Encouraging Self-Regulation in an Online University Course for Preservice Teachers: An Intervention Study

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Abstract

Although self-regulation (SR) has long been seen as an important educational concept, we know little about how to foster it in higher education online student populations. This research addresses this need by introducing an SR intervention into a preservice teacher course. The 30 students who participated used an intervention consisting of weekly student goal setting and self-reflection. Using data collected from a self-regulation survey, weekly reflections, final exam reflections, and interviews, all but one student indicated that the process of setting a goal weekly and especially reflecting on their actions during the week increased their self-regulation abilities. More than half the students focused on improving their study environment or their time management. Findings indicated that, although the process of the weekly intervention improved students' self-reflection abilities, the growth was uneven with good weeks intermingling with bad weeks. Findings also showed students' growth in SR influenced their work in other courses during the semester and in subsequent semesters. In addition, students noticed that the SR process helped them become more self-aware, allowing them to adapt SR dimension to their needs.

Keywords: Self-regulation, distance learning, higher education, intervention, preservice teachers, qualitative research

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Online learning is a growing educational option. Between 2012 and 2020, higher education enrollment rates shifted from almost three-fourths of students enrolled in completely in-person institutions to almost three-fourths enrolled in at least one online course (National Center for Education Statistics [NCES], 2013, 2021).

With such an increase in online enrollment, ensuring that students have the necessary tools for success in online modalities is imperative. One of these tools is self-regulation (SR). Although definitions differ, most include a cyclical structure containing elements of goal-setting, strategy use, and self-evaluation. Self-regulation has been connected to improved learning outcomes (Delen & Liew, 2016), as well as to increased motivation (Adnan et al., 2013), satisfaction, and engagement (Sun & Rueda, 2012). In online modalities, students with high SR skills had fewer struggles and were more willing to enroll in online courses and more confident in their ability to succeed than students with lower SR abilities (Barak et al., 2016).

However, students were often unprepared for the SR demands of online learning and . struggled with completing work and engaging in learning processes (Biwer et al., 2021). While online learning increased students' autonomy, which has been shown to increase engagement (Arnesen et al., 2019), it can also hinder students who do not have the necessary SR skills to create a self-made learning plan (Bol & Garner, 2011; Mokhtar et al., 2023).

The purpose of this research was to introduce an intervention designed to encourage higher education students enrolled in an online course. Using both quantitative and qualitative data, we examined the students' perceptions of the intervention as it relates to the decline or growth of the SR abilities.

Literature Review

The number of students participating in online courses in higher education has accelerated over the past decade. This acceleration quickened with the use of emergency remote teaching during the COVID-19 pandemic, causing a rapid rise in the number of students enrolled in online courses. See Table 1.

Table 1

Growth in Number of Students Taking Online Courses

Year	No online courses	At least one but not all online courses	Fully online
2012	74.22%	13.29%	12.49%
2019	63.04%	19.43%	17.53%
2020	25.98%	28.54%	45.47%
2022	45.76%	27.80%	26.44%

Note. Data from NCES (2013, 2020–2021, 2021–2022).

Although, in 2022, post-pandemic online enrollment decreased, it is still higher than enrollment in 2019 before the pandemic, indicating a more sustained growth. This growth has changed perceptions about online learning. Povejsil (2021), for example, reported that this shift led leaders in higher education to evaluate traditional educational practices. They recognized that online learning increased flexibility in meeting the needs of students and allowed for greater inclusivity and diversity in student populations.

However, research also indicated that some students struggled in online courses. They were not prepared for the extra organizational and self-governance demands of an online modality (Dabbagh & Kitsantas, 2004; Whipp & Chiarelli, 2004). Online learning gave students more autonomy and flexibility, but autonomy came with its own impediments. Students struggled to implement SR strategies and to maintain motivation (Rannastu-Avalos & Siiman, 2020). They had difficulties with attention, effort and time management. They felt they had to spend more effort and time to achieve the type of results they obtained in their in-person courses (Biwer et al., 2021).

For these students, providing SR instruction is one method educators can use to help prepare students for the greater SR demands of online learning. Research has indicated that online students who receive SR instruction are more capable of using the autonomy and flexibility of an online course wisely, as well as overcoming other SR challenges (Gupta & Bamel, 2023; McClannon et al., 2018; McGowan, 2017; Stephen et al., 2020). This study explores one way of providing that instruction.

Self-Regulation

In the 1990s, Barry Zimmerman, Albert Bandura, and others began discussing SR (Bandura, 1991; Zimmerman & Bandura, 1994; Zimmerman et al., 1992). Understanding that "neither intention nor desire alone has much effect if people lack the capability for exercising influence over their own motivation and behavior" (Bandura, 1991, p. 249), they proposed frameworks to explain and foster SR. These frameworks included constructs such as goal setting and some kind of student-initiated action that led to accomplishment of the goals (Lin et al., 2016; Odinokaya et al., 2019).

Zimmerman's framework has three phases: forethought, performance control, and self-evaluation. These phases are divided into processes or dimensions that students enact in order to participate in each phase. For example, in the forethought phase, students analyze the learning task and set goals to achieve it. They use self-control (time management, help-seeking, study strategies, environment structuring, and self-made consequences) and self-observation (metacognition) in the performance control phase and self-judgment (causal attribution and self-evaluation) and self-reflection, making changes for future cycles, in the self-evaluation phase (Cleary & Zimmerman, 2004; Wandler & Imbriale, 2017; Zimmerman & Risemberg, 1997).

