Family Science Review

ISSN: 2331-6780
Journal: https://www.familyscienceassociation.org/journal/

FSA family science association

Gaining a Sense of Control of Academic Performance: Increasing Self-Efficacy and Reflective Judgment

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ABSTRACT. Current Scholarship of Teaching and Learning (SoTL) work has found that college students who are trained to use evidence-based study strategies still do not employ these methods consistently. The current study examined how the development of self-efficacy and reflective judgment may affect how they prepare for examinations. Learning that one has control over one's studying and knowledge is beneficial so the individual can alter study strategies to fit the needs of different course material. In an introductory Human Development and Family Studies course, students were assessed at the beginning and end of the course regarding the use of study strategies and whether they had internal control over these processes. Over time, most students, when prompted, were able to reflect on their learning processes and alter their study strategies when they were not successful in their performance. Recommendations from this study include prompting reflection by the students to help enhance their understanding of their control over their learning and to gain self-confidence.

Keywords: reflective judgment, self-efficacy, awareness, academic confidence

Cite this article (APA 7):
Yaure, R. G. & Murowchick, E. (2025). Gaining a sense of control of academic performance: Increasing self-efficacy and reflective judgment. *Family Science Review, 29*(2). https://doi.org/10.26536/WMTI4251

Published online: December 2025
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Gaining a sense of control of academic performance: Increasing self-efficacy and reflective judgment

Research on the Scholarship of Teaching and Learning (SoTL) has indicated that certain study strategies are effective for improving academic performance, such as distributed, interleaved, and successive relearning (Lang, 2021). Theobald (2024) examined study time and study strategies and found that students who used more effective study strategies spent their time more efficiently. At the same time, other research has shown that college students eschew such strategies unless they are directly required to use those methods (Hartwig & Malain, 2022; Maurer & Shipp, 2021; Oreopoulos & Petroniijevic, 2023). This paper will describe some of the recent research on students' study strategy use and provide a recommendation for how to help students develop a sense of academic self-efficacy, which may help lead to improved academic preparation.

Direct Instruction of Effective Study Strategies

Recent research has taught students effective study strategies and then examined whether they use those methods. Oreopoulos and Petroniijevic (2023) conducted a study with close to 20,000 college students, providing them with significant supports, reminders, and the like to help them improve their academic performance, but found that this moved the needle little in terms of time spent studying and grades. In fact, the opposite effect was found, whereby students instead downgraded their expectations about their performance rather than increasing the amount of time studying.

Maurer and Shipp (2021) described a study in which college students were taught about successive relearning as an effective study strategy with a class demonstration and then followed to see whether they had used the method when preparing for an exam. While the results showed that they had learned a course concept through the demonstrated method, there was no significant change in their use of the study strategy over the course of the study. Maurer and Cabay (2023) extended the previous study and found that while the intervention did not have large effects on students' study behavior, some students reported starting a day earlier in preparing for an exam. This change, while seemingly trivial, supports the notion that their behaviors can change.

McCabe et al. (2021) designed an experiment in which college students received instruction and demonstrations on effective study strategies, the former plus activities to increase behavioral changes, or were in a control group. They found that over the course of a semester, students reported more knowledge of such strategies but did not display demonstrable differences in performance in the class. They also found that those students who had more of a growth mindset (c.f. Dweck, 2016) reported that the strategies were more helpful and were more likely to use them.

McDaniel et al. (2021) designed a college course that included instruction on the use of effective study strategies and then had students commit to and plan how they would use these strategies. Preliminary findings suggest that some students reported using those strategies in at least some of their courses. Similarly, Brown-Kramer (2022) taught students how to use high-utility methods, those that were deemed most effective study strategies, and had them write a paper about an effective study method. When factoring GPA into the study, they showed that better-performing students used more of the high-utility methods than those with lower GPAs.

Spontaneous Use of Effective Study Strategies

Collectively, these results suggest that direct instruction leads to increased knowledge of effective study strategies. Additionally, assignments designed to have the students practice with them increase their use, typically when required rather than voluntarily used (McDaniel & Einstein, 2020).

https://doi.org/10.26536/WMTI4251
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Hartwig and Malain (2022) looked at spontaneous usage of self-selected spacing and the use of quizzes. They found that students tended only to do what was required. Likewise, Ricke (2024) showed that students increased their time reading when encouraged by a digital learning platform.

In summary, it appears that students can learn about effective study strategies and use them when directed. What seems to frustrate many of these researchers is that while students may report knowing that certain methods may be most effective and show that they can use them, they do not use them without prompting. Explanations for why this may be range from a lack of time management (Kelly et al., 2022), procrastination, or some interpersonal factor (Oreopoulos & Petroniijevic, 2023). As shown above, the use of effective strategies differs for students with better preparation and academic performance (McDaniel et al., 2021). McCabe et al. (2021) indicated that students do not see "desirably difficult" (p. 257) strategies to be more effective than easy ones. These types of strategies are ones that may be more difficult to implement, prompting more errors to begin with, but ultimately leading to better retention.

Translational Research

Much of the research examining students' use of study strategies attempts to examine their performance in isolation, as empirical research often does, to identify the specific factor explaining the outcome. This translational research takes results on effective strategy use and implements them in a less-than-holistic manner. Even studies such as those by Oreopoulos and Petroniijevic (2023), which purport to provide wrap-around support, attempt to provide a one-size-fits-all approach, ignoring individual variations.

