

Self-Regulated Learning through Technology: A Study Review

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Abstract

With the Covid-19 Pandemic, almost every educational institute has resorted to digital classes by utilizing accessible technology. These paved the way for the students to maintain and develop Self-Regulated Learning as students have greater responsibility to manage their learning outcomes. In the present classroom scenario, technologies have become an indispensable tool to facilitate teaching-learning and with advancement, online learning is growing rapidly; concurrently students are responsible for their learning as the role of the teachers is only to guide or facilitate. The need for hence, Self-regulated learning and Technologies to achieve the optimal learning outcome. This paper aims to review the findings of related literature concerning technologies promoting Self-Regulated Learning. It further gives implications from the reviewed literature.

Keywords: Self-Regulated Learning; Technology, Promoting Self-Regulated Learning

Introduction

In the past few decades technology has been progressing rapidly; therefore, with the advancement, it has become an indispensable instructional tool for student-teacher teaching-learning to facilitate optimal learning outcomes. Under Higher Education, the National Education Policy (2020; Part 2, Chapter 23) also emphasizes the use and integration of Technology in Education and has pointed out the key initiative and the recommendation of technology in teaching-learning such as online education, online assessment and online examination, etc. With an emphasis on the blending of technology in teaching-learning comes to a greater responsibility on the students to self-regulate and manage their learning performance. This called the attention to the students to be independent learners in managing their learning, henceforth, Self-Regulated Learning

comes to light as it enables the students to know how to regulate themselves and how to regulate one's learning outcomes.

Self-Regulated Learning is defined as 'students' self-generated thoughts, feelings and actions which are systematically oriented towards the attainment of their goals (Zimmerman & Schunk, 1989). Pintrich (2000) also describes Self-Regulated Learning as an active constructive process whereby the learners set goals for their learning and attempt to monitor, regulate and control their cognition, motivation and behaviour guided and constrained by their goals and the contextual features of the environment.

Zimmerman(1989), as cited in Underwood & Banyard(2005), describes that Self-regulated learners draw on their knowledge and beliefs to devise an interpretation of a given academic

task, then set goals and think about the skills and strategies for achieving these goals. Self-regulated learners also monitor their progress toward the goals by judging their success against these goals". According to Zimmerman (1998), Self-Regulation involves the processes of planning, monitoring and evaluating. The term-Technology is very broad and complex hence, in a narrow term; it is a tool, technique or machine that may contain hardware and software to enhance human activities. There are various technologies for enhanced learning such as Technology Enhanced Learning Environment (TELE), ICT, e-learning, web-based learning, etc.

Objective of the Study

1. To review the findings of the related literatures concerning technologies promoting Self-Regulated Learning
2. To give implications based on the reviewed literature

Methodology

This study is based on qualitative methods only. The findings and implications of the study will be based on the review of related literature.

Criteria for inclusion

1. Only the topic of studies relating to the use of technology for promoting self-regulated learning was identified for the study.
2. According to the aim, review articles and books in the period 2004-2021 will be selected.

Data collection

The research study on the topic is very limited in number however through a search database for research articles relating to Self-regulated learning and Technology variables were identified from which 33 articles were selected

based on the most relevant literature and according to the aim of the review.

Study review on Self-Regulated Learning through Technology

Self-regulated learning has gained wide attention from researchers over the last two decades and many studies have been conducted on other variables too. Studies have shown that students with high Self-Regulated Learning achieve better learning outcomes as compared to students with low Self-Regulated Learning.

The teaching-learning paradigm has been shifted to a learner-centred approach along with the expanding prominence of technology which means individualizing the learning environment. Technology and Self-Regulated Learning are pivotal in today's teaching-learning context and it will be inevitable in the fast-changing world. As Learning becomes more learner-centred and individualized, technology is also becoming more personalized and user-centred (Underwood & Banyard, 2005), these changes will enable the students to self-regulate their learning by setting their own time and space to achieve goals. In a learner-centred environment, greater responsibilities are placed on the individual learner therefore Self-regulated learning skills are needed. Seeing this need, researchers and educators have been conducting studies to find out whether technological tools promotes self-regulated learning techniques such as the study conducted by Kaufman (2004) to investigate strategies that teachers can use to improve self-regulated learning by using web-based learning. A note-taking method which is one of the strategies in web-based learning was found to be predicting SRL. In a note-taking method, students take notes of information that were considered important from the lecture or online material sources. According to Cosnefroy (2014), the

note-taking method in online learning demands more autonomy as it enables a learner to exercise control and hence students may develop self-regulated learning skills. The study revealed that most students revisited online source material enabling them to reorganise notes and increase usefulness.

