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The Effect of Standardised Learning Diaries on Self-Regulated Learning, Calibration Accuracy and Academic Achievement

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THE EFFECT OF STANDARDIZED LEARNING DIARIES ON SELF-REGULATED
LEARNING, CALIBRATION ACCURACY AND ACADEMIC ACHIEVEMENT

by

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ABSTRACT

THE EFFECT OF STANDARDIZED LEARNING DIARIES ON SELF-REGULATED LEARNING AND ACADEMIC ACHIEVEMENT

Avanelle Joseph-Edwards
Old Dominion University, 2019
Director: Dr. Linda Bol

The online learning environment is a dynamic yet complex learning modality. Students are physically separated from their peers, they grapple with feelings of isolation, and they may be unable to self-regulate their learning. Studies have shown that self-regulation is related to academic achievement and student metacognitive monitoring in online settings. The present study investigated the effects of a standardized diaries on students' self-regulatory behaviors, calibration accuracy and academic achievement within an online learning environment. Using this self-monitoring and evaluation tool, forty online graduate students enrolled in a research methods course at a southeastern university in the United States participated in a semester-long experimental study. Students were randomly assigned to either a treatment or control group. The researcher used the Online Self-Regulated Learning Questionnaire (OSLQ) (Barnard-Brak, Lan, To, Paton, & Lai, 2009) to examine changes in students' self-regulatory behavior. Calibration accuracy was used to measure metacognitive monitoring while final course grade was used to measure achievement. The one-way ANOVA revealed that students who received the intervention were significantly more accurate on their metacognitive judgements made after taking the test (postdiction) when compared to the control group. However, no significant effect of the treatment was found on self-regulated learning behaviors or academic achievement.

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Dedication

To my husband, my son and my parents who have provided unwavering support.

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It would be remiss of me to not express my gratitude to all those who helped me along my graduate studies in general and my dissertation journey in particular. As I reflect on my journey, I think of Dr. Jill Stefaniak who served as my graduate advisor and my first dissertation chair. Thank you for sharing your knowledge and experience in the field and for steering me through the course of my initial dissertation preparations. I also want to thank Dr. Tian Luo who provided me with guidance both inside and outside of the classroom setting. Thank you for being so personable so much so that I felt comfortable emailing you ever so often with questions about my journey while at ODU. To Dr. Baaki who never taught me formally in a class, but who served as a guide and help in my dissertation writing, I am very grateful.

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To my mother, you have been a source of comfort throughout this journey. For the delicious home-cooked meals, the unexpected gifts and the unforgettable trips, you have made my journey much more enjoyable and stress free.

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CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

Online course enrollment continues to grow at an exponential rate. Between the years 2012 and 2016, online enrollment in the United States has seen a four percent increase in growth with the current standing at 29.7% of total university enrollments (Allen & Seaman, 2017). As of Fall 2016, nearly 3 million students were taking online courses exclusively whereas over 3 million students were taking a combination of online and face-to-face courses. Of the total 6 million US students who were taking online courses, 83% were studying at the undergraduate level (Allen & Seaman, 2017).

This rise in online education is attributed in part to the changing needs of students who must juggle family and work commitments while seeking to realize their academic goals (Conrad & Donaldson, 2011). The online learning environment gives students flexibility in organizing their learning experiences as they are not required to be onsite to receive instruction. Though the online setting cannot completely replicate the immediacy and dynamism of a face-to-face classroom, the Web 2.0 and 3.0 and communication tools afford the students and instructors an exchange of ideas via synchronous and asynchronous tools (Kitsantas & Dabbagh, 2011).

Notwithstanding, in a learning environment where students are physically removed from peers and instructors, students can feel isolated. This isolation is further exacerbated by a lack of ongoing instructional support which they were easily afforded in a face-to-face learning environment (Bol & Garner, 2011). Therefore in this modality, students are required to have a high locus of control over their studies, intrinsic goal orientation, sound management of time, learning resources and environment and academic self-efficacy (Cho & Shen, 2013; Kirmizi, 2013).

Given the dynamic and complex nature of the online learning environment, students often struggle with finding an equilibrium between coping with isolation and deploying the requisite skills to successfully navigate the online learning environment. As such, the high dropout rates experienced in some institutions are attributed to students' inability to self-regulate that is, plan, monitor and evaluate their learning (Cho & Shen, 2013).

Studies have shown that self-regulation is attuned to academic achievement in online settings. In fact, self-regulatory processes account for achievement differences among students and varying learning contexts, and it is also a means to improve achievement among students of varying proficiency levels (de Bruin, Kok, Lobbestael, & de Grip, 2017; Schunk & Zimmerman, 2011).

Nevertheless, there is a paucity of research on self-regulation in authentic online learning contexts (Delen & Liew, 2016). Even fewer studies explore the link between self-regulated learning (SRL) and academic achievement in online courses (Cho & Shen, 2013). Furthermore, there are only a few intervention studies that investigate strategies to support self-regulated learning for academic achievement (Brill & Hodges, 2011; Dorrenbacher & Perels, 2016; Kauffman, Zhao, & Yang, 2011) and metacognitive judgments in authentic real world online courses (Hacker, Bol, & Bahbahani, 2008).

Theoretical Framework

Self-regulated learning provides a useful framework for studying self-monitoring behaviors among online university students. Self-regulated learning can be defined as “self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals” (Zimmerman, 2000, p. 14). Therefore, this conception of self-

regulatory behavior attempts to explore the socio-cognitive reciprocal causation among personal, behavioral and environmental processes (Zimmerman, 2000).

Self-regulated theory has four underlying assumptions (Pintrich, 2004) which help to frame the current study. First, students are actively involved in directing their own learning. They rely on a combination of internal and external resources which, when deployed assist them in constructing knowledge. Second, learners are capable of monitoring, controlling and regulating their cognitive abilities, motivation, behavior and environment. Notwithstanding this potential, there are contextual, developmental and biological constraints which can sometimes impede their regulation. Third, learning goals can be used as criteria against which actual learning is evaluated. It assumes that learners use preset goals to map out their course of learning, exploit a combination of strategies and resources to accomplish the goal, reflect and evaluate progress made towards achieving the goal while treating and correcting maladaptive behaviors if the need arises. Last, student achievement is not only influenced by personal, demographic, cultural or contextual factors but also by students' self-regulation of their cognition, motivation and behavior which act as mediators between personal and contextual characteristics and actual performance (Pintrich, 2004).

However, in order for students to successfully self-regulate they should be accurate in the calibration of their learning. In other words, students' judgments of their knowledge and performance should closely match actual performance (Hacker et al., 2008).

In applying self-regulated learning theory to this study, four primary constructs will be explored – self-monitoring, calibration accuracy, academic achievement and learning diaries. A fundamental subprocess of self-regulation is academic self-monitoring that is defined as “students' efforts to observe themselves as they evaluate information about specific personal

processes or actions that affect their learning and achievement” (Zimmerman & Paulsen, 1995, p. 14).

When students engage in self-monitoring, they can compare actual learning states with the desired goal state via recording of their behavior (Zimmerman, 2000). A learning diary therefore can facilitate this process of self-observation and recording as students can note basic information relating to their academic progress on a regular basis. Diaries can also record subjective reactions or objective observations of learning events (Schmitz, Klug, & Schmidt, 2011). Therefore, it can be considered as a “standardized instrument to measure psychological variables” (Schmitz et al., 2011, p. 252).

Through the self-monitoring process recorded in learning diaries, students will be able to make use of either externally or internally generated feedback to judge their progress towards learning goals. Accurate self-assessment is therefore critical to self-regulated learning as the evaluation can provide useful information that will aid students in either adjusting goals or adopting different strategies to accomplish learning goals (Bol, Hacker, Walck, & Nunnery, 2012). Unfortunately, students often have difficulty in making accurate judgments about their learning (Labuhn, Zimmerman, & Hasselhorn, 2010; Snyder, Nietfeld, & Linnenbrink-Garcia, 2011). It is anticipated therefore, that interventions targeted to improve calibration accuracy would have a positive effect on self-regulated learning as improved monitoring can lead to an increase in self-regulation and control of learning processes (Greene & Azevedo, 2010).

One of the assumptions of SRL is that it can influence academic performance as students deploy the necessary strategies and resources to meet preset goals. In the context of this study, academic achievement will be measured by the final score obtained at the end of the semester for the course.

The following statements represent the underlying logic for conducting this study: If self-regulation is a contributing factor to student achievement and the act of recording (via self-monitoring) can prompt self-reflection and evaluation processes, then learning diaries, a self-monitoring tool, can impact the self-regulation competence and academic achievement of online students. Moreover, if learning diaries prompt self-monitoring then accurate monitoring in turn can lead to gains in achievement.

Literature Review

The purpose of this literature review is to highlight key research on self-regulated learning (SRL) in online learning contexts in higher education. Therefore, the first section concentrates on SRL theory and its application to the online setting. Next, focus is placed on the role of learning diaries as an intervention to enhance SRL. Following this is an examination of SRL and academic performance in online settings. The literature review will conclude with a look at calibration accuracy.

Given that online education is increasingly prevalent, new skills and roles which perhaps were once assumed by the instructor in the face-to-face environment are now shifted to the learner. In a distance learning environment, the learner has a greater locus of control (Hannafin, Hill, Land, & Lee, 2014) and is therefore more autonomous and self-directed in his or her pursuit of knowledge (Gunawardena & McIsaac, 2004). However, in such learning environments students can feel socially isolated and with the lack of ongoing instructional support or scaffolding, attaining self-regulation poses a challenge to learning achievement (Bol & Garner, 2011; Cho & Shen, 2013). In fact, studies have shown that students' failure to self-regulate has been attributed to high dropout rates encountered in some institutional programs (Cho & Shen, 2013).

Defining Self-Regulation

Self-regulation is a metacognitive, motivational, and behavioral process whereby a learner is self-directed to pursue knowledge without relying on support from instructors, peers or other agents (Zimmerman, 2000). Three SRL models that are often used in the literature when referring to self-regulation in online learning environments are those of Zimmermann (2000); Pintrich (2000); and Winne and Hadwin (1998). Common among all three of these models is the focus on cognition, motivation (e.g. self-efficacy beliefs, task orientation, interest), and context (e.g. evaluation and monitoring of changing task conditions) (Winters, Greene, & Costich, 2008).

Zimmerman's model however differs from Pintrich's and Winne and Hadwin's in that his is grounded in socio-cognitivist theory. His model builds the theoretical background for the present study as it acknowledges the influence of contextual factors in the learning process. It departs from other models in that it recognizes that self-regulatory behavior is not an attribute or disposition but rather it is contextual and varies from one situation to another. Specifically, Zimmerman's model addresses such situational influences and effects such as the learning context, learning goals, use of learning and volitional strategies and goal attainment (Schmitz & Perels, 2011). Furthermore, unlike the information processing models which emphasize the influence of personal and cognitive elements in self-regulation, in the socio-cognitivist model, there is a reciprocal causation among three processes: personal, behavioral and environmental (Zimmerman, 2000).

Personal regulation addresses one's self-beliefs, feelings, and actions that are planned and adapted for goal attainment. Behavioral self-regulation on the other hand involves self-appraisal in which one observes one's behavior and adapts performance strategies to bring about the desired performance. Environmental regulation refers to adjusting the contextual or environmental factors that can affect one's regulation. These three influences of SRL are perhaps

best captured in Zimmermann's (2000) three-phased SRL model (see Figure 1) which consists of forethought, performance/volitional control, and self-reflection.

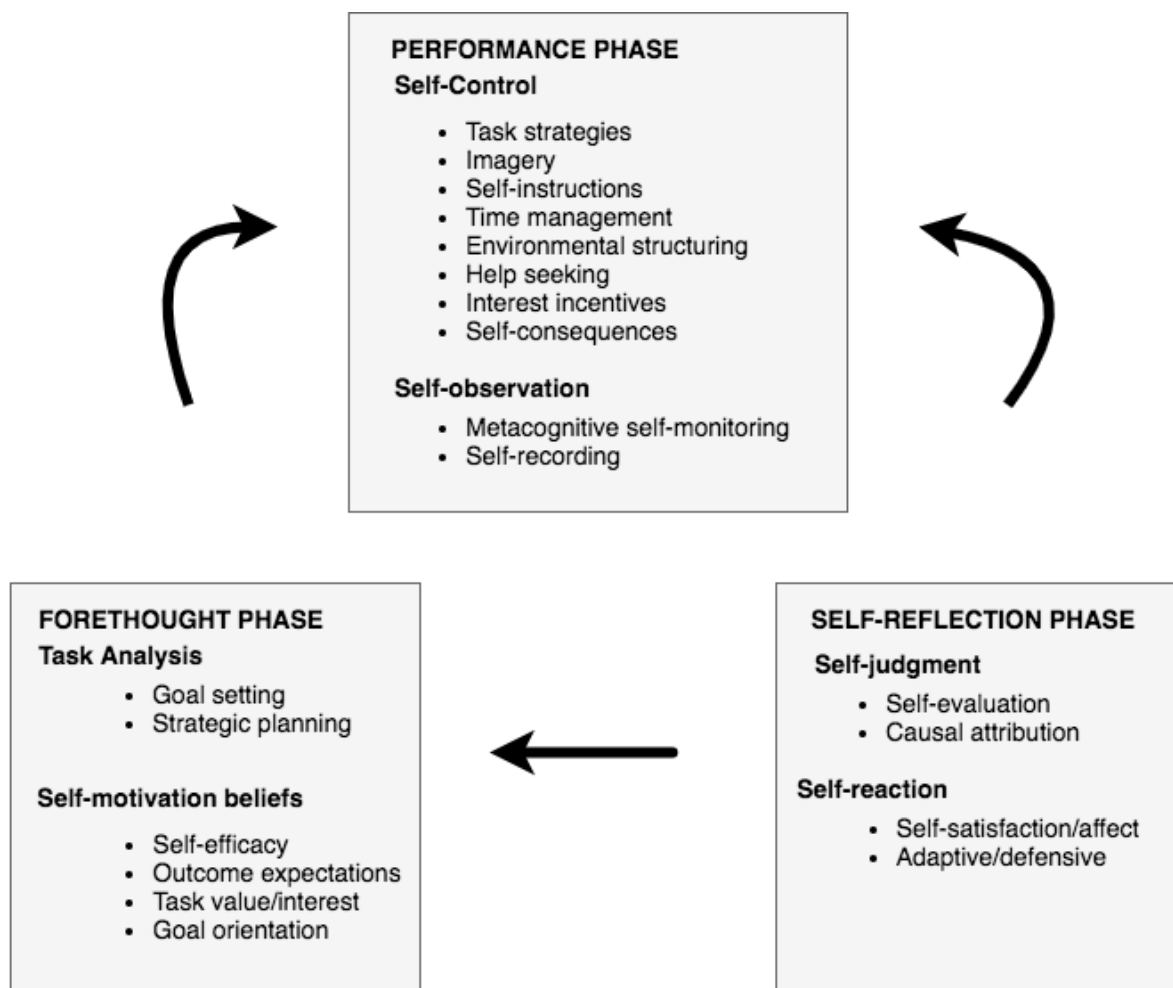


Figure 1. Self-Regulatory Processes in the SRL Model (Zimmerman & Moylan, 2009)

Stages and Processes of SRL

The first phase of the model is forethought. This phase refers to students' planning ahead – anticipating academic tasks and planning how to approach them. The two processes involved at this stage are task analysis and self-motivational beliefs. In the former, students set learning

goals and use and adapt cognitive strategies to achieve these goals. However, these goal-setting and strategic planning processes depend on learners' motivational beliefs about their goals and strategic planning. Therefore, self-efficacy, outcome expectations, student interest and value of the learning task are central to self-motivational beliefs (Zimmerman, 2000).