Grzywacz and Allen (2017) indicated that translational research that does not take a holistic approach to understanding human behavior tends to focus on a more mechanistic approach. A mechanistic approach involves breaking down the processes into their constituent parts and then studying their interrelations. In the current context, the mechanistic perspective tries to pinpoint students' problems as a lack of knowledge or usage of study strategies rather than providing a broader understanding of the processes that contribute to the performance and attitudes of the students. While demographic and personal factors, such as prior academic performance, are considered as factors to hold constant or to hold up as variables of interest, they are not investigated further. When conducting such translational research, Middlemiss et al. (2017) cautioned researchers to take heed of the views of subjects of inquiry, making sure to understand the context of the message and how it is received. Likewise, with the current topic of student study strategies, it is thus recommended that taking a more holistic perspective and taking into consideration student characteristics to explanatory factors that can inform the translational process. These include developmental and psychological factors that may influence whether and how they may use study strategies either spontaneously or after instruction.

Self-Efficacy and Reflective Judgment

A major task during adolescence, according to Bandura (2006), is to develop the ability to overcome challenges. The perception of this ability, known as self-efficacy, is associated with positive outcomes in terms of academic achievement, social relationships, and career trajectory. Additionally, between late adolescence and early adulthood, individuals move from prereflective to quasireflective to reflective judgment as they develop (King & Kitchener, 2004). They change from unquestioning reliance upon authorities to understanding that knowledge is constructed and that uncertainty in knowledge is to be expected. Their thoughts move from black and white thinking to the "grayness", or shadows, being able to accept more ambiguity of their experiences and decisions (Shedlock & Cornelius, 2003). They may then develop an understanding of the importance of evidence and reason in

the pursuit of knowledge and how knowledge may change as additional evidence is accrued. Reflective judgment involves becoming aware of the nature of knowledge and how it can change. Once adolescents or emerging adults understand that knowledge is not a fixed state, they may have a better understanding of how their own actions influence their acquisition of knowledge and, thus, gain a better sense of control over their learning and confidence in their ability to do so.

Through the development of self-efficacy and reflective judgment, adolescents may experience improved academic performance and an understanding of their own abilities as students. At the same time, experiences that students have may lead to their continued cognitive development. For example, King and Kitchener (2004) indicated that reflective judgment may be fostered when students work on ill-structured problems and examine evidence from multiple viewpoints.

Bandura (2006) indicated that students' self-efficacy is connected to increased performance through three pathways, two of which are through the role of teachers and their own sense of efficacy, and one through the students' beliefs about their ability to self-regulate and to learn material.

Self-Regulated Learning

Efklides et al. (2017) described self-regulated learning as a process that involves metacognition, affect, and motivation. Self-regulation allows students to monitor their learning processes and adjust according to their needs. It has been associated with higher levels of academic achievement (Broadbent & Poon, 2015; Mega et al., 2014; Theobald, 2024; Zimmerman, 2008) and has been shown to increase during students' college careers (Vermetten et al., 1999). Research suggests that while students can be taught to be self-reflective, a key aspect of self-regulation, it is subject to an individual's motivation and emotion (Boekaerts, 1997; Mega et al., 2014; Theobald, 2024) and may be domain-specific (Boekarts, 1997). Panadero (2017) reviewed studies of self-regulated learning and suggested that models of self-regulation that emphasized metacognitive strategies might be more effective for college-level students. Additionally, self-efficacy was reported as one of the highest predictors of academic success, as measured by GPA.

Fong et al. (2017) found self-regulation and a strong sense of internality and controllability to be associated with academic achievement. Rotter (1966) determined that people develop expectancies regarding success or failure in a situation based, at least in part, on whether they have a perceived sense of internal control. Students may hold an internal locus of control, believing that they have control over the circumstances surrounding their performance, or they may have an external locus of control, believing that events are controlled by outside factors, such as luck or their instructor. Those with a sense of external locus of control believe that their efforts make little or no difference. When students have too much self-doubt, believing that circumstances are beyond their control, and have little motivation to succeed, they are less likely to succeed and persist (Fong et al., 2017; Lin-Siegler et al., 2016; Mega et al., 2014). Additionally, students who have higher levels of self-efficacy are more likely to seek help to gain knowledge and skills (Won et al., 2021).

Self-Reflection

By encouraging students to reflect upon their own learning and enhance their meta-cognitive processes, it is possible that students may be more likely to self-regulate and perform at a higher level (Zimmerman, 2008) as part of a feedback loop. When students gain a sense of internal locus of control, they may increase their effort since they feel they can make a difference in their outcomes, which can, in turn, lead to increased effort and improved performance, and thus greater self-efficacy (See Figure 1).

https://doi.org/10.26536/WMTI4251
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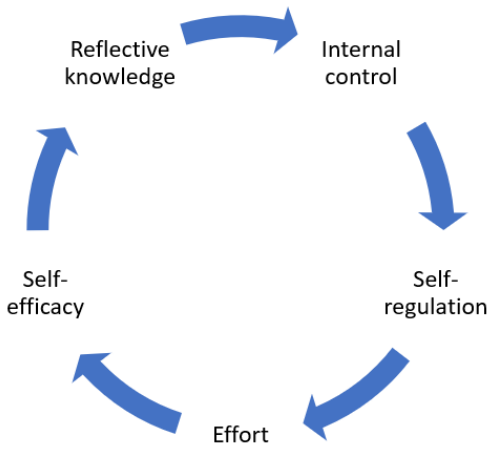
This model is similar to the notion of developmental cascade (Doty et al., 2017; Masten & Cicchetti, 2010), whereby positive changes will accumulate as positive outcomes are experienced.