Studies such as Bartlome et.al., 2007; Wong and Baarsa et.al., 2018; Alkhasawnh et.al, 2019; Hsu, 2020; Min and Nasir, 2020; Urbina et.al, 2021 pointed out that a Technology-enhanced learning environment (TELEs) promotes self-regulated learning. According to Antoniotte (2005), the needs and goals of the learner and educator in a Technology-enhanced learning environment (TELE) may mismatch therefore students can be informed by the teachers about the needs and goals of learning. The teacher's needs and goals for the students (external definition) may overlap the students' needs and goals (personal definition) so it is important to make them aware of the external definition. When a teacher guides the students with the external definition each student comes out with different strategies, skills or thinking styles to achieve their needs and goals. Once the students are exposed to a technology-enhanced learning environment, they have a better knowledge about the environment and develop a mental model of the environment which can help them further re-modify goals, strategies, skills and thinking styles. The mental model of the environment will further inspire the behavioural plan to be executed. Frank & Dommaschk (2005) under the initiative of the Department of Media Education and Further Education at the University of Leipzig conducted an online Seminar that tested the implementation of Self-Regulated Learning in Technology Enhanced Learning Environment (TELE) among higher education students in the subject of Media Literacy.

The seminar had three terms, in the first term the students were engaged in an online course led by student tutors, the tutors gives a reflection on the group work, with the increasing confidence of the participants the tutors gave lesser advice and eventually the participants engaged in planning and designing their course, which in the due course of the term, individuals were contributing actively in the learning process and was highly involved and thus promote Self-Regulation within the groups.

Technology is rapidly advancing and it is complex, therefore students in this kind of learning environment can be easily distracted which is why Self-regulated learning is important to stay goal-oriented, use strategies and monitor performances.

Paraskeva (2007) conducted a study on 188 IT of 1st year and 4th year students to determine the relationship between self-regulated strategies and computer self-efficacy in IT courses. The study findings revealed that the 4th year students performed greater and incorporated more use of self-regulated learning strategies because they were equipped with advanced knowledge of computers and experience as compared to the 1st year students. It was found that 4th year students use cognitive and metacognitive strategies more often than 1st year students, they were focused on their goals and better in managing study time and organizing study space.

Alexioua and Paraskevaa (2010) examine the computer science, university students, by implementing an e-portfolio and its potential to enhance self-regulated learning skills. Both quantitative and qualitative statistical analyses were used to evaluate, and the result indicated that higher levels of cognitive factors were associated with higher levels of motivational and affective factors, across all phases of

self-regulated learning and e-portfolio implementation. Thus it was concluded that the process of structuring an e-portfolio as a learning strategy can be used to enhance self-regulated learning skills.

Self-Regulation can be developed in several ways such as explicit instruction, problem-solving, and a collaborative approach. Technology can also support the development of SRL skills. In the book "Self-regulated Learning in Technology Enhanced Learning Environments: Problems and Promises", Bartolomé and Steffens (as cited in, Beishuizen, 2010, p-27) identified three requirements for technology-enhanced learning environments supporting SRL:

- Learners should be encouraged to plan their learning activities. To be able to plan, students should have the opportunity to develop planning and time management skills.
- Learners should be encouraged to monitor their activities.
- Learners should be encouraged to evaluate learning outcomes with the help of performance criteria provided by the TELE.

Similarly, Bartolomé and Steffen (2011, p-23) in the book "Self-Regulated Learning in Technology Enhanced Learning Environments; A European Perspective" gave the characteristics to a Technology Enhanced Learning Environment (TELE) should have to support SRL. Following are the given characteristics:

- A TELE should encourage the development of Planning skills and Time Management Skills (blogs, Personal Learning Environments).
- It should give a feedback form. (E-portfolios).
- Provide Criteria for the teacher and students to evaluate their learning

outcomes.