The two main processes during the performance phase are self-observation and self-control. In the self-observation process the learner engages in self-monitoring or metacognitive monitoring where he evaluates his performance against set criteria. This process is very similar to the third phase of the cyclical model – self-reflection, except that in the self-reflection phase, the monitoring takes place after the performance whereas in the self-observation phase, monitoring takes place during the performance (Winne & Hadwin, 1998). The second strategy involved in self-observation is self-recording. Here the learner traces and codes his actions as they are being performed. The self-control sub-process involves maintaining concentration, interest and motivation in the learning episode. Self-consequences, environmental structuring, self-instructions, interest enhancement are some of the strategies used in this process (Schunk & Zimmerman, 2011).

The final phase of the cyclical model is self-reflection. In this phase, self-judgment and self-reaction occur following the conclusion of the learning episode. Self-judgment can be viewed as a consequence of self-observation where the learner evaluates his or her performance against a standard or goal (Zimmerman, 1989). In this phase learners apply beliefs of self-efficacy and goal-setting and match them against standards such as social norms or performance levels.

In the self-reaction phase, learners evaluate their performance which can trigger causal attributions – adaptive inferences or maladaptive inferences that explain their performance (Bol

& Garner, 2011; Schunk & Zimmerman, 2011). In adaptive inferences, learners change their cognitive strategies, for example, in subsequent learning episodes, so that the learning goal can be attained. However, in maladaptive inferences where learners attribute poor performance to uncontrollable causes, they resort to procrastination, task avoidance, cognitive disengagement etc. (Schunk & Zimmerman, 2011).

To better understand the major components of the SRL phases, consider the example of Darla who is generally a successful learner. Darla is a high-performing online graduate student in education. It is the second week of the semester and Darla realizes that she has her first exam at the end of the month. In the forethought phase, Darla begins to map out what she would like to achieve on the exam. Given that she considers the course of study valuable for her academic pursuits and owing to the fact that she is highly self-motivated, she sets out to identify a goal that will bring her success. Thus, she sets a goal to receive between 93-100% in the upcoming exam. In order to realize that goal, she determines that she needs to devote one hour per day in reviewing the content material in preparation for the exam (*goal setting*). She then chooses the learning methods needed to accomplish the task. Thus, she decides that paraphrasing and generating questions about the content will assist her in meeting her goal (*strategic planning*).

The performance phase is where Darla executes the plan set in the forethought phase. Thus, she selects the appropriate learning content, spends one hour (*time management*) in reviewing the content by paraphrasing and generating questions about the material (*task strategies*). During her review, she judges her understanding of the material (*self-monitoring*). She then notes (*self-recording*) areas that are still unclear by placing a question mark next to the appropriate areas.

At the end of the week, Darla decides to review her progress towards getting an A on the exam. In evaluating her performance, she realizes that she did not always manage her time wisely and sometimes only spent 30 minutes in test preparation. Environmental distractions such as the television or radio, prevented her from meeting her test preparation target of one hour. She therefore decides to correct the maladaptive behavior (*self-reaction*) by studying in a cubicle in the library for future learning episodes. Moreover, she realizes that there are still a few areas that need clarification and so decides that seeking assistance from her peers is the best method to improve on her performance (*adaptive*). In her reflections she realizes that her performance will be due to how much and how well she studies (*causal attribution*).

Self-regulatory Learning Strategy Use

Darla in the above scenario is an example of a good self-regulator as she deployed the SRL learning strategies needed to achieve her academic and personal goals. Notwithstanding, becoming a good self-regulator is not an easy feat for most students (Donker, de Boer, Kostons, Dignath van Ewijk, & van der Werf, 2014). The situation is even further aggravated within an online learning context (Bol & Garner, 2011). As such, Barnard-Brak, Lan and Paton (2010) identified six constructs or SRL strategies in their SRL instrument that they deemed most useful in measuring student SRL levels. The constructs on this instrument will be used to measure students reported SRL levels following the intervention.

Environment Structuring. Environment structuring refers to the efforts made by the learner to regulate the physical and social study environments. It may therefore include studying in a noise-free location or having comfortable seating. The literature indicates high performers generally were more effective in managing their environment (Barnard-Brak, Paton, & Lan,

2008). Moreover, given that online students are not confined to a classroom setting, the role of environment structuring was more apparent (Kirmizi, 2013).

Goal Setting. This can be defined as the setting of specific outcomes of learning or performance (Zimmerman, 2000), such as reading a book chapter during a study session. By setting self-initiated goals, learners develop their own standards or criteria which would aid them in making metacognitive judgments and evaluating their progress toward goal attainment. There is empirical evidence to suggest that students who are goal-oriented use strategies to promote deeper learning and are more successful in their learning (Morisano, Hirsh, Peterson, Pihl, & Shore, 2010). Mastery-oriented goals in particular have been shown to have a positive relationship to persistence in academic learning and achievement outcomes (Ames, 1992; Meece & Holt, 1993).

Help-seeking. Help-seeking relates to seeking academic assistance with the aim of overcoming academic challenges. Given the autonomous nature of the online learning environment, students need to employ various avenues to get assistance to optimize their learning potential. Few studies have been conducted which establish a positive correlation between help-seeking and academic achievement. Moreover, the literature indicates that students with strong mastery-oriented goals are more likely to seek help in traditional settings (which will decrease the need for subsequent assistance) (Karabenick & Dembo, 2011). Notwithstanding, because of the relational disconnect that is often present among learners and between learners and the instructor in online settings, students do not typically seek help. The literature attributes this avoidance of assistance to the absence of relationship with peers and instructors and the perceived doubt of peer competence to provide useful help (Dunn, Rakes, & Rakes, 2014).

Time Management. Effective management of time is also another important skill for academic success in an online environment. In an online learning environment, students are required to invest more time in their learning than in the face-to-face course due to the lack of instructor presence (Palloff & Pratt, 2007). Several studies indicated a positive relationship between time management and academic performance in online learning (Michinov, Brunot, Le Bohec, Juhel, & Delaval, 2011; Puzziferro, 2008).

Task Strategies. Task strategies “assist learning and performance by reducing a task to its essential parts and reorganizing the parts meaningfully” (Zimmerman, 2000, p. 19). Students enact task strategies to assist them with their learning and performance. Some task strategies include highlighting salient material, creating outlines, and summarizing or using mnemonics.

Self-evaluation. This is a critical strategy in SRL in which students self-appraise their current performance against set goals. Moreover, given the self-directed nature of the online learning environment, greater demands are placed on the learner to regulate and assess his or her learning efforts (Kirmizi, 2013).

Self-Regulatory Learning as a Process

Research has indicated that there has been a shift away from viewing SRL as trait-like behavior to process-related behavior (Bannert, Reimann, & Sonnenberg, 2014; Panadero, Klug, & Järvelä, 2016). Zimmerman’s SRL model can be considered as a process model to describe SRL as it accounts for the cyclical nature of self-regulatory processes (Klug, Ogrin, & Keller, 2011; Roth, Ogrin, & Schmitz, 2016; Schmitz & Wiese, 2006).

A process can be defined as “a series of state measurements over time” (Schmitz & Wiese, 2006, p. 65). Therefore, when conducting process analyses, learning behavior is viewed as changeable over time and not as a stable, or static trait (Schmitz, 2006). As such, the study of

SRL as a process can be considered as episodic in nature given that learning occurs over a sequence of learning states.

Therefore, each learning episode can be considered a learning state which impacts future learning states. The examination of SRL in a sequence of learning states over time can provide a rich and dynamic picture of SRL behavior. Notwithstanding, the examination of learning behaviors over time is also context specific. Thus, process data that are collected in an online learning environment may present new challenges that merit discussion.

SRL in Online Learning Environments

Online education continues to grow at an exponential rate with more students choosing the online learning environment as their learning modality of choice as opposed to the traditional face-to-face environments (Emerson & MacKay, 2011). Online learning communities can be described as learning environments in which all activities and dialogues occur virtually or online (Tu & Corry, 2002).

Online learning occurs mostly through the Internet. This medium facilitates more open access to higher education as students are not required to be physically present to attend class. This open access therefore creates more flexibility for learners in that they have greater control over the structure, pace, time and location for their study (Narciss, Proske, & Koerndle, 2007). The online modality can also engender interactivity as there are many instructional Web 2.0 tools accessible which can facilitate discourse between peers, tutors and the course material itself either synchronously or asynchronously (Abrami, Bernard, Bures, Borokhovski, & Tamim, 2011; Kerr, 2011).

Often, online learning takes place using a learning management system in which multiple sources of information are housed. Nonetheless, students often have to sift through the content,

decode the information and assess its value to the whole learning experience. Online learning therefore demands a high degree of learner autonomy, control and self-directed learning (Hannafin et al., 2014). Moreover, in order for students to experience success in the online academic environment they need to be highly self-regulated. To support this development, sound measurements are needed to assess self-regulatory strategies students use while learning online (Endedijk, Brekelmans, Slegers, & Vermunt, 2015).

Thus, although the online learning environment offers technological affordances which can provide multiple representations of information and ways to manipulate the information, the onus is on the learners to use goal setting, time management, task strategies and help-seeking to determine which representations are most helpful (Barnard-Brak et al., 2010). These behaviors are self-regulatory skills and strategies that can be employed to successfully navigate the online learning experience.

However, the flood of information, the technical malfunctions, the seductive details of multimedia learning objects, negative perceptions to online learning, degree of flexibility to work with peers, and the incoherency of some of the documents posted online make the online learning experience somewhat pernicious for students (Bruso & Stefaniak, 2016; Narciss et al., 2007). Therefore despite the evidence to support that self-regulation is a needed skill to successfully navigate the online learning experience (Dillon & Greene, 2003), students often struggle when learning in this modality (Bol & Garner, 2011; Cho, Demei, & Laffey, 2010; Delen, Liew, & Willson, 2014).

Most of the research conducted on self-regulation has traditionally focused on the face to face learning environments (Delen & Liew, 2016). Moreover, though there is research on self-regulatory strategies in hypermedia learning environments (Azevedo, Moos, Johnson, &

Chauncey, 2010; Moos & Azevedo, 2008), limited research exists on self-regulation in real world authentic online learning environments, especially as it relates to academic performance (Ambreen, Haqdad, & Saleem, 2016; Cho & Shen, 2013; Delen & Liew, 2016; Moos & Azevedo, 2008).

Learning Diaries as an Intervention Tool

A learning diary, also referred to as a learning journal, log book, or reflective diary (Tanner, 2012) is a standardized instrument used to record subjective reactions or objective observations of learning events over a period of time (Schmitz et al., 2011). Learning diaries can gather both qualitative and quantitative learning outcomes depending on the structure. That is, learning diaries can contain either open-ended questions or objective questions on a rating scale, or a mixture of both, to gather data on learning events.

With learning diaries, students engage in self-observation and reflection (key phases in the SRL model) whereby they reflect on their learning process. Prior to a learning episode, students will record their learning goals in the diary and after the learning episode, they will reflect on and evaluate the degree to which their goals were met. The continual monitoring and evaluation of their progress towards learning goals over a period of time impacts their future learning actions.

Learning diaries therefore can be viewed as a planning and self-reflection tool as students are continuously engaged using set criteria or standards to evaluate and reflect on their learning behaviors. Self-monitoring can be defined as a “systematic observation and documentation of one’s thoughts, feelings, and actions regarding goal attainment” (Schmitz & Perels, 2011, p. 726). The benefits of learning diaries augment planning and self-reflection as often times the act of monitoring one’s progress can induce changes in behavior. Such a change can be referred to

as the reactivity effect (Schmitz, 2006). According to Schmitz (2006), learning diaries can bring about changes to maladaptive behavior due to the effect of self-observation. In this regard, learning diaries can serve as an intervention tool because of the impact it can have on learning behaviors (Panadero et al., 2016; Roth et al., 2016).

