Motivation

The following questions ask about your motivation for and attitudes about this class. Remember there are no right or wrong answers, just answer as accurately as possible. Use the scale below to answer the questions. If you think the statement is very true of you, circle 7; if a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

Not at all true of me 1 2 3 4 5 6 7 very true to me

1. In a class like this, I prefer course material that really challenges me so I can learn new things.	1 2 3 4 5 6 7
2. If I study in appropriate ways, then I will be able to learn the material in this course.	1 2 3 4 5 6 7
3. When I take a test, I think about how poorly I am doing compared with other students.	1 2 3 4 5 6 7
4. I think I will be able to use what I learn in this course in other courses.	1 2 3 4 5 6 7
5. I believe I will receive an excellent grade in this class.	1 2 3 4 5 6 7
6. I'm certain I can understand the most difficult material presented in the readings for this course.	1 2 3 4 5 6 7
7. Getting a good grade in this class is the most satisfying thing for me right now.	1 2 3 4 5 6 7
8. When I take a test I think about items on other parts of the test I can't answer.	1 2 3 4 5 6 7

9. It is my own fault if I don't learn the material in this course.	1 2 3 4 5 6 7
10. It is important for me to learn the course material in this class.	1 2 3 4 5 6 7
11. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.	1 2 3 4 5 6 7
12. I'm confident I can learn the basic concepts taught in this course.	1 2 3 4 5 6 7
13. If I can, I want to get better grades in this class than most of the other students.	1 2 3 4 5 6 7
14. When I take tests I think of the consequences of failing.	1 2 3 4 5 6 7
15. I'm confident I can understand the most complex material presented by the instructor in this course.	1 2 3 4 5 6 7
16. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.	1 2 3 4 5 6 7
17. I am very interested in the content area of this course.	1 2 3 4 5 6 7
18. If I try hard enough, then I will understand the course material.	1 2 3 4 5 6 7
19. I have an uneasy, upset feeling when I take an exam.	1 2 3 4 5 6 7
20. I'm confident I can do an excellent	1 2 3 4 5 6 7

job on the assignments and tests in this course.	
21. I expect to do well in this class.	1 2 3 4 5 6 7
22. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.	1 2 3 4 5 6 7
23. I think the course material in this class is useful for me to learn.	1 2 3 4 5 6 7
24. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.	1 2 3 4 5 6 7
25. If I don't understand the course material, it is because I didn't try hard enough.	1 2 3 4 5 6 7
26. I like the subject matter of this course.	1 2 3 4 5 6 7
27. Understanding the subject matter of this course is very important to me.	1 2 3 4 5 6 7
28. I feel my heart beating fast when I take an exam.	1 2 3 4 5 6 7
29. I'm certain I can master the skills being taught in this class.	1 2 3 4 5 6 7
30. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.	1 2 3 4 5 6 7
31. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.	1 2 3 4 5 6 7

Part B. Learning Strategies

The following questions ask about your learning strategies and study skills for this class. Again, there are no right or wrong answers. Answer the questions about how you study in this class as accurately as possible. Use the same scale to answer the remaining questions. If you think the statement is very true of you, circle 7; if a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

Not at all true of me 1 2 3 4 5 6 7 very true of me

32. When I study the readings for this course, I outline the material to help me organize my thoughts.	1 2 3 4 5 6 7
33. During class time I often miss important points because I'm thinking of other things.	1 2 3 4 5 6 7
34. When studying for this course, I often try to explain the material to a classmate or friend.	1 2 3 4 5 6 7
35. I usually study in a place where I can concentrate on my coursework.	1 2 3 4 5 6 7
36. When reading for this course, I make up questions to help focus my reading.	1 2 3 4 5 6 7
37. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do.	1 2 3 4 5 6 7
38. I often find myself questioning things I hear or read in this course to decide if I find them convincing.	1 2 3 4 5 6 7
39. When I study for this class, I practice saying the material to myself over and over.	1 2 3 4 5 6 7
40. Even if I have trouble learning the material in this class, I try to do the	1 2 3 4 5 6 7

work on my own, without help from anyone.