According to Bernacki et. al,(2011), Students who engaged in Self-regulated learning show a higher rate of learning in Technology Enhancing Learning Environment as compared to their peers who practised lesser Self-Regulated Learning. Research studies also show that technology can enhance SRL skills in students. This is supported by studies such as Barber et.al., (2011) who conducted a study on undergraduate students to examine the extent to which technology can facilitate Self-Regulated Learning. MyGrade Application in Blackboard is a technology that allows instructors to post students' grades on all course assignments, exams, quizzes and other projects and show running course percentages which students can access anytime. It was found that students who access the MyGrade Application were better able to monitor their grade performance and have significant improvement in their exam performance as compared to those who did not use the application. The students also reported that accessing the application helped adjust their study habits as well as classroom habits.

Johnson et.al (2014) mentioned in their studies that the elements of the Digital Learning Environment (DLE) facilitate the development of self-regulated learning strategies as it provides curriculum material and instructional procedures which enable students to clarify understanding of the task, develop effective plans and monitor personal mastery of learning requirement.

According to Barak (2014), as stated, "Technology education has the potential of being one of the best platforms for fostering students' self-regulatory behaviour in school for several reasons".

- Firstly, technology studies deal with issues that could interest

students personally, enhance their imagination, relate to daily life or concern the needs of individuals and society, for example, individuals with special needs.

- Secondly, technology studies put into practice the notion of 'learning by doing,' which educationalists recognized long ago as being an essential ingredient in developing an individual's cognitive and social aptitudes.
- Thirdly, technology studies take place in a rich learning environment, which includes, for example, materials, tools, instrumentation and computers. Moreover, while in many disciplines computers and communication technologies serve as aides for instruction and learning, in technology education the students often use computers and other interactive technologies as an integral part of the systems they design and construct.
- And fourthly, in learning technology students get feedback not only from their teachers and peers but also from their success or failure in their efforts to design, construct, troubleshoot and improve original and useful artefacts and systems.

Zhao, Hong and Chen, Li (2016) studied the relationship between self-regulated and e-learning 2.0 environments, the findings indicated that e-learning influenced self-regulated learning significantly by information quality, communication quality, and user satisfaction. The findings also show that System quality and service quality influenced self-regulation by way of communication quality and user satisfaction as the intermediated variable. Fung et al. (2019) also found that self-reflection prompts in the personalized weekly e-Learning Journals improved the self-regulated learning

(SRL) of university students.

Kizil and Savran (2016) conducted a study on 777 university students of English as Foreign Language (EFL) learners to examine the use of ICT tools to self-regulate their language outside the formal instruction setting. The survey study revealed that EFL learners used ICT to regulate a different aspect of the language learning experience by using self-regulated learning factors such as goal commitment regulation, active regulation and resource regulation. Similar findings of ICT supporting self-regulated learning is confirmed by the study of Dettori et.al, 2008; Celik et.al, 2012; Onivehu et.al.,2018; Khampirat, 2021; Su et.al., 2021.

Chelgoum (2017) studied the EFL classes to identify the effectiveness of online platforms on the self-regulation of students for which findings indicated that experimental group students have improved in their self-regulated learning as compared to control group students.

Dominguez and Marcelo (2017) conducted a study on 711 university students to find out whether students use technology to self-regulate their learning. The study revealed two groups of students with different self-regulated levels; though the students used the technology frequently they did not use technology to regulate their learning process, however, when learning another group of students used self-regulated strategies with technology. The study also revealed that students used Internet information search and instant communication tools continually of all technologies analysts.

Wong et.al (2018) conducted a study in primary schools with a sample size of 147 students; the traditional teaching method classroom was replaced with an i-classroom such as online educational resources, mobile and classroom technological tools to investigate

its effectiveness in promoting self-regulated learning strategies in three key aspects: learning motivation, planning and management, and self-monitoring.

These key aspects of self-regulated learning were investigated by comparing students' grades and academic performance. The result indicated that after the implementation of the i-classroom students were found to be active in learning, search for learning material and are aware of suitable learning and teaching methods for themselves however they were not good at self-assessment.

Blended learning is inevitable in classroom teaching-learning, as teachers deliver lessons with technology as supplemental tools for more efficient and effective learning. Uz and Uzun (2018) conducted a study to study the influence of blended learning on the development of SRL among University students. The sample consisted of 167 students and was divided into three groups, one group is the experimental group in which blended learning was applied and the other two were the control group. The study shows that the experimental group in the blended learning environment progressed better in terms of improvement in Self-Regulated Learning skills than the first and second control group.