This framework is often cited in recent research of SR in online contexts. Leite et al. (2022) used the framework to examine algebra students' SR and the role of the teacher. They found that students who demonstrated a high level of SRL strategies were more likely to have higher levels of achievement. Similarly, in a review of 22 articles on SR interventions in wholly

online courses (Arneen, 2024), all but one used constructs based on the cyclical model of three phases proposed by early pioneers of SRL. Thirteen of these articles were published in 2020 or later, and their citations include the following: Zimmerman, 65 citations; Pintrich, 24; Schunk, 15; and Bandura, 13.

The theoretical basis of the research in this paper adds to the tradition of intervention studies designed to increase SR, but also adds insight through an examination of students' perceptions of SR and of the process of improving in SR.

Self-Regulation Outcomes

Helping students grow in their capacity in each of these phases and dimensions can influence their abilities to enroll and succeed in online courses. For example, Barak et al. (2016) studied the activity and attitudes of 84 undergraduate students studying science and engineering. They were enrolled in the same educational psychology course, 29 in an online section and 55 in a face-to-face section. The online students expressed confidence in their ability to succeed in an online course: they understood the metacognitive and self-control demands and valued the flexibility. Face-to-face students, on the other hand, were fearful of enrolling in an online class. They felt they did not have the necessary self-discipline, that they often procrastinated assignments and felt unable to succeed without a high level of interaction. This research suggested that increased online SR skills not only helped students succeed in online courses but also led to their enrolling in them in the first place.

Self-regulation also significantly increased learning outcomes (Delen & Liew, 2016; McGowan, 2017). Alotaibi et al. (2017) researched preparatory year students in a Saudi Arabian community school to investigate the connection between the students' SR abilities and their academic outcomes. They found that the SR constructs of goal-setting, time management and planning, study strategies, and help seeking were positively and significantly related to academic achievement in English and mathematics courses.

In addition, SR impacts other areas of learning. It helped students maintain and increase motivation (Adnan et al., 2013; Lim & Yeo, 2021) and resulted in higher satisfaction, engagement, and perceived learning (Kara et al., 2021; Landrum, 2020). It was also associated with intrinsic goal orientation and self-efficacy, helped students maintain effort (Koçdar et al., 2018), impacted learner readiness (Stritto et al., 2023), and significantly mediated task value and control of learning attitudes (Lim & Yeo, 2021).

Modality Specific

Self-regulation appears to be modality specific. Online courses present unique SR challenges, including having fewer interactions with and reminders from the instructor, a diminished group of friends, and studying more at home, where students feel they should be able to relax. This change in location was one of the most difficult challenges students faced (Wood et al., 2022). Online students, although they appeared in class, did not ask the questions or respond to instructor's questioning as they did in face-to-face modalities (Neuwirth et al., 2021). Students in online courses appeared to be unprepared for the time, effort, and motivational demands of online learning. They often started an online course with high motivation but were unable to maintain it. They were unprepared for class and did not complete assignments or pass exams. They also had poor time management skills, often underestimating the amount of time and effort needed to complete

assignments (Yukselturk & Bulut, 2007). Thus, if students did not have self-regulated learning (SRL) abilities appropriate for online learning, they often did not adapt well and struggled to succeed. Similarly, Broadbent and Poon (2015), in a systematic review of 10 years of literature, found that effect sizes of effort regulation, time management, critical thinking, and metacognition were lower in online contexts than in traditional face-to-face contexts. They suggested that the online environment could "dampen" (p. 12) the effects of SR and recommended that online courses be designed explicitly to foster SRL. These outcomes suggest that SR instruction targeted specifically for use in online courses could increase students' success in online modalities.

Effects of SRL Instruction in Online Courses

Given the importance of SR, helping students gain these skills can help them overcome the challenges of online learning and use its affordances.

> In a review of 10 articles, McGowan (2017) found that, in studies testing the impact of SR instruction, students in experimental groups performed significantly better than students in control groups. Students in one study were separated into a treatment and a control group. Students in the treatment group received direct SR instruction and executed a plan based on the instruction. Results showed a significant difference between the two groups. The experimental group showed significant gains in metacognitive attitudes and skills, as well as in time management (Dignath-van Ewijk et al., 2015).

Much of the literature that examined methods for increasing students' SR focused on goal setting and self-evaluation, two areas that seem to help students start and continue SR activities (Dignath-van Ewijk et al., 2015; Wandler & Imbriale, 2017; Willems et al., 2021). Martin-Delpozo, & Martin-Sánchez (2022) introduced 39 undergraduate students in an Early Childhood Education program in Spain to a weekly self-reflection exercise. Students responded to a weekly survey in which they assessed and reflected on their performance. Students with high SR were more realistic in their assessment than non-self-regulated learners, and even when they did not have the highest grades in the course, they felt that self-reflection on the quality of their work helped them improve on end of semester projects.

Although research suggests that the need for students to develop high SR skills and dispositions is urgent and that SR instruction could be efficacious in fulfilling this need, research on SR interventions is sparse and much of it relies solely on quantitative analysis (Arnesen, 2024), which overlooks how students perceive and respond to the instruction or intervention. The present research attempts to address this gap in a way that increases understanding of student experience and gives instructors and designers insight into what the students see as helpful or unhelpful. We access these insights by introducing weekly student-directed SR goals and self-reflection and using both quantitative and qualitative data to understand the students' experiences.

To achieve this purpose, this study addressed the following research questions:

1. How do preservice teachers perceive the effectiveness of a weekly self-evaluation and

goal setting exercise in growing their self-regulation?

