

Literature Review-Influences of Self-regulation in Online Courses

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Abstract

The purpose of this literature review is to identify research innovations in self-regulated learning in an online environment in secondary and post-secondary learning institutions pre and post COVID. There is an abundance of research surrounding self-paced learning in online environments. The topic of self-regulation influences and strategies has its beginning with Albert Bandura's (2001) social cognitive theory, with influential contributors to self-efficacy (Schunk, 1994, 1995; Pintrich, 1996) and as behavioral self-control. Zimmerman and Schunk (1986-2002) have taken this information further in their studies of self-regulation and its effects on learning and successfully reaching academic goals. Self-regulated learning (SRL) refers to a learners' independent thoughts, feelings and beliefs that motivate them to strive toward their academic goals. This includes engaging in the appropriate actions toward their goal as well as monitoring and reflecting on their own progress. As the COVID pandemic caught most learning institutions off-guard, forcing course work to online environments, self-regulation in online environments became critical for mastery of content on unfamiliar ground.

Introduction

There is an abundance of research surrounding self-paced learning in an online/virtual learning environment. The topic of self-regulation influences and strategies have their beginnings with Albert Bandura's (2001) social cognitive theory, with influential contributors to self-efficacy (Schunk, 1994, 1995; Pintrich, 1996) and as behavioral self-control. Zimmerman and Schunk (1986-2002) have taken this information further in their studies of self-regulation and its effects on learning and successfully reaching academic goals. Self-regulated learning (SRL) refers to a learners' independent thoughts, feelings and beliefs that motivate them to strive toward their academic goals. This includes engaging in the appropriate actions toward their goal and monitoring and reflecting on their own progress. As the COVID pandemic caught most learning institutions off-guard, forcing course work to online environments, self-regulation in online environments became critical for mastery of content on unfamiliar ground. Moreover, new technology enhancements are gearing up for a possible new disruption in the form of automated intelligence (AI). Students' opinions and conceptions about the encroachment in education is important to how AI should be designed and used to support SRL in both classrooms and in online learning environments. While the uses of AI in online learning environments is not prominent in this review, it is covered in the *Potential for Improvements and Future Study section at the closing of this review.*

For this review, sources on self-regulation in secondary and post-secondary institutions in online course work provided insight into the transition of self-regulation skills from the conventional classroom environment to the virtual classroom environment. Searches in Google Scholar, Indiana University Library searches and reference reviews from other articles for the

topic of 'self-regulation in online learning environments' returned numerous journal articles, books and or book chapters, conference papers and videos. When sorting through these resources I chose peer reviewed and empirical articles and book chapters that represented the influencers of self-regulation, skills/strategies and supports needed for learners to self-regulate, as well as the impact self-regulation has on the success of academic achievement in online learning environments. The result was 8 resources ranging in time-period from 2005 through 2021 that explored various components of self-regulation in learning environments. More resources are referenced to support the research and findings of the original eight articles and book chapters. These supplemental resources provided rich evidence for practices supporting SRL in both the classroom and in online learning environments.

While COVID was highly influential for sending coursework and leaning environments to an online/virtual space, especially in educational institutions, studies in supporting students in online learning environments began in the early 2000's. Fisher and Baird (2005) provide interesting insights into supporting student preferences in online learning, Tsai (2009), Rowe and Raferty (2013) and Delen and Liew (2016) present possible frameworks and interventions to support students' success in virtual courses. Student satisfaction in relation to success in virtual courses was explored by Inan, Yukselturk, Kurucay and Flores (2016) and Automated Intelligence (AI) was introduced as a virtual instructor to scaffold students lacking in self-regulation by Son and Dongho (2020). Finally, Code, Zap and Ralph (2021) look at the influence of mediating self-efficacy's impact on personality and academic performance.