Figure 1

Model of feedback loop from reflective knowledge to self-efficacy



Helping students understand that they can make a difference in their performance can help them change their preparation behaviors rather than making the least effort. This is similar to the notion of hope described by Levi et al. (2014) and a growth mindset (Dweck, 2016). Hope combines both the determination and ability to create plans to achieve goals. It has been associated additionally with academic achievement via increased effort, including the implementation of study strategies and behaviors. A growth mindset, according to Dweck (2016), is apparent when students believe they can change their efforts and effect change. Soria and Stubblefield (2015) showed that when students focused on their strengths, they were more likely to persist academically. Duckworth et al.'s (2007) notion of grit is similar to this, with the expectation that "grittier" students are more likely to persist when they are challenged and experience failure over long periods of time.

Schwab et al. (2021) considered reflection a necessary tool in students' professional development, and providing opportunities to hone their reflective skills will enhance this development. Additionally, Hamon and Jones (2023) described the value of self-reflection for the development of family scientists. Scott et al. (2024) provided a list of learner-centered strategies for family science courses, including group activities and using questions to spark student learning. Their recommendations share the idea that students need to be actively engaged in the learning process for it to be most effective. This supports the notion that instead of just telling students how to learn most effectively, the students themselves must generate the experience, and self-reflection is a key conduit for this.

Current Study

As described above, past research has shown that students are able to practice evidence-based study strategies when they are instructed to do so, but do not necessarily always adopt these behaviors (Hartwig & Malain, 2022; Maurer & Cabay, 2023; Maurer & Shipp, 2021; McDaniel & Einstein, 2020). It is expected that there is more going on than just deciding whether to carry out the specific behaviors that are instructed or not. It may be that students have not internalized the lessons as they are imparted, that they do not have the wherewithal to adopt the methods on a regular basis, and that they are focusing

more on the here-and-now rather than the long-term impact of these strategies. Examining how students are thinking about their test performance and their adoption of study strategies will be beneficial in understanding their beliefs about their study strategies and how they may adopt new methods.

This study explores college students' thoughts regarding their exam performance. Their sense of preparation, their belief in their ability to effect change, and why they performed as they did on their exams are examined. Using the frameworks provided by Bandura (2006) relating to students' perceptions of their ability to succeed as well as King and Kitchener's (2004) explanation of reflective judgment, this study will explore themes relating to self-regulation, effort, internal and external forces influencing performance, and expectations of success.

The research questions are: 1) What do students think about regarding their exam preparation? and 2) do their views on their exam preparation change over the course of a semester, after having more experience with exam taking and reflecting upon their performance? It is predicted that most students will have a greater sense of control and belief in their ability to change their study habits, with fewer students indicating a lack of internal control.

Methods

This study utilizes a qualitative research design to analyze a subset of data from a larger mixed-methods study. The original mixed-methods study included analysis of student test performance and scoring on a study skills assessment, the Study Behavior Inventory (SBI; Bliss & Mueller, 1986, 1987). The SBI results were utilized as part of a study skills intervention that provided feedback to the students as they reported on their general study strategies and assessed their level of confidence in their academic preparation. There were two time points for this study: Time 1 (T1), just prior to the first exam at Week 4 of the semester, and Time 2 (T2), which was just after the second exam at Week 14. At each time point, students were asked qualitative reflection questions regarding their study approach, exam preparation, and exam performance. The open-ended reflections at both time points were the focus of this current study. Participants

The study was conducted in an Introduction to Human Development and Family Studies course at a small campus, which is part of a regional university in the Northeast United States. The study was approved by the Institutional Review Board of the university. The course covered lifespan development from conception to death and was conducted as a mixture of discussion, lecture, and small group activities. At the beginning of the semester, students were asked to participate in the study and told that the activities for the study were required components for the course, but that their data would be used only if they gave permission. Five out of 35 students opted to exclude their data from the study. The subjects were 25 females and five males; 25 White, one Black, three Hispanic/Latina, and one of unknown background; and 27 under age 23 and three over age 23. Most of the students were in their first two years of college, with 23 in their first semester, four in their third or fourth semester, and two in their fifth semester or later. Seven students identified with "higher academic confidence," as indicated by their first SBI score while 20 students identified with "lower academic confidence." Three students did not complete the SBI as part of the first exam analysis, and two different students did not complete the second exam analysis, even though these were required for the course.

Instrument

The Study Behavior Inventory (SBI; Bliss & Mueller, 1986, 1987) is a 46-item questionnaire (see Appendix) that asks students to respond with regard to their current study behaviors, not aspirational ones. Based on their responses to the inventory questions, students receive four scores:

https://doi.org/10.26536/WMTI4251
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academic confidence, short-term, long-term study strategies, and a total score, which combines the previous three scores. The inventory was available on campus network computers. Students completed the inventory on the computer and then had to print out the results and submit them in class. The results included both raw and percentile scores. Those students who scored below the 50th percentile score for any of the three areas received automated suggestions on each of the relevant areas as to how they might improve their performance. Table 1 includes the descriptive statistics for the SBI results for both Time 1 (T1) and Time 2 (T2) as well as the % of subjects who earned at the 50th percentile or below for each of the scores. Scores that were 50th percentile or below were labeled "lower academic confidence," and those above were labeled "higher academic confidence." The academic confidence scores were converted into a dichotomous variable that indicated either high confidence or low confidence to provide context in the qualitative coding of the subjects' written responses to the exam analyses.