2. Does a weekly self-evaluation and goal setting activity improve preservice teachers' online self-regulation skills?

Methods

Research Design

The purpose of this study was to explore preservice teachers' perceptions of and experiences with SR in an undergraduate, online course. To answer the research questions, we used a mixed methods approach. Because we were interested in "understanding how people interpret their experiences" and used "words as data," we examined this phenomenon primarily through a qualitative lens (Merriam & Tisdell, 2016, p. 6), using limited statistics to triangulate the data and add richness and insight to the analysis.

Context

This research took place in a one-credit, online, required course about teaching in K–12 online and blended contexts. The 14-week course met synchronously over Zoom for 11 weeks and asynchronously for 3 weeks.

The course included an SR intervention. Students took a pre- and post-SR survey at the beginning and end of the semester, set an SR goal (which they could change as needed), and reported on their progress in a weekly self-reflection.

Participants

The participants for this research were undergraduate preservice teachers who were enrolled in one of two sections of the course. All 40 students enrolled in the two sections were invited to participate in the research through a link to a consent form given in a class Zoom meeting. None of the students were aware of other students' decisions. Thirty gave consent. All students were under the age of 25 and white; 83% were female and 17% were male.

Data Collection

In order to look at SR from students' varying perspectives and to triangulate the data in order to show evidence supporting the main ideas in the qualitative analysis, the researchers collected data from multiple sources described below. All the data were deidentified and kept in a secure file, to which only the researchers had access.

Pre and Post Self-Regulation Survey Scores

Before the first-class meeting and during the final exam, students took a SR survey. The survey was adapted from the Online Self-Regulated Learning Questionnaire (OSLQ) (Barnard et

al., 2009). We chose this survey because it was designed to measure SR in online contexts and it was structured on students' perceptions of their abilities in five SR dimensions we used as means of evaluation in their weekly self-reports: goal setting, time management, environment structuring, help-seeking, and self-evaluation (Wandler & Imbriale, 2017). In addition, the format was readily adapted to fit our context. Confirmatory factor analysis showed that goodness of fit measures for the survey varied from adequate to good. (See Table 2.) The survey data showed quantitatively any differences the students experienced in their perceptions of SR dimensions from the beginning to the end of the course.

Table 2

Goodness of Fit Statistics of the SR Survey

Measure	Survey Value	Optimal Value	Goodness of Fit Category
Root Mean Square Error Of Approximation (RMSEA)	0.051	<0.05	Adequate
90% Confidence Interval (CI)	0.048–0.054	<0.05	Adequate
Comparative Fit Index (CFI)	.904	>0.95	Adequate
Tucker-Lewis Index (TLI)	.889	>0.95	Adequate
SRMR (Standardized Root Mean Square Residual)	.051	<0.08	Good

Note. Goodness of fit statistics for the OSLQ, upon which this survey was based, include the following: RMSEA, 0.06; CFI, 0.95; TLI, 0.93 (Barnard et al., 2009).

Self-Regulation Goal(s)

Based on their pretest survey results, students set a goal for improvement in at least one SR dimension. The goals were fluid and students could change them as desired.

Weekly Self-Reports and Final Reflections

Each week students filled out a self-report in which they reflected on their progress with their SR goal. The self-report included two questions. The first asked students to evaluate their efforts in improving their SR that week on a 10-point scale from “lousy” to “excellent.” The second was a free response question, asking students to respond to this prompt:

> SELF-REGULATION consists of gaining skills in these areas: (1) goal setting, (2) environment structuring, (3) time management, (4) help-seeking, and (5) self-evaluation. Review the self-regulation goal you made at the beginning of this semester. Share one specific thing you have done this week to work on your self-regulation skills. How

successful were you? What could you change to be more successful? Do you need to change your goal? If so, what is your new goal?

These weekly SR reflections were compiled into a chronological file for each student, allowing researchers to see the students' changes in SR over time. In addition, students wrote a final reflection over the whole semester as part of their final exam.

Semi-structured Interviews

After the semester concluded, students were invited to participate in a semi-structured interview of 30–40 minutes. Nine students consented and participated in an interview.

Data Analysis

Both the qualitative and quantitative data captured students' perceptions. Thus, we analyzed the data in a way that organized these perceptions of SR and its influence on the students' work. Researchers especially looked for unexpected insights, differences, and discrepancies that could deepen understanding of SR or give insight into students' perceptions of or experience with SR. Table 3 shows a summary of how the data and its analysis related to the research questions.

Table 3

Data and Analysis Related to Research Questions

RQ	Data Source	Analysis
RQ1: How do preservice teachers perceive the effectiveness of a weekly self-evaluation and goal setting exercise on their self-regulation?	Weekly self-report reflections, interviews, final exam reflections, goals	Thematic Analysis
RQ2: Does a weekly self-evaluation and goal setting activity improve preservice teachers' online self-regulation skills?	Pre- and post-SR surveys	Paired t-test with effect sizes
RQ2: Does a weekly self-evaluation and goal setting activity improve preservice teachers' online self-regulation skills?	Interviews, weekly self-report and final exam reflections, goals	Thematic Analysis

Quantitative: Paired Sample T-test

We analyzed the pre- and post-survey data with a paired sample t-test to examine the significance and effect sizes. This test charted the changes in the students' perceptions of their SR understanding and use over the time of the semester, allowing us to triangulate the data and give another measure of the impact of the intervention. The quantitative data allowed us to compare these findings to the qualitative data, giving a more complete understanding of students' experiences.

