

CHAPTER - 2

REVIEW OF LITERATURE

The goal of this chapter is to give a review of the literature on the link between technology use, academic achievement, student engagement, and self-directed learning. Gaps in the literature were discovered throughout the evaluation process, and these will be addressed in the current study.

2.1 Technology usage and academic performance

According to Glenn (2000), for Net Generations to offer individually meaningful learning experiences, self-directed learning opportunities, and interactive environments, different types of feedback and assignment choices that draw from a variety of resources are required. Contrary to popular belief, Hay (2000), younger generations prefer more active, inquiry-based learning approaches and are less inclined to simply take in information. According to Candy (2004), learning settings that meaningfully integrate technology may have a major impact on self-directed learning because they connect students to resources in ways that were previously unattainable.

Trimmel & Bachmann (2004), children who used technology in school had better rates of involvement, more learning interests, and more performance motivation than those who did not..

Gulek & Demirtas (2005) demonstrated using a longitudinal method that the usage of technology has a direct impact on student engagement and learning results. Those that used technology had higher GPAs.

Suhail & Bargees (2006), in a study of Pakistani university students, it was discovered that using technology to better understand the curriculum and subject matter had a positive effect on the students' learning outcomes.

To determine the connection between student involvement activities and their use of technology, Laird and Kuh conducted this study in 2005. The use of technology and student participation was found to be strongly positively correlated.

Oblinger and Hagner (2005) believe that traditional teaching methods rapidly become boring and that pupils in the digital age display a need for more varied kinds of communication.

Lei and Zhao (2007) investigate how students utilise technology, the software programmes that are most popular with them, and the software programmes that can improve student performance in the classroom. According to the study, youngsters may benefit from periodically using computers to improve their learning outcomes.

S.-Y. Chen & Tzeng (2010) contend that rather than how much time students spend online, what they do online has a bigger influence on their results. Students are not required to utilise technology only for academic purposes, the research claims Bennett et al., (2008). Henderson et al. (2015) found that the majority of students' internet usage habits were unrelated to their academic objectives.

According to Drain et al. (2012) students' grades increased when they employed technology successfully to support their learning goals. According to the study, students who recognised using technology in their assignments, projects, and themes performed far better than those who did not. According to research, students' involvement in the topic directly correlates with their usage of technology Fonseca et al., (2014). Another study discovered that youngsters learned more well in modern classrooms Hwang et al., (2015).

Drain et al., (2012) discovered that when students used technology appropriately to further their learning objectives, their academic performance-as indicated by their GPAs-improved. There was a noticeable difference in performance between students who reported using technology more frequently to contribute to their projects, assignments, and themes.

Reese Bomhold (2013) presents the results of a study on smartphone app usage among undergraduate students in this article Students search for academic materials through apps. The most typical method for locating academic information is through search engines.

According to **Wentworth and Middleton (2014)**, the effect on academic performance is getting worse as college students use technology more frequently both inside and outside of the classroom. Despite the fact that cognitive theory and research clearly indicate a negative effect, other studies have found little to no effect.

To explain and balance these contradicting findings, our study examined a wide sample of students. The author looked at the relationship between students' usage of technology and their academic performance as shown by their GPA, SAT scores, study habits, and expected course grade.

Both theories received some acceptance. There was a weak but unfavorable correlation between students' GPAs and the amount of time they spent on computers each week. The amount of time spent studying and the amount of time spent on computers each week, on the other hand, had a larger inverse association. Because of this, those who used computers more frequently had lower GPAs and spent less time in class than those who used them less frequently. The inverse was also true: Those who used computers less frequently had higher GPAs and invested more time in their studies than those who used them more frequently.

According to research, most students' online behaviors have nothing to do with their academic goals Paretta & Catalano, (2013). He studied 730 students in the library and found that their academic motivation accounted for 60% of their behavior. For 73 percent of students, non-study activities included checking emails, accessing Facebook, and visiting other websites.

Fonseca et al. (2014), according to research, student direct participation is related to how much technology is used in relation to the subject matter.

Lin et al. (2015), a different study discovered that better classrooms led to better student learning outcomes. According to Lepp et al., (2014), what students do online has a greater impact on their outcomes than how much time they spend online. The survey found that students are not only expected to use technology for academic purposes Kennedy et al., (2008).

Dukic and colleagues (2005), the objective was to provide an overview of how college students utilised cellphones for research and their opinions on whether or not they were effective teaching aids. The findings demonstrate that LIS students value using their smartphones for academic purposes and do so regularly. They use their smartphones to access course materials, look through the library catalogue, collaborate on group projects, and take notes, among other things. Although they are still underutilised, the aforementioned university libraries provide a variety of mobile

device services. The smartphone's small screen is a significant barrier to using it for academic purposes.

Ainin et al. (2015) look into how Facebook use affects students' academic performance additionally, it examined how socialization affected Facebook usage. In order to get empirical data from 1165 university students in Malaysia, a questionnaire survey was used. Facebook usage is influenced by the idea of social acceptance, not acculturation (assimilation to a foreign culture, frequently the dominant one). The results also showed a relationship between students' Facebook usage and their perceived academic success, with higher usage being associated with better performance.

Dukic et al (2015), the purpose of the study was to provide an overview of how college students used cellphones for research and to gauge their attitudes toward the suitability of smartphones for learning. According to the findings, LIS students regularly use their smartphones for studying and consider them to be very helpful for their academic work. They use their smartphones to take notes, search the library catalogue, access course materials, work together on group projects, and more. Although the two university libraries in question provide a variety of mobile device services, these services are not frequently used. The small screen of the smartphone is a major barrier to using it for academic purposes.

Hawi & Samaha (2016), sought to ascertain whether youngsters who were at a high risk of Smartphone addiction might achieve outstanding academic success. It also determined if male and female students were equally affected by these phenomena. The study found that both male and female college students are prone to Smartphone addiction. Additionally, university students who were equally addicted to their smartphones had cumulative GPAs of distinction or above.

Chen & Yan (2016), focused on three areas as they reviewed recent research on the impact of mobile phone multitasking on academic achievement. To completely comprehend the phenomenon of mobile phone multitasking and to help students avoid multitasking distractions and develop effective multitasking skills in today's culture, it was suggested that systematic research programmes are required.

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determined if male and female students were equally affected by these phenomena. The study found that both male and female college students are prone to Smartphone addiction. Additionally, university students who were equally addicted to their smartphones had cumulative GPAs of distinction or above.

Chen and Yan (2016), in order to evaluate the mounting evidence, concentrated on three themes linked to the impact of multitasking on academic performance: What impact does smartphone multitasking have on learning? (a) How does cell phone use affect education? (b) How can I avoid being distracted by my phone? Multiple methods were employed to find the current research literature, and the discovery of 132 papers between 1999 and 2014 was the result. The results of these studies were contrasted with those of an earlier inquiry into mobile phone multitasking and driving, which was the initial area of study into the subject. Both new research endeavours and existing research limits were noted. Mobile phone multitasking has been discovered to disrupt learners in a variety of ways and processes, and a variety of tactics can be used to prevent and manage the distraction. In ten sessions of the same course at an online university in Kwangju, 1,604 students' demographic data (age and employment status), self-reported psychological data (self-efficacy, inventiveness, perceived ease of use, and perceived usefulness of mobile (LMSs), and external factors (subjective norms) were gathered. The outcomes of the logistic regression revealed that the adoption of mobile LMSs among students was largely determined by their age and employment status, as well as possible associations between mobile LMS use and gender, age, and psychological traits. The study also found that using a mobile LMS improved academic success for online students. The study also found that using a mobile LMS improved academic success for online students. The results of this empirical study help us understand how mobile devices are used by students in higher education.

Heflin et al. (2017), assessed students' involvement, critical thinking, and attitudes toward collaborative learning in three distinct collaborative learning contexts, both with and without mobile devices. According to the research, mobile technology is connected with increasing student disengagement in class as well as favorable student impressions of collaborative learning. More so than other type of collaborative learning environment, the tools used to create written solutions were linked to students' critical thinking. Students who utilised a mobile device to create paragraph

responses shown significantly more critical thinking than those who typed or wrote their comments by hand.

Nayak (2018) in his study found that female students use their phones more frequently than male students. However, it has been demonstrated that male students experience a considerable impact on their academic performance.

Iftene and Trandabăț (2018) four AR apps were created by for four different groups of children: autistic children, kindergarten children, middle-aged children, and high school students. The main objective is to observe children's responses to augmented reality apps and the effects they have on both children and teachers.

