



Examining the Effects of Self-Regulated Learning Skills on Digital Lifelong Learning Among Online Graduate Students

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Abstract: Amid the COVID-19, educators noticed the resurgent importance of lifelong learning while delivering remote learning. The U.S. Department of Education indicated that self-regulated learning skills prepare learners for lifelong learning. The rapid development of advanced technology and the accelerated-expanding nature of workforce training will create ever-increasing demands for individuals to be self-regulated lifelong learners. Although self-regulated learning is vital to formal learning, it remains unexplored on how self-regulated learning skills may relate to nonformal and informal learning. Using a quantitative research design combining inferential and descriptive statistic methodology, this paper aims at examining the effects of self-regulated learning skills on graduate students. The major findings show that learners with high self-regulated learning skills might not necessarily have positive digital lifelong learning, particularly goal setting and time management to nonformal and informal learning. More specifically, participants had the highest self-regulated learning skill in environment structuring with the average score of 6.07 per item but a lowest self-regulated learning skill in task strategies with the average score of 4.13 per item. It is unavoidable for the agencies, educational institutions, and governments, to prepare digital lifelong learners by making learners more aware of the values and aims of nonformal and informal learning; and by recognizing lifelong learning.

Keywords: self-regulated learning; digital lifelong learning; formal learning; nonformal learning; informal learning

1. INTRODUCTION

The open education movement and prevalent digital learning technology have advanced lifelong learning to an unprecedented level. As the COVID-19 decimated the world economy, it has accelerated and prompted educators to rethink the needs and applicability of digital lifelong learning (Fischer, Lundin, & Lindberg, 2020). Meanwhile, remote learning bears brunt of ineffective online learning that could decimate all learning stakeholders' confidence in future digital learning. Ivone, Jacobs and Renandya (2020) contended that the remote learning practices amid the pandemic raised and promoted the awareness of digital lifelong learning. Anyone with digital tools can access open resources and instructions online facilitated through the channels of OER (Open Educational Resources), and MOOCs (Massive Open Online Courses). Julia, Peter and Marco (2021) researched MOOCs to fathom the best scalable practices in the context of digital lifelong learning. Lifelong learning is no longer reserved for senior learners. In fact, with the swift evolution of modern information and knowledge, modern humans need to be actively engaged in lifelong learning to meet their personal and professional development needs to reach self-fulfillment. Formal learning and informal learning may not be sufficient to address all needs. To become proficient professionals, modern human persistence is required to enrich their professional and personal skills and knowledge which may not be delivered fully by formal learning. Additionally, it is unrealistic to demand lifelong learners to return to school for additional formal learning. Informal learning is commonly not organized and harvested or recognized with credits, despite the fact that it occurs anywhere and anytime, enriching the learning context (Selwyn, Gorard & Furlong, 2006). Recently nonformal learning is gaining attention, considering that it may deliver more adaptable learning environments to meet personal and professional learning goals; however, it is a fairly alien learning concept to learners, educators, researchers, and institutions.

Eilam and Reiter (2014) argued that digital self-regulated learning (SRL) is an imperative skill to subscribe to lifelong learning in response to rapidly evolving information. More specifically, digital SRL should embrace more creative, personal, sharing, and community/network-oriented learning strategies (Leone, 2013). By doing so, each individual is afforded the opportunity to manage and organize their learning progressions, networks, and environments to reflect their needs for personal and professional growth. Barnard-Brak, Lan and Paton (2010) prompted educators that SRL skills are not just essential to formal learning delivered by educational institutions, but are also significant in professional development and lifelong learning (Sagasser et al., 2015). Competent digital SRL skills would warrant digital lifelong learners to take on relevant learning responsibilities and to make critical decisions in what to learn and how to learn to achieve their lifelong learning missions (Weinstein, Acee & Jung, 2011). In sum, adaptive digital self-regulated lifelong learners need to be able to embrace and to integrate advanced digital tools to respond to rapidly and perpetually demanding work knowledge and skills to accomplish self-fulfilling lifelong goals.

While SRL is vital to formal learning, current research is lacking knowledge of how SRL skills may be relevant to nonformal and informal learning. This investigation addressed the following research questions:

1. How will each of the six self-regulated learning skills (i.e., goal setting, environment structuring, time management, task strategies, help seeking, & self-evaluation) respectively predict the use of self-regulated skills to support formal learning?
2. How will each of the six self-regulated learning skills (i.e., goal setting, environment structuring, time management, task strategies, help seeking, & self-evaluation) respectively predict the use of self-regulated skills to support nonformal learning?
3. How will each of the six self-regulated learning skills (i.e., goal setting, environment structuring, time management, task strategies, help seeking, & self-evaluation) respectively predict the use of self-regulated skills to support informal learning?