Qualitative Analysis

In qualitative research, investigators approach coding and analysis in a way that helps establish trustworthiness. Therefore, it is critical that the coding process be both discernable and thorough. Creswell and Poth (2018) suggested several processes for creating trustworthiness. In this research we used the strategies of prolonged engagement, triangulation, peer debriefing, and negative case analysis.

Because one of the researchers was also the instructor for the courses, thus giving her prolonged access to the students, she was able to develop a trusting relationship with them. The instructor and students communicated through emails; Zoom class meetings; instructor, TA, and peer feedback to assignments; and individual conferences as needed. The course included both online and Zoom discussions, where issues were explored deeply. Breakout rooms enabled small group conversations. The students felt comfortable with each other and with the instructor.

Nowell et al. (2017) suggested that a first step in data analysis is getting to know the data. They suggest reading through the text several times, looking for patterns, asking questions, and identifying meanings and insights. The researchers followed this process, reading through the data as it was collected and again in its entirety, recording ideas and impressions.

One researcher initially coded all qualitative data (interviews, final reflections, and self-reports), identifying phrases, sentences, or larger excerpts that communicated a single thematic idea. While some of these themes included five dimensions of self-regulated learning (Zimmerman, 1989), other themes also emerged and were coded. These codes included challenges the students encountered, affective and academic difficulties and successes, and reasons students gave for their success or failure in improving their SR. The researchers remained open to new themes in the texts and coded them accordingly. As codes were created, they were reviewed, defined, and later refined as new sections of text were added to the codes.

Two researchers worked together on finalizing the coding. One coded all texts independently then shared the coding structure and themes with the other, who provided peer-debriefing by reading and analyzing each iteration of the coding structure. They analyzed problem areas and suggested changes. The coding structure was then modified to represent a consensus between them.

A sample of the coding structure (see below) is indicative of the ways we created and organized the codes. Each code included quotations from the students.

Sample of the coding structure:

Outcomes

- Increased self-awareness
- Affective
    - Negative emotions associated with low SR
        - Increased stress and anxiety
        - Low self-regard

    - Positive
        - Increased confidence
        - Less stress
        - Increased productivity
- Academic
    - Outcomes associated with low SR
        - Procrastination
        - Falling behind
        - Low motivation
    - Outcome associated with high SR
        - Increased engagement, interest, excitement, and focus
        - Ability to do better work
        - More time to seek help
        - Increased learning

Finally, researchers conducted a negative case analysis with one researcher rereading all the data and looking for any data that was not accounted for or contradicted the thematic structure they had created. They modified the structure as needed.

Ethical Considerations

The research participants in this study were considered a vulnerable population because one of the researchers was also an instructor in the two sections of the course. However, because the instructor was part of the research, she was able to have prolonged access to the students, which helped establish trust. To mitigate concerns, the instructor introduced the research to the students, indicated she was part of the research, and explained how the data would be secured. In addition, most of the data was drawn from regular class activities and assignments, which the instructor already had access to and for which students gave consent to use in the research. None of the students knew who gave consent, and participants were assured that their participation or nonparticipation would not affect their grades in the course. Students who participated in interviews were asked to fill out an additional consent document with the same assurances. All interviews were conducted after grades were submitted. The data was deidentified and available only to the research team. It was secured in a password protected file. The institutional review board approved this process before any of the research was conducted.

Limitations

Because this research did not include a control group, the findings, especially the quantitative findings from the survey, may not reflect the efficacy of the intervention but only a natural growth over time. In addition, this research included only 30 students, giving enough for parametric statistical measures. However, a larger sample size could enhance the results. Finally, the findings are limited to two sections of one course over one semester. Research that covered longer periods of time, included a larger and more diverse population, and used contexts with different content areas could add further insight.

Results

Pre- and Post-test Survey

Because probability theory suggests that a population of 30 justifies using a parametric test, we ran a paired sample t-test to determine the significance of the change in the survey scores over time. Except for a few anomalies, the pre and posttest scores showed significant changes. The t-test and effect sizes (Table 4) showed that the changes in all the dimensions except environment structuring (ES) and time management (TM) were significantly higher in the posttest than in the pretest. Because the two most common student goals were in the dimensions of ES and TM, these findings could suggest either that the students perceived no growth in the areas on which they concentrated or that their perceptions of their abilities changed as they worked more closely with each dimension. In other words, the students who worked to increase time management, for example, may have grown in their understanding of what time management meant and how to improve in it. The qualitative data seems to suggest this latter paradigm.

Also suggestive are the Cohen's *d* effect sizes of the differences in the pre and post surveys. Self-evaluation, the one SR activity that students engaged in every week, had the largest effect size. Again, the two constructs that most students worked on had the lowest effect size, a finding that the qualitative data helped explain.

Table 4

Paired Sample T-test and Effect Size Results

Construct Pairs	Mean	Standard Deviation	t	Two-sided	Cohen's d	Effect size category
Goal-Setting	-1.83333	4.32832	-3.322	.027	-.424	Small
Environment Structuring	-.7000	5.22692	-.734	.469	-.134	Small
Time Management	.33333	3.11097	.587	.281	.107	Medium
Help-Seeking	-1.80000	3.44814	-2.859	.008	-.522	Medium
Self-Evaluation	-2.80000	4.27825	-3.585	.001	-.654	Medium
Total	-7.56667	14.04349	-2.951	.006	-.539	Medium

Note. A negative Cohen's *d* indicates that the post-test score was higher than the pretest score, indicating students' perceived growth. Time management was the only construct with a positive Cohen's *d*, (or a score lower at the end of the semester than at the beginning, suggesting that students' perceptions of their abilities in time management fell during the semester.