41. When I become confused about something I'm reading for this class, I go back and try to figure it out. 1 2 3 4 5 6 7

42. When I study for this course, I go through the readings and my class notes and try to find the most important ideas. 1 2 3 4 5 6 7

43. I make good use of my study time for this course. 1 2 3 4 5 6 7

44. If course readings are difficult to understand, I change the way I read the material. 1 2 3 4 5 6 7

45. I try to work with other students from this class to complete the course assignments. 1 2 3 4 5 6 7

46. When studying for this course, I read my class notes and the course readings over and over again. 1 2 3 4 5 6 7

47. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence. 1 2 3 4 5 6 7

48. I work hard to do well in this class even if I don't like what we are doing. 1 2 3 4 5 6 7

49. I make simple charts, diagrams, or tables to help me organize course material. 1 2 3 4 5 6 7

not at all very true
true of me of me

50. When studying for this course, I often set aside time to discuss course material with a group of students from the class. 1 2 3 4 5 6 7

51. I treat the course material as a starting point and try to develop my own ideas about it. 1 2 3 4 5 6 7

52. I find it hard to stick to a study schedule. 1 2 3 4 5 6 7

53. When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions. 1 2 3 4 5 6 7

54. Before I study new course material thoroughly, I often skim it to see how it is organized. 1 2 3 4 5 6 7

55. I ask myself questions to make sure I understand the material I have been 1 2 3 4 5 6 7

studying in this class.

56. I try to change the way I study in order to fit the course requirements and the instructor's teaching style. 1 2 3 4 5 6 7

57. I often find that I have been reading for this class but don't know what it was all about. 1 2 3 4 5 6 7

58. I ask the instructor to clarify concepts I don't understand well. 1 2 3 4 5 6 7

59. I memorize keywords to remind me of important concepts in this class. 1 2 3 4 5 6 7

60. When coursework is difficult, I either give up or only study the easy parts. 1 2 3 4 5 6 7

not at all very true
true of me of me

61. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course. 1 2 3 4 5 6 7

62. I try to relate ideas in this subject to those in other courses whenever possible. 1 2 3 4 5 6 7

63. When I study for this course, I go over my class notes and make an outline of important concepts. 1 2 3 4 5 6 7

64. When reading for this class, I try to relate the material to what I already know. 1 2 3 4 5 6 7

65. I have a regular place set aside for studying. 1 2 3 4 5 6 7

66. I try to play around with ideas of my own related to what I am learning in this course. 1 2 3 4 5 6 7

67. When I study for this course, I write brief summaries of the main ideas from the readings and my class notes. 1 2 3 4 5 6 7

68. When I can't understand the material in this course, I ask another student in this class for help. 1 2 3 4 5 6 7

69. I try to understand the material in this class by making connections between the readings and the concepts from the lectures. 1 2 3 4 5 6 7

70. I make sure that I keep up with the weekly readings and assignments for this course. 1 2 3 4 5 6 7

71. Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives. 1 2 3 4 5 6 7

72. I make lists of important items for this course and memorize the lists. 1 2 3 4 5 6 7

73. I attend this class regularly.	1 2 3 4 5 6 7
74. Even when course materials are dull and uninteresting, I manage to keep working until I finish.	1 2 3 4 5 6 7
75. I try to identify students in this class whom I can ask for help if necessary.	1 2 3 4 5 6 7
76. When studying for this course I try to determine which concepts I don't understand well.	1 2 3 4 5 6 7
77. I often find that I don't spend very much time on this course because of other activities.	1 2 3 4 5 6 7
78. When I study for this class, I set goals for myself in order to direct my activities in each study period.	1 2 3 4 5 6 7
79. If I get confused taking notes in class, I make sure I sort it out afterwards.	1 2 3 4 5 6 7
80. I rarely find time to review my notes or readings before an exam.	1 2 3 4 5 6 7
81. I try to apply ideas from course readings in other class activities such as lecture and discussion.	1 2 3 4 5 6 7

APPENDIX C

INTERVIEW PROTOCOL AND STUDENTS' REFLECTIVE JOURNAL PROMPT

Interview Protocol for IRB

Interview questions for student teachers:

1. How would you define SRL in your own words?
2. How has the SRLAD intervention impacted your learning? Explain
3. How has the SRLAD intervention impacted your academic performance? Explain
4. Which SRL strategies were helpful to you? Explain
5. Would learning about SRL benefit your teaching? Explain
6. Would you recommend this intervention to other students? Why or Whynot?

Student Journal Prompt

Write at least five bullet points reflecting on the impact of applying SRL strategies to aid your learning. Be sure to include what SRL strategies you use, how the application of SRL strategies positively or negatively impacts your learning, and your general feelings about using SRL strategies to aid your learning.

APPENDIX D

PRETEST/POSTTEST

Test

CODE AND NAME OF COURSE: ESC 4103 **– Teaching of Science at the Early Childhood and Primary Level lll**

DURATION: 1 hr

EXAMINERS: Ms. Y. Garraway

USI: …….. .