Table 1

Descriptive statistics for Study Behavior Inventory (SBI) used for intervention

	Min Score	Max Score	*M*	*SD*	% of scores at 50th percentile and below* (number of subjects)
After Test 1 (*n*=27)					
Academic Confidence	1	98	36.33	32.85	74% (20)
Short-term Study Strategies	2	99	62.11	30.47	33% (9)
Long-term Study Strategies	6	99	48.93	25.39	41% (11)
After Test 2 (*n*=28)					
Academic Confidence	1	99	50.93	30.42	54% (15)
Short-term Study Strategies	40	99	78.82	18.73	7% (2)
Long-term Study Strategies	25	99	63.46	25.69	29% (8)

* Score of 50th percentile or below prompted intervention feedback from SBI

Procedure

The subjects took two exams during the semester. The exams were fifty multiple-choice questions covering four chapters of the textbook and material presented in class. They completed the SBI prior to the first exam (T1) and after the second exam (T2). A workshop was presented by a learning specialist from the university's academic support center on the day the first SBI assignment was due the week of the first exam. The timing of the workshop was primarily a function of the learning specialist's availability, rather than a specific factor determined for the study. During the workshop, the learning specialist explained how to interpret the results of the inventory and then had the students brainstorm and present on ways to improve in the seven key areas indicated by the SBI: time management, study reading, general study habits, writing skills, listening/notetaking, test anxiety, faculty relations, and test-taking skills. One of the goals was to provide the students with the understanding that they could effect change in their preparation and performance. The students worked in groups to identify such methods and shared them with the whole class. The learning specialist focused

on evidence-based aspects of studying, such as distributed learning, active reading, and note-taking, as well as other more general suggestions, such as organizational and time management skills.

After each exam, the students completed an exam analysis (see Table 2) to explain why they thought they earned the exam score they had gotten and to reflect on their performance on the SBI and how that related to their exam performance. For both exam analyses, the subjects were asked to reflect on whether they had implemented any of the recommendations from the SBI results. After the second exam, they were asked to reflect on how their academic confidence and short- or long-term study strategies over the course of the semester may have changed.

Analytic Strategy

We conducted a qualitative, thematic data analysis (Naeem et al., 2023), using a combination of inductive and deductive processes (Thomas, 2006), examining the data for themes relating to student perceptions of their effort and changes in their study strategies and habits. Using McCracken's (1988) five-step method for long-term interview analysis, the first author read through the responses, took notes, and then coded themes that arose through examination of similar responses. As suggested by Naeem et al. (2023), key terms were identified from each response. Response categories were then color-coded according to themes that emerged from the data, as part of the deductive analysis. Following initial analyses, this author revisited the literature, particularly Bandura (2006) and King and Kitchener (2004), to identify and refine these initial themes, following through with the inductive process. Once the themes were determined and the data were recoded using these themes, the second author examined the data using these codes, and then the data coding of the two authors was compared. The two authors discussed any disagreements until agreement was made on the coding of the themes. This debriefing was consistent with the method outlined by Thomas (2006).

Table 2

Post-Exam Analysis Questions

After Exam 1
• Why do you think you earned the score on this test that you did? • How do you plan to change your studying/preparation prior to the second exam, if at all? • What are some changes that the Study Behavior Inventory suggested for you? Have you implemented any of them yet? Why or why not?
After Exam 2
• If your exam grade improved from exam #1 to exam #2, what did you do differently, if anything? If it did not improve or went down, did you try anything new? • Why do you think you earned the score on this test that you did? • What differences did you find in the Study Behavior Inventory results between the first and second time you took it? Did you make changes in your study strategies based on the results? Did you find those changes made a difference in your performance?

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Findings

The findings are arranged by the four themes that were identified during the coding process. One theme relates to whether they had a sense of internal control over their studying and exam performance, whether they felt external events influenced their results, or had a mix of those responses. The second theme has to do with their self-confidence in their own control. The third theme illuminated how the students tried to implement changes in their study behaviors. The fourth indicates how students reported feeling when a method they tried to implement did not work as they had hoped or expected. Based on students' scores for academic confidence on the SBI, their responses are categorized as either "lower" (50th percentile or lower) or "higher" (above 50th percentile) confidence at Time 1 (T1) or Time 2 (T2), depending upon when the quoted response was given. The use of the 50th percentile to determine the group category of higher or lower was based on the SBI standard of providing feedback and suggestions for scores that fell below the 50th percentile. Table 3 contains the four themes, an explanation of each theme, and exemplar quotations.

Theme 1: External versus Internal Locus of Control

External

When students attributed their performance to external circumstances, things beyond their sense of control, these were coded as "external." For each of the two exam analyses, two students had responses that were coded as "external." Three of the responses explained that either the wording on the exam was "tricky" or that the subject itself was "confusing." For example, subject #9 (T1 lower confidence) stated, "Some of the questions were worded in a way that I could not understand." The other student provided more explanation:

> I believe that i earned this test grade because I was not in class a few days because of sickness and my car crash so I did not get to learn the information first hand, instead I had to teach myself the information that I missed. (Subject #5; T1 higher confidence)

These responses were coded as "external" since they explained the outcome of the test on events or aspects of the test that were outside of their control.

Internal

When students explained their performance because of an action that they took or did not take, these were coded as "internal." Just over half of the students' responses for the first exam and almost 90% for the second exam were coded as "internal," suggesting that more of them felt that they had control over their preparation and circumstances when they took the second exam. Subject #1 (T1 higher confidence) stated: "I earned this score cause did look over everything that I needed to look over, but perhaps I could've asked myself more questions on some of the chapters I didn't fully understand." Subject #16 (T2 higher confidence) reported: "I paid attention in class and was interested in the material. Additionally, I studied consistently." Subject #8 (T2 higher confidence) said:

> Because I didn't spend as much time studying that I should have. If I have spent at least 3-5 days studying for the exam, I probably would've gotten a better grade. Also, if I read in depth all of the chapters, my grade most likely would've improved.