Overview

Self-regulation and self-efficacy can be easily traced back to Albert Bandura's (2001) social cognitive theory work and Barry Zimmerman and Dale Schunk's (1986-2002) exploration of various contextual influences on human regulatory skills, especially in the areas of social cognitive influences on self-regulation. This is important in academic environments because learners skilled in self-regulation are reported to have higher self-efficacy regarding setting intrinsic goals and better academic outcomes than those students who are less skilled in SRL. (Cho & Shen, 2013). This ability to self-regulate also transfers to online learning environments especially when social experiences are provided. For those students lacking in self-regulation, interventions are possible to improve academic success in online environments. Many authors in this review use works in social cognition as constructs to expand on the importance of social cognition's influence on self-regulated learning (SRL) in online environments, both synchronous and asynchronous, as well as provide tools to support students in improving their self-regulatory skills.

Constructivist View

Fisher and Baird (2005) found providing online learners with participatory learning tools and discussion opportunities with peers allows students to be teachers in asynchronous environments. This constructivist approach reinforces social cognitive and cognitive learning skills by giving learners the opportunity to share their knowledge, create community, and apply critical thinking to discussion feedback. Learners feel less isolated and become more involved because of these opportunities. Through immersion in online course communities, learners have opportunities to develop and practice self-regulation. They can also learn self-regulation through

those who are skilled already by participating in discussions that can provide social etiquette, broaden their own and others' perspectives, and positively influence and motivate others.

Learning Environments

It is also important to consider that the environment of online learning is comprised of many environments (i.e., social, cognitive, interactive, responsive). It is critical to evaluate these environments with SRL in mind to diminish the effect it may have on cognitive load. Tsai (2009) evaluated students' online learning strategies to determine the characteristics of SRL to succeed in learning in online environments. He developed a model, the Online Learning Strategies Scale (OLSS) to measure student approaches to learning online that includes characteristics of e-learning domains and core strategies for students' academic success in learning in an online environment. Tsai (2009) presented the skills needed to learn online including reflection skills, planning skills, study skills search skills, application skills and self-evaluation skills. To enhance these skills, there is a need for deep understanding of students' approaches to the e-learning environment and proposed a model to help describe these strategies. Tsai's (2009) Model of Strategic e-Learning incorporates the needed student skills and strategies within the dynamic interfaces of online learning environments. Using the OLSS as an instrument to analyze student strategies, his findings suggest that learners need preparation to be successful in online environments and that the online experience itself can be instrumental in this preparation. The model and methodology can inform instructors, designers, and developers of online learning by providing feedback that can assist in improving students' self-awareness of their own e-learning experiences.

Intrinsic Goal Orientation

Cho and Shen (2013) found relationships between self-regulated learning (SRL) and academic achievement in online course studies when measuring students' goal orientation, academic self-efficacy, metacognitive regulation, effort regulation and interaction regulation and how these characteristics bring quality perspectives to the different constructs that can influence success in an online learning environment. However, they found that those students already skilled in SRL have higher goal orientations and are more academically advanced in self-efficacy compared to less skilled students. Additionally, students with intrinsic goal orientation are more successful in online learning environments than extrinsically goal orientated students. Cho and Shen (2013) state, "Academic self-efficacy is associated with both metacognitive regulation and interaction regulation; therefore, enhancing online students' academic self-efficacy is significant for student success" (p. 296). Interaction regulation refers to the amount of time spent in the online learning environment and was demonstrated to have an impact on SRL and achievement in e-learning. Their results confirmed a relationship between SRL and academic success in an online learning environment.