_____

INSTRUCTIONS TO CANDIDATES: This paper has FORTY (40) objective-type questions in which you must answer ALL.

Calculators are allowed.

SECTION A

CIRCLE THE CORRECT RESPONSE

1. Which of the following is a derived unit?

(A) Length (B) Weight (C) Mass (D) Time

2. **TWO** effects that may be produced by force are changes in _____ and _____.

i. mass ii. shape iii. colour iv. velocity

(A) i and iii only (B) i and iv only (C) ii and iii only (D) ii and iv only

3. In the absence of an external force, a moving object will

(A) stop immediately. (B) slow down and eventually come to a stop.
(C) go faster and faster. (D) move with constant velocity.

4. When standing on the moon, the mass of an astronaut is 70kg. When he returns to earth, his approximate weight will be_____.

(A) 70kg (B) 420kg (C) 70 N (D) 700 N

5. Which of the following is an example of a **VECTOR** quantity?

(A) Distance (B) Displacement (C) Speed (D) Time

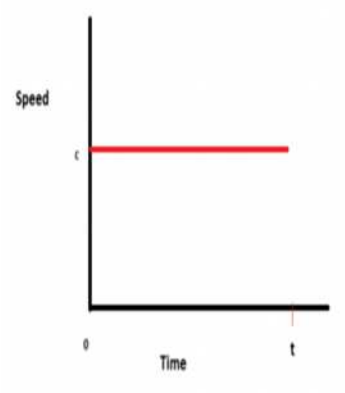
5. car covering a distance of 14.5 meters in 10 seconds would have traveled at a speed of _____.

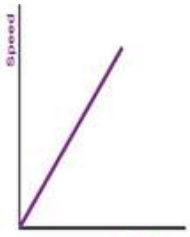
(A) 145 m/s (B) 24.5 m/s (C) 1.45 m/s (D) 4.5 m/s

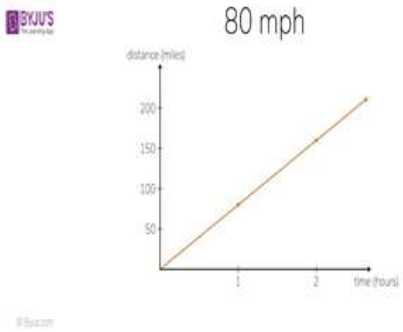
7. A soccer ball is kicked and travels at a velocity of 12 m/sec. After 60 seconds, it comes to a stop. The rate of this journey is best described in terms of

(A) velocity (B) acceleration (C) distance (D) speed

8. Which of the following graphs represents a constant speed?



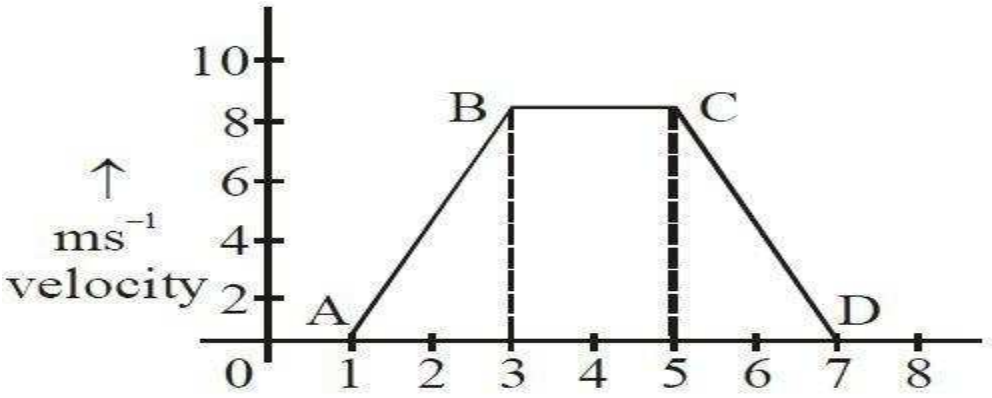




Graph 1 Graph 2 Graph 3

(A) 1 only (B) 2 only (C) 1 and 2 only (D) 1 and 3 only

9. For the velocity-time graph shown below, what is the distance covered by the body in the 7s?



(A) 120m (B) 56m (C) 32m (D) 8m

10. Which of the following situations BEST describes Newton's Third Law of Motion?

(A) A football acceleration proportionally to the force applied to it
(B) A driver kept fixed by his seat belt after a collision
(C) A stone resting on a ledge
(D) A fish swimming in a pond

11. Which of Newton's laws best explains why a motorist should buckle up?

(A) The first law (B) The second law

(C) The third law (D) The law of gravitation

12. Newton's first law of motion states that an object in motion will not change UNLESS

(A) the net force acting on it is greater than zero

(B) a force continues to be applied to the object

(C) its inertia is stronger than the applied force.