Felisoni & Godoi (2018) in order to increase students' self-efficacy in social networking and professional development, Anders (2018) employed networked learning. It was discovered that networked learning greatly boosted self-efficacy for social networking and professional development activities. In order to determine whether there is a connection between students' daily smartphone usage and their academic achievement, carried out a study. This study adds to the growing body of knowledge about the dangers of excessive smartphone use, and it should be of interest to academic stakeholders like teachers who are worried about how technology may affect students' academic performance.

Chang et al. (2019) carried out a study with Turkish students and used SEM to analyse the data. The study's results show that task-related compulsive internet use and some types of academic social media involvement are beneficial to students' academic progress.

Johnson & Radhakrishnan (2019) it was the goal of to look into how often students used their smartphones in the classroom. Students may utilise smart phones for academic purposes in a variety of ways, including basic reading, browsing, and downloading academic resources, according to an exploratory study. Their motivation to participate in class, their capacity to learn, and their ability to prepare and turn in assignments on time all improve as a result.

Chang et al. (2019) aimed to distinguish between task-related and non-task-related compulsive internet usage, as well as academic and non-academic types of social media involvement, in order to predict academic success. The results show that task

related compulsive internet use and academic social media participation have a positive effect on academic achievement.

Chang et al., (2019) Turkish student data was examined by who used SEM to analyse it. The results of the study show that task-related compulsive internet use and academic types of social media involvement have a favorable impact on students' academic attainment.

Dunn & Kennedy, (2019) were interested in how students' grades were impacted by their emotional, cognitive, and behavioral involvement with TEL as well as how motivation levels varied across various types of TEL. The statistics show that internal motives predict usage whereas external goals affect engagement. Importantly, involvement rather than use was associated with higher grades.

Sana et al., (2013) several studies have concurrently found a link between technology use and subpar academic achievement. The sheer pervasiveness of information technology is impeding learning, claim Fuchs & Wößmann (2004). According to the findings of a comprehension exam, using technology in the classroom had a negative effect on students' accomplishment.

Tiwari (2020) this study was carried out by to look at the significant variables influencing university students' impressions of online learning. The Unified Theory of Acceptance and Use of Technology (UTAUT) paradigm, which explains how opinions of online courses among students are connected, serves as the foundation for the study. In addition to the UTAUT model's structures, the elements of perceived cost are included (Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions). 430 undergraduates from Mathura's GLA University completed online questionnaires (India). The Behavioral Intention to Adopt Online Classes variance is explained by the expanded UTAUT model in 62.3 percent of cases.

To learn more about how students utilise smartphones in the classroom, Johnson and Radhakrishnan (2020) conducted a study. Students may utilise smart phones for academic purposes in a variety of ways, including basic reading, browsing, and downloading academic resources, according to an exploratory study. Their motivation to participate in class, their capacity to learn, and their ability to prepare and turn in assignments on time all improve as a result.

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Toquero, (2020) this article explores how COVID-19 has affected higher education and how it might change in the future to address new issues. This article exhorts academic institutions to conduct research in order to disseminate knowledge on and compile data on the pandemic's effects on the educational system. Furthermore, there is a larger need for educational institutions to create curricular strategies and modify them to meet students' educational needs outside of traditional classroom settings.

Malik and associates (2020) the study's objective is to determine whether certain online psychosocial wellbeing and online activity indicators are associated with social media fatigue. The most accurate indicator of social media fatigue was determined to be the quantity of time spent on social media. Other significant signs of social media fatigue included self-disclosure and online social comparison. According to the findings, social media fatigue may contribute to subpar academic results.

Aristovnik and associates (2020) the research is the widest and most in-depth analysis of students' perceptions of how the COVID-19 crisis's initial wave will affect several elements of their lives internationally in early 2020. According to the study, which included 30,383 students from 62 different countries, students were most pleased with the academic support and public relations efforts of their institutions throughout the global closure and change to online learning. Nevertheless, because they lacked computer literacy and felt like they were carrying more weight, they found it difficult to recognise their better performance in the new learning environment. The main concerns of students were their upcoming professional prospects and academic pursuits, and they frequently expressed boredom, stress, and

unhappiness. Some hygiene practices, including washing hands and donning masks, have been adopted in response to the pandemic, while others have been outlawed (e.g., leaving home, shaking hands). Students also felt that hospitals and universities played a more positive role in the pandemic than did politicians and banks.

Alghamdi and colleagues (2020) it has been established that multitasking in the classroom is detrimental to pupils' academic performance. The self-efficacy for self-regulated learning (SESRL) measure was used to examine the indirect effects of multitasking on academic performance (i.e., Grade Point Average [GPA]) in both males and females (i.e., by gender). The SESRL and measures of multitasking behaviors were given to university students in both online and conventional (i.e., face-to-face [F2F]) format courses. The two methods under consideration were basic mediation and moderated mediation. According to the basic mediation analysis, the association between multitasking behaviors and GPA was totally mediated by SESRL in F2F classrooms but only marginally mediated in online classes. According to moderated mediation effect evidence, only female students in entirely online courses appeared to experience a substantial indirect effect. Higher SESRL scores among female students are associated with greater academic performance because online multitasking has less of an impact on their GPA.

Mahdy (2020) this cross-sectional study's objective was to determine whether the COVID-19 lockout had an impact on the academic performance of experienced medical students and researchers. The data showed that the majority of participants' academic success was affected to varying degrees by the COVID-19 pandemic lockdown (96.7 percent). Even if self-study is an option in online learning, it is still very difficult to provide practical teaching in the field of veterinary medicine. Because most online courses are practical, learning there could be difficult.

Bozkurt et al. (2020) this report details the overall situation, viewpoints from K–12 and higher education environments, lessons learned, and suggestions. It is the product of collaboration between 31 countries worldwide, which together make up 62.7 percent of the world's population. According to the findings, the methods used today can be classified as emergency remote education, which is different from planned activities like online learning, distance education, and other derivatives. Additionally, there is the value of each incidence for each nation. This study highlights how social injustice, the digital divide, and unfairness were all made worse by the pandemic. If

these issues are to be resolved, specific and targeted solutions are required. Since parents are stressed by their usual daily and professional commitments as well as the expanding educational responsibilities, pedagogy of care, compassion, and empathy is necessary. To varying degrees, all parties are going through trauma, mental stress, and anxiety.

Toquero (2020), this essay examines how COVID-19 will affect higher education and how it might adapt to meet new difficulties. In this article, educational institutions are urged to do research to distribute information on and document the pandemic's effects on the educational system. The need for educational institutions to improve their teaching methods and modify their curricula to better serve their students, even outside of the traditional classroom, is also growing.

Malik et al. (2020), the purpose of the study is to determine whether certain online behaviors and indicators of psychological health are related to social media fatigue. The most accurate indicator of social media tiredness was determined to be the quantity of time spent on social media. Other notable indications of social media exhaustion included self-disclosure and social comparison online. The results also imply that social media fatigue worsens the drop in academic performance.

Aristovnik et al. (2020), The study offers the most in-depth and comprehensive analysis to date of students' perceptions of how the initial wave of the COVID-19 issue will impact several parts of their lives abroad in early 2020. Students were most satisfied with the assistance they received from lecturers and their universities' public relations during the global lockout and shift to online learning, according to the research, which comprised a sample of 30,383 students from 62 countries. People were unable to recognize their own enhanced performance in the new educational environment because of their inadequate computer abilities and a belief that they were working harder. Concerns about education and work in the future, as well as boredom, worry, and dissatisfaction, were among students' top concerns. Some common actions have been discouraged due to the outbreak, while others, including hand washing and mask wearing, have been adopted (e.g., leaving home, shaking hands). For how they handled the financial crisis, students gave hospitals and colleges higher grades than governments and banks.

Alghamdi et al. (2020), According to research, multitasking in the classroom hurts students' academic performance. In this study, the association between academic success (measured by grade point average [GPA]) and self-efficacy for self-regulated learning (SESRL) in both males and females was investigated (i.e., by gender). Assessments of multitasking activities were conducted with university students in traditional (face-to-face [F2F]), online, and SESRL classroom settings. There were two distinct forms of unmediated and straightforward mediation examined. SESRL marginally mediates this association in online classes compared to F2F classrooms where multitasking tendencies and GPA are connected, according to the fundamental mediation study. Only online classes showed evidence of a moderated mediation effect, perhaps because only female students had a substantial indirect impact. Higher SESRL scores for female students improve their academic performance since online multitasking has less of an impact on their GPA.