2. SELF-REGULATED LEARNING SKILLS

Self-regulated learning skills are a set of proficiencies for the meta-cognitive learning processes and are vital to achieve effective online learning. SRL is the process through which learners “transform their mental abilities into task-related academic skills” (Zimmerman & Schunk, 2001, p.1) with the help of personal initiatives, perseverance, and adaptive skills. This model centers learning behaviors and processes on how each individual applies “active and initiative” actions to succeed intended learning goals and needs (Woolfolk, Winne & Perry, 2000). Six SRL skills emerged from Barnard-Brak, Lan and Paton’s study (2010). They are goal setting, environment structuring, task strategies, time management, help seeking, and self-reflection respectively. Schunk (2005, p. 85) stated that “Self-regulated learning is seen as a mechanism to help explain achievement differences among students and as a means to improve achievement.” In an online learning environment, SRL skills are very important because students with higher SRL skills exhibited more positive learning experiences and achieved higher learning outcomes in academic instructions compared to their counterparts (Barnard-Brak, Lan, & Paton, 2010). Therefore, improving these skills in more independent learning environments is vitally important.

2.1. Three Phases of SRL

These six SRL conducts can be aligned to three phrases “Forethought, Performance, and Self-reflection” (Zimmerman, 2002). The Forethought phase, a planning act, pertains to goal setting that students administer short and long learning goals. This process would support students evaluating their academic achievements throughout the process by employing effective learning strategies.

The second phrase is Performance that includes environmental structuring, task strategies, time management, and help seeking. Learners evaluate and select different learning strategies to archive their learning goals. These applied strategies function may be adapted and modified continuously to ensure their meeting learning needs. Students establish and personalize their physical and digital learning networks and environments as a platform to conduct their learning activities and to avoid any distraction in physical, online, or mobile settings.

Different and multiple task strategies can be applied to enhance learning. These strategies range from note taking, reading aloud, preparing questions, and conducting additional instructional activities, to building people networks, resource networks, and tool networks to connect and to collaborate. Time management is necessary to ensure that students are able to allocate, schedule, distribute relevant time to different instructional activities for effective learning. The size of allocated time can extend from small portions of time to conduct just-in-case, just-in-time, and bite size learning to substantial amounts of time to engage in deeper learning. How learners may solicit help and support from different networks, such as instructors, peers, coaches, learning centers, is vital and, particularly, more crucial to online learning. Digital technologies expand the range of channels for help seeking. In online learning environments, students have choices in obtaining help through different platforms (Face-Face, e-mail, discussion board, real time chat, social media), on various devices (phone, computer, tablets, mobile). The last phase is Self-reflection that permits students to evaluate and to cogitate their learning processes and outcomes and to ensure achieving their learning goals. The obtained feedback in this evaluation process would serve as adjustment to students' next SRL cycles.

2.2. SRL, Learning Outcomes and Instructions

The significance of self-regulated learning skills to face-to-face learning can be applied to online learning. Barnard-Brak, Lan and Paton (2010) signified that effective online learning requires competent SRL skills. Research has revealed that better SRL skills would lead to more positive learning performances (Chen, & Huang, 2014) and more sound academic achievement (Hesterman, 2015; Montgomery et al., 2019). Clearly, the learning outcomes and performances can be enhanced by proficient SRL skills. Different studies have revealed that SRL skills were effective strategies in online discussions. SRL sustains the growth of critical learning inquest (Bai, 2012) and growth of the learning community (Vighnarajah, Wong & Abu Bakar, 2009) in online discussion instructions. In fact, Lee and Lee (2016) clearly discerned that students' online discussion activities and behaviors were impacted by SRL skills. Furthermore, Kramarski, and Mizrachi (2006) observed that students' SRL skills were improved by interactive online discussion participations.

Due to the significant role that SRL skills play in learning, researchers started understanding how students may be improved with strategic learning instructions. Instructional intermediations might be necessary applied to improve students' SRL skills (Bambacas et al., 2013). Vanslambrouck et al. (2019) asserted that these instructional intermediations would result in competent SRL skills through exercising practical value, time management, and peer and group collaboration whereas Hsu, Wang, and Levesque-Bristol (2019) emphasized on the relationships between self-adjusted motivation and learning satisfaction. More recently, Stoten (2019) perused the potential of integrating learning analytics through educational data mining to enhance students' SRL skills.