Weekly Self-report Data

The weekly self-reports revealed that students' SR journeys and experiences varied over time. During some weeks students felt they successfully completed their goal; in other weeks they did not. However, the weekly reports also showed that only one student reported more unsuccessful than successful weeks across the semester. Successful goal completions outweighed unsuccessful goal completions as reported in the weekly reflections, with 224 reported as successful and 71 reported as unsuccessful, even and especially in the two areas that statistically showed the least growth. These reports suggest that the insignificant findings for time management and environment structuring may be indicative of students' becoming more aware of their SR activities and/or more careful in their evaluations, recognizing more accurately where they were falling short than they indicated in the pretest. Thus, the statistical data and weekly comments complement each other and may show the real-life messiness of SR growth.

Students' Perceptions of Using the Weekly Self-report

The qualitative data explained, added nuance to, and sometimes contradicted the quantitative data. Although the students' experiences with SR varied from week to week, in their final exam reflection and subsequent interviews, they revealed that, in general, they found the self-reports to be helpful in tracking and improving their SR. In the final test reflections, one student indicated that she "made a lot of progress in time management and goal setting, which I accredit to the weekly checks that required me to reflect on my goal." Hazel noted that the self-report gave her structured time for self-reflection.

> We all know that it's such a good thing to reflect and think back on how we can improve, [but] a lot of times we don't do it. . . . [The weekly self-report] was a helpful exercise because even just setting the goal made me think and evaluate myself.

Students' Perceptions of Goal-setting

For many students the inclusion of a goal in the self-report helped them focus their efforts and their self-evaluation. Student's final exam self-reflections included statements like these: "Setting goals is something I have definitely taken away from this course." And "reflecting on my habits before this semester, I never really set goals for myself. . . . This semester I was able to set goals more frequently because of our self-regulation focus [each] week."

One student found himself with unexpected SR demands. He was hired as an eighth grade U.S. history teacher early in the semester.

> I was simultaneously enrolled as a full-time student and felt the pressure of lesson preparation and homework nearly every day," he said. "It was through careful planning and goal setting that I was able to achieve my goals and make it through the semester with decent grades and confidence in my classroom.

For each of these students, setting goals became a way of organizing demands on their time and improving their study.

Even students who struggled to meet their goals found that the process of reflecting on them increased their awareness. Clara, for example, did not always feel that setting a goal helped her achieve the goal.

> But it helped me be more aware of it. And I was like, okay, I did really bad this week. I did my homework 10 to 20 minutes before it was due. What can I do differently next week? And then it's like, okay, I'm going to do this online homework first.

These insights reflected both the uneven growth of SR as indicated in the weekly reports and the overall growth illustrated in the pre- and post-tests, the final exam reflections, and the interviews. The students' experiences suggested that the lack of immediate success might still contribute to SR growth, especially when it was paired with self-reflection.

Outcomes

Students experienced both positive and negative outcomes in self-awareness, affect, and academic achievement. They often recorded negative outcomes during their weekly reports but found more positive gains as they reflected on the entire semester. Importantly, they also found that their increased understanding of and skills in SR helped their studies in other courses and in the next semester.

Self-Awareness

One of the most telling outcomes of the students' reflection and goal-setting was an increased self-awareness that helped them design goals and plans that fit their individual needs. Most of the growth in self-awareness centered in two dimensions: environment structuring (mentioned by 40% of the students) and time management (mentioned by 23.33% of the students).

In the area of environment structuring, students found individual solutions for creating an environment conducive to studying. Hazel, for example, knew from past experience that "I couldn't be in a super quiet environment," but during this semester "I kind of discovered that being in a busy environment, but not . . . in a group was what I needed." For Ava an effective environment was one where she was "not with a friend. I like to be by myself." Clara found that her environment could vary according to the task: if she were reading, she needed quiet, but if she were working on something less demanding, such as making a lesson plan, she could have music or a movie in the background or study in a louder section of the library. Each of these students discovered through their SR goals, reflections, and efforts what environment was most conducive to their learning needs.

The process of setting goals for time management led to self-discovery that strengthened how students planned and used their time. These discoveries included such strategies as taking "a quick break, which helped refocus my mind" or noticing that "I do best during the day. When . . . 5 or 5 o'clock hits, I start to crash." Some of the students found that understanding how to best use time helped them overcome challenges in other areas. For example, one student said

> I have discovered this semester that if I sit down and block out time for each assignment, such as setting a timer for one hour and working hard until the timer goes off, I am able to get a lot done. I have also found out that most assignments are a lot easier than I think. The hardest part is simply getting started. Once I begin an assignment, I am able to crank it out and avoid any meltdowns that I first foresaw.

Understanding the negative results of procrastination and their best times and structures for study helped students plan more effectively.

However, not all students grew in self-awareness. Benjamin struggled with the weekly self-reports and was not often aware of his lack of progress. In his final test reflection, he said, "This survey does not reflect how I did as a student or how I grew, as the ways in which it expects me to act are opposite of what I found useful in certain situations." He did not explain this conclusion, and his actions in class did not support it. He continued, "The progress I have made during this semester in most or all of my classes and not simply in this class has been that I turned in every single assignment no matter what." Again, the record did not support this statement. In class, he did not turn in 3 assignments and 10 were late. His judgment of how he was doing did not match his academic record.