An example of such a study is Aarsal (2010) who investigated the impact of learning diaries on self-regulation with 60 pre-service science teachers. Using an experimental research design, the teachers were randomly assigned to either the treatment group or the control group. For both the pretest and posttests, teachers completed an achievement test. The treatment group recorded their learning activities for 14 weeks; whereas, the control group was not required to keep a diary. Participants were also required to complete the Motivated Strategies for Learning Questionnaire (MSLQ). The results of the study revealed that the experimental group reported higher levels of self-regulatory behavior and achievement than the control group.

Few studies exist which utilize learning diaries as a measurement or an intervention tool in a higher education context (Wallin & Adawi, 2017). Nonetheless, there is a common pattern of measurement that undergird these studies. In most observed studies, learning diary measurements were documented before the learning state and right after the learning state (Bellhauser, Losch, Winter, & Schmitz, 2016; Dorrenbacher & Perels, 2016; Schmitz & Perels, 2011; Schmitz & Wiese, 2006). Such considerations in the measurement account for the cyclical nature of the SRL. In the learning diary, the pre-learning section relates to the forethought phase of Zimmerman's (2000) model. The performance and self-reflection phases are reflected in the post-learning section of the diary.

In many studies, learning diaries are used as a support measurement tool for SRL training interventions (Bellhauser et al., 2016; Ferreira, Simao, & da Silva, 2015; McCardle & Hadwin,

2015; Otto & Kistner, 2017). Notwithstanding, there are inconsistencies in the findings of the research as the effect of the learning diary are often confounded with effects of the training intervention (Fabrizz, Ewijk, Poarch, & Büttner, 2014).

Leidinger and Perels (2012) conducted a study investigating the effects of a learning intervention on students' SRL. Using a time series, pretest-posttest experimental design, 135 fourth graders were assigned to either a control or experimental group. The experimental group was trained in self-regulated learning and filled out a learning diary for the six-week period of the study. Specifically, students were introduced to a fictitious character who was confronted by various learning challenges (e.g., how to deal with distractions that affect learning). Students then had to reflect on the problem and devise strategies to resolve the problem. Alternatively, they learned how the character resolved the issues by herself. The learning diary measured SRL at the state level. Using a four-point Likert-type scale, students reported on their daily learning behavior before and after performing homework tasks. The control group received neither training nor diaries.

The results of the study showed that the self-regulatory levels of students in the experimental group remained stable across the study whereas the SRL levels of the control group dropped significantly. Moreover, students in the treatment group also slightly improved in their math scores when compared to their peers in the control group. In order to examine the indirect effects of an intervention, trend analyses were used (Perels, Otto, Landmann, Hertel, & Schmitz, 2007; Schmitz & Wiese, 2006). As such, the findings of the study indicated that there were significant linear trends found for self-recording – a variable that was not explicitly trained but would have been influenced indirectly by the treatment. Therefore, the time trend explained 14% of the variance of self-recording over the period of 30 days.

In another study (Otto & Kistner, 2017), the researchers investigated the differential effects of a training program on low and high achievers' mathematical problem-solving skills and self-regulatory behavior. Eighty-nine fourth grade students participated in the training. Students were grouped into the low-achievers or high-achievers group based on their math scores. The training content consisted of a mixture of self-regulatory strategies and subject-specific mathematical problem-solving strategies. The training was evaluated by a learning diary in which students were also required to rate items on a four-point Likert scale. Items relating to the pre-action phase on the self-regulation model were completed prior to learning; whereas, the post-action items were completed following the learning episode. Time series analyses were used to investigate the effectiveness of the intervention and trend analysis was used to examine the variables that were indirectly affected.

The results of the study revealed that both low and high achievers benefited from the training program. However, the high achievers benefited more as it related to self-regulatory and mathematical problem-solving strategies. Moreover, different patterns were observed for low and high achievers as it related to the training effects. For example, the low and high achievers chose and adapted different mathematical problem-solving strategies in their learning activities.

Given that students' self-recordings in the learning diary occurred at the same time of the training, the effects of the intervention and the monitoring were confounded. As such, the individual effects of the intervention and monitoring could not have been analyzed separately. What is needed therefore, is an experimental research design in which the effects of students in the treatment group (training+diary) can be compared to the effects of students in the controlled group (diary only).

Nonetheless, in few studies where the effect of learning diaries alone was investigated, no effects on SRL were observed (Dorrenbacher & Perels, 2016; Fabriz et al., 2014). However, when learning diaries were combined with training on SRL, there were positive effects on students' strategy use. However there was no reported effect on academic achievement (Fabriz et al., 2014). More research is therefore needed to examine the longitudinal effects of self-monitoring interventions and its effect on academic performance in the online classroom (DiGiacomo & Chen, 2016).

Calibration and Self-Regulated Learning

In order for self-monitoring and self-reflection to impact academic achievement, predictions of performance must match closely to actual performance. Calibration is the measure of the degree to which perceived performance matches actual performance (Bol & Hacker, 2012). It is calculated by taking the difference between the predicted performance on a task or set of items with the corresponding actual performance.

Metacognitive monitoring and self-evaluation are two SRL processes that impact academic achievement (Broadbent, 2017; Kauffman et al., 2011; Koriat, 2012). Metacognitive monitoring refers to the subjective assessment of one's performance processes and outcomes (DiGiacomo & Chen, 2016; Zimmerman & Paulsen, 1995). Through this self-checking process, students are able to assess their progress and correct maladaptive behavior to ensure goal attainment. Self-evaluation or reflection on the other hand refers to self-judgments on performance. During this process, one examines the self-monitoring information against set goals or standards. If however students do not accurately monitor and evaluate their performance, they are likely to deploy misappropriated control strategies, withdraw their effort and or inefficiently allocate attentional resources (Dunlosky & Rawson, 2012). Notwithstanding,

accurate calibrations do not always translate into effective use of control or self-regulatory strategies. Therefore, factors affecting calibration accuracy need exploration.

Factors impacting calibration. Several factors influencing calibration accuracy have been highlighted in the literature. One such example is the timing of calibration judgments. Studies on calibration have consistently found that postdictions are more accurate than predictions. Postdictions are the self-evaluative judgments made following the completion of a task (Labuhn et al., 2010). These judgments tend to be more accurate than predictive judgments as the former only requires reflection of past performance whereas the latter requires students to assess the scope of their knowledge base, estimate the difficulty of the task and estimate future performance (Snyder et al., 2011).

It is believed that postdictions provide students with a more comprehensive view of their knowledge of the accuracy of their judgments and thus postdictions are useful in providing further information about students' ability to monitor their performance (Labuhn et al., 2010); thus, they tend to be more accurate than predictive judgments (Snyder et al., 2011).

Hawker, Dysleski, and Rickey (2016) in a study investigated general chemistry students' postdiction accuracy and its relationship to academic performance. The researchers collected data from students enrolled in General Chemistry I and General Chemistry II. Five multiple choice exams and a comprehensive final exam were administered throughout the course of the two-semester chemistry sequence. For each exam completed, students were required to make postdictive judgments of their performance.

The findings indicated that most general chemistry students are not accurate in their postdictions of exam scores. In fact, only between 9.1% to 31.4% of all students were able to achieve perfect calibration in their scores. The general accuracy of students' postdictions was

low (averaging one to two exam score categories away from actual performance) throughout the two-semester general chemistry course. Consistent with other research, the findings of this study indicated that higher-performing students made more accurate postdictions than lower-performing students. For example, in the fall semester, the mean absolute calibration for high performers was 0.68 whereas for low performers it was 1.62.

Working with one-hundred and seven pharmacy students, Schneider, Castleberry, Vuk, and Stowe (2014) investigated students' calibration accuracy on their performance on a summative examination. They assessed whether students could identify their incorrect responses. During the administration of the examination, students were required to fill out a questionnaire in which they were asked to identify up to 10 items they were confident were answered incorrectly. Students were also asked to gauge their success on the examination in a percentage.

The results of the study indicated that students were somewhat able to predict their performance on the examination however, students whose GPAs were higher were better able to identify incorrect items than lower-performing students. When postdictions were correlated with actual performance, the results indicated a moderate correlation of ($r = .41$). Additionally, most students under-predicted their performance on the examination. Finally, inconsistent with current calibration studies, the lower performing students were better predictors of performance.

As noted, the finding that lower performing students were more accurate is inconsistent with prior research findings. The literature indicates that there is a durable relationship between performance level and calibration accuracy. Specifically, high performing students tend to be more accurate calibrators than their low-performing counterparts (García, Rodríguez, González-Castro, González-Pienda, & Torrance, 2016; Hacker et al., 2008).

In a study (Snyder et al., 2011) examining differences between gifted and typical students' metacognition and its relation to exam performance, the findings indicated that gifted students who had a higher level of calibration accuracy performed better than typical students on four exams. However, the study relied on correlational data and therefore no causal inferences can be made.

Yet another study investigated students' calibration accuracy in a classroom setting (Hacker, Bol, Horgan, & Rakow, 2000). Ninety-nine undergraduate psychology students enrolled in a course aiding in the development of self-assessment skills. During the course of the semester, students received three multiple-choice exams in which they registered their predictions and postdictions. Following each exam, students were encouraged to engage in self-appraisal in which they analyzed their predictions and postdictions against their actual performance. The results of the study indicated that high performing students made more accurate judgments of their performance with accuracy improving over multiple exams. Low-performing students on the other hand had moderate prediction accuracy but made good postdictions. The findings also indicated that prior judgments rather than prior performance impacted on their predictions and postdictions. Finally, students' judgments of performance and actual performance had little bearing on preparation for future tests.

Therefore, stability in judgments is another factor affecting calibration accuracy. Though it is a widely held belief that prior performance is a main determinant in future performance, the research indicates that students place little value on prior performance when making predictive judgments (Foster, Was, Dunlosky, & Isaacson, 2017). Rather, it is prior judgments of performance which impacts on prediction and postdiction in future learning episodes (Hacker et al., 2000).

Foster, Was, Dunlosky, and Isaacson (2017) examined whether memory of past exam performance contributes to judgment accuracy. Eight-seven undergraduates enrolled in an educational psychology course completed thirteen multiple-choice type exams on lecture content covered during the semester. Before and after each exam, students were required to complete a questionnaire asking them to estimate their exam performance. The study revealed that students were overconfident in their predictions and this overconfidence did not wane across exams. Additionally, student prior test performance did not impact upon their subsequent predictive judgments.

Support for these results can be found in another study investigating student accuracy of judgments of learning across time (Townsend & Heit, 2011). Participants in this study engaged in computerized multi-trial learning situations in which they viewed three paragraphs in total and made judgment of learning and a judgment of improvement after watching each paragraph for sixty seconds. Next, students were asked to recall the paragraph. The findings of the study indicated that there was a poor correlation between judgments of improvement and actual improved performance. There was however a correlation between judgments of improvement and changes in judgments of learning although these judgments are not valid indicators of actual improved performance. Therefore, as in the case of Foster et al. (2017), the participants were not accurate assessors of their learning, in this case, their rate of improvement.

In yet another study (van Loon, de Bruin, van Gog, & van Merriënboer, 2013) the researchers investigated the effect of inaccurate prior knowledge activation on children's calibration accuracy. One-hundred-and three primary school children were administered a pretest to estimate their prior knowledge of the concepts to be learned in class. Next the children studied the 20 concepts and their related meanings. Following this, students were asked to make

predictive judgments on how well they would be able to recall the meanings of the concepts. Students were then prompted that they would be required to take a test to estimate their knowledge of the concepts. In the next phase, students were provided with an opportunity to restudy the concepts in preparation for the exam. The procedure concluded with students providing postdictive judgments of their accuracy on the test.

The findings revealed that inaccurate prior knowledge has a negative impact on students' metacognitive judgments. The activation of inaccurate prior knowledge had a negative impact on students' predictive and postdictive judgments. Students were also overly confident when they activated inaccurate prior knowledge.

Improving Calibration and Performance. Calibration therefore is important part of self-regulated learning process as accurate calibrators will tend to deploy effective self-control strategies to positively impact their academic performance. Conversely, poor calibrators may use inappropriate strategies, withdraw effort and poorly allocate attentional resources when engaged in a learning task (DiGiacomo & Chen, 2016).

Though research suggests that calibration accuracy improves learning (Huff & Nietfeld, 2009), few studies exist which examine calibration accuracy and academic performance outside of laboratory settings (Leggett, Sandars, & Burns, 2012). Furthermore, the research conducted on calibration in classroom contexts has produced conflicting results (Bol & Hacker, 2012; Hacker et al., 2008). Nonetheless, the literature has identified two main strategies that are used to improve calibration accuracy namely, strategy training, and feedback. With regards to the former, learners are taught strategies to better equip them to make more accurate monitoring judgments. In this regard they are able to identify discrepancies between their actual performance and perceived performance (Huff & Nietfeld, 2009).

Reid, Morrison, and Bol (2016) showed positive effects of strategies on calibration accuracy among college students but no significant effect on performance. Using an experimental design with eighty undergraduate students in a laboratory setting, the researchers investigated whether mixed strategy treatment in digital text results in higher calibration and meta-comprehension accuracy. Students were placed in four groups – a metacognitive strategy treatment group, a cognitive strategy treatment group, a combined group of metacognitive and cognitive strategy treatments and a control group which received neither cognitive nor metacognitive treatment. The results indicated that students in metacognitive and cognitive strategy treatment reported higher calibration accuracy when compared to those in the metacognitive and control groups.

Legget, Sandars and Burns (2012) investigated the impact of workbooks with self-monitoring exercises on calibration accuracy and academic performance in undergraduate medical students. Every week, students completed a workbook in which they would respond to multiple-choice questions on the topic covered during the week. The intervention group in particular responded to additional questions on their perceived confidence and satisfaction levels on the answers they provided. Furthermore, they had to elaborate on their confidence judgments by providing a justification for why they believed their response was accurate or inaccurate. The results of the study indicated that students in the treatment group improved both their calibration accuracy and academic performance when compared to the control group.