In each of these cases, the subjects indicated that the changes in their performance or lack thereof were a result of their own actions. They took responsibility for their results.

https://doi.org/10.26536/WMTI4251
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Mixed

Responses that included explanations with some internal and some external reasons were coded as "mixed." Seven responses were coded as such on the first exam analysis and only one was coded that way for the second exam analysis. One who had a mixed response on the first exam had a response coded as "external" after the second exam, while the one with a mixed response after the second exam had a response coded as "internal" after the first exam. Subject #21 (T2 higher confidence) showed an internal explanation that stemmed from external causation due to multiple exams in one week, which led to increased stress, leading to poor time management: "My stress level has been over the top and I had a couple of exams this week. So I just didn't have good time management I guess." Subject #12 (T1 lower confidence) stated: "I don't think I prepared myself enough for it before the actual exam itself. I didn't think the exam would be as difficult as it was either," identifying both an internal (not prepared enough) and external (exam was difficult) thus having a "mixed" explanation.

Both responses above suggest that the students had taken some responsibility for the outcomes on the exam, indicating that their preparation was not sufficient. At the same time, however, they indicated that there were other reasons for their difficulties that were not within their control, such as having multiple exams or that the exam itself was more difficult than expected.

Theme 2: Changing Academic Confidence/Self-efficacy

As indicated above, the SBI provided an "academic confidence" score, based on an analysis of responses indicating that studentswere competent and secure and had confidence in their ability to succeed in academic settings (Bliss & Mueller, 1986). After each exam, the students were asked to reflect on their SBI results and whether they had made any changes in response to the results on the SBI.

After First Exam

Given that the first exam was taken just after the SBI was completed the first time, it is not surprising that they had not changed in their level of confidence, although four specifically mentioned improving this. One student (Subject #12; T1 lower confidence) said in response to the question asking what changes were suggested by the SBI results: "Have more confidence in myself when it comes to test taking. Also, to look over my notes more often than I normally do." Another student stated: "Suggest that I need to work on my academic confidence and meet with tutors. I have begun to go to tutors and also look over my notes after each class" (Subject #29; T1 lower confidence). Subject #17 (T1 lower confidence) stated:

> The Study Behavior Inventory showed me that I need to work on my academic confidence. My short-term and long-term study habits also totaled to lower scores. I was given suggestions to seek help for my test anxiety by meeting with tutors, advisers, and counselors. I have already begun to see a writing tutor and a counselor. I have also scheduled to go to a group study session for a quiz in my English class.

While only a few had specifically mentioned increasing their academic confidence, all of them indicated some way that they planned to make changes before the next exam, as suggested by the SBI results.

After Second Exam

While the question asked both about the SBI results and whether they had implemented changes, five students responded just to the latter portion of the question. Just over half of the students reported that their SBI scores had changed, with around one-third indicating that their academic confidence had changed, mostly increasing. However, two reported that their confidence scores had decreased. All but

three of them indicated that they had changed their exam preparation, although some indicated that their preparation had not led to improved performance. One student stated, “Even though I got the same grade, I feel that more confident because I study way more and the make my own study guide helped!” (Subject #9; T1 lower confidence). Another said: “I found that the difference in this exam and first exam was the confidence I had in myself” (Subject #2; T1 higher confidence). Subject #27 (T2 lower confidence) explained “My confidents [sic] for the first exam was higher then my second exam, but i score higher on the second exam because i study alot and when over the powerpoint.” Subject #29 (T2 lower confidence) said: “That my academic confidence was lower and I changed my study behaviors by starting to use flashcards.” Additionally, two students described changes in their confidence:

> The biggest difference I noticed in the Study Behavior Inventory results was my academic confidence increased dramatically. After taking several exams and learning about how college courses go, I am feeling less anxious and more confident in my academic abilities (Subject #17; T2 lower confidence).
>
> I felt more confidence in my academics lately and that changed from last behavior test I think. My confidence level increase has helped me with my grades in various courses. Other than that I don't think much has changed too much (Subject #21; T2 higher confidence).

Since most of the students reported that they changed how they prepared for the second exam, this suggests that they have a sense of self-efficacy and, in some cases, increased academic confidence. The two students who reported lower academic confidence scores after taking the SBI the second time also indicated that they changed how they prepared for the second exam, thus suggesting that they were able to make changes in their preparation.

Theme 3: Self-Implementing Changes in Study Behaviors

After the second exam, all but one of the participants indicated that they had tried to implement at least some change in their study methods. The one who did not do so stated that they had been focusing more on the group project which was due after the second exam. Many students identified ways that they worked to improve their performance, including using the materials available to them, such as study guides, PowerPoint slides from the class lectures, and the textbook. For the last two chapters that were covered in the class, the students were required to write their own study guides, which many reported finding useful in improving their understanding of the material in the text. Although some indicated that they had not been aware of the style or format of the exam prior to the first one, a sample interactive exam had been available to them in the course management system. Six students indicated that they studied “more,” with some lacking detail about what that meant, while others added that they had read their notes, focused on theories, or created the required study guides, which they indicated helped. Three students said they studied more in advance of the second exam than for the first exam, including one who said they studied “as I went” (Subject #28, T2 no score). Subject #4 (T2 higher confidence) stated: “I studied more in-depth then last time. Subject #10 (T2 higher confidence) explained: “I read the textbook this time so I could better understand the material.” Additionally, these three subjects reported spending more time with specific activities:

> I spent more time studying. I also wrote down all the theories and made sure I knew what each theory was. Also, as opposed to last exam I made my own study guides which helped me learn the material a lot better. (Subject #8; T2 lower confidence).
>
> One of the things I did was read more of the book. At first I thought that if I just went to class and paid attention to the PowerPoints in class I’d be fine, but after the first exam I decided to

> read the book and ask myself questions that pertained to the chapter I'm reading. (Subject #1; T2 higher confidence)
>
> In the first exam I read the chapters and made my own study guide and took specific notes which got me a low score but I believe the reason for that could be that it was my first exam in that class and I didn't really know the format or the style of the exam. Meanwhile on the second exam I paid more attention to the powerpoints and practice quizzes and exam which got me a better grade. (Subject #2; T2 lower confidence)

As is apparent from these reports, the students employed many techniques to prepare for the second exam differently from the way they had for the first exam. Depending upon the feedback they received from the SBI, the learning specialist, the instructor, and their own experiences, they worked to identify what method would help them improve their performance.

Theme 4: When What They Tried Did Not Work as Well as Hoped

Just under half of the students reported that their performance on the second exam was not as good as they had hoped it would be. In some cases, they explained that their efforts had fallen short because of not making enough effort. Others suggested that their method of preparation was not appropriate for what they needed to know, such as not using the practice quizzes enough, poor time management, or rushing while taking the exam. Subject #5 (T2 higher confidence) stated, "I tried a different way of studying since I believed that the material for exam 2 was more difficult. However, the new study technique I used did not help improve my grade." Subject #22 (T2 higher confidence) suggested that: "I think I didn't do so well because I was too confident that I knew the material, or so I thought I did. The way I study also played a huge roll [sic]."

Most of these students provided explanations regarding why they did not perform as well on the exam as they had hoped or expected, which related to something they had done or not done while preparing for the exam. These suggested that they felt that the changes were under their control.

Discussion

The themes that emerged in this analysis of the data are consistent with past findings related to students' development of self-regulation regarding their academic performance (Efklides et al., 2017; Fong et al., 2017; Levi et al., 2014; Theobald, 2024). The hypothesis for this study was that over the course of the semester, more students would indicate a sense of control over their performance on exams with greater focus on preparing for the exams by changing their study habits. After the second exam, many of the students described how they had changed their methods to improve their outcome, and a few indicated frustration as these changes did not help them improve their exam performance. Some students stated that they had not prepared as long or as well as they had planned, suggesting that it was their own efforts that led to the outcome and indicating a sense of internal control over their situations. Others reported that their academic confidence score on the SBI, as well as their sense of their ability to succeed, had increased during the semester. Even those who did poorly on the exams tended to understand that their efforts, or lack thereof, were what led to their poor performance. However, some students stated that external forces led to their test results. They reported situations that were outside of their control that affected their results, such as being stressed, having multiple exams to prepare for, or that the test was "tricky."

Many of the methods that the students employed are ones that have been shown to be effective, such as distributed learning (i.e., not cramming). Two students reported studying about the same amount of time, but more effectively. Others indicated that they self-tested, using flashcards or Quizlet.

https://doi.org/10.26536/WMTI4251
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Distributed learning and self-testing together comprise "successive relearning," which has been demonstrated as an effective study strategy (Maurer & Cabay, 2023; Maurer & Shipp, 2021). Theobald (2024) described how self-regulated learning enhanced both academic achievement and well-being, with reduced stress and more efficient use of time.

Other methods the students used have been considered less successful, such as rereading the text and retaking the practice tests (Maurer & Cabay, 2023). However, it is a bit difficult to tell if the reports of reading the text were signs of ineffective strategies, since it may be that the students had not read the textbook much or at all for the first exam, which likely led to poorer comprehension and retention.

Implications

Current research recommends that instructors encourage self-reflection to increase student self-efficacy, performance, and professional identity (Hamon & Jones, 2023; Schwab et al., 2021). Instructors can provide opportunities for students to reflect on their performance, develop the sense that they have control, and modify and assess their ability to perform on exams and other academic and professional tasks, as predicted by the model shown in Figure 1. Calkins and Seidler (2011) explored faculty perspectives on the values of their courses and found that they varied in terms of the level of reflective judgment. Those with the most complex perception of their role as faculty understood that they should help students develop critical thinking skills and "reflective judgments about knowledge" (p. 222). Steur et al. (2016) suggested that "graduateness," a particular stage of intellectual development, involves reflective thinking, among other skills that are expected of college graduates. During college students' academic careers, Steur et al. stated, the recognition that knowledge is uncertain is part of this developmental process. Thus, by encouraging students to develop their reflective skills through practice with ill-structured problems and reflection activities, college faculty can encourage the cognitive development of their students who may then be prepared for their future careers and the management of tasks that adults need in their personal lives.

In the course of this study, the focus has been on helping students become more reflective in their judgments about their performance in class. The SBI was used as a vehicle for drawing the students out about how they prepared for exams, and how they felt they managed their time, and so on. By encouraging them to test their assumptions about their preparation and performance, they were required to move beyond foreclosure of their beliefs about these. Statements such as "I'm bad at tests" are examples of how students have foreclosed on beliefs and are not willing to explore this further. Reducing the likelihood that students will stop at such judgments about their abilities can help them in their developmental processes (Bandura, 2006; King & Kitchener, 2004). Having students reflect upon their performance after each exam provided them with the opportunity to assess the state of their learning and gauge the effectiveness of their preparation. This provided the students with experiences with an ill-structured problem, which could help lead them to develop a more mature level of reflective judgment.