Mahdy (2020), the current cross-sectional study set out to determine how the experienced medical students' and researchers' academic performance was impacted by the COVID-19 lockout. The majority of participants' academic success was affected in a variety of ways by the COVID-19 pandemic lockdown, according to the data (96.7 percent). The largest challenge with veterinary medical science online education is how to give practical instruction, even while self-study is an option. Because the vast majority of online courses are practical, it is challenging to learn something online. Students consider it difficult to complete veterinary competences just through online education. It might be improved in a number of ways, including by making online training more interactive, depicting medical procedures in actual clinical settings, giving clear instructions, and including 3D virtual instruments to simulate the real scenario. Drain et al., 2012- According to the study's authors, students who used technology responsibly to improve their learning outcomes had higher academic accomplishment, which was reflected in each student's individual GPA. Particularly, the results supported the notion that students who claimed to use technology more regularly for projects, assignments, and classes scored marginally better than those who claimed not to.

According to Fuchs & Wößmann's (2004), "the sheer pervasiveness of information technology is inhibiting learning." The findings of a comprehension test revealed that employing technology in the classroom had a negative effect on students'

achievement.

Nayak (2018) according to the poll, female students utilised their smartphones more often than male students. However, it has been found that male pupils' academic performance is disproportionately impacted.

Chen & Tzeng (2010) according to the study, what kids do online matters more than how much time they spend there in terms of affecting the outcomes? Furthermore, research indicates that students don't always need to use technology for academic goals.

Henderson et al. (2015) this survey also discovered that most students' internet usage had little to no effect on their academic performance. He observes 730 students individually as they behave in the library and finds that while 33% of them are engaged in activities like checking their e-mails, using Facebook, or visiting other websites, 60% of their overall behavior is devoted to their studies.

Tiwari (2020) researchers conducted this study to learn more about the key factors affecting university students' opinions toward taking online programmes. The study's foundation is the Unified Theory of Acceptance and Use of Technology (UTAUT) paradigm, which explains how students' views regarding online courses are related. Along with the UTAUT model's constructions, the elements of perceived cost are also incorporated (performance expectation, effort expectation, social influence, and facilitating conditions). Online questionnaires were given to 430 undergraduate students at GLA University in Mathura (India). The application of the multiple regression approach found that social influence had a minor but significant impact on behavioral intentions to take online courses, whereas performance expectations, effort expectations, and enabling factors had a large and meaningful impact. It was decided that the apparent expense was unimportant. The enlarged UTAUT model accounts for 62.3 percent of the variation in behavioral intention to accept online courses.

Wentworth & Middleton (2014) the researcher in this study made the hypothesis that it would become more important to find an answer to the topic of how technology use affects academic performance as college students' use of it grows gradually both inside and outside of the classroom. Cognitive theory and research on multitasking, however, strongly suggest a negative effect, even though some studies have found little to no effect. This study used a sizable sample of students in an effort to provide

explanation on these contradictory findings. The relationship between students' use of technology and their academic standing—as indicated by their GPA, SAT scores, study habits, and projected course grade—was examined by the author. The correlation between students' GPAs and their weekly computer use was found to be weak but statistically significant. However, there was a substantial inverse relationship between the amount of time spent each week using computers and the amount of time spent studying. Therefore, people who used their computers more often had lower GPAs and studied less than those who used them less frequently. The contrary was also true; individuals who used computers less frequently had higher GPAs and spent more time studying than those who utilised them more frequently.

Chang et al. (2019) Turkish students participated in this study, and SEM was utilised to assess the data. The study's findings demonstrated that students' academic performance is positively impacted by task-related compulsive internet use and use of academic social media.

Hawi & Samaha (2016), the purpose of this study was to ascertain whether students who are very susceptible to Smartphone addiction have lower chances of achieving a notable academic achievement. It also demonstrated that both male and female pupils were equally impacted by this phenomenon. The results suggested that smartphone addiction can be an issue for college students of both sexes. Within the same levels of Smartphone addiction, university students of both sexes achieved cumulative GPAs with distinction or higher.

Felisoni & Godoi (2018) to determine whether there is a link between students' actual daily smartphone use and academic accomplishment; the researcher conducted an experiment in this study. This study offers new proof of the possible harm of excessive smartphone use for educators and other academic stakeholders interested in the subject of how technology influences students' performance.

Carmona-Halty et al. (2021) this study examined the relationship between positive emotions and academic achievement as well as the mediating roles of academic psychological capital and academic engagement using a sample of 497 high school students from Chile. The participants' average age, which ranged from 14 to 17, was 15.71 (SD = 1.15). The correlation between positive emotions and academic success was found to be moderated by academic psychological capital and academic

engagement, as predicted by our model (GPA). The proposed approach offers both theoretical and practical implications for educational contexts. Principals, teachers, and parents must focus on the development of positive emotions in children in order to promote academic psychological capital and academic engagement, which may in turn lead to increased academic accomplishment.

For the straightforward reason that increased academic performance opens the door to a better future for any country, the nebulous concept of student academic achievement is accorded enormous weight. The importance of comprehending the concept's integrities is equally enormous. The current study aims to examine the various meanings of "academic performance" and address the factors assumed to influence the academic performance of students enrolled in higher education institutions (HEIs). The validity of the "Grade Point Average" (GPA) as a tool for determining academic accomplishment has also been explored in more detail.

Aristovnik et al. (2020) the survey provides the most thorough and in-depth examination to date of how students believe the first COVID-19 issue will affect several aspects of their lives abroad in early 2020. The study, which surveyed 30,383 students from 62 different countries, found that throughout the global lockdown and shift to online learning, students were most pleased with the assistance from academic staff and the public relations initiatives of their universities. Individuals, however, were unable to recognise their own enhanced performance in the new educational setting due to insufficient computer skills and a sense of expending more effort. In addition to feeling bored, anxious, and frustrated, students' top concerns were related to their education and future professional employment. The study provides the deepest and most thorough examination to yet on how students perceive how the COVID-19 crisis's initial wave will affect several aspects of their lives internationally in early 2020. The study, which included a sample of 30,383 students from 62 nations, discovered that students were most satisfied with the support provided by academic staff and the public relations efforts of their universities during the worldwide lockdown and transition to online learning. However, due to inadequate computer abilities and a sensation of exerting more effort, people were unable to recognise their own improved performance in the new educational environment. Students' top worries included their education and future employment as well as feelings of boredom, anxiety, and frustration. When formulating policy suggestions and activities to help

students during this pandemic and any any in the future, policymakers and higher education institutions around the world may find value in these findings.

Rudd et al. (2021) academic resilience has the potential to improve learning outcomes for children who are at risk of dropping out of school, but there is no proven technique for testing it. This study aimed to provide a summary of the approaches taken over the preceding 20 years in quantitative research to measure and analyse academic resilience. Our research went beyond earlier evaluations by focusing on how academic resilience has been operationalized as a specific construct. In a thorough assessment of the literature, 127 studies were identified that used quantitative data to draw conclusions about academic resilience. The three distinct ways for measuring academic resilience identified by theme analysis methodologies are definition-driven, process-driven, and latent idea approaches. The results that academic resilience researchers might draw are influenced by how well each of these approaches fits with different types of studies. We look at the results of these measurement variations. The utilisation of robust traits and the absence of risk indicators in existing evaluations may seriously impair the validity of studies addressing the idea of academic resilience. The purpose of the study, the value of the findings, and the inclusivity of the evaluation method are some of the micro level variables that influence how researchers decide how to operationalize academic resilience. This study demonstrates the value of considering the methodological decisions made by researchers and advances the understanding of academic resilience as a separate term in the field of resilience research.

Gonzalez and et al. (2022) research on the effects of online homework systems vs traditional ones on student achievement is contradictory. This uncertainty may be caused by methodological issues with the research design in addition to technical differences. Hypothesis In this initiative, students from five Engineering degrees will practice their assignments using tasks that the "e-status" platform automatically generates. Instead of comparing students using the platform against those who aren't, we divided the material into two blocks and created nine probability tasks for each block. Then, at random, the students were put in one block to finish the tasks there using e-status. In the task, the teachers and reviewers were disguised. Five weeks after receiving the assignment, each student answered to a written test that asked questions about every subject. The primary finding of the study was the discrepancy between

the test scores for the two blocks. The two groups each contained 166 students, or 163. The test was taken by 103 and 107 of these, respectively, with the other candidates earning a score of 0. While the average score for those who were assigned to the first block was \$1.85, it was \$3.29 (with a 95% confidence interval of \$2.46 to \$0.43) for those who were assigned to the second block. Less than three hours were spent on problems on average during the period they had access to the platform before the test. Our findings indicate that students' performance can benefit from even a small amount of active online effort.