Internal or external feedback is also another method used to improve calibration. When students receive feedback on their performance, it engenders self-reflection which can prompt evaluative judgments on their performance. Moreover, given that the SRL process is cyclical, the feedback received on actual performance can assist the learner in future performances. The

forethought phase includes the motivational precondition or the adaption of strategies to succeed on learning tasks.

In one study (Labuhn et al., 2010), researchers examined the effects of individual and social comparison feedback and self-evaluative standards on students' calibration accuracy and performance on a math test. In a 3x3 factorial experiment, ninety fifth grade students were randomly assigned to treatment and control groups. The results of the study indicated that self-evaluative standards had no impact on calibration accuracy and performance. On the contrary, students receiving feedback increased in predictive judgments. Furthermore, for the overconfident students, feedback had a minimal positive impact on performance.

Feedback and other treatments were investigated in a study conducted by Callender, Franco-Watkins, & Roberts(2016). Treatment included the effects of instruction on metacognition, practice making judgments, and the provision of incentives and feedback on exam performance and calibration accuracy were examined. In Study 1, the researchers conducted the study with 127 undergraduate students enrolled in a decision-making course. During the course, students received instruction on issues related to metacognition and calibration, including information on feedback and calibration accuracy. They received immediate feedback on their responses and calibration accuracy, information on their judgments and performance and bonus points based on their postdiction accuracy scores. Study 2 was similar to Study 1 except that Study 2 had two additional groups – one receiving feedback and another no feedback.

The results from the studies indicated that metacognitive accuracy improved across exams with the aid of instruction, practice, incentives and feedback. Consistent with previous research, the authors found that lower performing students were more overconfident compared to

higher performing students who were more underconfident. Moreover, students' metacognitive accuracy improved greatly from the first to the second exam.

In the studies examined, most of the calibration research has taken place in the context of laboratory or traditional face to face classroom settings. Given that self-regulated learning is highly situational, students' calibration accuracy may also be context specific. The question that remains unanswered is how students' calibration accuracy is affected within online learning settings. Though there are studies that utilize online technologies such as digital texts (Reid et al. 2014) and online planning tools (Hadwin & Webster, 2013), few studies have been conducted in online learning contexts (Bol, Campbell, Perez, & Yen, 2016; Bol, Hacker, & Shea, 2005). Therefore, calibration accuracy within online context merits investigation.

Self-Regulatory Learning and Academic Achievement in Online Settings

Schunk (2005) posited that students' skills and attributes do not provide the full picture when examining student achievement. Rather, academic achievement is broader in scope and encompasses other dimensions such as self-regulated learning and motivation. With regards to the former, Schunk affirmed that self-regulated learning can be used as a means to explain achievement differences among students and as a mechanism to improve achievement. Because self-regulated learners typically are self-motivated, they are better positioned to exert the necessary effort and to persist in their learning when compared to others who are not self-regulated. Moreover, they are better equipped to make use of suitable learning strategies to achieve their goals. Finally, because they can readily self-monitor and make adjustments in future learning episodes their achievement levels are likely to be higher than those who do not adequately self-regulate. The section that follows examines predictors of academic achievement in traditional and online learning settings.

Predictors of Academic Achievement

Goal Setting. Research on goal-setting and academic achievement have shown some consistent results. Self-efficacy and goal quality are strong predictors of achievement (Greene, 2018) as are goal proximity (Bandura & Schunk, 1981; Seijts & Latham, 2001) as well as goal difficulty (Schunk, 1983, 1995; Seijts & Latham, 2001; Sitzmann & Ely, 2011) .

In a study investigating the structural relationships among locus of control, self-efficacy, task value, satisfaction, achievement, and persistence (Joo, Lim, & Kim, 2013), it was determined that self-efficacy and task value had a positive effect on academic achievement. These motivational constructs appear in the forethought phase of SRL in addition to affecting the self-reflection phase at the end of a learning task.

Short-term goals strengthen self-efficacy. It is easier to gauge learning progress in the short term because these goals afford continuous information to help monitor learning (Schunk & Zimmerman, 2001). For example, Schwinger and Stiensmeier-Pelster (2012) investigated high school students' use of motivational regulation strategies while preparing for an exam. The results indicated that mastery self-talk and proximal goals were positively related to students' learning efforts and improvement in exam scores.

Time management. Another critical factor impacting on performance is time management. Regardless of the learning context, traditional or online, management of time impacts on learning performance. However, time management is even more critical in the online environment where students are removed in time and space from their peers, have volumes of material to filter through, and have greater autonomy and control in their learning (Cho & Shen, 2013; Kirmizi, 2013).

The literature has recorded several instances where time management has had a positive impact on achievement both in online (Carson, 2011; Hao, Wright, Barnes, & Branch, 2016) and traditional settings (Stoeger & Ziegler, 2008; Zimmerman, Bonner, & Kovach, 1996). In most instances, time management was examined as a variable within a wider self-regulatory training program. Notwithstanding, the results from both online and traditional formats confirm the positive relationship between time management and academic performance.

One study examined SRL and academic performance in an online undergraduate educational technology course (Lewis & Litchfield, 2011). The students were randomly assigned to three different training modules designed to examine the impact of a WebQuest on self-regulated learning skills. Goal setting and technology forms were completed at the start and end of the semester and during the course of study, weekly monitoring and evaluation forms were completed. Results indicated that time and study environment significantly related to academic performance and that student self-efficacy beliefs were predictors of final course grade.

A similar study was conducted in a traditional classroom setting. Two hundred and nineteen elementary school students from 17 classes were randomly assigned to a training group or a control group in a study investigating self-regulated learning (Stoeger & Ziegler, 2008). Students in the training group received training during traditional class instruction and homework assignments. Students in the control group did not receive training but engaged in the same math activities. At the end of the study, the math assignments were evaluated, and the results confirmed that students in the training condition improved in various self-regulatory skills, among them, time management.

Effort regulation. Another self-regulatory skill affecting performance is effort regulation. This can be defined as the ability to persist in the face of academic adversity

(Puzziferro, 2008; Richardson, Abraham, & Bond, 2012). Komarraju and Nadler (2013) investigated implicit beliefs, goals and effort regulation in a traditional learning context. Four hundred and seven undergraduates completed the MSLQ and reported on their GPA. Using a hierarchical regression analysis, the findings indicate that effort regulation was a significant predictor of incremental variance in GPA.

Cho and Shen (2013) in an online study assessed students' goal orientations, academic self-efficacy, metacognitive regulation, effort regulation, and interaction regulation. Effort regulation in particular was measured using the MSLQ. The results of the study showed that effort regulation and time spent on the online learning platform predicted academic achievement.

Help seeking. Help seeking is a learning strategy that is often symptomatic of a greater learning problem. It suggests that learners have difficulty in understanding learning material, completing tasks or performing satisfactorily without assistance (Karabenick & Dembo, 2011). As such, many students have difficulty in acknowledging the need for assistance and therefore fail to seek the help they need. As a result, students could have a negative affect and challenge in succeeding academically.

Ryan and Shin (2011) in a study in a traditional setting, investigated the role of help-seeking in learners' efficacy and achievements over a period of time. The primary help-seeking behaviors under study were avoidant and adaptive behaviors. Two hundred and seventeen students from secondary school completed surveys on self-efficacy and achievement. Help-seeking behaviors were measured by teacher-generated reports. The study found that students displaying adaptive help-seeking behavior scored higher in self-efficacy and achievement when compared to students displaying avoidant help-seeking behavior. The study also revealed that prior achievement impacts on help-seeking behavior in future learning episodes.

Yet, in another study (Hao et al., 2016), predictors of online help-seeking behaviors were investigated. These online help-seeking behaviors included online searching, asking instructors for help and asking peers for help online. Findings indicated that academic performance was a predictor for online help-seeking behaviors. Thus, students with higher performance tended to seek help more frequently.

Despite the reported positive effects of SRL strategies on academic achievement, there are some limitations to the research. Most studies investigating SRL and academic achievement in online setting utilize correlational analyses. Few intervention studies investigate the causal effect of specific SRL strategies on academic achievement (Broadbent, 2017; Perels, Otto, Landmann, Hertel, & Schmitz, 2007).

Furthermore, among the existing studies on online SRL and academic achievement, most utilize traditional measurements such as the MSLQ which may not be representative of learning behavior in online settings (Broadbent, 2017). Though such measurements report high validity and reliability, this may not be translated into online learning settings. Therefore, more research needs to be conducted on online-specific measures such as the OSLQ when investigating the causal relationship between SRL and academic achievement.

Online Self-Regulated Learning Questionnaire (OSLQ)

The OSLQ is a self-report measure that reflects the contextual nature of SRL within an online learning context. To date, it is the only SRL measure that can be applied to online learning context. As such, this questionnaire will be used as the pretest and posttest measures in this study. There are 24 items with a five-point Likert rating scale and include the following subscales: goal setting, environment structuring, task strategies, time management, help-seeking,

and self-evaluation. More about this measure and its psychometric properties is presented in the Method section.

Purpose of Study

Metacognition, thinking about one's own thought processes, has been touted as a key process in SRL as students engage in planning, monitoring and evaluating their learning (Fabrizz et al., 2014). However, research has shown that students do not make sufficient use of metacognitive strategies, in their academic learning experience. This failure to draw on effective SRL strategies to steer the learning process makes it difficult for students to succeed in online academic settings. Moreover, success in the online setting is also dependent on the extent to which students can accurately calibrate their learning (Bol & Garner, 2011). Thus, while evidence exists to support learning diaries as an effective method to promoting self-monitoring behaviors (Tanner, 2012), little is known about the impact of learning diaries on self-regulatory behaviors, academic achievement and calibration accuracy in the higher education context (Wallin & Adawi, 2017).

The purpose of this study was to examine the influence that standardized learning diaries have on student academic achievement and self-regulatory learning skills. The following research questions guided this study:

Research Questions and Hypotheses

Research Question1: Do standardized learning diaries impact online students' reported self-regulated activities as measured by the OSLQ instrument?

Hypothesis 1: Students who use standardized learning diaries report higher levels of self-regulated activity than those who do not as measured by the OSLQ instrument.

Research Question 2: Do standardized learning diaries impact academic achievement as measured by final course grade?

Hypothesis 2: Students who use learning diaries will outperform students not using learning diaries as measured by final course grade.

Research Question 3: Do standardized learning diaries impact calibration accuracy?

Hypothesis 3: Students who use standardized learning diaries will have higher calibration accuracy when compared to those who do not use standardized learning diaries.

Significance of Study

A study investigating the effect of learning diaries on self-regulated learning, calibration accuracy and academic achievement is important for several reasons. First, whereas past studies heavily relied on self-reported measures alone to investigate self-regulated learning, the current study deviates from this trend by utilizing measurement (OSLQ) and intervention (learning diary) tools to examine self-regulated learning. Moreover, this tool affords researchers and instructors alike the ability to examine SRL as a sequence of events rather than as a disposition. This is a significant departure from most studies as self-regulated learning strategies are typically examined solely as dispositions rather than episodic behavior or a process.

Secondly, few intervention studies exist on SRL in the online learning context and even fewer on the use of learning diaries to support SRL. As such, this study is among the few that examine the causal effect of self-regulated learning strategies on student academic achievement (Perels et al., 2007).

Furthermore, the results of the study have implications for online instructors and students alike for improving practice. On the one hand instructors will be able to design learning environments that promote self-regulatory behavior by having self-monitoring tools embedded

into the instruction. In addition, the results of the study can aid students in becoming more effective and self-directed and regulated learners. Both parties may be better positioned to determine how learning diaries can impact self-regulatory behavior and academic achievement. Finally, this study adds to the breadth of research on SRL as there is a paucity of research on the impact of SRL on academic achievement in tertiary level online settings.

Summary

In online learning settings, students are required to have a high degree of autonomy and locus of control on their learning (Cho & Shen, 2013; Kirmizi, 2013). Self-regulation, though a critical component to online academic success (Hill & Hannafin, 2001), is challenging to attain for many students (Bol & Hacker, 2001). It is well established that SRL strategy use impacts academic performance (Richardson et al., 2012). Nonetheless, the effectiveness of such strategies depends to a large degree on frequency of use (Dorrenbacher & Perels, 2016) and strategy choice (Barnard-Brak et al., 2010).

Self-observation and reflection are two important online SRL strategies. The systematic observation and documentation of one's beliefs, thoughts and actions regarding goal attainment (Schmitz & Perels, 2011) over a period of time can have a direct impact on future learning behaviors of an individual (Schmitz, 2006). Learning diaries therefore have great potential in having a causal effect on learning behaviors as it can prompt or sensitize learners about maladaptive behaviors which they can correct in future learning episodes (Panadero et al., 2016; Roth et al., 2016). Notwithstanding the promise of learning diaries as an intervention tool, very little is still known about its impact on SRL in an online learning context (Wallin & Adawi, 2017).

Another area of study that is highly under researched in the online academic setting is calibration accuracy. Defined as the degree to which students' judgments of their capability or performance match their actual performance, calibration accuracy is noted to be strongly associated with academic achievement (DiGiacomo & Chen, 2016; Hacker et al., 2000). In general, high-achievers are more accurate calibrators than low-performing students (García et al., 2016; Snyder et al., 2011). Another finding that is consistent in the research is that the timing of confidence judgments impacts on calibration, with postdictions being more accurate than predictions (Hawker et al., 2016; Snyder et al., 2011). Stability in judgments (Foster et al., 2017) is also another factor affecting calibration accuracy. Thus far, only two strategies have been known to improve calibration accuracy: strategy training (Huff & Nietfeld, 2009) and feedback (Labuhn et al., 2010). However, further research is needed which examines calibration accuracy and academic performance outside of laboratory settings (Leggett et al., 2012).