Once adolescents or emerging adults understand that knowledge is not a fixed state (cf. growth mindset, Dweck, 2016), they may have a better understanding of how their own actions may influence their acquisition of knowledge and thus gain a better sense of control over their learning and confidence in their ability to do so. The development of reflective judgment and self-efficacy may lead to improved academic performance and experiences for students, as indicated by the model depicted in Figure 1.

This model proposes that there are multiple steps involved in this development:

1. Become aware of their own learning (meta-cognition, self-awareness).

2. Realize they can effect change (self-efficacy, sense of control) and that things are changeable (growth vs. fixed mindset)

3. Determine that effort leads to better performance (internality) and better performance is not a matter of luck or chance or out of their control (externality)

4. Monitor their own progress and adapt as needed (self-regulation)

5. Want to make changes (motivation).

By understanding the steps that are involved in this process, faculty can help students work their way towards their goals of succeeding academically and professionally. Providing opportunities for students to reflect upon their performance, evaluate their current strategies, and change them when they are not successful would benefit the students. Helping students learn that they have control over their own success and how they may change their behavior to gain success are roles that faculty may play in addition to delivering academic content. Additionally, having students reflect upon their preparation and performance on multiple occasions, as was done in this study, helps them test their beliefs about their preparation and understand the iterative nature of improvement. Given the shifting nature of knowledge, it may be that these are some of the most important roles that faculty have (Calkins & Seidler, 2011) as it will help them in their academic and professional futures.

Limitations

There are limitations in the sample size as well as composition that may reduce the generalizability of this study's results to a broader college population. The students were primarily White, under age 23, and from a rural campus. It is not known how many of them were first-generation college students or who had family and work responsibilities outside of their schoolwork. The academic preparation of the students from other college courses and their high school years was not examined, and so it is possible that these students differed from students at other higher education institutions. The methods used in this study were specific to the course in terms of the use and timing of the SBI and workshop, and so may be difficult to reproduce by other researchers and teachers. Yet, in this short-term longitudinal study, we demonstrated changes in some self-reflection and self-regulation similar to other studies (Theobald, 2024).

There may have been fewer responses indicating external explanations for difficulties on the exams than would be typical because of how the questions on the exam analysis were worded, since they specifically focused on what the students did and whether and how their efforts led to change. Additionally, throughout the class, the instructor focused on empowering the students and letting them know that the changes were within their control by talking about students' efforts and suggestions on how to improve their study performance, and so the students may have reflected that language rather than how they truly felt about their performance. Given that this study took place during just one semester, it is not clear whether the changes they implemented were ones that they continued to use beyond the scope of this course or whether they used them for other classes as well.

Since the students had to complete the SBI for the first time the same week that they had taken their first exam, it is not surprising that they had not implemented the actions prior to the exam. If they had completed the SBI the first time earlier in the term, it is possible that the improvements would have been made sooner and reflected in their performance on the first exam. The SBI was primarily used for this research since it was available on the campus network and enabled students to examine their preparation for their exams in some detail. While the SBI has been shown to predict exam performance (Yaure & Schwab, 2011), it is not currently available in digital form. Thus, it is not clear whether it

would be as effective alone at encouraging particularly effective study strategies as other more widely used measures (cf. Maurer & Shipp, 2021; Maurer & Cabay, 2023). This study included an intervention with the learning specialist, which would not be replicable in another study as the record of the specific details is not available. While the level of academic confidence is noted in the findings section along with their written responses to the questions about their performance, it is not entirely clear what this shows, as the specifics about their responses to the questions on the inventory are not provided in the test results. It is also possible that some subjects are confident in their academic abilities but are really unfamiliar with all that they are *not* doing to prepare well for their exams. The suggestions that were automatically generated were based on the overall score (below 51st percentile) rather than being specific to their answers.

Based on the findings of this study, it is recommended that instructors encourage their students to reflect on their performance on exams as well as on written work. Having students articulate how they had prepared and where that may have fallen short and plan for future improvement should help the students understand that they have control over their actions, which could then lead to a change in their performance. Additionally, it may be most useful if individually directed ideas about possible improvements could be made.

Future Research

Grzywacz and Allen (2017) identified some of the difficulties of translational science, which may be at the crux of the matter in this situation. They stated that "humans…can be understood only holistically and as active creators of their reality" (p. 575). This suggests that the mechanistic view of research that individuals or families can be understood as a simple sum of their parts is not as effective for family scientists, given that their subjects are more complex and embedded within a complicated milieu that affects how interventions may work (cf. Middlemiss et al., 2017). It may be that educational interventions as previously described in some studies do not take into consideration the challenges that students have in adopting evidence-based methods. It may be that students understand that there may be more effective methods, but that they do not fit their needs or are too complicated to be implemented easily. As McCabe et al. (2021) suggested, students tend to use easier methods that are less effective than those that are more difficult to implement but may be demonstrably more effective. Less effortful methods are those that they fall back upon and are considered "good enough." This type of "satisficing" has long been recognized as a method that many people use since it has some effectiveness, even if not the most effectiveness, in decision-making (Simon, 1956). When students have so many demands upon their time and attention, they may rely upon less optimal processes that will get them a "good enough" outcome. It takes effort and attention to overhaul one's study methods completely, and students may not have the wherewithal to make such changes without feeling overwhelmed. Many work part-time or full-time jobs, have families, feel psychologically overwhelmed, have full course loads, etc., and all of this leads them to feeling unable to put their all into the work. Helping these students use their study time well and feel efficacious may be key to their success.