Information and communication technologies (ICTs) have been the subject of debate up until this point in time. ICTs are commonly considered to be changing the way that people learn, but actual research to date has not consistently supported these claims. Many studies that support the positive effects of ICTs on attainment concentrate mostly on developed countries. By providing data from the tertiary education system in Tunisia, this study aims to highlight the knowledge gap about the impact of ICT on education in developing nations. In order to evaluate the impact of ICT availability and use along with other student, university, and teacher factors that may affect academic achievement, a multilevel study was conducted utilising survey data from 377 college students and teachers. The results revealed a distinct, albeit negative, effect of ICT on performance, raising questions about the effectiveness of Tunisia's educational initiatives. The findings also suggest that strengthening university support is essential for enhancing ICT's benefits on learning.

Fahim et al. (2021) the COVID-19 pandemic placed upon humanity a new system and a different pace. In these times of epidemics, education must change and reinvent itself by seeking for new chances employing digital technology in online learning environments. Therefore, it is necessary to comprehend the crucial factors that affect academic accomplishment when learning online. Discussing how time management, course load, and student characteristics impact online learning is the main goal of this study. Examining the effects of online learning on academic achievement while accounting for burnout, technology, and teacher is the main goal. The notable business schools from which the information was acquired from 313 students included IBA, SZABIST, LUMS, IQRA University, and Institute of Management Sciences. The data were analysed with PLS-SEM and SPSS. Time management, course load, and student characteristics are found to have a significant impact on

online education. The results also imply that burnout is not a mediating factor in the relationship between academic success and online learning. This study also investigated the potential effects of teachers and technology on students' performance in online courses. The results show that the instructor's involvement moderates the link; technology has no moderating effect.

Smith et al. (2021) student achievement has been increased in varied degrees by online films used to supplement classroom instruction. This analysis suggests that the majority of the online video literature consists of observational studies that do not take confounding variables into account, which is the cause of the conflicting results prior to COVID-19. The effects of therapy on observational studies were quantified in this study using the difference-in-differences (DID) method. The following participant groups underwent assessments of the films' therapeutic effects: 1) The entire group that used the videos, 2) The group that first received failing marks but later received passing grades, and 3) The group that was divided into grade percentage ranges. While the movies had no effect on the entire class, it was found that they had a significant influence on pupils who had initially received failing grades, particularly those with scores between 40 and 49 percent. One important finding was that the student's starting grade affects how well the online films raise grades.

Alghamdi et al. (2020) multitasking in the classroom is detrimental to pupils' academic achievement, according to study. The relationship between academic achievement (as determined by grade point average [GPA]) and self-efficacy for self-regulated learning (SESRL) in both males and females was examined in this study (i.e., by gender). Assessments of multitasking activities were conducted with university students in traditional (face-to-face [F2F]), online, and SESRL classroom settings. There were two distinct forms of unmediated and straightforward mediation examined. According to the basic mediation analysis, SESRL very slightly mediators this link between multitasking propensities and GPA in online classes as opposed to F2F classrooms. Because only female students had a significant indirect impact, it is possible that only online classes demonstrated a mitigated mediation effect.

Amez & Baert (2020) we present the initial comprehensive analysis of research on smartphone use and academic performance. In this section, we give a summary of the theoretical arguments, empirical methods, and empirical results that have been previously published in the interdisciplinary literature. Our review of the literature

demonstrates that there is a preponderance of empirical data that link frequent smartphone use by students with worse academic achievement. The method used to collect the data, the academic achievement indicators employed in the study, and the smartphone usage metrics all influence how strong this correlation is. The study's primary flaw is the inability to ascribe a causal explanation to the discovered relationships. More study directions are offered in light of the constraints and results that have been analysed.

Mahdy (2020) the recent coronavirus outbreak caused a number of schools and colleges to stop offering classroom education and move to online learning. The current cross-sectional investigation sought to determine how the COVID-19 lockdown affected the academic performance of veterinary medical students and researchers. Students and researchers interested in veterinary medicine were given access to an online Google form survey. The survey was completed by a total of 1,392 respondents from 92 different countries, with a response rate of 94.1%. The statistics show that the COVID-19 pandemic lockdown had a range of negative effects on the majority of participants' academic progress (96.7 percent). The overall average assessment score for online learning was 5.1 2.4, compared to the practical components' average evaluation score of 3.6 2.6. Even though self-study is an option, the biggest challenge in veterinary medical science online education is how to provide practical training. It is difficult to study something online because the vast majority of online courses are practical. Students think it is difficult to complete veterinary skills just through online education. Numerous things might be done to make it better, such as making online training more interactive, showing medical procedures in real clinical settings, providing clear directions, and incorporating 3D virtual instruments to imitate the actual scenario.

2.2 Student Engagement

Student involvement has long piqued the interest of the academic community. Behavioral, cognitive, and emotional responses are all referred to under this general phrase. Student involvement is the amount of time and effort students devote to interacting with others for academic goals (Kuh, 2001). There are several studies on student use of digital tools in the classroom, but few on how these two topics are

related. The previous study shows a link between research and learning depth, but it also raises a crucial question: Does using technology increase student engagement? Their findings suggest that integrating social media and technology as a teaching tool can boost student involvement Tarantino et al., (2013). Students that use information technology for academic objectives are more likely to actively participate, engage, and collaborate with other students, according to their research. Kuh & Laird, (2005) technology encourages a deeper link between the instructors, the students, and the course material, and academic engagement rises as technology use does as well. Students can take part in a learning community because to the many opportunities for teamwork offered by technology. Because they are more engaged with the course material, the learning objectives-including critical thinking and individual student development-are more successfully met.

Gosper et al. (2011) analyzed student technology use and looked into the technologies that kids liked. The findings showed that pupils preferred a range of Web 2.0 teaching resources (emails, learning management systems, You Tube, podcasts).

Laird & Kuh (2005) did this study to look into the connection between technology use and student engagement. It was shown that there was a considerable positive correlation between student engagement and technological use.

Attard & Holmes (2020) this study looks at how teachers may make the most of their pupils' excitement for arithmetic while simultaneously showing their peers that they are adept technology users. Three participant groups-teacher, leader, and student focus groups-provided the information. It was discovered that teachers employ technological tools to create student-centered pedagogies that encourage students' interest in mathematics and to more fully comprehend each student's unique learning requirements.

Farrell & Brunton (2020) this study presents the findings of a qualitative investigation of online student involvement in a higher education setting. Using a case study approach, the inquiry followed 24 online students for one academic year. The results of this study show that a variety of psychological traits, such peer community, an engaging online instructor, and confidence, as well as structural traits, like life load and course design, have an impact on effective online student engagement.

Bond (2020) this narrative systematic review summarises the research on the flipped learning method in K–12 settings that was published between 2012 and 2018 and was indexed in seven international databases. A bio ecological model of student involvement is used to present the findings from the examination of 107 articles, book chapters, dissertations, conference papers, and other pieces of grey literature. The findings show that most studies have been conducted in high schools in North America and Asia, with a slight bias toward quantitative approaches, and have mostly focused on students' impressions of flipped learning and their accomplishments in STEM subjects, particularly Mathematics. With 93 percent of studies reporting at least one feature of behavioral, emotional, or cognitive engagement and only 50 percent of studies reporting characteristics of disengagement, the research examined in this review revealed that the technique is significantly supportive of student involvement. Disengagement is more likely to happen with non-teacher-made videos than with teacher-made ones. Collaboration tools including Google Docs, Google Classroom, and Edmodo were significantly associated to engagement. Less than half of the studies used a theoretical framework, and only 12% of the research described student participation.

Parsons & Taylor (2011) the research literature on student involvement is examined in the study that follows. The goal of this study is to pinpoint curriculum and pedagogical approaches that instructors might use to get their students more involved in the literature they are studying. Before going into the specifics of the research, a succinct synopsis of what was learned through examining the literature is provided to give readers who may be unfamiliar with this area of study some perspective. The findings of this study show that efforts to increase student engagement have advanced in a number of areas, the most notable of which is the focus on engaged learners rather than disengaged students (those who are not learning) (who are learning). It was suggested that more recent study on student engagement, as opposed to earlier research on student involvement, which aimed to "reshape" youngsters back into the educational fold, is open to reforming schools to better fulfil students' learning requirements. This modification, which seems to be important, will probably have an effect on the structure of upcoming research on student engagement.

Zepke & Leach (2010) this article summarises two researches on student participation and proposed improvements. A conceptual organiser for student

involvement is first created by merging 93 research studies from 10 different nations. This conceptual organiser includes all four study-reported elements: involvement for active citizenship, teacher-student interactions, student motivation, and institutional support. Additionally, the essay collects information from various viewpoints into 10 suggestions for increasing student involvement in higher education. In its conclusion, it lists some of the conceptual organizer's drawbacks and suggests a solution for coming up with a more thorough plan for student engagement. To ascertain the impact of the technology, Aslan et al., (2019) carried out a preliminary study. Researchers used a multi-method strategy that included a quasi-experimentation element. A case study and design were developed to analyse how technology has altered the surroundings around the classroom in order to understand environmental and social problems. The results show that technology, student behaviour (such as providing more scaffolding for students), and interaction had a substantial impact on the teacher's classroom (i.e., less boredom). These results suggest that technology might be able to help teachers and educators alike.