Student Readiness

Research is also clear that not all students come to the online learning environment with the skills needed in SRL. This came to light particularly during the COVID-19 pandemic when students had no choice but to quickly transition to web-based learning. However, research indicates that there are supports that can be implemented for SRL in online learning environments that include both web-based and pedagogical interventions to supplement course work. Rowe and Rafferty (2013) provide an empirical literature review of the types of

interventions to support SRL and how to apply them within online learning environments to enhance SRL and improve academic outcomes. Their study found that students who participate in metacognitive training were more successful with recall, knowledge, and overall academic performance. Students who receive question prompts are more successful at solving problems and learning outcomes were influenced by providing self-monitoring prompts like having students predict their score for post-lesson quizzes and determine how they could improve their scores. Both metacognitive and reflection prompts were found to improve problem solving skills and improve the quality of responses to questions. Strategies to assist with problem-based learning include having students set goals, plan activities, implement strategies and evaluate the outcomes of completing these tasks. These interventions have found success when implemented in both synchronous and asynchronous online environments.

Importance of Learning Design and Planning

Delen and Liew (2016) prepared a literature review of successful SRL in asynchronous online learning environments. Like the work of Cho and Shen (2009), their work on how the online learning environment itself can contribute to self-regulation and academic success focuses on the design elements that can be implemented to support SRL. The design of the learning environment can play an important role in both supporting those skilled in SRL and scaffolding those who may not have the appropriate SRL skills needed for successful academic outcomes in this environment. There are many useful strategies as well as functions within learning management systems that can foster students' self-regulation. Delen and Liew (2016) point to the importance of learning environment tools that can assist with goal setting, self-monitoring, and finding help when needed. Ensuring students are aware of these functions and integrating self-regulating activities into instruction is paramount to successful use of these enhancements.

In an online platform, when students use strategies that are related to self-regulation, they can regulate their personal functioning and benefit from the online learning environment by changing their behaviors accordingly. Thus, it is important to explore and embed new interactive functions to the online learning environments and lead learners to use self-regulatory behaviors in those learning environments (Delen & Liew, 2016, p. 24).

Delen and Liew (2016) report that learner-centered education also sets the standard for students to be more self-regulated, taking on the responsibility for learning which transfers well to asynchronous online learning environments. However, students must still be set up for success in the online learning environment by providing courses designed to provide opportunities for self-directed learning, feedback from peers and instructors, and scaffolds in place to support less self-directed learners. Similarly, Inan, Yukselturk, Kurucay, and Flores (2016) found planning to be the most important self-regulation component in learner's achievement and satisfaction in online courses. Students with better planning skills achieved higher performance than those with less or no planning skills. Planning also has an impact on student satisfaction with the online course and influences achievement. Planning is one of the responsibilities that students can learn and implement for self-regulation. By designing strategies to be successful in an online learning environment, students will understand the steps needed to be taken to be successful in achieving success in their academic goals. However, the authors of this study recommended further investigation of this study using undergraduates or graduates. This study used participants in an online certification program with only a small number of students having prior online learning experiences in the past therefore it was not a traditional learning context. Students may also have been influenced by their sense of value in terms of completing the certificate program to the minimum efforts to do so rather than receiving grades for academic performance.

Importance of Feedback

As mentioned, the social cognitive perspective may provide clues to understanding influences of successful web-based learning. Much of Bandura's (2001) work "placed emphasis on social cognitive theory in order to understand relationships between personal, behavioral, and environmental influences" (Wang & Wu, 2008, p.1589) that impact or improve student success in SRL. Wang and Wu (2008) studied three influences on student success in web-based learning environments: personal, behavioral, and environmental influences. Their results, among others, indicated that elaborated feedback (Wang & Wu, 2008) was consistent with learner self-efficacy in online learning environments although it did not predict academic success. However, students who received feedback in the form of "knowledge of correct response (KCR), improved students' academic performance" (Wang & Wu, 2008, p. 1596). Providing students with KCR had a scaffolding effect on improving their success in online courses.