3. LIFELONG LEARNING

Lifelong learning emphasizes that learning should be expanded to the entire lifespan and to prepare modern humans to improve knowledge, skills, and competences for their personal life, social and community living, civic engagements, and work advancements. OECD (2014) categorized it into formal learning, nonformal learning, and informal learning. When learning is discussed, it is alluded to formal learning primarily. Latchem (2014) pointed out that formal learning only accounts for 10-30% of lifelong learning whereas the 70-90% is nonformal learning and informal learning. Solely relying on formal learning to advance lifelong learning is insufficient. More specifically, Jeffs and Smith (1997, 2005, 2011) noted that more learning occurs in family, community, and workplace as informal learning throughout life; while Latchem (2014) argued that people learn through the channel of nonformal instruction as well, such as seminars, meetings, conferences, offices, home, or kitchens where concomitant with the opportunities of deploying knowledge to solve real-world problems to meet lifelong learners' self-realization goals (Hall, 2009). More specifically, formal and informal learning generated a greater degree of impact on the quality of life.

Researchers and educators should go beyond the content of lifelong learning and start investigating how innovative instructional design, digital and open technology integration, and creative curriculum planning may enhance lifelong learning. An architecture for lifelong learning that addresses from the perspectives theoretical (pedagogical) and technological, should be identified to ensure effective

practices for digital lifelong learning (Caron et al., 2007). Donnison (2009) believed that higher education and teacher preparation programs should embed effective pedagogy, and creative and vigorous curriculum for digital lifelong learning into existing formal learning; therefore, Gen Y would obtain capability and capacity as a change agency for their lifelong learning. For curriculum design, Schuwer et al. (2015) suggested that connecting formal and nonformal learning by granting learning credit would create and return effective and innovative lifelong learning. The advanced open and distance technical skills for teachers are crucial in formal and nonformal learning instructions (Mariki, 2014).

3.1. Formal Learning

Formal learning is well planned and designed learning procedures with clearly identified learning goals and curricula that are delivered and determined by the educational institutions that grant credits, certificates, degrees, or other formal recognitions. These learning processes prepare students with their desired knowledge, skills, and competences with formal recognitions (OECD, 2014) that enrich students' qualifications and credentials for career advancements. Although formal learning has been well received, Chen and Bryer (2012) observed an argument that formal learning has resulted in infinitesimal effects in lifeline learning. More specifically, within the lifelong experience of human learning, Banks et al. (2007) reported formal learning played 19% in k-12 and surprisingly, it declined significantly to 8% in undergraduate study and 5% in graduate levels. Miligan and Littlejohn (2014) examined an emerging phenomenon in digital lifelong learning that educational institutions infuse the concept of Open Educational Resources (OERs) with their existing formal learning instructions and delivered them as nonformal MOOCs to address learners' lifelong learning needs. More interestingly, they noted most students in MOOCs evinced the high interests in nonformal learning rather than formal formats due to its openness and flexibility in content, pedagogies, and learning activities etc.

3.2. Nonformal Learning

Nonformal is a new development in lifelong learning that is located in between formal and informal learning. Selwyn, Gorard and Furlong (2006) indicated that the nonformal learning instructions are organized and structured by the instructional designers, instructors, or institutions; however, they are not necessarily granted with any recognition officially. The planned and structured instructions may range from seminars, workshops, on-the-job training sessions or courses, interested-based courses, private instructions (Kwon, Park & Byun, 2019) for working adults (Beltrán Hernández de Galindo, Romero-Rodriguez & Ramirez Montoya, 2019) or senior learners (Lido et al., 2016) with self-directed learning (Morris, 2019) or various instructional lengths from hours, to days or months. Nonformal learning shifts the point of view of learning from institutions or educators to learners since the content and the instructions are predicated upon learners' interests with more adaptable learning process than formal learning (OECD, 2014). Nonformal learning can be designed as the means are managed by institutions while learning objectives and instructions are determined by learners (Alsaadat, 2017). In fact, Beltrán Hernández de Galindo, Romero-Rodriguez, and Ramirez Montoya (2019) noted that enrolling MOOCs as nonformal learning platforms becomes a trend for working adults for the purposes of professional developments.