Carini et al., (2006), this study looks at three main issues: (1) how strongly experimental and conventional measures of academic achievement are correlated with student involvement; (2) whether these correlations are conditional; and (3) whether different institutions have different capacities for linking student engagement to academic performance. 1,058 students from 14 four-year schools and universities completed various assignments in 2002. However, it was shown that a variety of student engagement metrics were favorably connected with desired learning outcomes, including critical thinking and academic achievement, even though the majority of the correlations were shaky. According to the findings, low-ability students benefit from engagement more than their peers do, first-year students and seniors convert various forms of engagement into academic success, and certain institutions are better at converting student engagement into improved critical thinking test performance.

Groccia (2018) before presenting a multidimensional strategy for creating a wide range of engagement possibilities that result in a rich and difficult higher education experience, this chapter explores the origins and various meanings of student participation.

Rands & Gansemer-Topf (2017) the use of a recently renovated active learning space by instructors and students at Iowa State University, as well as the connection between this design and environmental and behavioral factors of student engagement, were investigated using a responsive case study evaluation approach involving interviews and focus groups. The results show how many active learning practices can be supported in a flexible, open, student-centered environment, and how a classroom's design can promote involvement by utilising affordably priced teaching resources. This case study also emphasises the importance of assessing efforts to remodel classrooms in order to advance and enhance future learning environments.

Schindler et al. (2017) a concept that is generating a lot of interest in higher education due to its connections to a number of beneficial academic outcomes is student engagement. Despite the fact that computer-based technology has permeated many areas of life and business, little is known about how it might be used to promote student engagement. This article's goal is to provide a critical evaluation of research from the preceding five years on how web conferencing software, social media platforms like Facebook and Twitter, online games, blogs, and wikis effect student participation. Before presenting the findings, we thoroughly explained student involvement criteria and indicators. The findings revealed three distinct forms of engagement (behavioural, emotional, and cognitive), which served as the basis for our classification of articles. In terms of their capacity to significantly affect various forms of student involvement, Facebook and online conferences rank second and third, respectively, according to our research. Due of the few research that have been conducted in the previous five years, the results for wikis, blogs, and Twitter are less apparent. In general, the findings offer some preliminary evidence that computer-based technology affects student engagement, but further research is needed to confirm and build on these findings. In order to increase understanding of how computer-based technology may be strategically used to achieve the greatest improvements in student engagement, we provide a list of recommendations for action as part of the essay's conclusion.

(Manwaring et al., (2017) investigated the degree of active student participation in blended learning courses at the university level. They used sophisticated longitudinal methodologies to gather activity level engagement data for 67 students enrolled in six blended courses across two colleges over the course of a semester. They used

structural equation modelling to provide a complete picture of learning environments, including the influence of individual attributes, course design, and student evaluations of the learning experience on immediate cognitive and emotional participation. To examine the temporal relationships between emotional and cognitive engagement, they used cross-lagged modelling methods. According to the findings, multitasking by students significantly reduced their level of engagement, and course design and student perception factors had a greater impact on engagement than individual student characteristics. Students' levels of cognitive and emotional involvement were significantly positively influenced by how much they valued the activity. Participation had a substantial impact on the students' perception of learning and growth.

Quin (2017) indications of teenage students' involvement in school were examined in this study, along with how those indicators connected to interactions between teachers and students (TSRs). The social sciences, psychology, and education were exhaustively searched across seven databases. For a thorough analysis, 46 published articles (13 longitudinal) were included. According to cross-sectional research, higher academic engagement levels were associated with better TSRs. It has been demonstrated that certain student engagement indicators are connected to TSRs (i.e., psychological engagement, academic grades, school attendance, disruptive behaviors, suspension, and dropout). Similar connections were found in longitudinal studies. Longitudinal and cross-sectional associations persisted after characteristics from the individual, family, school, and teacher settings that are known to influence student involvement were taken into consideration. TSRs were proven to play a big part in their relationship with many different student engagement indicators, but not the sole one.

Strati et al. (2017) the sixth sentence of this article's Relations of Challenge and Support subsection should read: ["Results from a baseline null cross-classified model indicated that 53% of the variance in engagement occurred between cells (cross-classification of student and instructional episode), about 37% occurred between-students, and approximately 10% was attributed to instructional episode. In high school science classes, this study looked at correlations between students' perceptions of difficulty, instructor assistance and interference, and students' fleeting intellectual involvement. Analyses evaluated whether the connection between difficulty and engagement was influenced by teacher support, teacher obstruction, and individual

variables including gender and grade level. Separately, the instrumental and emotional components of support and obstruction were examined. While instructors' instrumental assistance was favorably connected with engagement across all levels of perceived challenge, students' perceptions of challenge were positively correlated with their immediate reports of participation in scientific learning activities. Even if emotional support from instructors was not a predictor of student involvement, emotional blockage from teachers had a negative correlation with it. Student involvement was less consistently correlated with teachers' instrumental hindrance and only decreased during the times when students felt the curriculum was more difficult. The association between challenge and engagement was found to be moderated by grade level and gender. The ramifications of the findings for ongoing research and instructional strategy are highlighted. (c) 2019 APA, all rights reserved. PsycINFO Database Record)

Curran & Standage (2017) motivation studies are crucial to understanding why some students are extremely engaged in their learning on a behavioral, cognitive, and emotional level and why some students are uninterested, bored, and quit up (i.e., are disaffected). Using the concepts of self-determination theory (SDT), this essay provides a theoretically informed examination of student participation and disaffection in the context of school physical education (PE). Our approach is centered on the SDT's assertion that meeting basic psychological needs—specifically, those for autonomy, competence, and relatedness—supports successful motivational functioning and wellbeing. Examined is how well these psychological needs are met or obstructed by instructor strategies and class design.

Smallhorn (2017) due to a decline in both domestic and international students attending lectures, teachers have been obliged to reevaluate their instructional approaches and look at strategies that increase student engagement. The flipped classroom idea, which is based on active learning methods, transforms the traditional face-to-face classroom. Students prepare for the flipped classroom by watching fast internet films and undertaking readings on their own time. By collaborating with peers to solve challenges, face-to-face time is used to put learning into practice. Face-to-face education took place in a flipped classroom, replacing our second-year cohort's lectures with brief online videos, which increased engagement and learning outcomes. The impacts of the flipped classroom were examined using survey data,

attendance records, learning analytics, and test outcomes from both before and after it were implemented. The results show an increase in student engagement and a positive perception of the teaching approach. The academic achievement of the kids did not, however, show any improvement.

Schnitzler et al. (2021) student involvement and cognitive and emotional involvement in learning activities, which are driven by elements such as academic self-concept, have a substantial impact on academic success. This study employed a person-centered approach to show how different aspects of student participation are intermingled among certain pupils. Variable-centered studies have successfully demonstrated these correlations. They especially looked at the correlation between the number of hands raised in various engagement patterns and student cognitive and emotional participation. Additionally, it was investigated how these engagement patterns relate to academic success as a consequence and academic self-concept as a precursor. In an empirical investigation, high school students (N = 397) from 20 eighth-grade classrooms were surveyed while a mathematics lesson was watched and recorded. The design included pre- and post-tests, with videotaping done in between. Five within-student engagement types were identified using latent profile analysis: disengaged, obedient, silent, engaged, and active. Students with higher academic self-concept were more likely to exhibit a pattern of moderate to high participation. In terms of end-of-year achievement, pupils with stronger engagement patterns consistently outperformed those with lower engagement levels. These findings demonstrate how person-centered research may illuminate the complexity of student participation. They highlight the need for differentiation beyond just engaging or disengaging students and convey the knowledge that involvement may take many forms, from compliance to busyness.

Heilporn et al. (2021), this qualitative study looked at how instructors promoted student participation in classrooms that included both synchronous and asynchronous activities, or blended learning (BL). Twenty semi-structured interviews with professors who instruct at the undergraduate or graduate level in a variety of areas were done at four different institutions. After then, the data were examined using an inductive methodology. The study consequently gave a thorough and in-depth overview of the instructional approaches used by teachers to increase student engagement in BL. These approaches were separated into three meta-categories based

on the course structure and pace, the choice of teaching and learning activities, the teacher's role and interactions with the students. Everywhere possible, links between the strategies and the behavioral, emotional, and cognitive dimensions of student participation were made. The results illustrated the importance of synchronous and asynchronous BL modes being completely integrated within a well-paced, well-structured training programme. Forcing student involvement in BL appears to depend on developing trusted connections with students and clearly communicating the course's expectations at the beginning of the semester. While graduate students' cognitive and emotional involvement was mostly addressed through experience-sharing and learning co-construction among students, the usage of various digital technologies was also highlighted to enhance student behaviour and emotional participation at the undergraduate level.