Concentrated Scaffolding

Song and Dongho (2020) also found that scaffolding techniques can improve self-regulation in online learning environments, but it did not impact participation or performance rather "explicit training [scaffolding] was effective to foster self-regulated learning" (p. 252). Like the findings of Azevedo et al (2008) indicating that adaptive scaffolding from a human tutor promoted self-regulation processes, Song and Dongho, (2020) were also successful in promoting SRL in online learning environments through concentrated scaffolding. Prompts that initiated reflective activities also benefited SRL skills in students and learner outcomes. However, it is important that these prompts coupled with feedback are conducted by a monitor and that these interactions are paramount to scaffolding success. Song and Dongho (2020) found that learner participation increased when online interactions were coupled with scaffolding self-regulation.

Impact of AI on SRL

The need for human interaction in online learning environments to promote and improve SRL in students has been well documented. However, in many cases this places heavy demand on the instructor especially when the online student population for a course is significantly large. Song and Dongho (2020) proposed using an “intelligent agent” in the form of an AI chatbot to substitute for the human interaction needed to scaffold SRL in learners and is the crux of their investigation. What the authors found in this study was that while using AI as an agent to scaffold students in web-based environments it did not impact learning outcomes or participation in the course. A possible cause is that the bot was used for the sole purpose of influencing self-regulation and not as a general interactive tool. The conclusion for this study was that using an AI agent for self-regulation training is worthwhile for scaffolding SRL in student in online learning environments. This is still an area to be investigated to determine the beneficial impacts of using AI to interact with students in an online learning environment. Keeping with Bandura’s (2001) original characteristics of social cognitive theory, and the “capacity to exercise control over the nature and quality of one’s life” (p.313) is solely a humanistic trait. While AI may have beneficial implications for education, negative impacts to SRL may also be incurred if students feel this control over their own capacities of self-efficacy are invaded through attempts to substitute technology for human interaction.

Drivers of Student Motivation

It is also crucial to understand why a student is taking a course online. Some of the drivers of choosing online learning could be that the course is only offered online, or in the case of educational institutions during the COVID-19 pandemic, it’s out of necessity labeled by Hodges et al (2020) as Emergency Remote Teaching or ERT. According to Code, Zap and Ralph

(2021), it is crucial to understand why students choose to participate in online courses and how students react to online learning to inform the design, delivery, and evaluation of the courses in a web-based learning environment. The authors found that students who sought out online learning did so because they were confident in their abilities to learn in this modality. Student demographics played a part as well. Those choosing online courses were usually higher-education seniors wanting to fulfill degree requirements right before they were to graduate. It may also be important to disclose that this study was done pre-pandemic and the authors caution that there may now be different motivators to participating in web-based learning. COVID-19 was one of the great disruptors in educational systems across the globe and institutions had to make quick decisions on whether to cancel classes or switch to an alternative delivery medium. Code, Zap and Ralph (2021) refer to “pandemic transformed pedagogy” that negatively affected student’s self-efficacy, leaving them less confident in their learning skills for an online environment. This pre-COVID-19 study aimed at researching the gap that exists between personality characteristics of students and academic performance outcomes that are affected by individual preference (Code et al, 2021). The result of their findings indicates that the most significant trait affecting academic achievement is conscientiousness and that self-efficacy improved learning outcomes in online learning environments. They also concluded that for students who do not have efficient levels of conscientiousness, including strategies to develop student conscientiousness and self-efficacy into course design would be worthwhile.

Potential for Improvements and Future Study

The studies in this review provide a small portion of the research in SRL and academic achievement in online learning environments. As knowledge of SRL has begun to transfer to web-based learning each successive study in this review provides recommendations for deepening the understanding of SRL in online learning environments. This includes instructor awareness of the factors that are important to learners such as cultivating relationships between student and instructor as well as between students and peers, (Fisher & Baird, 2005; Song, & Dongho, 2020), using constructivist learning designs to initiate and follow through the fostering of self-regulation (Tsai, 2009; Roe & Rafferty, 2013; Song & Dongho, 2020; Code, Zap & Ralph, 2020) and providing supports that help improve SRL in learners participating in web-based courses (Delen & Liew, 2006). With the emergence of new technologies, their application to online learning environments will need to be vetted to optimize their impact using evidence-based design elements. Studies should also be done using larger audiences than those in this review and within differing contexts of online course study. Massive Open Online Courses may be a challenging population for exploration because of vast differences represented in MOOCs (i.e., language, cultural diversity, high student to instructor ratios, dependance on social interactions with peers to replace interactions with instructors, etc.) than in regulated higher education courses or workplace training. However, with improvements in learning analytics, tracking students' behavior, and learning outcomes in MOOCs will continue to improve (Reparaz, Aznárez-Sanado, and Mendoza, 2020). Workplace SRL in self-paced employee development programs is not included in this review but is of interest to the writer.