The relationship between SRL and academic achievement has been widely viewed through the social cognitive lens of the triadic interaction of self-observation, self-judgment and self-reactions. As such, it is heavily documented in the research that learning strategy use and instruction on such strategies affect academic achievement (Greene, 2018). Among the chief predictors of success in an online learning environment are: goal setting, effort regulation, time management, help seeking (Broadbent & Poon, 2015). Despite students' ability to persist and ultimately achieve, academic goals are dependent to an extent on students' self-efficacy beliefs and as such the latter also affects academic performance (Komarraju & Nadler, 2013).

Notwithstanding the literature examined in this review, there remains a paucity of research on SRL in online academic settings (Delen & Liew, 2016). The following chapter will introduce a study that sought to add breadth to current research by exploring the impact of

learning diaries on self-regulatory skills, academic achievement and calibration accuracy in an ecologically valid natural classroom setting.

CHAPTER II

METHODOLOGY

The purpose of this true experimental study was to investigate the influence of standardized learning diaries on self-regulatory behaviors, academic achievement, and calibration accuracy of online graduate students. As such, this chapter provides detailed information about the design, selection of participants, instruments administered, data collection procedure, analyses, and limitations of the study.

Research Design

This study employed a true experimental research design. Specifically, a pretest- posttest control group design was used. The experimental group kept a standardized learning diary for the period of a semester while the comparison group on the other hand did not use a standardized learning diary during the semester but engaged in a weekly assignment (See Appendix E) where they wrote out definitions of key terms related from the glossary for the duration of the study.

This design was appropriate for this study as it allowed for the investigation of causal relationships among variables. Therefore, the pretest-posttest design facilitated the measurement of self-regulated learning (SRL) behavioral levels before the introduction of the treatment which was then compared to the levels of SRL after the introduction of the treatment (Bordens & Abbott, 2014). Additionally, the impact of learning diaries on calibration and achievement was examined. Figure 2 shows a visual representation of the research design by week.

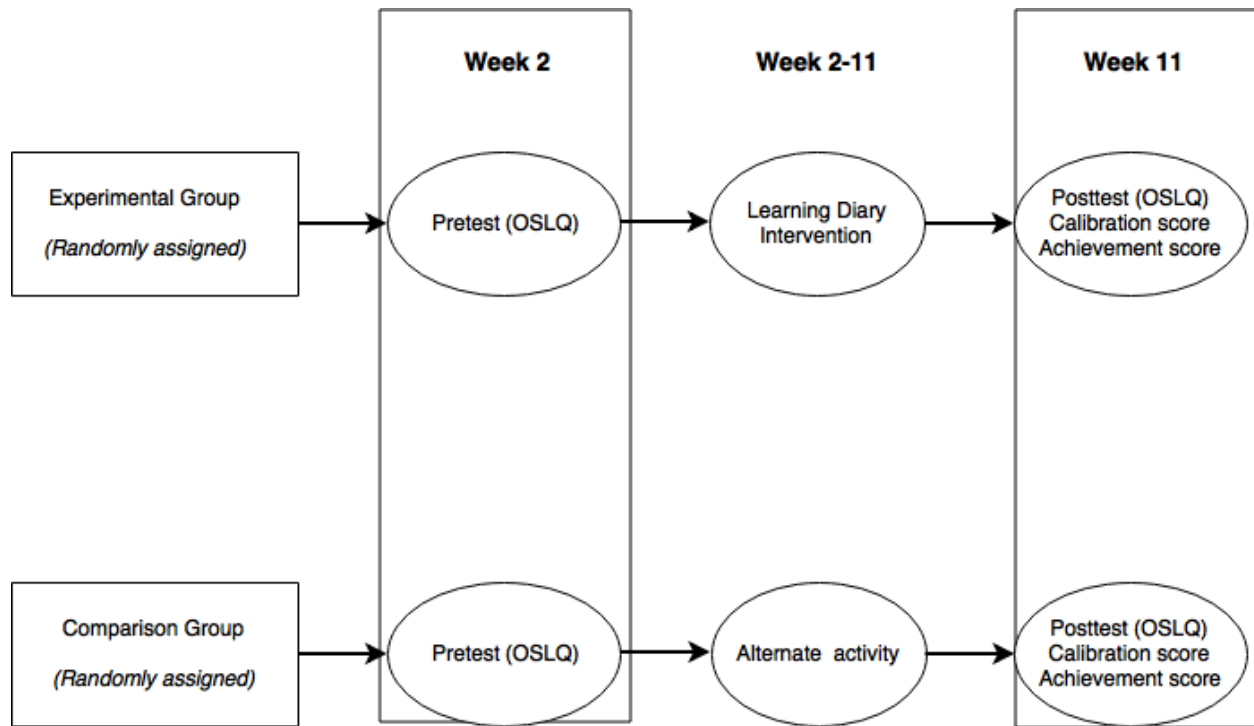


Figure 2. Pretest-Posttest Research Design

The independent variable of the study was the instructional strategy – learning diary or copying key terms. The dependent variables were self-regulatory behaviors as measured by the Online Self-Regulated Learning Questionnaire (OSLQ) instrument, academic achievement as measured by final course grade and calibration accuracy. Calibration accuracy was measured by the absolute difference between the predicted and actual final score and the absolute difference in the postdicted and the actual final course score. Table 1 below provides a summary of the variables used in this study.

Table 1

Research Study Variables

Variable	Type	Description	Range
Condition	IV	Treatment or Control	1 or 2
Self-regulated learning	DV	Responses on Online Self-Regulated Learning Questionnaire	1-5
Achievement	DV	Final course grade (%)	0-100
Calibration accuracy*	DV	Absolute prediction accuracy on final course grade	0-100
	DV	Absolute postdiction accuracy on final course grade	0-100

*Smaller values indicate better accuracy.

Population and Sample

Fifty-four participants, from a range of disciplines within the College of Education at a public, southeastern university in the United States initially consented to participate in the study. Specifically, online graduate participants, enrolled in two sections of an online course, Introduction to Research Methods, were recruited in the summer and fall semesters of 2018. The course focused on acquiring knowledge and skills related to accessing, evaluating, and synthesizing empirical research. Students were awarded points for participation in the study which accounted for part of their total course grade.

The final number of students participating in the study was 40 (28 female and 12 male). The attrition was due to student withdrawals from the course and irregularities found in the data. With regards to the latter, students who did not complete the surveys or responded with the same values for each survey item (e.g., marked “6” for all items in the survey) were excluded from the data pool.

The design guarded against some threats. To guard against selection bias, the Research Randomizer (Urbaniak & Plous, 2013) was used to randomly assign participants in the experimental and control groups. Moreover, in order to increase external validity, the study was

conducted during an existing research course where the experimental condition activities served as opportunities for learning and self-evaluation. Finally, although the course was taught by two instructors (each section assigned one instructor), the instructional content and the assignments were the same for both sections of the course.

Table 2 presents the demographic characteristics of the participants. Most participants were female (74%) compared to 26% male. Most students were less than 25 years (42%), with 19% between 26-30, 21% between 31-35, 11% between 36-40 and 7% being over 40 years. The majority of participating students were full-time (74%), with only 26% recorded as part-time students.

Table 2

Descriptive Statistics for Research Participants (N=40)

Item	Frequency	Total (%)
Treatment Group	22	55
Control Group	18	45
<i>Gender</i>		
Male	12	30
Female	28	70
<i>Enrolment Status</i>		
Part-time	10	25
Full-time	30	75
<i>Age Range</i>		
Less than 25 years	17	42.5
26 to 30 years	7	17.5
31 to 35 years	8	20
36 to 40 years	4	10
40+	4	10

Instrumentation

Online Self-Regulatory Learning Questionnaire (OSLQ). The Online Self-Regulated Learning Questionnaire (OSLQ) (Barnard-Brak et al., 2009) was selected in particular for this study as, to date, it is the only self-report measure of self-regulation targeted for online learning environments. Moreover, Schunk (2001) affirms that given self-regulatory behaviors vary highly according to the context, a measure specific to the online context is warranted.

The questionnaire consisted of 24 items with a 5-point Likert type rating scheme having values ranging from strongly disagree (1) to strongly agree (5). The measure included the following subscales: goal setting, environment structuring, task strategies, time management, help-seeking and self-evaluation. The original author reported internal consistency at $\alpha = .90$. This is well above the minimum suggested score reliability of .70 (Nunnally, 1994). The Cronbach's alpha values across the six subscales ranged from .85 to .92. Table 3 provides the corresponding subscales and alpha values. The Cronbach's alphas for the items on the pre and post instruments in the present study were .88 and .90 respectively.

Table 3

OSLQ Subscales and Alpha Values (Barnard-Brak et al., 2010)

Subscale	Cronbach's Alpha
Goal setting	.88
Environment structuring	.92
Task strategies	.85
Time management	.91
Help-seeking	.92
Self-evaluation	.89

Instrument validity was determined by the confirmatory factor analysis which provided evidence of construct validity. The chi-square goodness of fit statistic was significant - $\chi^2(246) = 758.79$, $p < .05$. Moreover, the Non Normed Fit Index (NNFI) read .95 and the Comparative Fit Index (CFI) was .96 (Barnard-Brak et al., 2009). A fit index close to .96 is representative of a good fit (Hu & Bentler, 1999).

Demographic information was also included in the OSLQ (see Appendix A). The data included information relating to the participant's name, gender, age, enrolment status and major. The participant name was included in order to correctly match students' responses to the pre and posttests.

Higher scores on the measure indicated better self-regulation in online learning by students. Students completed the questionnaire electronically via Qualtrics™. The data collected were exported into SPSS™ Version 23 for analysis.

Learning Diary. Learning diaries have been shown to be an effective tool in not only measuring self-regulation processes but also influencing self-regulation in a desired direction (Schmitz et al., 2011). Furthermore, given that learning diaries call for the systematic observation and record-keeping of daily activities, they can foster self-monitoring (Zimmerman & Paulsen, 1995). As such, this study employed a standardized learning diary consisting of 27 items (22 Likert type items on the 7-point rating scale and 4 open-ended questions) which were filled out twice weekly for 10 weeks. (See Appendix B for the learning diary questions).

The first part reflected the forethought phase of the SRL model, and it was completed at the start of the week, prior to learning. It contained nine Likert type items on the following scales: goal setting, environment structuring, time management and help seeking. The second part centered on the performance and self-reflection phases which were completed at the end of

the week, following the learning episode. In total, there were 13 Likert type items and 4 open-ended questions with the following scales: goal setting, environment structuring, task strategies, time management, help-seeking, and self-evaluation. Table 4 highlights the structure of the diary. The first column represents the corresponding phase in Zimmermann's model (2000) in the learning diary. The second column itemizes the various scales of the diary that correspond to the OSLQ. The third column indicates the diary items that match the subscales. And the last column provides an example statement in the learning diary that corresponds to the SRL phase and OSLQ subscale.

Table 4

Phases of the SRL model and the corresponding scales in the learning diary

Phase	Subscale	Corresponding Items in Diary	Examples from Diary
Forethought	Goal setting	1,2, 10,11	"Before I begin working, I will set out specific learning goals to accomplish the tasks I set out."
Performance	Task strategies	14, 15, 16, 17	"This week I made short summaries of the most important points."
	Environment structuring	3, 4, 12, 13	"This week I will arrange my workplace in a way that I will be able to work undisturbed."
	Time management	5, 6, 18, 19	"This week I will assign a specific time to complete each learning task."

Table 4 Continued			
	Help-seeking	7, 8, 9, 20, 21	“This week I will consult with my peers or instructor if I do not understand the material.”
Self-Reflection	Self-evaluation	22, 23, 24, 25, 26, 27	“I have understood this week’s learning material quite well.”

The items consisted of a mixture of self-generated questions and questions modified from Schmitz and Wiese (2006) and Schmitz and Perels (2011). The diary was based on Zimmerman’s model of self-regulation (2009) and the scales used mirrored those in the OSLQ pretest and posttest. This allowed for a comparison of pretest and posttest scores and learning processes as observed in the diary.

Students completed the diaries electronically via Qualtrics™. The data collected were exported into SPSS™ Version 23 for analysis. Items 18 and 19 in the time management subscale were recoded prior to analysis as they were negatively worded. Overall, the reliability coefficient (Cronbach’s α) was .96. Table 5 shows the reliability coefficients for all the subscales.

Table 5

Reliability Analysis per Subscale

Phase	Subscale	Corresponding Items in Diary	Reliability Coefficient
Forethought	Goal setting	1,2, 10,11	.95
Performance	Task strategies	14, 15, 16, 17	.85
	Environment structuring	3, 4, 12, 13	.82
	Time management	5, 6, 18, 19	.79
	Help-seeking	7, 8, 9, 20, 21	.82
Self-Reflection	Self-evaluation	22, 23, 24, 25, 26, 27	.89

Calibration Accuracy. The dependent variable calibration accuracy for each student was calculated by taking the absolute value of the difference between the predicted or postdicted score and its corresponding performance score (Bol et al., 2012). Smaller scores represented greater accuracy; the closer the calibration score was to 0 the higher the calibration accuracy. Thus, for example, a student who predicted to receive 95% as the final score for the course grade but actually received an 80% as the final score, his accuracy score was 15. Predictive and postdictive judgments were recorded at the time of the OSLQ pretest and posttests respectively. For example, for prediction students were asked, “What percentage (1-100) do you expect to receive for your final course grade?” For postdiction students were asked, “Now that you have completed all your course work, what percentage (1-100) do you expect to receive for your final course grade?”

Final Course Grade. The dependent variable academic achievement was measured by the observed final grade obtained at the end of the summer and fall semesters of 2018. This grade was the accumulation of scores (out of a possible 100%) for coursework completed in the given

semester. The coursework consisted primarily of low-stake assignments which tested students' application and evaluation of the content taught for each of the fourteen modules. Among the main assessment items were critiques of articles using various research designs, design problem scenario, survey building etc. At the end of the semester, there was one examination which accounted for 15% of the final score.