Chiu (2022) remote/online learning has been established to aid students in completing their education while the COVID-19 epidemic-related school closures are in force. According to self-determination theory, student engagement is required for learning and is driven by several factors (SDT). Using pre- and post-questionnaires filled out by 1201 students in Grades 8 and 9 within six weeks of participation in online learning, this study examined how the three perceived psychological factors in SDT affected student involvement in online learning. The findings demonstrated the importance of relatedness support and the superiority of digital support techniques in meeting students' demands. Additionally, it was shown that every requirement predicted the degree of involvement.

Abou-Khalil et al. (2021) interested in learning which engagement strategies college students who are attending online courses in low-resource settings think are useful. They conducted a sequential mixed-methods study based on Moore's interaction paradigm for distant learning. To obtain their opinions on various engagement strategies, we polled 313 students who were taking part in low-resource emergency online learning. Our data suggest that student–content engagement strategies such as screen sharing, summaries, and class recordings are the most effective, closely followed by student–teacher strategies such as Q&A sessions and reminders. Group discussion and collaborative work are the least effective student–student strategies. Different engagement strategies are judged to be more or less effective depending on the kids' access to technology and gender. To help teachers, instructional designers,

and researchers, we offer a 10-level paradigm for student engagement in low-resource emergency online classrooms.

Olivier et al. (2021), this study examines three hypotheses to determine the best combination of teacher need-supporting practices (autonomy support, structure, and participation) in terms of classroom levels of behavioral, emotional, and cognitive engagement. Multilevel analysis was performed on a sample of 1193 eighth graders who were spread out across 57 math classrooms. The findings did not support the additive hypothesis (H1), which proposed that when taken collectively, all three activities would be associated to levels of interest in the classroom. The findings also disproved the synergistic hypothesis (H2), which postulated that the best benefits would occur in courses with a high level of two or three practices. The findings also disproved the synergistic hypothesis (H2), which postulated that the best benefits would occur in courses with a high level of two or three practices. The global hypothesis (H3), which proposed that the global level would be best supported by the global level averaged over the three activities and portrayed by a global component, was likewise supported by the results. Specific traits that reflected the imbalance in autonomy support, structure, and involvement also had an impact on several aspects of classroom engagement levels.

Gillen-O'Neel (2021) the bulk of research on sense of belonging in higher education to date has been on between-person connections, as demonstrated by Murphy and Zirkel in *Teach Coll Rec* 117(12):1–40 (2015) and Ostrove and Long in *Rev High Educ* 30(4):363–389 (2007). In the current study, first- and second-generation college students (N = 288) assessed their sense of belonging as well as their emotional and behavioral participation in school each evening for a week. These data were used to look at the individual dynamics of student involvement and belonging on a daily basis. With very few exceptions, having a sense of belonging was associated with all forms of student engagement, both individually and regularly. Studies have revealed that students who feel more connected to the school than their classmates do also tend to be more emotionally and behaviorally involved. Regardless of how they generally feel about their school, students' emotional and behavioral participation tended to be higher than usual on the same day if they felt a very strong sense of belonging. For the two measures of student involvement—feelings toward school and in-class engagement—first-generation college students were more sensitive to daily differences in sense of

belonging. The student generation did not have many extra effects, though. Overall, the results suggest that a strong sense of belonging is an important component of maintaining student engagement for all students, but especially for first-generation college students.

Chiu (2021, p. 12), during the outbreak, students in schools and universities were compelled to swiftly transition from traditional classroom settings to online learning at home. Online learning requires active student participation that may be explained by the self-determination theory (SDT). In fact, the developers of SDT have said that future studies based on the theory should pay close attention to how to fulfill the basic assumptions of the theory in technologically enhanced learning situations. We also don't know a lot about how many K–12 kids engage in online learning. This qualitative study used the SDT as a framework to understand student engagement and disengagement in online learning in K–12 schools. Thematic analysis was used to examine the interview data from 36 children and 18 teachers. The findings indicate that I online learning environments that supported greater autonomy were more likely to cognitively engage students in the development of two important lifelong skills—digital literacy and self-regulated learning—and (ii) environments lacking in emotional attachment, equipment, and resources were less likely to do so. These factors, along with the students' perceived digital incompetence and ineffective learning experiences, resulted in environments that suppressed cognitive and emotional engagement. Thus, one must satisfy the demands of competence and relatedness while designing and implementing online learning.

Bowden et al. (2021), how to establish settings that foster student participation, achievement, and retention is a recurring issue in the higher education sector. Contentment has typically been accorded high consideration when assessing student achievement. The student experience must be viewed from a larger, more thorough and ontological perspective that takes into account the persons and things that students are developing into. A thorough approach for measuring student engagement is developed by this study. It models and quantifies the relationship between the two prerequisites for engagement, i.e., involvement and expectations, the four dimensions of engagement, i.e., affective, social, cognitive, and behavioral engagement, and their relative and differential effects on five particular student and institutional success outcomes, i.e., institutional reputation, student wellbeing, transformative learning,

self-efficacy, and self-esteem. The results show that expectations and student involvement are key initiators of student engagement. Affective involvement was the main element impacting institutional reputation, wellbeing, and transformative learning. Behavioral engagement was a factor in determining self-efficacy and self-esteem. Cognitive and social engagement was necessary but not sufficient for pupils to succeed.

Fisher et al. (2021), as more institutions become aware of the mechanisms in these cutting-edge pedagogies that may improve student performance and, in the case of the institutions, student retention, they are adopting flipped and blended learning pedagogies more often. The limited research that has been done has not yet demonstrated definitively the empirical link between flipped and blended learning pedagogies and the intended student outcomes of engagement, performance, and satisfaction. Over the course of four semesters, 348 responses were collected and looked at. The findings demonstrate that both flipped and blended learning are beneficial to students' perceptions of engagement, performance, and satisfaction, but that flipped learning mediates the effects of blended learning, emphasising that blended learning pedagogies are merely delivery strategies and have no bearing on students' capacity to learn. Students also find the engagement that the flipped learning approach fosters to be intrinsically rewarding, regardless of how well they believe they performed. These results provide more evidence those educational institutions' investments in flipped learning pedagogies will have the desired effects on a financial, cultural, and individual level, bridging the gap between what we believe and what we can verify.

2.3 Self- Directed Learning

Glenn (2000), adult education is dominated by self-directed learning. Although it has been acknowledged and studied for years, the advent of the digital age brought it to the forefront, and the use of technology in learning environments has also transformed the context in which it is understood. It has been regarded as one of the crucial skills in the twenty-first century, and focus has been placed on improving this capacity.

Barnes et al. (2007), in order to provide individually relevant learning experiences, it was highlighted that "Net Geners require opportunities for self-directed learning,

interactive settings, many types of feedback, and assignment alternatives that leverage a variety of resources."

According to Fahnoe & Mishra, (2013), students that are exposed to technology-rich learning environments would have more possibilities and skills to be self-directed in their learning. As a result, they become experts in selecting relevant resources and in managing and using information appropriately. When students are self-directed learners, they may choose what to study and when and for how long, thanks to the flexibility that technologies like social media offer.

Due of this, they learn effectively Tullis & Benjamin, (2011) self-directed learning has been proposed as a potential more direct path to comprehending the true dynamics of and interactions between learning and technology (Candy, 2004). The literature study shows that there is substantial consensus regarding the potential impact of contemporary technological affordances on SDL, but there is little actual data available addressing how technology use affects self-directed learning. According to Candy (2004), learning settings that effectively integrate technology may have a significant influence on self-directed learning because they link students to resources in ways that weren't previously possible.

Previous research on the application of technology and its subsequent effects on SDL and student engagement have shown both positive and negative outcomes. Supporting favorable outcomes were shown to be positively correlated with improvements in cognitive and attention abilities Subrahmanyam et al., (2001).

Oblinger and Hagner (2005), note that students in the digital age exhibit a need for more diversified forms of communication and report easily becoming disinterested in conventional teaching techniques. While (Hay, 2000) finds that Net Generation prefer more hands-on, inquiry-based approaches to learning and are less willing to simply absorb what is presented to them, (Glenn, 2000) emphasises that in order to generate personally meaningful learning experiences, the Net Generation needs self-directed learning opportunities, interactive environments, many kinds of feedback, and assignment choices that leverage various resources.