A study conducted by Bahri et.al (2019) also supported the findings that technology supports the improvement of self-regulated learning skills as the students who inferred moodle-based learning were found to be effective in developing self-regulated learning skills. Furthermore, Uysal and Gundogdu's (2019) study also shows that there was a positive correlation between the attitudes toward web-based instruction and self-regulated learning skills among University students.

Supriyono et.al. (2020) study revealed a significant positive correlation between technology acceptance and self-regulated learning, thus technology acceptance contributes to self-regulated learning. The finding further indicated that students use technology to regulate their language through various self-regulatory skills.

In summary, the reviewed literature depicted that technology was supporting self-regulated learning.

Implication

From the above review of related literature the following implication can be drawn:

Technology is becoming more personalized and hence it enables the students to plan and manage their learning. For example, Personalized Learning Environment (PLE) allows students to plan their own goals and organize learning in a personal web environment. Personalized student computers will enable students to enhance their lesson planning as well as schedule time for task completion; this will enable them to have a clear vision of the task completed within a time framework. There are also lesson planning applications and websites on mobile phones that students can easily access which can assist them to plan out lessons. Note-taking methods in web-based learning will also enable students to take note of important information while going through online learning resources and thus enabling them to reorganize notes.

There are various applications, learning management systems and online classroom platforms that will enable the students to monitor their learning; technologies like E-Portfolios and Google classroom will enable students to monitor their performances and keep track of their grades, project work,

and areas in need of improvements, achievements or performances in different activities. This will help them be aware, motivated, and monitor learning to reach the desired goals. Applications like 'MyGrade' and 'Grade' can be used by students to monitor their semester exam performance, and check their progress by the total averages and semester average; students can also set reminders and goals and adjust their study habits. Information and Communication Technology (ICT) used in the classroom can also be used for the promotion of self-regulated learning behaviour. Introducing computer knowledge and skills to students at an early stage and integrating through a transitional phase from easy to difficulty level is recommended as Paraskeva (2007) mentioned that computer self-efficacy enables a student to confidently use learning strategies.

Learning Management Systems such as Moodle, Blackboard and various other teaching apps allow teachers to create online learning resources and assignments for the students; these allow students to create their own learning material with meaningful, accurate and accessible information. These digital learning allow students as well as the teachers to monitor students' progress. One of the great advantages of Technology in enhancing self-regulated learning is Evaluation. It can be in the form of peer review or feedback. The teacher can give feedback on the student's performance or students evaluate their overall performance in the feedback form. Technology like Google classroom will enable the teachers to give immediate feedback on students' assignments and activities performance. This will help the students to reflect on their behaviour, skills, performance etc hence re-modify goals, strategies or thinking styles if necessary.

Metacognitive, Behavioral, and

Motivation are very important components of SRL. Thus, Technology can promote these SRL components to some extent as it allows them to plan, monitor and evaluate learning by portraying a clear mental picture of their learning goals and strategies and execution, availability of learning resources, feedback, etc.

Conclusion

The finding from the reviewed works of the literature shows that technology can be used to enhance or promote Self-Regulated Learning. Technology facilitates learning and influences the development of Self-Regulated Learning. It is a tool that enables a learner to plan, monitor and execute strategically as well as motivates the learning process. However it can be complex therefore, it has to be carefully carried through and introduced to the students with plans, strategies and expected outcomes. In a learner-centred environment, a teacher is a facilitator, so keeping this in mind during the initial stage; a teacher should guide the student with the concept and knowledge of technology. If the growing competence in the students is observed, the students can go on with their independent learning, setting their individual desired goals and strategies for achieving the goals. It is important to introduce the concept to the students so that they would not proceed blindly with trial and error but with objectives and strategy in mind.

Teaching-learning paradigm is a learner-centred approach, therefore technology and self-regulated learning skills will be helpful for students to attend optimum learning i.e. Life-Long Learning. Through the review of literature on the study 'Self-Regulated Learning and Technology', it has been realized that only a limited number of studies have been carried out and therefore more empirical research is needed with conclusive findings. In conclusion, the

present review study calls for the need construction for Technology enhancing for quantitative research and tools Self-regulated learning skills.

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