Data Collection Procedures

Prior to the start of the study, the researcher obtained permission from the Human Subjects Committee to collect data for the study. Following receipt of approval, the study started in the second week of the summer and fall semesters. Each student in the course received an information letter via email detailing the nature and purpose of the study (See Appendices C and D). Thereafter, the OSLQ measure (pretest) was administered online via Qualtrics™ to all participants.

At the end of the pretest (OSLQ), students of the two course sections were assigned to either the experimental or comparison group by simple randomization using the Qualtrics™ Survey Flow tool. The randomizer allowed for an even allocation of students across conditions Qualtrics (Qualtrics, 2018). Students were blind to the conditions other than their own until participation was complete.

Following the pretest, students in the experimental group logged into their course site, Blackboard Learn™, where the learning diary was administered online via Qualtrics™. Each learning diary consisted of written instructions as to how the diary should be completed. The learning diary was separated into two parts – Part A and Part B. Part A consisted of the pre-studying items which students filled out and submitted at the start of each week. Part B consisted

of the post-studying items which were completed and submitted online at the close of each week. This activity was repeated for a total of 10 weeks.

Students in the comparison group were not required to complete the learning diaries. Instead, each week students reviewed the assigned chapter from the course text and selected five key terms for which they wrote definitions. Students reproduced the glossary terms found at the end of the course text to write the definitions. Once completed, the five terms were submitted electronically via the dropbox in Blackboard Learn™. Thus, at the end of the 10-week period for the study, students submitted 50 key terms from the course text. See Appendix E for instructions on the activity. At the end of each week, students in both groups were awarded points for the successful completion of the standardized learning diary.

Both groups, in the eleventh week of the semester, completed the posttest which was identical OSLQ instrument completed in week two, save for the final item which asked, “Now that you have completed all your course work, what percentage (1-100) do you expect to receive for your final course grade?” Lastly, at the end of the semester, the researcher retrieved the student scores from the instructors.

Data Storage

The researcher took reasonable steps to keep private information such as the OSLQ questionnaire and learning diaries confidential. All identifiers from the questionnaire and learning diaries were kept confidential and all data were stored in a password-protected computer. Data collected for this study will be destroyed within one year of publication of this dissertation.

Data Analysis

SPSS TM Version 23 software was used to analyze the data in this study. Table 6 shows the relationship between the research question and the corresponding variables, data collection methods and analyses.

Table 6

Summary of Data Analysis

Research Question	Independent Variables (IV) and Dependent Variables (DV)	Data Analysis
Do standardized learning diaries impact online students' reported self-regulated activities as measured by the OSLQ instrument?	IV – learning diary DV – self-regulatory activity	One-way ANCOVA
Do standardized learning diaries impact academic achievement as measured by final course grade?	IV - learning diary DV - academic achievement	One-way ANOVA
Do standardized learning diaries impact calibration accuracy?	IV – learning diary DV – pre- and postdiction scores	One-way ANOVA

Descriptive data for all independent variables were included in the study. Thus, the means, standard deviations, and range of scores for the variables were computed and recorded. For the first research question, the one-way ANCOVA was used to analyze the significant differences between the two group means, while controlling for the covariates (pretest OSLQ scores). The second research question utilized the one-way ANOVA to assess the explained variance from the group means in relation to the unexplained variance (error). Similarly, for the third research question, a one-way ANOVA was utilized in order to determine the difference in group means as it relates to calibration accuracy.

CHAPTER III

RESULTS

This study examined the impact of standardized learning diaries on self-regulated learning, achievement, and calibration accuracy. The results are organized according to the research hypotheses: (1) Students who use standardized learning diaries report higher levels of self-regulated activity than those who do not as measured by the OSLQ instrument. (2) Students who use learning diaries will outperform students not using learning diaries as measured by final course grade. (3) Students who use standardized learning diaries will have higher calibration accuracy when compared to those who do not use standardized learning diaries.

Hypothesis 1 – Standardized Learning Diaries and SRL

A one-way between-groups analysis of covariance (ANCOVA) was conducted to examine the differences between the treatment and control groups on the dependent variable, self-regulated learning (SRL). The independent variable (group) had two levels: standardized learning diary and control and the dependent variable was the reported score on the Online Self-Regulated Learning Questionnaire (OSLQ) posttest. The reported score on the OSLQ pretest was used as a covariate.

The OSLQ posttest is a 24-item questionnaire with a 5-point Likert type rating scheme. The lowest possible score is 24 and the highest possible score is 120. In this study, the mean posttest (OSLQ) total score was 89.05 as shown in Table 7 with the lowest recorded score being 68 and the highest being 112.

Table 7

OSLQ Posttest Mean Score for Participants

Metric	Score
<i>N</i>	40
<i>M</i>	89.05
Median	88.50
<i>SD</i>	9.45
Range	44
Minimum	68
Maximum	112

Table 8 summarizes means, standard deviations for the difference in posttest scores in the experimental and control group respectively. The descriptive statistics suggest that the treatment group had higher posttest scores on task strategies, time management and self-evaluation. On the other hand, the control group had higher mean scores on goal setting environment structuring and help-seeking.

Table 8

Descriptive Statistics of OSLQ Subscales

	Experimental Group				Control Group			
	Pretest		Posttest		Pretest		Posttest	
Subscales	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>

Table 8 Continued

Goal setting	20.88	2.44	20.38	3.98	21.22	2.71	20.89	2.99
Environment structuring	16.96	2.44	16.33	2.681	16.33	2.40	16.63	2.14
Task strategies	13.00	2.48	13.92	2.77	13.94	3.19	13.47	2.86
Time management	11.16	2.12	11.54	2.09	11.44	2.12	10.79	2.18
Help-seeking	13.24	2.57	12.21	3.56	13.28	2.82	13.47	2.816
Self-evaluation	14.08	2.57	13.96	2.76	13.39	3.109	12.89	2.826

Preliminary checks resulted in the removal of two outliers which had standard deviations greater than ± 3 . The data were normally distributed for each group, as assessed by Shapiro-Wilk test ($p > .05$); and there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ($p = .161$). A mean score was computed across items. The means and standard deviations of the SRL as measured by the OSLQ for the two groups are presented in Table 9.

Table 9

Adjusted and Unadjusted Means for OSLQ Posttest Scores

	<i>Unadjusted</i>			<i>Adjusted</i>	
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SE</i>
Treatment	22	88.68	8.654	88.93	1.96
Control	18	89.50	10.579	89.20	2.17

Note: *N* = number of participants, *M* = Mean, *SD* = Standard Deviation, *SE* = Standard Error

After adjusting for pretest scores, there was no significant effect of treatment on SRL, $F(1,37) = .009, p = .925, \text{partial } \eta^2 = .000$. As evidenced in Table 9, the scores across treatment and control groups were very similar ($M = 88.68$ and $M = 89.50$ respectively). What is interesting to note as well is that the pretest scores were very similar to the posttest scores with the treatment group scoring 88.95 and the control group having a mean of 90.94. Nonetheless, there was a moderate relationship between the pretest and posttest scores on the OSLQ test, as indicated by a partial eta squared value of .106 (Cohen, 2013). Therefore, contrary to the hypothesis that the learning diary treatment group would report higher levels of SRL than the control group, the data did not reveal a statistically significant difference.

Hypothesis 2 – Standardized Learning Diaries and Achievement

The second hypothesis predicted that the learning diary group would outperform those not using a diary. The dependent variable of achievement was measured by final course grade. The raw scores out of a possible 230 points were converted to percentage correct. A one-way ANOVA was conducted to determine whether student achievement was different between the

treatment group ($n = 21$) and the control group ($n = 18$). One univariate outlier was detected, as assessed by boxplot which required deletion. The data were normally distributed for each group, as assessed by Shapiro-Wilk test ($p > .05$); and there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ($p = .192$). The achievement scores for both groups ranged between 80% and 100% with the mean score being 91.92%. This indicated that each group had a high achievement score. Table 10 highlights that the treatment group had slightly higher achievement scores ($M = 92.24$, $SD = 3.632$) than the control group ($M = 91.56$, $SD = 5.193$). Notwithstanding, the difference between them was not statistically significant $F(1,37) = .231$, $p = .633$, partial $\eta^2 = .006$. Therefore, the group means were not statistically significant ($p > .05$), and the hypothesis cannot be supported.

Table 10

Group Means for Achievement Scores

	<i>N</i>	<i>M</i>	<i>SD</i>	<i>SE</i>
Treatment	21	92.24	3.632	.793
Control	18	91.56	5.193	1.224

Note: *N* = number of participants, *M* = Mean, *SD* = Standard Deviation, *SE* = Standard Error

Hypothesis 3 – Standardized Learning Diaries and Calibration

The third hypothesis predicted that students using the learning diaries would demonstrate higher calibration accuracy when compared to those not using a diary. The dependent variable, calibration accuracy was calculated by taking the absolute value of the difference between the predicted or postdicted score and its corresponding performance score (Bol et al., 2012). Thus, if

a student judged that they would obtain 100 as their final course grade, and they actually received 80, the difference was 20 points (absolute difference). Smaller accuracy scores therefore represented greater accuracy; the closer the calibration score was to 0 the higher the calibration accuracy. Table 11 illustrates the means and standard deviations for prediction and postdiction accuracy for both groups. The descriptive statistics suggest that participants in both groups were generally well calibrated, with calibration scores being on average only three-to-five points off their prediction and postdiction scores. With regards to the postdiction accuracy scores however, only the treatment group showed greater accuracy.

Calibration bias score was the second monitoring accuracy index used in this study. Calibration bias consisted of the signed difference between the average prediction or postdiction scores and the average performance scores. A score of 0 equals no bias. Positively signed scores indicate overconfidence while negatively signed scores indicate under confidence. Thus, a student who had a prediction score rating of 84% but attained a final performance score of 98%, their calibration bias score would be -14, which indicates under confidence. The calibration bias index has been used in a number of other studies with adults (Hacker et al., 2000; Huff & Nietfeld, 2009).

Table 11 indicates that on average, both the treatment and control groups were overconfident in their predictions and postdictions. Notwithstanding, the treatment group was much less overconfident with a mean signed postdiction score of 1.14 while the treatment group had a signed postdiction average of 2.50. The control group was roughly one point more overconfident than the treatment group.

Table 11

Group means and standard deviations for absolute prediction and postdiction

Calibration Accuracy										
		Prediction			Postdiction			Calibration Bias		
								<i>Prediction</i>	<i>Postdiction</i>	
		<i>N</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Treatment Group	22	4.00	2.330	3.14	2.232	2.50	4.501	1.14	3.883	
Control Group	18	4.39	3.517	5.39	3.583	2.83	5.833	2.50	6.148	

Note: *N* = number of participants, *M* = Mean, *SD* = Standard Deviation

To confirm the absolute accuracy scores found from the descriptive statistics of the sample, a one-way ANOVA was conducted to determine whether there was a significant difference between the groups for their prediction and their postdiction accuracy. The homogeneity of variances assumption for both prediction and postdiction were met, as assessed by the Levene's test ($p = .074$) and ($p = .083$) respectively. Moreover, the normality assumption was not violated, as assessed by Shapiro-Wilk test ($p > .05$). The ANOVA results for prediction accuracy was not significant, $F(1,38) = .175, p = .678, \eta^2 = .005$. However, the ANOVA results for postdiction accuracy was statistically significant, $F(1,38) = 5.912, p = .020, \eta^2 = .135$, with the treatment accounting for about 14% of the variance in scores.

CHAPTER IV

DISCUSSION AND CONCLUSIONS

The purpose of the research was to examine the effects of standardized learning diaries on online graduate students' self-regulated learning, academic achievement, and calibration accuracy. Participants either kept a weekly standardized learning diary or engaged in a weekly assignment where they generated definitions of key terms related to research methods for the for the period of a semester. In this chapter the results from the data presented in Chapter 3 are interpreted and discussed. Implications for practice and recommendations for further research are presented.

Self-regulated learning

There is consensus in the literature that learning diaries are an effective tool in fostering metacognition (Schmitz & Wiese, 2006) which in turn can affect students' prospective learning (Panadero et al., 2016). Nonetheless, the findings of this study did not support this contention. Contrary to the hypothesis, participants who used standardized learning diaries did not report higher levels of self-regulated activity when compared to those who did not use learning diaries.

Evidence in the literature suggests that learning diaries alone do not positively impact SRL behavior (Dorrenbacher & Perels, 2016; Fabriz et al., 2014). The authors posit that students need to be provided with information as to the benefits of self-monitoring in order for them to engage in adaptive behaviors. In the current study, students were provided with a brief description of the purpose of the activity which purported to help them regulate their learning. However, the level of detailed instruction was somewhat sparse compared to previous studies.

One could therefore surmise that as the students did not receive concentrated SRL strategy instruction that they were unable to enact SRL strategies. However, strategy instruction

has been shown to be most useful for young students as well as for low-achieving students of all ages (Schraw & Gutierrez, 2015). The assumption is that younger and lower-achieving students know fewer metacognitive strategies and therefore, there is greater room for growth in self-regulatory behavior as opposed to older, higher-performing students.

Moreover, it is likely that the students of the current study have been held to high academic standards in their previous academic programs and may have received mentorship or coaching about strategy use at a younger age. Though they may not have employed learning diaries per se they could have used equally effective learning strategies diminishing the effects of this intervention. Furthermore, given that the overall achievement score for students in this study was reported at 92%, it is possible that their high achievement coupled with prior knowledge of strategy use may have impacted on their self-regulatory behaviors in the present study (Li & Belkin, 2010).