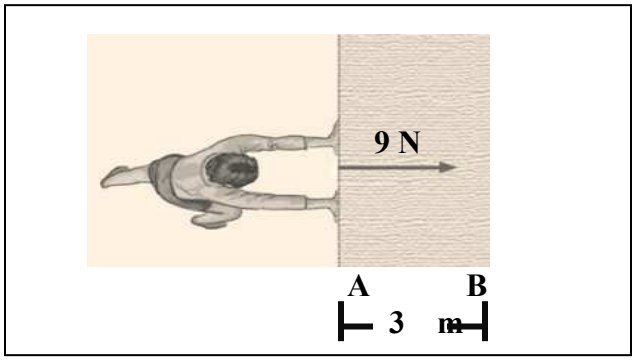
(D) The object has no inertia.

13. You're driving a car. The car has a mass of 2500 kilograms. The car has an acceleration of -10m/s^2. Using Newton's 2nd Law of Motion (f=m×a), calculate

the net force acting on the car.

(A) 25000N (B) – 25000N (C) 250N (D) -250N

Study the picture below, then answer question 14.



14. How much work will be done moving the box from point A to B?

(A) 27 J (B) 6 J (C) 3 J (D) 0.3 J

15. Forty (40) J of work was done on an object when a constant force of 10N was applied. What was the distance moved by the object?

(A) 0.25m (B) 4m (C) 50m (D) 400m

16. The kinetic energy possessed by a car of mass 1 kg, rolling at a velocity of 4 m/s, is _____.

(A) 8 J (B) 4 J (C) 3 J (D) 2 J

17. The potential energy possessed by a stone of mass 2.5 kg resting on a ledge of the height of 3 m is

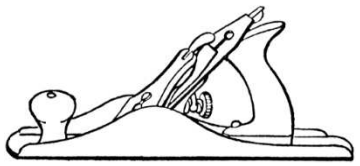
(A) 5.5 J (B) 7.5 J (C) 75 J (D) 80 J

18. Which of the following equation is true?
(A) Power = work done × time (B) Power = work done/time
(C) Power = work done × velocity (D) Power = work done/ velocity;

19. All of the following are examples of first-class levers EXCEPT

(A) Claw Hammer (B) Pliers (C) Stapler (D) Scissors

Study the picture of the machine below, then answer question 20.



20. Which **TWO** types of simple machines can be found in the machine shown above?

i. screw ii. lever iii. wedge iv. axle

(A) i and ii only (B) i and iii only (C) ii and iii only (D) ii and iv only

21. Using a lever, Joe can lift a 10,000 N car off the ground with a force of 1000 N. What is the mechanical advantage of the lever?

(A) 1 (B) 10 (C) 100 (D) 1000

22. Third-class class levers:

(i) the applied force is between the load and fulcrum
(ii) an example is the arm used in lifting objects
(iii) the applied force and load act in the same direction

(A) i and ii only (B) i and iii only (C) ii and iii only (D) i, ii and iii

23. What is room temperature, 25 ^{0} C, on the Kelvin scale?

(A) 25K (B) 273K (C) 298K (D) 310K

24. Phase changes:
(i) can occur by adding or taking away heat from a substance
(ii) indicate a reversible change in a substance
(iii) include freezing, melting, and condensation
(iv) indicate a chemical change in the matter

(A) i, ii and iii only (B) i, ii and iv only (C) ii, iii and iv only (D) i, ii, iii and iv

25. What is the reading shown on the thermometer in degrees Celsius below?

(A) 20 (B) 21 (C) 22 (D) 70

26. A concrete floor feels cold to bare feet, but a carpet on the same floor feels warm because

(A) the stone floor is at a lower temperature
(B) the carpet is warmer
(C) the carpet is a better conductor of heat
(D) the floor is a better conductor of heat

27. A Solar eclipse is formed when _____.

(A) the sun passes between the earth and the moon

(B) the moon passes between the sun and the earth

(C) the earth passes between the sun and the moon

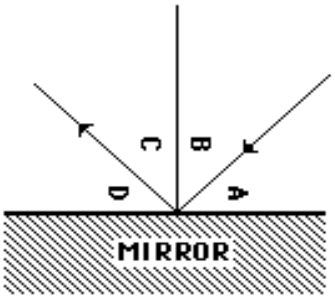
(D) the sun passes between the earth and the stars

28. Which of the following statements is **incorrect** concerning images formed by plane mirrors?

The image formed by a plane mirror is

(A) is real. (B) virtual. (C) same size as object (D) distance as the object

Study the diagram of a ray of light striking the surface of a plane mirror, then answers question 29.