Morris (2019), one of the main goals of adult education is to support adult learners' ability to adapt effectively to our constantly changing reality. The new goal of the current research is to investigate whether designing adult education in a way that

promotes self-directed learning and equips learners with adaptable thinking and behavior could benefit from taking into account different learning modes (instruction, performance, and inquiry). The typology of Houle is where the idea of modalities of learning first appeared (1980). However, no study has gone beyond this typology to yet, particularly when it comes to the possibility of incorporating modes of learning into the planning of adult education. The relevance of considering whether inquiry is incorporated in the learning process is specifically an apparent omission in adult learning theory; its inclusion may distinguish the objectives of teaching, the character of performance, and the underlying epistemological orientation. Two models of learning modes are suggested and contrasted to allay this worry. Teacher-directed learning is encouraged by the paradigm of learning styles that reinforces teaching, performance, and learning without inquiry. A major drawback of using this paradigm in adult education is that learners may get accustomed to routinely reinforcing patterns of perception, thought, judgment, emotion, and behavior. These patterns may become very rigid and are demonstrated by a lack of enthusiasm for self-directed learning. Employing this model in adult education has several important drawbacks, including the potential for learners to develop habitually reinforcing patterns of perception, thinking, judging, feeling, and acting-performance that may be rather rigid and represented by a clear lack of a perceived need to adapt to social contextual changes, which in turn results in a lack of motivation for self-directed learning. In contrast, the adapting model of learning modes (instruction, performance, and inquiry) may help learners be adaptive in their performance by encouraging enhanced learner sensitivity toward changing social contextual conditions, potentially increasing learners' motivation for self-directed learning.

Sriarunrasmee et al. (2015), with the growth of the Internet, students may now take online courses that offer flexibility and individualised instruction to suit their learning preferences, including face-to-face instruction. To develop students' 21st-century abilities, blended learning has been used in schools. Utilizing an experimental research approach, this work looked at how well the blended learning model supported students' development of communication skills and their ability to learn on their own. Tests of communication skills and self-directed learning were used as data collection instruments. 84 first-year graduate students in the Faculty of Science at Srinakharinwirot University who enrolled in the Information Literacy Skills course

during the first semester of 2013 made up the sample group for this study. Two groups were formed from them. The experimental group consisted of 41 pupils, whereas the control group had 44 students. Data analysis methods included the t-test, mean, standard deviation, and percentages. The outcomes showed that students in blended learning classrooms performed better than those in traditional classrooms in terms of self-directed learning and communication abilities. This shows that blended learning is advantageous for general courses that help first-year students acclimatize to university life and prepare them for the workplace, as well as the Information Literacy Skills course.

Siriwongs (2015), as the world changes, individuals should take charge of their own education and make self-directed inquiry a top goal for the rest of their lives. Nowadays, self-directed learning is crucial because people learn a great deal from many various sources that affect their way of life and decision-making. People get greater knowledge through their own autonomous experiences. In general, the term "Andragogy," which is defined as the art and science of assisting people in learning, has come to represent the whole meaning of self-directed learning. It's interesting to note that a researcher firmly feels that Knowles' approach and the justification for self-directed learning enable proper application and efficient planning for teaching and learning. In relation to this research, it aims to identify approaches to meet individual learning preferences and requirements through self-directed learning and evaluate students' knowledge retention using actual experiences as a case study. In the Suan Sunandha International College's annual international fair, students can exhibit their product-selling and product-buying experiences as well as their ability to apply skills to real-world situations. Students must be aware of an important chapter in economics and adhere to certain ideas in order for their activities to flow smoothly.

Ayyildiz & Tarhan (2015), the goal of this study was to create a reliable and accurate scale for evaluating the self-directed learning abilities of high school pupils. All abilities linked to self-directed learning were identified using data from related instruments and a review of the literature. Then, 255 pupils from various high schools were given access to an item pool that had been prepared. Exploratory factor analysis was carried out to evaluate the applicability of the collected data. The findings showed that there were correlations between the questions, allowing for the possibility of component analysis and the identification of nine factors. Regarding the strength of

the factor structure, a confirmatory factor analysis (CFA) was conducted. The nine-factor solution was supported by the CFA's findings. The scale's final iteration features 40 elements altogether and a nine-factor structure. The Self-Directed Learning Skills Scale is the name of the instrument, which employs a five-point Likert-type scale (SDLSS).

Şenyuva & Kaya (2014), the fast proliferation of web-based learning environments is a result of the current involvement of new web technologies in the educational system. The growth of web-based learning has emphasized the importance of the ability to study on one's own initiative as the key to success. This study aimed to demonstrate how a web-based course improved nursing students' readiness for independent learning. The study only included one group, and the pretest and posttest were given one after the other. In the fall semester of the academic year 2011–2012, 162 second graders from a nursing school in Turkey who were enrolled in a web-based patient education course made up the research group. During the first week of the online course and at its conclusion 14 weeks later, data were gathered using the "Information Form" and the "Scale of Readiness for Self-Directed Learning." The majority of the female nursing students in the research group had an average age of 20.281.59. Students regularly utilise the internet. Before and after the web-based course, the average student scores on readiness for independent study varied dramatically and statistically. The findings demonstrated that a web-based course has a favorable impact on students' preparation for self-directed learning. These findings imply that web-based learning environments should be incorporated into educational initiatives in order to help nursing students become more prepared for self-directed learning.

Aziz et al. (2014), this study's goals are to compare nursing students who get PBL to those who receive standard lectures in terms of their outcome abilities, such as critical thinking, problem-solving, and self-directed learning, and to look at links between these abilities.

Ramli et al. (2018), the degree of preparation for self-directed learning is influenced by a variety of factors. The purpose of this study is to examine the connection between preparation for self-directed learning and internal, environmental, and psychological elements. For the fourth-year medical students at Tadulako University, this research was conducted using the census approach. Data were quantitatively

analysed using the Structural Equation Modeling (SEM) with Partial Least Square (PLS) technique analytical tool. The latent variables in this study are readiness for self-directed learning, external stimuli, and environmental conditions. According to the study's findings, variations in the model may be responsible for as much as 24% of the variation in internal components and 55.8% of the variation in readiness for self-directed learning. The external effects had a significant impact on both internal factors and readiness for self-directed learning. While the internal factors serve as a mediator between the external variables and the preparation for self-directed learning, the internal factors also directly benefit the external variables.

Sumuer (2018), this study looked at the elements that affect college students' use of technology for self-directed learning. A survey of 153 college students was used to gather information about their readiness for self-directed learning, their usage of Web 2.0 technologies for learning, their confidence in using computers and online communication, and their confidence in online communication. Sequential multiple regression and mediation techniques were used to analyse the data. According to the findings, the predictor factors accounted for 19% of the variation in technology-enhanced self-directed learning. It has been shown that two crucial aspects impacting students' ability to study independently using technology are their preparation for self-directed learning and their use of Web 2.0 tools for learning. The findings also show that students' use of Web 2.0 learning resources considerably reduced the negative impact of their computer and online communication self-efficacy on their technology-assisted, self-directed learning.

This study suggests that in order to enhance students' technology-assisted self-directed learning, teachers should offer scaffolding or assistance for computer use, online communication, self-directed learning methodologies, and the use of Web 2.0 technologies.

Malan & Ndlovu (2014), this article details the qualitative findings of a research that looked at whether integrating a problem-based learning (PBL) approach into a one-year foundation programme might foster the growth and maintenance of learners' capacity for independent learning. The field of evaluative research contained this interpretative constructivist case study. 35 current students and 14 previous students were interviewed as well as classroom observations were used to get the data. The research revealed that exposing students to a PBL method did encourage more

significant learning patterns, exemplified by analysing the subject matter critically and self-regulating learning processes. If students' beliefs in the method did not support the activities used, the sustainability of the meaning-directed learning skills was in doubt. Students' ability to study independently and start a growth process toward lifelong learning can both be enhanced by integrating PBL into a foundations curriculum.

Khiat (2015), an essential component of adult education is self-directed learning (Caffarella, 1993; Knowles, 1975; Knowles, Holton & Swanson, 2005; Merriam, 2001; Merriam & Caffarella, 1999). Thanks to self-directed learning tools, adult learners may be better able to balance their education with caring for their family, working, and taking care of other duties. This study conceptualised and assessed a learning diagnostic assessment within the framework of SIM University (UniSIM), a Singaporean institution for adult learning. The learning diagnostic tool helps the students to identify their best and weakest self-directed learning areas. The investigation employed a survey research strategy. The survey received 1,960 responses, and the data was analysed using exploratory and confirmatory factor analysis. A strong validity and reliability of the instrument were confirmed by the confirmatory factor analysis, which demonstrated that the final model of self-directed learning, as actualized by the items of the learning diagnostic tool, has a good match on the data. Currently, one of the student learning support methods used to assist UniSIM students in becoming self-directed learners is this validated learning diagnostic test.