In contrast, Foerst, Klug, Jöstl, Spiel and Schober (2017) challenge this idea by advocating that discrepancies exist between students' knowledge about SRL and their ability to enact them. In their exploratory study, the researchers attributed students' inaction of SRL to "production deficiencies". That is, though students possess the requisite cognitive information to apply an appropriate SRL strategy, they, for one reason or another, fail to apply that strategy to their learning behavior. Their study highlighted that though the higher education students possessed advanced knowledge on beneficial as well as adverse SRL behaviors, their knowledge did not translate into action.

Though limitations of this study will be more thoroughly addressed later in the chapter, two of the most salient limitations warrant mention because they potentially account for the non-significant differences between groups. First the sample size was small, and the students were all

high-achieving, reducing the amount of variance that could be explained by the treatment. The use of a self-report measure could have contributed to the lack of significant findings as students may have produced socially desirable responses or may have had issues accurately recalling their learning behaviors. With weekly diary usage, students are prompted to continuously report on their strategy use throughout the duration of the study and thus the risk of memory shortfall as experienced with typical retrospective self-reports is lower (Ewijk, Fabriz, & Büttner, 2015; Schmitz et al., 2011).

Achievement

Although the literature supports the effectiveness of learning diaries on academic achievement (Arsal, 2010; Ferreira et al., 2015; Nückles, Hübner, & Renkl, 2009; Otto & Kistner, 2017; Schmitz & Perels, 2011), the researcher's hypothesis was not supported. The researcher predicted that students receiving the learning diary treatment would outperform those who received no treatment as measured by final course grade. Nonetheless, despite previous research supporting the positive impact of learning diaries, there was no significant difference between the control and treatment groups' course grades.

Many of the studies in which performance was positively impacted by learning diaries also included strategy instruction (Ferreira et al., 2015; Glogger, Schwonke, Holzäpfel, Nückles, & Renkl, 2012; Gutierrez & Schraw, 2015). The literature heavily supports the use of strategy instruction in influencing academic achievement (DiGiacomo & Chen, 2016). Huff and Nietfeld (2009) contend that the teaching of metacognitive monitoring skills improves learning outcomes and monitoring. Notwithstanding, in many of the studies in which strategy instruction was included, the instruction was in a face-to-face, K-12 setting (Dignath, Büttner, & Langfeldt, 2008; Ferreira et al., 2015; Schmitz & Perels, 2011). Only a few studies have been conducted in

an online learning environment to determine whether these strategies have the equivalent effect (Bol et al., 2016; Broadbent & Poon, 2015). Therefore, great caution should be taken when trying to generalize the findings of multifaceted SRL interventions on academic achievement in an online higher education context. Moreover, as Stoten (2019, p. 8) aptly describes, “it may be difficult to isolate metacognitive strategy knowledge from other conditioning factors in a student’s approach to learning.” As such, the interrelatedness of the various SRL processes at play warrant further investigation.

Nonetheless, several studies have shown that multi-component interventions can be disadvantageous to academic performance (Dorrenbacher & Perels, 2016; Fabriz et al., 2014) within higher education. For example, Hacker et al. (2008) found that strategy training was not as effective as incentives given that low-achieving students benefitted from incentives but not from strategy training. Additionally, Broadbent and Poon (2015) in their meta-analysis determined that the effect of metacognitive strategies on online academic outcomes was significant but weakly associated with academic achievement.

Despite the non-significant results, what is certain is that both the treatment and control groups had good academic performance as evidenced by a mean of about 92% in overall course grade. Therefore, it is plausible that the treatment did not have a significant effect on academic achievement since all of the participants are generally high performers.

On the other hand, one may argue that the control group activity may have been equally beneficial in supporting academic performance and thus, contributed to the lack of variance in scores. Recall that the control group activity consisted of the reproduction of definitions of key terms found in the learning materials. It is possible that the control group activity prompted learning. If students did not simply reproduce the definitions but paraphrased them the strategy

may have generated better learning (Morrison, Ross, Kemp, & Kalman, 2010). However, after close examination of the data, it was observed that the participants did not employ generative learning strategies such as paraphrasing because the definitions were copied verbatim from the glossary. Another possible advantage of the control group activity was simply more time being spent with the content.

Calibration Accuracy

The hypothesis that students who use standardized learning diaries will report higher calibration accuracy (prediction and postdiction) when compared to those who do not use standardized learning diaries was partially supported. The results indicated that prediction accuracy did not differ significantly between groups of this study. While there are studies showing improvement in prediction accuracy following metacognitive monitoring interventions (Bol et al., 2012; DiGiacomo & Chen, 2016; Reid et al., 2016), other studies have found non-significant results (Hacker et al., 2008; Hadwin & Webster, 2013; Hawthorne, Bol, & Pribesh, 2017).

A close examination of judgment accuracy scores across the semester revealed that the mean scores for the treatment and control groups remained relatively stable, in that there was slight variation from prediction to postdiction. One possible conclusion that can be drawn from this finding is that judgment accuracy remains relatively stable over time and task (Hacker et al., 2008) and therefore resistant to improvement.

In the context of this study, it is possible that students' predictions were based on their perceptions of desired course grade rather than perceptions of actual course grade. This notion is supported in previous studies in which students were provided with multiple opportunities to predict their performance, yet maintained stable averages in their predictions (Foster et al., 2017;

Serra & DeMarree, 2016). This suggests that there are other ‘stable’ traits such as personality or attributional style (Hacker et al., 2008) which can account for stability.

Furthermore, prediction may be more difficult to achieve in naturalistic contexts as there are varying factors at play which contribute to accurate prediction. Factors such as previous knowledge (van Loon et al., 2013), prior judgments (Hacker et al., 2000), personal characteristics (de Bruin et al., 2017; Hacker et al., 2008), nature of the assessment items (Pieschl, 2009), among others, contribute to predictive accuracy. According to Snyder, Nietfeld and Linnenbrink-Garcia (2011), “Prediction is a particularly advanced skill because it requires the individual to not only assess the breadth of their current knowledge base, but also estimate the difficulty of the task and estimate future performance based on those judgments” (p.182).

On the other hand, postdiction accuracy is easier to achieve as students have more time to engage with the learning tasks and are therefore better poised to evaluate the assessment standards against their actual performance and thus make more accurate postdictions (Hadwin & Webster, 2013). When students postdicted their course grade, they had more information and cues about the test and items in order to make more accurate calibration judgments. . This assumption is supported in part by the finding that postdiction accuracy was generally more accurate than predictive accuracy (Bol & Hacker, 2012; Hadwin & Webster, 2013). The results of the current study echo research undertaken elsewhere where participants were more accurate in their postdictions than in their predictions (Hacker et al., 2000; Zabucky, Agler, & Moore, 2009).

Therefore, intervention studies on a whole aimed at improving absolute calibration accuracy have therefore been met with mixed results (Bol & Garner, 2011; DiGiacomo & Chen, 2016). For example, in Experiment 1 of Miller and Geraci’s study (2011), it was discovered that

students who were given incentives and received feedback on their performance did not improve on their metacognitive calibration. This finding converges with other findings that metacognitive monitoring training does not improve calibration accuracy (Bol et al., 2005; Hadwin & Webster, 2013; Nietfeld & Schraw, 2002). Yet, these findings contrast others where monitoring tools have positively impacted on monitoring accuracy among students (de Bruin et al., 2017; DiGiacomo & Chen, 2016; Gutierrez & Schraw, 2015).

In addition to the previous factors proposed to explain the results found for prediction and postdiction accuracy in this study, there are two other possible factors that can explain the overall mixed results generally found in calibration research. In the first instance, though the provision of metacognitive training may increase students' global metacognitive awareness, this does not always readily translate into an improvement in the selection and use of study strategies (Li & Nietfeld, 2007). Thus, metacognitive awareness does not equate to improved self-regulation. On the other hand, metacognitive training can prompt students to be more self-aware to the extent that they are motivated to employ appropriate metacognitive skills and thus improve on their calibration accuracy and by extension, self-regulation (DiGiacomo & Chen, 2016; Dunlosky & Rawson, 2012; Schmitz & Perels, 2011).

Apart from examining prediction and postdiction accuracy, this study examined calibration bias among participants. One interesting discovery was that both groups were overconfident in their predictions and postdictions. However, the treatment group was much less overconfident when compared to the control group. This finding is supported in other research studies (Bol, Riggs, Hacker, & Nunnery, 2010; Foster et al., 2017; Pazicni & Bauer, 2014; Serra & DeMarree, 2016).

What is clear in the literature is that students have a tendency to be inaccurate calibrators (Dinsmore & Parkinson, 2013; Hadwin & Webster, 2013) with high-performing students being more accurate and less overconfident than their low-performing counterparts (Bol & Hacker, 2012; Miller & Geraci, 2011). The results of the current study support this finding.

The overconfidence among students can be attributed in part to the difficulty of the performance tasks. Whereas in most research studies monitoring accuracy is investigated based on test performance across one or a few tasks which occur for a short period of time (Callender et al., 2016; Hawker et al., 2016), this study investigates several performance tasks across an entire semester. Thus, by virtue of the increase in the number of tasks involved and the varying degree of their complexity, students' likelihood to be accurate calibrators is greatly diminished. Dubbed as the Dunning-Kruger effect (Kruger & Dunning, 1999), low performing students experience a deficiency in both content knowledge and metacognitive skills (Lindsey & Nagel, 2015). Moreover, given that there is a well-established relationship between accurate self-evaluation, self-regulated learning and learning outcomes (de Bruin et al., 2017; Dunlosky & Rawson, 2012; Rinne & Mazzocco, 2014), a student's overconfidence will compromise his or her ability to self-regulate.

Limitations

The limitations of this study should be noted. First, the statistical power of the study was impaired by the use of a modest sample size of 40 participants. Thus, while the study reported a high ecological validity, there may not have been sufficient power to detect differences.

Moreover, this study utilizes self-report data to measure self-regulatory behavior. The OSLQ could have generated a false sense of effective self-monitoring in that students became aware of things that would have otherwise gone unnoticed (Panadero & Alonso-Tapia, 2014).

Furthermore, the OSLQ could have generated the reactivity effect in the sense that participants could have reported what they felt should be acceptable rather than what they actually used (Roth et al., 2016). This represents a threat to the internal validity of the study as the data are heavily dependent on the participants' memory. Notwithstanding, the study reports of a high ecological validity as students filled out the diaries in their natural learning setting (Schmitz & Wiese, 2006).

Fidelity of the treatment is another potential limitation that could have affected internal validity. Smith, Daunic and Taylor (2007) established that the monitoring of the accuracy and consistency of the intervention is what constitutes treatment fidelity. As it relates to the monitoring of the accuracy of the intervention, it is possible that students may not have taken the diaries seriously and simply just filled out the required survey form. However, the consistency of the intervention was confirmed in several ways. The fact that the intervention was administered electronically via the Internet and not manually, would suggest that it was not subject to human error and this would ensure consistency in the delivery of the intervention. Moreover, each week the researcher monitored student participation by allocating points to students for each diary that was successfully completed. In cases where diaries were incomplete or not filled out, those data were not included in data collection. In addition, technical difficulties encountered with the delivery of the intervention were resolved in a timely manner. Finally, the dose of the intervention was monitored by Qualtrics™ which was used to deliver the intervention. Therefore, the monitoring of the consistency of the treatment helped to establish internal validity.

Design contamination was another limitation of this study. Participants of this study were randomly assigned into either a control group or treatment group within each class. There was a

possibility that students could have communicated among themselves and discovered that their assigned task differed from other classmates.

Lastly, there are limitations associated with the achievement measure. In this study, final course grade is used to measure academic achievement. Course grades do not measure student proficiency in the purest sense as they are susceptible to measurement error and vulnerable to corruption or inflation (Johnson, 2003).

Implications for Research and Practice

The aim of this study was to address the lack of research evidence on the use of standardized learning diaries on graduate students' SRL behavior, academic achievement and calibration accuracy in an online learning environment. This was done by employing a pretest posttest control group design.

Accordingly, the major contribution of the current study is that it provides the much-needed empirical data on the use of learning diaries in online graduate level settings to support self-monitoring and self-evaluation in a naturalistic context. Among the few studies conducted previously investigating the causal effect of learning diaries on learning behavior, no study investigated its effect in an online graduate setting within a naturalistic context. An examination of learning diaries under such conditions will inform instructors and instructional designers to craft learning strategies that promote self-monitoring and self-evaluation, skills which are critical to success in an online academic environment.

Further research can explore varying the sample size and the design of the experiment. The sample size used in the study was relatively modest and so an increase in the sample size can improve the potential power of the intervention. Moreover, other research designs such as the

time-series design can be used to shed greater light on within-person variation over time (Schmitz & Wiese, 2006).

The study further raises questions as to whether strategy instruction should be included as part of learning interventions to SRL behavior. While the research is clear on its positive impact on younger children, much more research is needed ascertain its relevance within an online higher education context. Therefore, further research is needed to support the assumption that strategy instruction in tandem with learning diaries positively improve SRL in an online context. There also needs to be greater symmetry in the research design methods, theoretical frameworks and research instruments used to conduct studies examining the relationship between SRL and academic achievement. In this regard, researchers would be better able to arrive at a consensus as to the impact of learning diaries on academic achievement.

In addition to the need for this research, the study highlights that the enactment of self-regulatory behavior does not solely hinge on the successful implementation of a metacognitive monitoring learning intervention. Other factors, outside of the knowledge provided by strategy instruction, impact on the successful enactment of appropriate SRL behaviors. For instance, to what degree do motivational variables and age impact on SRL behaviors? What are the interaction effects with learning diaries? Furthermore, in order to have a more holistic view and understanding of the factors affecting learning behavior, qualitative designs or measures can be used which would provide an in-depth assessment that goes beyond the quantitative frame (Klug, Schultes, & Spiel, 2018). In this sense therefore, this research is timely as academic institutions are increasingly adding more online programs of study to their course offerings (Seaman, Allen, & Seaman, 2018).