Contexts for online instructor pedagogical approaches in various subject matter areas is also important to consider. For example, tools and support for an online science course may not be transferable to an online second language course and further contexts within these subject

areas, there may also be varying needs or circumstances related to supporting SRL. Advances in AI may be one avenue to informing the technology that could be used for a variety of purposes to support students online. Some of the current AI supports include AI-based plan organizers (Somasundaram et al, 2020) that help students set learning goals and plans of action and AI-based questions generators (Hussein et al, 2014) uses “natural language processing technology to support students’ self-learning with regard to different topics and fields” (in Jin, Yoo, Roll & Seo, 2023, p. 5 of 21). Others include intelligent assessments, analytics applications, AI agents to answer students’ questions and research in machine learning to enhance support for students’ self-reflection over time. Among the concerns students have with encroaching AI in educational courses, Jin et al (2023) found that issues related to responsibility, agency and surveillance were top of mind with students and that they preferred human support to AI. AI’s use in education in general is a broad field that continues to be studied. However, it is imperative to understand the students’ perspectives on the involvement of AI in their course work whether online or in the classroom.

Conclusion

Self-regulation strategies for classroom learning have been in the literature for decades. Adapting Bandura’s and Zimmerman’s work in self-efficacy and self-regulation for learner success can transfer to online learning achievements as well. Researchers are expanding on this theme by creating instructional design methods and models to improve learner self-regulation in online course environments. Feedback is also an important piece to improve self-regulation in an online learning environment, but students need knowledge of the correct response. For learners without self-regulation skills, teacher presence in online environments is important. This has its challenges due to the ratio of students to instructors, especially in Massive Open Online Courses

(MOOCs) and in post-secondary education. One possible solution to bridge this gap is to use AI as a chat bot to engage students in reflection, and goal setting as a scaffolding strategy during their participation in eLearning. Instructional design strategies that address adult learning theory and provide intentional opportunities for peer engagement where learners can share their expertise and feedback, engage in interactive activities, provide opportunities for development of cognitive and meta-cognitive skills and self-regulation training have all been successful in improving academic achievement in online learners. One caveat is that students prefer human interaction in online environments (Wang & Wu, 2008). One research opportunity is to develop a more humanistic approach to substitute for instructor presence in online environments. With the current creation of life-like bots that can emulate human emotion, and carry on conversations, perhaps this can be transferred to interactive chat bots that can provide empathy for the learner in an online environment. However, keeping in mind students concerns with AI should be at the forefront of research and resulting implementation. Enforcing AI supports for SRL may in fact encroach upon student's agency, self-efficacy, autonomy, and social cognition and their perceived need to be part of a group as well as impart some sense of loss of control in playing a part in their own development (Bandura, 2001).