Affective Outcomes

Seven students in their weekly self-reports and two in their final exam reflections reported negative emotions associated with a failure to self-regulate, including increased levels of stress and anxiety. William wrote the following:

> Several times this semester . . . I came home and I did not follow the plan that I had set at the beginning of the week. This caused me to get behind and, frankly, increased my stress and anxiety.

Another negative outcome students experienced when they were unregulated was low self-regard. Sadie wrote, "I end[ed] up feeling bad about myself because [I spent] 5 hours on Hulu," and Camilla reported, "I hate going to bed and feeling like I just wasted an entire day." Many students shared similar experiences. They became absorbed in video games, television, cooking for roommates, and playing intramural sports. They struggled to manage their time and interests, resulting in feelings of disappointment or self-reproach.

On the other hand, students reported positive emotional outcomes from their successful attempts at SR. Three students reported feeling increased confidence because they realized they were capable of managing their productivity. Clara wrote in her weekly report, "I did so good on my goal this week! I wanted to finish my assignment . . . so that I wouldn't be rushing to get it done. . . . I got it done which was awesome!" And Camilla wrote, "I felt productive each day and accomplished."

Several students reported feeling less stressed as they managed their time. For example, Ava stated, "I have been working to stay ahead this week, and it has paid off! I have been less stressed." Leah agreed:

> I continue to focus on time management and really enjoy it because I have been noticing a change not only in this class, but my life in general. I am better equipped to prioritize my time and I've noticed that I've been able to get all of my work done AND still have time to myself to enjoy.

Academic Growth

Just as students experienced changes and growth in self-awareness and affect, they also experienced changes in their academic growth.

Five students reported short-term negative academic outcomes. Three of the students had difficult weeks when they strayed from their SR goals and "procrastinated and got behind," "got really off track," and "felt a little behind." Alena wrote:

> I feel like my week has been absolutely insane and I'm so upset with myself that I let it get this out of hand… I reached out to the professor and told her I was sorry I turned in the assignments late, and she was very understanding.

These negative experiences often led to improved outcomes. Alena, for example, described a difficult week, but instead of giving up, she talked with the instructor, worked diligently, and got back on track.

Alena's experience is representative of the majority of the students. Their SR goals enabled them to focus, have time to reach out for help, finish early, and feel prepared for class, resulting in their feeling that they learned more and were able to do good work.

Students who finished early were excited about their success: "I was able to have fun creating the bitmoji and got it done well before the due date"; and "[I] got this assignment [done] with plenty of time to spare." Charlotte described an especially successful week:

> My goal for this past week was to get all my homework done before the weekend. In 4/6 of my classes, I got it all done. . . . I liked that goal because it allowed me to have a more enjoyable weekend.

Working on assignments early facilitated help-seeking, giving students "time to reach out and receive help" and to talk with instructors "at a time that is convenient" for them, thus relieving the stress of unanswered questions or unavailable instructors. It also helped students feel better prepared for class. Ava worked "to stay ahead this week, and it has paid off. I have been . . . more involved in classroom discussions, and overall feel more prepared for class."

Strong SR helped one student "do my assignments better because I wasn't on a time crunch." Oliver noted that when he didn't "wait until the very last minute to complete assignments, [he] put in a lot better work." Students also found that working diligently and strategically gave them more time to grasp concepts and remember them. Chloe was excited when her "time management went well this week! I completed the assignment at a time I wasn't rushed and could pay attention to details." Each of these students discovered that planning their

time, paying attention to strategies, and starting early not only helped them finish their assignments but also facilitated learning.

Influence on Current and Future Courses

Eight students reported that SR growth facilitated by the weekly self-report began to help them in their other classes. Hazel noticed that her SR skills "started to bleed into my other classes and overall improve my classwork." Similarly, Maya said that SR "was a part of the class, but it was like that's where I learned it, and then I applied it everywhere else." Students were gratified as they found their overall SR improving in many contexts.

Because the nine student interviews took place after the conclusion of the semester, students were able to discuss the effects of their SR experience on a new semester. Five students indicated that SR growth played an important role in a new semester. Madison was scheduled to start one of her practicum experiences midway through the semester. "I've been trying to get the work done, that I . . . can get done before [practicum starts,] so . . . once harder things come I can . . . prioritize what I need to do to get all my work done." Sadie agreed: "Because I tried so hard last semester," she said, "it became more of a habit to do those things. It's easier for me . . . to stay on top of it, and I feel better about myself and my self-regulation."

Eleanor had a slightly different experience. "Last semester was kind of a mess, but especially with this semester, I feel like it actually . . . clicked in my brain." Although Eleanor did not feel successful in building SR during the semester of the intervention, she saw marked improvement in the following semester.

These outcomes indicate that the practice of weekly self-reflection and goal setting influenced students in a variety of ways. It increased their self-awareness, helping them make better decisions about building SR; yielded increased positive affect toward their work and their ability to complete it; and resulted in positive academic outcomes. In addition, students indicated that the knowledge and skills they gained through the weekly self-report influenced their work in other courses and semesters.

Discussion

With the addition of qualitative data triangulated with quantitative data, this research adds and expands insight in previous research on SR in higher education, online contexts. It seems to clearly indicate that a weekly self-reflection and goal-setting experience can help preservice teachers grow in SR. The quantitative data showed the growth in SR throughout the semester, while the qualitative data explained the students' experiences. Most students expressed excitement and confidence as they were able to overcome obstacles and experience self-directed improvement in their SR. In addition, some students indicated that their SR growth was not limited to the course that included the intervention but influenced both concurrent and future courses. Although the students' experiences highlight themes of this growth, limitations on the context and findings of this research indicate areas for future research.