Another implication stems from the finding of the second hypothesis. The finding suggests that learning diaries do not impact the academic performance of students. To date, while much of the literature confirms the positive relationship between the two constructs (Richardson et al., 2012; Schunk & Zimmerman, 2011), many of the investigations were correlational in nature which does not allow for causal inferences (Broadbent, 2017; Broadbent & Poon, 2015; Carson, 2011). Moreover, in the empirical studies conducted, the results were mixed (Cigdem, 2015; Delen et al., 2014; Greene & Azevedo, 2010; Molenaar, van Boxtel, & Slegers, 2011). This study therefore sheds light on the fact that the extent of the variance in academic performance explained by SRL is still unclear. What is needed therefore is further exploration of the moderating factors which work together with the self-monitoring, provided by learning diaries, to influence academic achievement.

Another implication derives from the finding that learning diaries, in part, positively impact students' calibration accuracy. Secondly, the study reveals that calibration accuracy is closely related to academic performance as the higher-performing students were more accurate and less overconfident in their postdictive judgments.

The study also has implications on the factors affecting improvement in judgments towards the end of the semester. Recall that the students were asked to make predictions of their GPA at the start of the semester and then again at the end of the semester. Apart from the influence of the learning diary, there may be other moderating effects such as time and knowledge gain which could impact the strength of the relationship between the dependent and independent variables (de Bruin et al., 2017).

Overall however, the findings of this study contribute to the corpus of evidence that suggests that students are inaccurate calibrators (Dinsmore & Parkinson, 2013; Hadwin &

Webster, 2013). This finding is of grave concern especially within the higher education context where self-monitoring is of pivotal importance. There is therefore need for universities and colleges to formalize monitoring accuracy training (de Bruin et al., 2017) so that students could be better calibrators which would in turn improve their academic performance. Further examination on the factors owing to low-performing students' overconfidence is also warranted.

The formalized use of learning diaries within post-secondary institutions also has implications on design of instruction. Notwithstanding the benefits of learning diaries and metacognitive strategies as a whole in improving SRL, academic achievement and calibration accuracy, the question remains whether metacognitive strategies should be embedded within the instruction or presented as a standalone activity.

In the current study, the learning diary can be considered as an embedded content-independent strategy (ECIS) (Osman & Hannafin, 1992) as the diary items were not limited functionally by the research methods course content but rather it provided general guidance on self-monitoring which was not domain specific. One of the challenges however of the embedded approach is that it becomes difficult for the instructional designer to maximize the potential of diary while minimizing the cognitive load associated with strategy use.

It is possible that in the present study the self-monitoring and evaluation processes may have reached a plateau thereby reducing the effects of the treatment. Thus, in order to minimize the cognitive load imposed by the activity, instructional designers should gradually fade out the external prompts provided to the learner. That is, as the learner develops skills of self-assessment, learning goal formulation and resource selection, the frequency of the metacognitive prompts (in this case learning diaries) should gradually fade (Brand-Gruwel, Kester, Kicken, &

Kirschner, 2014). In this way, students would arrive at a point where they can automate and self-invoke appropriate metacognitive strategies with minimal external prompting.

However, the frequency of strategy use is not the only consideration for instructional designers. The type of strategy used is also important. Through a learner analysis, the instructional designer can identify the varying performance levels of the learners and design differentiated strategies for each group. Thus, for the expert self-regulator, minimal external support should be provided as the learner is able to automatize certain metacognitive processes in order to free up the working memory capacity to engage in a learning task (Greene, 2018). For the novice self-regulator on the other hand, they may need more frequent and extensive metacognitive prompting until executive control of the strategies can be shifted from the designer to the learner.

Conclusion

This study was designed to contribute to the growing body of literature investigating the causal effect of metacognitive monitoring tools on SRL, achievement and calibration accuracy. Contrary to the hypothesized, the standardized learning diary did not lead to improved SRL behavior or achievement scores. The limitations could perhaps explain the non-significance of the results.

In fact, much of previous research on self-regulation was conducted in a traditional, laboratory setting (Ambreen et al., 2016; Cho & Shen, 2013; Delen & Liew, 2016; Moos & Azevedo, 2008). This study is therefore among the emerging few that investigated SRL in an authentic, online, naturalistic setting. Furthermore, this study is among the first to have investigated the effectiveness of standardized learning diaries in promoting SRL, achievement and calibration accuracy. What is clear from this study however is that more research is

warranted to investigate the impact of standardized learning diaries on SRL. Self-regulated learning is of critical importance to the online learning context and so more research is needed to understand the factors affecting the successful enactment of strategies to promote SRL and by extension achievement and calibration accuracy.

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Appendices

Appendix A

Online Self-Regulated Learning Questionnaire (OSLQ) Appendix A (Pretest/Posttest)

Demographic Items:

Please answer the questions below by selecting the response that best describes you.

1. What is your current age in years?
 - a. Less than 25 years
 - b. 26 to 30 years
 - c. 31 to 35 years
 - d. 36 to 40 years
 - e. 40 and above
2. What is your gender?
 - a. Male
 - b. Female
3. What is your ethnicity?
 - a. Black/African American
 - b. Asian
 - c. White
 - d. Hispanic
 - e. Other
4. What is your enrolment status?
 - a. Part-time (fewer than 9 credits)
 - b. Full-time (9 or more credits)
5. What is your major? _____

Item	Subscale
1. I set standards for my assignments in online courses.	Goal Setting
2. I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the semester).	
3. I keep a high standard for my learning in my online courses.	
4. I set goals to help me manage studying time for my online courses.	
5. I don't compromise the quality of my work because it is online.	
6. I choose the location where I study to avoid too much distraction.	Environment Structuring
7. I find a comfortable place to study.	
8. I know where I can study most efficiently for online courses.	
9. I choose a time with few distractions for studying for my online courses.	
10. I try to take more thorough notes for my online courses because notes are even more important for learning online than in a regular classroom.	Task Strategies
11. I read aloud instructional materials posted online to fight against distractions.	
12. I prepare my questions before joining in the chat room and discussion.	
13. I work extra problems in my online courses in addition to the assigned ones to master the course content.	
14. I allocate extra studying time for my online courses because I know it is time-demanding.	Time Management
15. I try to schedule the same time every day or every week to study for my online courses, and I observe the schedule.	
16. Although we don't have to attend daily classes, I still try to distribute my studying time evenly across days.	
17. I find someone who is knowledgeable in course content so that I can consult with him or her when I need help.	Help Seeking
18. I share my problems with my classmates online so we know what we are struggling with and how to solve our problems.	
19. If needed, I try to meet my classmates face-to-face.	
20. I am persistent in getting help from the instructor through e-mail.	Self Evaluation
21. I summarize my learning in online courses to examine my understanding of what I have learned.	
22. I ask myself a lot of questions about the course material when studying for an online course.	
23. I communicate with my classmates to find out how I am doing in my online classes.	
24. I communicate with my classmates to find out what I am learning that is different from what they are learning.	

25. What percentage (1-100) do you expect to receive for your final course grade?

Appendix B

Standardized Learning Diary

Purpose: The purpose of this activity is to assist you in regulating your learning by actively recording, observing and evaluating your learning behaviors during the course of the semester.

Instructions: This learning diary has two parts. In Part A you are required to complete the 9 items rating how much you agree to the statements on a scale from 1-5. Part A of the diary should be completed at the start of the week *prior* to engaging in any learning activity related to this course.

For Part B of the diary, you are required to complete 14 items rating how much you agree to the statements on a scale from 1-5. You are also required to answer 4 open-ended questions in which you would record your response using complete sentences.

Be sure to also indicate the diary ID, date and time at which you made your entries. The diary ID corresponds to the week in which the diary was submitted. Thus, the diary ID for the first week will be “01” whereas the diary ID for the fifth week will be “05”.

Diary ID: _____

Time: _____

Date: _____

Pre-Studying Items (Part A)

Please indicate how much you agree (7-strongly agree) or disagree (1-strongly disagree) with each of the following statements:

1. Before I begin working, I will set out specific learning goals to accomplish the tasks I set out.
2. Before I begin working, I will determine which areas of study I need to prioritize.
3. This week I will arrange my workplace in a way that I will be able to work undisturbed.
4. When learning, I will sit at the same place I did the last time for study.
5. This week, I will assign a specific time to complete each learning task.
6. Before working, I will reflect on how to make effective use of my time.
7. This week I will consult with my peers or instructor if I do not understand the material.
8. If I am unclear about the material, I will check other resources (e.g. Internet, textbook etc.) to assist me.
9. If I encounter any gaps in my notes, I will turn to my peers for help.

Post Studying Items (Part B)

Please indicate how much you agree (7-strongly agree) or disagree (1-strongly disagree) with each of the following statements:

1. I managed to realize my learning goals for this week.
2. This week I divided my overall learning goals into sub-goals.
3. This week, I had no interruptions while studying.

4. I managed interruptions that distracted me from my learning tasks.
5. This week I made short summaries of the most important points.
6. I highlighted the most important points in my notes and texts.
7. I committed important material to memory.
8. This week I made charts, diagrams etc. in order to structure the learning content.
9. This week, I did not organize my time correctly.
10. This week I skipped some of the tasks I wanted to accomplish.
11. This week I used supplementary resources to assist me in achieving my goals.
12. I consulted with my peers or instructor to assist me in understanding the material.
13. I have understood this week's learning material quite well.
14. I tried to learn from my mistakes this week.

Open Ended Questions

Please answer the following questions as honestly and as fully as you can:

1. Explain what worked in your studying/learning this week.
2. Explain what didn't work well in your studying/learning this week.
3. How could you change or improve what you did?
4. To achieve next week's learning goals, what could you do differently from this week?

Appendix C

Participant Information Letter

The Effect of Learning Diaries on Self-Regulated Learning, Calibration Accuracy and Academic Achievement

My name is Avanelle Joseph-Edwards and I am a doctoral student in the PhD program Instructional Design and Technology at the Old Dominion University. You are invited to take part in this research study, which I am conducting as part of the requirements of my degree.

This project aims to discover the effect of keeping a learning diary on learning behavior and achievement. If you choose to take part in the project you will be asked to complete two online questionnaires (35 minutes each) and maintain learning diaries (35 minutes each) for the period of 10 weeks.

All information collected during the research study will be treated confidentially and all personal identifiers will be removed. All data collected will be stored securely on a password-protected computer and the files will be encrypted. The data will be stored for a period of five years following the conclusion of the study. Thereafter, the data will be confidentially destroyed. The data collected can be used as a presentation, publication or report. You may be sent a summary of the final report on request.

I do not foresee any risks associated with participating in this study. By completing the online questionnaires and maintaining learning diaries you will be meeting partial requirements for the course and thus you will be awarded points accordingly.

Should you have any questions about the research study or require further information please feel free to contact the following:

Student Researcher: Avanelle Joseph-Edwards
Email: ajose010@odu.edu
Tel: 1-868-487-2616

Human Subjects Review Committee Chair
Dr. Laura Chezan
Email: lchezan@odu.edu
Tel: 757 683 7055

Thank you for your time,

Yours sincerely,

Avanelle Joseph-Edwards



PhD Student
Old Dominion University

Appendix D

Participant Information Letter – Comparison Group

My name is Avanelle Joseph-Edwards and I am a doctoral student in the PhD program Instructional Design and Technology at the Old Dominion University. You are invited to take part in this research study, which I am conducting as part of the requirements of my degree.

This project aims to discover the effect of a planning and reflection tool on learning behavior and achievement. If you choose to take part in the project you will be asked to complete two online questionnaires (35 minutes each) and create a list of research-related terms (30 minutes each) for the period of 10 weeks.

All information collected during the research study will be treated confidentially and all personal identifiers will be removed. All data collected will be stored securely on a password-protected computer and the files will be encrypted. The data will be stored for a period of five years following the conclusion of the study. Thereafter, the data will be confidentially destroyed. The data collected can be used as a presentation, publication or report. You may be sent a summary of the final report on request.

I do not foresee any risks associated with participating in this study. By completing the online questionnaires and creating lists of key terms you will be meeting partial requirements for the course and thus you will be awarded points accordingly.

Should you have any questions about the research study or require further information please feel free to contact the following:

Student Researcher: Avanelle Joseph-Edwards
Email: ajose010@odu.edu
Tel: 1-868-487-2616

Dissertation Committee Member - Dr. Linda Bol
Email: lbol@odu.edu
Tel: 757-683-4584

Thank you for your time,

Yours sincerely,

Avanelle Joseph-Edwards



PhD Student
Old Dominion University

Appendix E

Key Terms and Definitions Activity

The purpose of this assignment is to create a list of research-related terms that represent the most important concepts that you encounter for the duration of the course. This activity will be repeated weekly for the duration of 10 weeks.

Instructions

1. Select five key terms from the assigned weekly readings of the course text, *Research in Education: Evidence-Based Inquiry*.
2. Re-write the definition for each of the five terms using the glossary found in the course text.
3. All five terms should be submitted on a word document and submitted electronically via the dropbox in the Learning Management System.

VITA

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Education

Doctor of Philosophy Instructional Design & Technology Old Dominion University, Norfolk, Virginia, USA	December 2019
M.A. in Educational Technology (summa cum laude) San Diego State University, California, USA	May 2012
Post Graduate Diploma Educational Technology (distinction) University of the West Indies (St. Augustine)	June 2008
B.A. in French and Spanish (honors) University of the West Indies (St. Augustine)	May 2003

Professional Experience

Curriculum Development Specialist University of the West Indies Open Campus St. Augustine Trinidad and Tobago	July 2014 to date
Educational Technology Support Officer Arthur Lok Jack Graduate School of Business University of the West Indies Mt. Hope Trinidad and Tobago	2013-2014
Spanish/French Teacher (Forms 1-6) St. George's College Barataria	2005 - 2014