There is the assumption that student perceptions may be less important to examine than more "direct" measurements of learning in some of the Scholarship of Teaching and Learning literature (Maurer, 2018). However, there is much research on "non-cognitive" aspects of academic success (Yaure et al., 2020) that suggests that study strategies are only one part of the equation related to academic performance. The current study focused on examining student perceptions since these may be mediators of academic performance between study strategy knowledge and implementation. Understanding how students feel about their attempts at improving their exam preparation and why they

may have changed or not changed their behavior can lead to a more holistic sense of student behavior and perceptions.

There are many avenues to continue research in this rich domain of intellectual development of students using a similar paradigm as this study. While some other studies (Procter, 2020; Steur et al., 2016) have examined reflective judgment development directly, this study instead focused more on students' explanations of their success and failure. A combined effort to determine how their students' level of cognitive development may predict their exam preparation and explanations for their performance would be beneficial. Additionally, having different types of questions on exam analyses, such as the ones used in this study that provide more opportunity for spontaneous indications of internal versus external control and self-regulation could be useful. Updating and expanding the use of the SBI instrument could be part of a research agenda to provide a tool to students in helping them determine areas of improvement as well as determine if there are areas of preparation, including short- and long-term study strategies, that are most relevant to helping students succeed. Future research should examine how the tool, either the SBI or another, reflects evidence-based study strategies. Students' reflections upon these strategies, which include their reasons for where they may fall short, must be included to gain insight into individuals' implementation of recommended strategies. Qualitative data, such as that used in the current study, can be used to examine the context of student academic preparation, which may assist researchers who are striving to understand behaviors that are less effective than evidence-based ones.

Faculty who are interested in the Scholarship of Teaching and Learning should apply rigorous methods to their studies to enable others to replicate the methods. Identifying key factors that enable students to reflect and improve on their performance is important, but facilitating the transfer of these to other contexts is crucial.

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Appendix: Study Behavior Inventory questions (Bliss & Mueller, 1986)

Factor 1: Academic Confidence

1. I have to re-read material several times; passages do not have much meaning the first time I go over them.
2. I get nervous and confused when taking an examination and fail to answer questions to the best of my ability.
3. I do poorly on tests because I find it hard to think clearly and plan my work when I am faced with an exam.
4. I have difficulty in picking out important points of a reading assignment; points that later appear on examinations.
5. I lose points on true-false or multiple-choice examinations because I changed my original answer only to discover later that I was right the first time.
6. When tests are returned, I find that my grade has been lowered because of careless mistakes.
7. During an examination, I forget names, dates, formulas, and other details that I really do know.
8. I think I could do much better on tests if I could take them alone and/or not feel pressured by a time limit.
9. Worrying about how well I will do interferes with my preparation and performance on tests.

Factor 2: Short-Term Study Strategies

10. I find it hard to force myself to finish work by a certain time; work is unfinished, inferior, or not on time.
11. My teachers criticize my written reports as being hastily written, or poorly organized.
12. I lay aside returned examinations, reports, and homework assignments without bothering to correct errors noted by the instructor
13. I watch too much television, and this interferes with my studies.
14. I work too many hours for the course load I am carrying.
15. Personal problems with my family affect my ability to concentrate on studying.
16. I skip over the figures, graphs, and tables in a reading assignment.
17. I am careless with spelling and mechanics of English composition when answering examination questions.

Factor 3: Long-Term Study Strategies

18. I keep my assignments up-to-date by doing my work regularly from day-to-day.
19. When I am having difficulty with my schoolwork, I try to talk over the trouble with the teacher.
20. I try to do some "over-learning", working beyond the point of immediate memory or recall.
21. When reading a long textbook assignment, I stop periodically and mentally review the main points that have been presented.
22. After a class lecture, I go back and recite to myself the material in my notes, rechecking any points I find doubtful.
23. Before attending class, I prepare by reading or studying the assignment

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Factor 4: Specific Activities

24. In preparing reports, themes, term papers, etc., I make certain that I clearly understand what is wanted before I begin to work.
25. When I get behind in my schoolwork for some unavoidable reason, I make up back assignments without prompting from the teacher.
26. When in doubt about the proper form of a written report, I refer to an approved model to provide a guide to follow.
27. I keep all the notes for each subject together, carefully arranging them in some logical order.
28. I plan out in my mind the answer to subjective or essay-type questions before starting to write the answer.
29. When preparing for an examination, I learn facts in some logical order of importance, order of presentation in class or textbook, order of time in history, etc.

Questions That Did Not Load With Others

30. My time is unwisely distributed; I spend too much time on some things and not enough on others.
31. With some of my courses, I like to study with others.
32. I complete my homework assignments on time.
33. I try to carry over and relate material learned in one course to that learned in others.
34. I copy the diagrams, drawings, tables, and other illustrations that the instructor puts on the blackboard.
35. I prefer to study alone rather than with others.
36. At the beginning of a study period, I organize my work so that I will utilize the time most effectively.
37. Difficulty in expressing myself in writing slows me down on reports, themes, examinations, and other work to be turned in.
38. My studying is done in a random, unplanned manner; impelled mostly by the demands of approaching classes.
39. I put off writing themes, reports, term papers, etc., until the last minute.
40. I try to summarize, classify, and systematize the facts learned, associating them with previously learned materials and facts.
41. After reading several pages of an assignment, I am unable to recall what I just read.
42. When writing down notes from a lecture, I have trouble picking out the important points: I tend to put down material which turns out to be unimportant.
43. Although I work until the last possible minute, I am unable to finish examination within the allotted time.
44. If time is available, I take a few minutes to check over my answers before turning in my examination paper.
45. I believe that grades are based upon a student's ability to memorize facts rather than upon the ability to "think things through."
46. I study harder for final exams than for the rest of my coursework.

https://doi.org/10.26536/WMTI4251
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