Nonformal learning can be implemented into all subjects and levels of education, such as high school Chemistry education (Zowada et al., 2019). Based on Haning's (2019) conclusions that nonformal learning has found institutional influence was diminishing while students made more often intentional and structured learning with the instructions. This was validated by Yang's (2019) results that nonformal learners deployed more practice and experiential learning through more cooperative instructional strategy. The instructional activities may not appear as clearly designated for learning; however, critical learning elements are imbedded in instructions (OECD, 2005). Rabin, Kalman and Kalz (2019) proffered that digital lifelong learning instructions drawing upon learner-centered outcomes are more suitable due to it values learners' learning goals. In fact, Yang (2019) also found that transformative learning is appertained to students' characteristics in a nonformal learning setting.

With the prevalence of open and digital learning tools and platforms, researchers investigated how digital technology may serve as effective means for nonformal learning. In reference to innovative curricula planning and design, digital nonformal learning can be planned for service learning, co-

curricular activities, and student exchange programs (Tang's et al., 2017). With a new concept of digital nonformal learning and open technologies, nonformal instructions are available for everyone. At the instructional level, digital nonformal learning has expanded from formative written feedback that students involved in more innovative designs, such as learner-learner interaction, cross-cultural understanding, and communities of practices. Mirzaee and Hasrati (2014) found these extended nonformal activities were valuable. Interestingly, Kwon, Park and Byun (2019) found nonformal instructions delivered by distance learning format has positive relationships between workshop and students' earnings for both genders while female students demonstrated positive relationships between on-the-job training and earnings.

The open learning movement has played a critical role to nonformal learning. Educators foresee the potentials of merging open technology, open instructions, and Open Educational Resources (OERs) (Farrow et al., 2015) to promote nonformal learning culture. Massive open online courses (MOOCs) are considered as an innovative way to democratize learning opportunities for all. Research has revealed that nonformal learners have mixed learning experiences in MOOCs. Students in nonformal MOOCs were highly motivated by instructional participations (O'Toole, 2013). In blog learning environment, nonformal learners participated actively in blogging activities with meaningful blog posts and expressed their satisfaction in such active learning (Harju, Pehkonen & Niemi, 2016). However, nonformal learners also indicated that they were not satisfied with instructional planning, instructional design, and assessments (Gutiérrez-Santiuste et al., 2015) while O'Toole (2013) detected similar results in dissatisfied assessment in MOOCs. In addition, Gutiérrez-Santiuste et al. (2015) found higher level of technical challenges was observed in nonformal learners.

Researchers noticed the importance of SRL played in the practices of MOOCs. Lung-Guang (2019) identified forethought phase (goal setting) in SRL showed higher level of planned behaviors in MOOC environment while students responded to SRL-prompt actively and interactively in class instructional activities. In fact, fairly similar sequential participations in SRL-prompt in completing activities were observed (Wong et al., 2019). Furthermore, students with higher SRL skills were more likely to follow the course structure to complete the activities. While examining affective learning in MOOCs, the uses of goal setting and environmental structuring are found as critical preceptors to affective learning (Li, 2019). Especially, higher usages of environmental structuring were observed in Latin American MOOCs students. The relationships between MOOCs and SRL were not limited to instructions only. Albelbisi (2019) concluded that SRL was shaped by the service quality of MOOCs.

3.3. Informal Learning

Informal learning is referred to as non-clearly identified, planned, and designed learning activities that are executed at individual level and generally occur anytime and anywhere. It does not require learners to identify learning outcomes, objectives, and goals noticeably. Often learners may not be cognizant of the occurrence of informal learning. It is grounded in whatever intertwines with learners' experiences (OECD, 2014), such as reading books or publications selected by the learners, receptivity of coaching or mentoring, and communities of practices (Paradise & Rogoff, 2009).

These activities can be conducted at any physical and online contexts in more public and private settings. With open online technology omnipresent, the activities of watching streaming video, self-study, reading articles, engaging in social media, participating in discussion forms and real time chat, or playing games can be conducted online, and on mobile platforms at anywhere and anytime. Guinbert (2020) strengthened that mobile learning can be integrated to facilitate peer interaction in informal learning settings.

3.4. Digital Lifelong Learning

With the movement of open education, digital lifelong learning accelerates the fulfillment of self-actualization and goal-realization. The applications of open online learning, as a driving force, forge the nonformal learning to build and to bridge the chasm of formal and informal learning. Ideal and effective digital lifelong learning instructions should be grounded in open pedagogy that emphasizes student-centered, and student-driven instructions to address each student's learning intentions (Altinay et al., 2020).