Growth of SR Using a Weekly Reflection and Goal Setting Activity

This research focused on the self-evaluation phase of SR models, which acts as a catalyst for change. Students reflected on and evaluated past SR performance, targeted areas of needed improvement, and set goals to enact that improvement. Such growth in SR was not linear. However, these findings indicated that weekly reflection seemed to help most students focus on and engage in the process in a way that led to positive experiences and growth. As such, the findings support those of Andrade and Bunker (2009), Anderton (2006), and Martin-Del-pozo and Martin- Sánchez (2022).

Andrade and Bunker proposed a model of SR instructional activities and self-reflection, which they introduced into post-secondary English language courses with preliminary, positive results. Anderton used a weekly self-reflection with preservice teachers, reporting only quantitative results. Martin-Del-pozo introduced a weekly reflection into a course for students studying early childhood development. All three studies showed the potential for self-reflection to increase SR. This article, combining both qualitative and quantitative data, validated and expanded the work done by these researchers.

Importance of Becoming Self-Aware

The SR survey was most useful if it helped students recognize general areas in which they needed to improve. However, students were best able to grow in those areas when self-reflection aided them in becoming self-aware. The students' weekly and final reflections, as well as the interviews, revealed that those who engaged in self-reflection understood their own specific weaknesses and created targeted goals based on overcoming them. These findings amplify those of Wang and Lu (2020), who used mindfulness to develop self-awareness and Blackmore et al. (2021), who tied metacognition to the development of self-awareness. Similarly, Kalman et al. (2020) found that undergraduate students who were aware of what techniques worked and did not work for them were able to successfully adjust to online learning during the COVID-19 pandemic. The intervention implemented in this research indicates that such self-awareness could be fostered through weekly self-reflection.

Weakness of SR Instruments

Self-regulation research relies heavily on two SR surveys, the Motivated Strategies and Learning Questionnaire (MSLQ) (Pintrich et al., 1991) and the Online Self-Regulated Learning Questionnaire (OSLQ) (Barnard et al., 2009). This study used a modified version of the OSLQ and contained items that specifically addressed SR actions or attitudes pertinent to the context of preservice teachers in an online course. The original surveys contain statements designed to measure SR in different dimensions and may not be appropriate for all students. For example, an item in the OSLQ states, “I read aloud instructional materials posted online to fight against distractions” (Barnard et al., 2009, p. 5) Similarly, an item in the MSLQ includes “When I study for this class, I practice saying the material to myself over and over” (Pintrich et al., 1991, p. 18). These statements target a specific action a student might take to increase SR. However, although these statements may help students begin to target areas of SR weakness, the specific actions indicated may not be helpful for each student. Some students, for example, do not need to read instructional materials aloud or to repeat material over and over. They may indeed have

problems with distractions or retention but find unique, more helpful, methods for overcoming them. Such students would indicate a lower score on these statements, lowering their overall SR score, but still have found ways to overcome the problem, thus becoming more self-regulated. This phenomenon does not make the survey invalid or unnecessary but suggests caution in basing conclusions solely on the scores.

The Contribution of Both Quantitative and Qualitative Data

In this study all the data was grounded in the students' perceptions; thus, neither source provided empirical data. However, understanding how the students perceive their own SR is important to creating pedagogies and instruments that can aid SR growth. The quantitative survey resulted in important data: in most areas it showed students' perceptions of growth over time. However, in two areas—time management and environment structuring—the conclusions were limited and sometimes inaccurate. For example, the paired sample t-test showed that students improved least in the two areas they worked on most. Relying only on the quantitative data could have obscured and oversimplified the students' experiences. The qualitative data, although also grounded in student perceptions, expanded and refined the quantitative data, creating a more robust, more precise narrative of the students' experiences over the semester. Merriam and Tisdell (2016) describe the purposes of such data, noting that "discovery, insight, and understanding from the perspectives of those being studied offers the greatest promise of making a difference in people's lives" (p. 1). This research used qualitative data to fulfill these purposes, showing how students grew in their understanding of specific SR dimensions and illustrated their struggles and triumphs in developing SR in that dimension. Thus, while the quantitative data indicated students experienced no or negative growth in time management and environment structuring, the qualitative data suggested that the students understood where they were weak and made specific plans to improve. The students saw this process as growth. Their end of semester survey results may reflect the journey more accurately than did the pretest results with the students understanding better at the end of the course where they needed to improve than they did at the beginning and, therefore, rated themselves more accurately. Their self-awareness may also have led them to different methods for improving SR than the quantitative data measured. The quantitative data suggested questions that the qualitative data attempted to answer. Both were important to understanding the students' SR experiences.

Conclusion

Self-regulation intervention literature in online higher education contexts is sparse and rarely includes qualitative data (Arnesen, 2024). The present research added to this body of literature, supporting similar findings using both quantitative and qualitative data. The quantitative data showed general trends, while the qualitative data added insight into the process of SR growth. The findings indicated that preservice teachers enrolled in an online course perceived that an SR intervention focusing on weekly self-reflection and goal setting could become a catalyst for SR growth. The research highlighted the experiences of the students as they worked to improve their SR abilities. The results of the research revealed four themes: the success of the intervention; the importance of reflection that leads to self-awareness; the weakness in SR surveys; and the value of using both quantitative and qualitative data in SR studies. The research emphasized the need for interventions that can increase SR and

demonstrated that a simple self-reflection and goal-setting intervention could help students become aware of their attitudes, actions, and habits in a way that directed their goals towards self-improvement. It also suggests that SR development should be ongoing, that habits develop and self-awareness grows over time and needs continual re-evaluation.