References

- Bandura, A. (2001). Social Cognitive Theory: An Agentic Perspective. *Annual Review of Psychology*, 52(1-6). <https://doi.org/10.1146/annurev.psych.52.1.1>
- Cho, M., Shen, D. (2013). Self-regulation in online learning. *Distance Education*, 34(3), 290-301.
- Code, J., Zap, N., Ralph, R. (2021). Academic success online: the mediating role of self-efficacy on personality and academic performance. *International Journal on E-Learning*, 20(4), 377-410.
- Delen, E., Liew, J. (2016). The use of interactive environments to promote self-regulation in online learning: a literature review. *European Journal of Contemporary Education*, 15(1), 24-33.
- Fisher, M., Baird, D.E. (2005). Online learning design that fosters student support, self-regulation, and retention. *Campus-Wide Information Systems*, 22(2), 88-107.
- Hodges, C., Moore, S., Lockee, B., Trust, T., Bond, A. (2020, March 27).
The Difference Between Emergency Remote Teaching and Online Learning.
<https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-andonline-learning>

- Hussein, H., Elmogy, M., & Guirguis, S. (2014). Automatic English question generation system based on template driven scheme. *International Journal of Computer Science Issues (IJCSI)*, 11(6), 45.
- Inan, F., Yukselturk, E., Kurucay, M., Flores, R. (2016). The impact of self-regulation strategies on student success and satisfaction in an online course. *International Journal on E-Learning*, 16(1), 23-32.
- Jin, S., Im, K., Yoo., M., Roll, I. Seo, K. (2023). Supporting student's self-regulated learning in online learning using artificial intelligence applications. *International Journal of Educational Technology in Higher Education* 20(27). <https://doi.org/10.1186/s41239-023-00406-5>
- Pintrich, P. R., & Schunk, D. H. (1996). *Motivation in education: Theory, research, and applications*. Englewood Cliffs, NJ: Merrill/Prentice Hall.
- Reparaz, C., Aznárez-Sanado, M., & Mendoza, G. (2020). Self-regulation of learning and MOOC retention. *Computers in Human Behavior*, 111, 106423.

- Rowe, F.A., Rafferty, J.A. (2013). Instructional design interventions for supporting self-regulated learning: enhancing academic outcomes in postsecondary e-learning environments. *MERLOT Journal of Online Learning and Teaching*, 9(4), 590-601.
- Schunk, D. H. (1994). *Self-regulation of self-efficacy and attributions in academic settings*. In D. H. Schunk & B. Zimmerman (Eds.), *Self-regulation of Learning and performance. Issues and educational applications*. Mahwah: Lawrence Erlbaum Associates (pp. 75–99).
- Schunk, D. H. (1995). *Self-efficacy and education and instruction*. In J. E. Maddux (Ed.), *Self-efficacy, adaptation, and adjustment: Theory, research, and application*. New York: Plenum Press (pp. 281–303).
- Somasundaram, M., Junaid, K. M., & Mangadu, S. (2020). Artificial intelligence (AI) enabled intelligent quality management systems (IQMS) for the personalized learning path. *Procedia Computer Science*, 172, 438–442.
- Song, D., Dongho, K. (2020). Effects of self-regulation scaffolding on online participation and learning outcomes. *Journal of Research on Technology Education*, 53(3), 249-263.

Tsai, M. (2009). The model of strategic e-learning: understanding and evaluating student e-learning from metacognitive perspectives. *Educational Technology & Society*, 12(1), 34-48.

Wang, S., Wu, P. (2008). The role of feedback on web-based learning: The social cognitive perspective. *Computers & Education*, 51(4): 1589-1598.

DOI:[10.1016/j.compedu.2008.03.004](https://doi.org/10.1016/j.compedu.2008.03.004)

Zimmerman, B. J., & Martinez-Pons, M. (1986).

Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal*, 23, 614–628.

DOI:10.3102/00028312023004614

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning.

Journal of Educational Psychology, 81(3), 329-339. doi:10.1037/0022-0663.81.3.329

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, 25(1), 3-17. DOI:10.1207/s15326985ep2501_2

Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal*, 29(3), 663-676. DOI:10.3102/00028312029003663

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, 41(2), 64-70. DOI:10.1207/s15430421tip4102_2

Zimmerman, B. J., & Schunk, D. H. (2011). Self-regulated learning and performance: An introduction and an overview. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of self-regulation of learning and performance* (pp. 1–12). New York, NY: Routledge