29. If the angle A is 45°, the angle of incidence is_____

(A) 45° (B) 55° (C) 65° (D) 90° 27.

30. The Rainbow Effect occurs mainly as a result of _____.

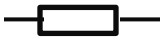
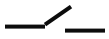
(A) Reflection (B) Refraction (C) Diffraction (D) Dispersion

31. All of the following are examples of good insulators of electricity, **EXCEPT**

(A) Glass (B) Gold (C) Plastic (D) Rubber

31. Which of the following is the **correct** symbol for a cell?

(A) 

(B) 
(C) 
(D) 

33. Some torch lights work on 9V. If each cell is rated at 1.5V, how many cells must you connect in series for the torchlight to work?

(A) 1 (B) 3 (C) 5 (D) 6

34. A small laboratory immersion heater is rated at 12V and 36 W. The current flowing through it is ____

(A) 0.33A (B) 3A (C) 24A (D) 432A

35. In a circuit, a 33 Q resistor carries a current of 2 A. The voltage across the resistor is _____.
(A) 33 V (B) 66 V (C) 80 (D) 132V

36. A **correct** statement concerning Magnetism would be that the strength of a bar magnet is _____.

(A) greatest at its sides.
(B) weakest at its sides.
(C) greatest at its poles.
(D) weakest at its poles.

37. In a magnetized substance, the magnetic domains

(A) point in the same directions
(B) point in opposite directions
(C) are disarranged
(D) point in an E-to-W direction

38. A magnet that has two south poles at its opposite ends

(A) cannot exist
(B) comes from a broken magnet
(C) is said to possess consequent poles
(D) always attract other substances

39. The only sure test for polarity in magnets is_____.

(A) locating the North Pole
(B) stroking the magnet
(C) attraction
(D) repulsion

40. In using a solenoid to make a magnet, it was noted that from one end, the current was flowing in a clockwise direction. That end of the magnet produced would be _____.

(A) the South Pole
(B) the North Pole
(C) the most magnetic
(D) the least magnetic

END

ESC 4103 COURSE OUTLINE

UNIVERSITY OF GUYANA
SCHOOL OF EDUCATION AND HUMANITIES
DEPT. OF CURRICULUM AND INSTRUCTION

COURSE OUTLINE:
ESC 4103 – TEACHING OF SCIENCE AT THE EARLY CHILDHOOD AND PRIMARY LEVEL III.

CREDITS: 2 Time: -3hrs (1L and 2 lab/tut.)

PRE-REQUISITE: ESC3105/3204 CO-REQUISITE: Nil

EXEMPTIONS: Successful completion of an equivalent course from another acceptable tertiary institution.

DESCRIPTION:

This course is intended to promote the acquisition and practice of a body of skills and behaviors relevant to the teaching of science at the Primary Level III. The course consists of both methodology and content.

The content component constitutes the larger component and will provide fundamental knowledge and skills for the Primary science teacher in keeping with the Primary School Curriculum.

LEARNING OUTCOMES:
This course will:
1. provide trainees with insights, techniques, and skills they can use to become competent practitioners.

2. make the trainees knowledgeable of the science content and skills appropriate at the Primary Level.

This course is taught in two modules:

Module A – Introduction to the Methodology of Teaching of Science
Module B – Science Content – Mechanics and general physics, heat, light, weather, magnetism, and electricity.
Module A: WEEKS 1 - 4

WEEK	CONTENT	RESOURCES
1.	Educational Objectives	Prepared Handout
	Classification of Objectives	Eggen et al.