Fonseca et al. (2014), students nowadays are developing in a world of ongoing technology breakthroughs, rapid knowledge, and continual communication. Many have argued in favour of and against the use of mobile devices in K–12 classrooms due to the fact that they are becoming more and more common among students in grades K–12. Instantaneous information availability and group cooperation are highlighted as advantageous affordances that support students' independent learning. 706 middle school students from 18 technology and engineering education classes participated in this study and collaborated in groups of two to three to solve an open-ended engineering design assignment. In answer to the design challenge, students finished design portfolios and built prototypes. Classes were separated between those that permitted mobile device use during the study and those that did not. Additionally,

some of the randomly chosen classes completed the design portfolio on paper, while others completed it electronically. Using an evaluation technique known as adaptive comparative judgement, final student portfolios and projects were evaluated and given a rank order. Six instructor interviews and thirty student interviews were performed. A statistical analysis was done to determine the association between student access, portfolio style, self-directed learning, and academic success. Results showed that throughout the study, student-directed learning was independent of mobile device accessibility. Mobile device accessibility, which was strongly associated with higher student scores on the design portfolio, was unrelated to student ratings on design goods. . In order to promote students' self-directed learning, this study sought to understand how secondary students in Malaysia viewed the use of information, communication, and technology (ICT). The surveys' purpose was to gather quantitative data; hence they were created as surveys. From two private secondary schools in Selangor, Malaysia, 100 pupils were chosen at random to serve as samples. To examine descriptive and inferential statistics, SPSS V22.0 was utilised. The study found that Malaysian students were accustomed to using ICT, that it had promoted a high level of self-directed learning preparation, and that it had helped students form connections with ICT, peers, and teachers. The findings indicated a connection between gender, ICT use, and independent learning. Additionally, compared to children from rural areas, students from metropolitan areas tended to be more self-directed learners. More research should be done on how much self-directed learning occurs among secondary school students in Malaysia's rural areas. The distinction between urban and rural regions' infrastructure and facilities is an essential topic that needs exploration.

C.-H. Chen et al. (2021), self-directed learning is commonly emphasised as a critical talent required living in the twenty-first century due to the quick changes in globalisation and technology growth. In August 2019, the Taiwan Ministry of Education released the revised Curriculum Guidelines for 12-Year Basic Education. As Taiwan's first official curriculum to support it, this study helped us better understand how the application of curricular standards influences students' preparation for independent learning. At seven separate universities, 10,020 valid questionnaires from three cohorts of high school students were received. The study made use of Lucy Guglielmino's well-known tool, the Self-Directed Learning

Readiness Scale (SDLRS) (2000). The outcomes gave us evidence from above that confirmed our ideas regarding the beneficial, albeit minor, influence of introducing new curricular standards on promoting independent high school students. Additionally, it was shown that schools and demographic groupings had different rates of self-directed learning preparation development. To deepen our understanding of curriculum reform and learner autonomy, future researchers should (a) qualitatively explore how particular latent variables were affected in various instructional interventions, and (b) conduct panel studies. (Kim et al., 2021) Enormous Open Online Courses (MOOCs) are open and vast, which might result in a lack of teacher presence and hinder learners' commitment to and progress in their learning. The degree to which participants have control over their own learning, then, determines how effective MOOCs are. The course design components have a substantial influence on learners' self-directed learning and devotion, despite the lack of direct student-instructor interactions. This study fills a gap in the literature by examining the correlations between MOOC design features, learner commitment, self-directed learning, and goals for future learning. It does this by using survey responses from 664 learners who participated in a large-scale MOOC. Our results showed a relationship between students' self-directed learning and the transactional distance between learners and material. The course structure and organisation predicted students' commitment to self-directed learning and the MOOC. The relationships between course design components and participants' inclinations to keep studying were also found to be influenced by self-directed learning. Based on our research, we provide design strategies for efficient learner-content interactions in massive self-paced MOOCs.

Li et al. (2021), previous literature has emphasised the potential for self-directed learning (SDL), its value in higher education, and lifelong learning. However, there is still a lack of knowledge on how SDL ability influences learners' affective and behavioural results in educational settings, necessitating more research. Due to this knowledge vacuum, this study created the goal-oriented active learning system GOAL to assist students' SDL and examined how students' views of their SDL proficiency impact their desire for lengthy reading, reading engagement, and SDL behaviour. The findings revealed that students with strong SDL abilities had noticeably higher levels of reading engagement, SDL behaviours, motivation, and autonomy for in-depth

reading than students with poor SDL abilities. These results suggested that an SDL support environment could be utilised as a practical tool to support the learning of foreign languages in the classrooms; however, the affective and behavioural outcomes produced by the environment were affected to varying degrees by the levels of students' SDL proficiency. The study has significance for both academics researching SDL environments and extensive reading as well as for teachers looking to enhance extensive reading via the use of SDL techniques.

Chau et al. (2021), numerous facets of education have been severely impacted by the coronavirus (COVID-19). Since the outbreak of the virus, Asian nations and areas have been among the first to shift totally online. This essay has two objectives. In order to comprehend the combined impacts on presences in the participating synchronous learning settings, this study first looks into the correlations. Second, this report offers educators empirical data and insights about upcoming trends in online learning and instructional design. In order to improve the design of the e-learning teaching pedagogy and determine how the key elements of e-learning perception are inter-correlated, this study examined students' perceptions of synchronous online learning during the COVID-19 pandemic. This allows teachers to concentrate on certain areas. The study has significant ramifications, including the finding that student technological competence is essential to support the current practise of integrating online instruction.

Kumar et al. (2021), workload prediction is essential to intelligent resource scaling and load balancing, which optimise both the financial success of cloud service providers and the satisfaction of users (QoE). There are several methods for forecasting future workloads, and machine learning is frequently applied to increase prediction accuracy. The self-directed workload forecasting approach (SDWF) described in this research uses recent forecast deviation to compute the forecasting error trend and then applies it to improve the precision of future predictions. For the purpose of training neurons, the model makes use of an enhanced heuristic methodology based on the blackhole phenomenon. Six distinct real-world data trails are used to assess the effectiveness of the suggested strategy. The model's accuracy is contrasted with that of existing models that employ various cutting-edge techniques, such as deep learning, differential evolution, and back propagation. When compared to current techniques, the mean squared forecast error may be reduced most

significantly up to 99.99 percent. Additionally, Friedman and Wilcoxon signed rank tests are used in the statistical analysis to confirm the effectiveness of the suggested forecasting model.

Morris & Rohs (2021), for surviving and succeeding in an increasingly complicated and unpredictably changing environment, self-directed learning is an essential skill. Researchers emphasise the necessity to look at how self-directed learning competency may be built from infancy as the notion of self-directed learning emerged from the adult learning area. However, there aren't many empirical research that look into how children's formal education in the digital era supports self-directed learning. A literature search was carried out to examine empirical studies that aid in comprehending this research topic. The research under consideration highlighted the potential of digital technology to assist students in this process, but frequently students lacked the skills necessary to utilise these tools for learning. Students frequently needed assistance, particularly with the planning and evaluating components of self-directed learning, as well as direction on how to utilise digital devices successfully for educational reasons. Importantly, there aren't many research that examine how to encourage self-directed learning in young learners. Given that this is a critical skill for training our young to deal with job and life in our quickly changing world, it is imperative that more research be done on self-directed learning in early school.

Karatas & Arpaci (2021), this study looked into the role of 21st century abilities and competencies, metacognitive awareness, and self-directed learning skills in determining preparedness for online learning during the COVID-19 pandemic. Data from 834 potential instructors were gathered using the 21st Century Skills and Competencies Scale, Self-Directed Learning Skills Scale, Metacognitive Awareness Inventory, and Readiness for Online Learning Scale. According to the results of structural equation modelling (SEM), 21st century skills and competencies, self-directed learning abilities, and metacognitive awareness all positively predict prospective instructors' preparation for online learning. According to these results, improving future teachers' self-directed learning, metacognitive awareness, and 21st century skills and competencies may help them be more prepared for online education.

2.4 Summary of the Literature Review

The in-depth comprehension of the several elements of the issue statement as presented in the research was further aided by the substantial literature review previously mentioned. It is clear that there is a lot of interest in knowing more about how technology use affects college and university students' academic performance, despite the conflicting research findings. Although other studies also looked at the different kinds of technology, the majority of research investigations concentrated on the connection between one or a few specific technological breakthroughs and academic accomplishment. Today's young are genuinely using and absorbing a multitude of technologies at once, a convenience made possible by contemporary technology and made accessible anytime, everywhere, like mobile phones.