Future research could involve interventions that are introduced in secondary education and continue in higher education. It could also investigate more robust methods of accountability, perhaps having students check in regularly with an instructor or teacher's assistant to discuss progress and offer suggestions and support. Also, the context of the study, students enrolled in a private Western university, precluded more diverse populations of students—students of varying socio-economic classes, gender, and ethnic groups, as well as students in diverse majors. More extensive SR intervention research in online courses serving many types of students studying a variety of subjects could result in a body of literature that identifies similarities as well as differences in many contexts, allowing practitioners to target specific students and subject matters.

Declaration of Interest

The authors declare no conflict of interest.

Declaration of Ethics

The Institutional Review Board approved this research before the research took place.

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Appendix A

Semi-structured Interview Protocol

1. Do you normally think of yourself as a good student? Why or why not?

2. Does your ability to self-regulate influence your perceptions of yourself as a student?

3. Do you think it is important to be self-regulated as a student, or are other characteristics, habits, or abilities more important? Explain.

4. What personal characteristics do you think a good student has?

5. What methodological skills do they have? That is, what do they do to be a good student?

6. How did making a goal and doing a weekly self-report influence your self-regulation skills for this class during each week?

7. What goal did you set for this class? Did you ever change your goal? Why or why not?

8. What else might we have done as instructors/designers of this course to help you grow in self-regulation?

9. Can you share an experience from this class of a time you were self-regulated? Not self-regulated? What was the difference between the time you were and the time you were not self-regulated? Why do you think you sometimes are self-regulated and sometimes not?

10. Did you feel motivated to do the homework for this class? Was your motivation constant? What made it change? How did the changes affect your work for this class?

11. Did your efforts to be self-regulated influence your feelings about the class or the work for this class?

12. Do you feel you have grown in self-regulation this semester? Why or why not? Is self-regulation an important concept to you? Why or why not?

13. What is the best environment for you to study in?

14. Can you share an example of a time you reached out for help in this class? How do you

feel about asking for help? (help-seeking)

15. How do you typically structure your environment when you study? Where do you typically study? What do you do about distractions? What are your greatest distractions? (environment structuring)

16. What kinds of strategies did you use in doing your work for this class? Did they work? Did you modify those that didn't work? Did you learn anything about yourself through the strategies you used? Did you try any new strategies this semester? Were they effective? (learning strategies)

17. Did you read the feedback from your instructor/TA for this class? Why or why not? How did you respond to the feedback? (self-evaluation)

18. Did the weekly self-report help you evaluate your self-regulation each week? Did you make any changes as a result of your weekly self report? (self-evaluation)

19. How do you decide when to study? Do you make plans for when you will study? (time management)

20. Do you set goals for your study? What kinds of goals? Do you achieve your goals? Why or why not? (goal setting)

21. Are there any parts of self-regulation that you do automatically, that you don't have to think about?

22. What do you do about interruptions or invitations that might take you away from your studies? How do you evaluate them?

23. How do you juggle demands on your time? How do you decide what to do when you have competing demands on your time?

Appendix B
Instruments

Self-Regulation Survey

Introduction

Self-regulation is an important skill for online students to develop. This questionnaire is to help you evaluate your own self-regulation abilities in online and blended courses. For each of the following statements, check the box that best represents your learning practices. Make sure you read the statement carefully. Your accurate evaluation of these questions will allow you to honestly reflect on where your own self-regulation abilities are in five important dimensions that will be shared when you are finished. Please select your level of agreement with the following statements.

[Possible levels of agreement include "Strongly disagree (1)," "Disagree (2)," Somewhat disagree (3)," "Somewhat agree (4)," "Agree (5)," and "Strongly Agree." The computer randomizes the questions and gives each student a report.]

Statements

I set goals for my performance on online assignments. (GoalSet1)

I set weekly goals to help me succeed in an online course. (GoalSet2)

I set a goal to review assignments requirements well ahead of the due dates. (GoalSet3)

I set goals to help me manage my study time for this online course. (GoalSet4)

I remove myself from digital distractions (phone, social media, email, games) when I study. (EnviroStruc1)

When I study, I exit/minimize browser windows not related to my work. (EnviroStruc2)

I organize my digital resources so I can easily access them when I study. (EnviroStruc3)

I study in a clean, organized physical space. (EnviroStruc4)

I study in physical places that help me avoid distractions from other people. (EnviroStruc5)

I often listen to distracting music or sounds when I study. (EnviroStruc6) [reverse]

I plan time to complete all of the assigned reading. (TimeMan1)

I set aside time each week to study for my online courses. (TimeMan2)

I begin working on my assignments well before the due date. (TimeMan3)

I often find that I don't spend very much time on online courses. (TimeMan4)

When I need help, I reach out to my instructor/TA online. (HelpSeek1)

I work online with other students to complete assignments. (HelpSeek2)

I communicate online to get help with my course assignments. (HelpSeek3)

I use online resources to find answers to questions on my own. (HelpSeek4)

I evaluate the strategies I use when studying to see if I can improve them. (SelfEval1)

I evaluate the strategies I use when studying to see if I can improve them. (SelfEval2)

I regularly reflect on the personal effort I am devotion to an online course. (SelfEval3)

I use online feedback from the instructor to improve my learning and skills. (SelfEval4)

I reevaluate my course-related goals when necessary. (SelfEval5)