2.	Unit/ Lesson Plans Content, method Developmental stages Evaluation/ Reflection	Prepared Handout
3.	The General Inductive Model The General Deductive Model Advantages and disadvantages	Eggen et al. Presentation of lessons. Assignments given.
4.	The Discovery Method Lesson stages Study Habits / Skills and Homework.	Prepared Handout.
MODULE B	WEEKS 5 to 14	
5.	SI units. Mass and Force of Gravity. Weight and its variation. Friction.	Practical- finding g.
6.	Speed, velocity, and acceleration Distance – time graphs Velocity – time graphs	Scalar and vector quantities Plots of velocity – time graphs.
7.	Newton's Laws of Motion Measuring weight. Calibrating spring balances.	Practical – Calibrating a spring balance.
8.	Work, Energy, and Power. Potential and Kinetic Energy	Test on Weeks 1 to 5
9.	Simple Machines: Classification of levers Mechanical advantage Velocity ratio and efficiency	Handout
10.	Heat and its measurement. Thermometers and thermometric Liquids. Expansion of solids, liquids, and gases The unusual expansion of water	Practical- volume change of ice to water
11.	Light rays and reflection Shadows, eclipse	practical- light travels in a straight line, image in a

	Refraction and refractive index	plane mirror
12.	Introduction to electricity Simple circuits and parallel circuits. Ohm's law (V= IR) Insulators and conductors Calculating energy use in the home	Practical–making series
13.	Magnetism: Magnetic and non-magnetic substances Making magnets by induction Single and divided Electromagnetism, solenoid touch methods and De-magnetization electrical method.	Test – Weeks 6 - 11 Practical –Test for polarity
14.	Exams	

EVALUATION:

In-class tests (2)	40%
Presentation	10%
Assignment/Projects	10%
Final Examinations	**40%**
Total	100%

MAIN TEXTS:

Contant T. L., Bass J. E. & Carin A. A. (2014). Teaching Science Through Inquiry and Investigation. (12th Edition). Pearson, US.

Eggen P. D. & Kauchak D. T. (2012). Strategies and models for Teachers: Teaching content and thinking skills. Allyn & Bacon, Inc.

Farley A., Taylor M. & Trotz C. (2014). Physics for CSEC Examinations. Macmillan Caribbean

Hall P. (2004). Prentice Hall Science Explorer: Physical Science. N.J. Prentice Hall Inc.

Loxely P., Dawes L., Nichols L. & Dore B. (2013). Teaching Primary Science: Promoting Enjoyment and Developing Understanding. Routledge. NY.

NOTE: Any CSEC or GCSE Physics text will help in the content area.

APPENDIX F

IRB EXEMPTION GRANT LETTER

EXEMPTION GRANTED
Stephanie Smith
Division of Educational Leadership and Innovation - West Campus
-
Steph.Smith@asu.edu
Dear Stephanie Smith:
On 7/20/2022 the ASU IRB reviewed the following protocol:
Type of Review: Initial Study
Title: Creating Self-Regulated Student Teachers: Strategies
to strengthen student teachers' awareness and learning
skills.
Investigator: Stephanie Smith
IRB ID: STUDY00016216
Funding: None
Grant Title: None
Grant ID: None
Documents Reviewed: • IRB-UG Letter to Dr. Marsh Ethics Review Initial
approval with names and titles-revised (1).pdf,
Category: Off-site authorizations (school permission,
other IRB approvals, Tribal permission etc);
• Yassanne Garraway IRB Protocol.docx, Category:
IRB Protocol;
• Yassanne Garraway recruitment_methods.pdf,
Category: Recruitment Materials;
• Yassanne Garraway supporting_documents -
Interview Schedule and Journal Prompt.pdf, Category:
Measures (Survey questions/Interview questions
/interview guides/focus group questions);
• Yassanne Garraway_ Support DocumentMSLQ.pdf, Category: Measures (Survey
questions/Interview questions /interview guides/focus
group questions);
• Yassanne Garraway_Supporting Document-PretestPosttest.pdf, Category: Measures
(Survey
questions/Interview questions /interview guides/focus
group questions);
The IRB determined that the protocol is considered exempt pursuant to Federal
Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 7/18/2022.
In conducting this protocol you are required to follow the requirements listed in the
INVESTIGATOR MANUAL (HRP-103).
If any changes are made to the study, the IRB must be notified at

research.integrity@asu.edu to determine if additional reviews/approvals are required. Changes may include but not limited to revisions to data collection, survey and/or interview questions, and vulnerable populations, etc.
REMINDER - Effective January 12, 2022, in-person interactions with human subjects require adherence to all current policies for ASU faculty, staff, students and visitors. Up to-date information regarding ASU's COVID-19 Management Strategy can be found here. IRB approval is related to the research activity involving human subjects, all other protocols related to COVID-19 management including face coverings, health checks, facility access, etc. are governed by current ASU policy.
Sincerely,
IRB Administrator
cc: Yassanne Garraway
Yassanne Garrawa

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