Derived from socio-cultural learning (Goh, 2019), digital lifelong learners should be encouraged to select, deploy, manage, and personalize learning technologies to fulfill their personal and diversified learning perspectives. Culturally responsive teaching is vital to prepare a proficient lifelong learner (Rockich-Winston & Wyatt, 2019). Not all learners are equipped with fundamental lifelong learning skills and knowledge that ensure students to actively and interactively engage in learning to become responsible members of a community (Waters, 2012). Olson, Green, and Hill (2006) argued that it is necessary to create and to facilitate digital lifelong learning environments that submerge learners in all practices of formal, nonformal, and informal learnings at anytime and anywhere. Amano et al. (2020) drove digital badges, a concept of gamification, to increase the students' completions of digital lifelong learning activities. These practices would require digital lifelong learners equipped with effective digital self-regulated learning skills.

4. SELF-REGULATED LEARNING AND DIGITAL LIFELONG LEARNING

Educators, researchers, institutions, and governments all notice the pressing role that SRL skills play in preparing competent digital lifelong learners (Carneiro et al., 2011; TEAL, 2010). Research has identified SRL are the fundamental skill sets for lifelong learning (Huh & Regeiluth, 2018). Research (Luftenegger et al., 2012; Pirrie, & Thoutenhoofd, 2013) supported the findings that SRL are the key components and the key proficiency skills for digital lifelong learning. When researchers examined SRL in an in-depth level, they recognized cognitive and affective notions in SRL as driving forces to achieve effective lifelong learning (Clark, 2012). In addition, these two states served as catalysts to promote positive motivation to learn, to galvanize rational skills, to hone meta-cognitive skills, and to advance performance outcomes. Competent digital lifelong learners recognized themselves as explorers, researchers, and observers with strong intrinsic motivation in learning (Railean, Trofimov & Aktas, 2020).

Digital lifelong learners with competent SRL skills should embrace adaptive learning concepts to react to the constant evolving skill sets, knowledge, and competencies in different workplaces, communities, and society. From a social justice perspective, digital lifelong learning progression is a self-fulfillment, self-development process. To nurture digital lifelong learners, educators need to harness lifelong learners with proficient SRL skills which are acts of "inclusive education, equitable education opportunities, and quality education" (UN, 2009). Therefore, digital lifelong learners can constantly make contributions to societies and practice their self-development with digital learning capability (Ala-Mutka, Punie & Redecker, 2008).

Self-regulated learners with lifelong learning in mind are facing the continuous challenges at current and upcoming workforce; consequently, they ought to contain ideal capability, and ability to adapt to the perpetual evolving environments (Schwendimann et al., 2018). van Poeck, Læssøe and Block (2017) accentuated that "sustainability change agents" play a catalyst role to cultivate lifelong learning, more specifically in nonformal learning. TEAL (2010) clearly signified this critical capability and capacity to convey lifelong learners' skills, knowledge, ability from one field or setting to another. When lifelong learners are able to fully sublimate into adapted self-regulated learners, they would drive themselves to the completion of selves in life (Lee, Choi & Cho, 2019).

Educators have been identifying different instructional strategies to advanced lifelong learners' SRL skills through nonformal learning, and informal learning, in addition to formal learning. Researchers have purposed educators should prepare students to develop proficient SRL skills and strategies through course interventions and educators' scaffolding pedagogies. These instructional strategies and activities should be implemented into all levels of education, particularly in higher education (Hawe & Dixon, 2017). Sebesta, and Speth (2017) advocated SRL development to be cultivated and promoted via course-specific integrations. It should be promised an undivided instructional platform and environment. Ben-Eliyahu (2017) and Mieder, and Bugos, (2017) especially focused on the idea that these instructions should be integrated through educators' scaffolding practices. Consequently, educational professionals should be equipped with proficient SRL skills, and SRL instructional designs and strategies (Milligan & Littlejohn, 2014).

Several researches inquired into the relations between SRL and informal learning. Boekaerts and Minnaert (1999) stated that SRL skills are imperative to informal learning context. Zhou and Urhahne (2017) identified five SRL strategies that were significant to informal learning: elaborating

understanding, help seeking, effort making, reorganizing, and surface learning. In addition, these strategies can serve as predictors to students’ “motivational appraisals.” Furthermore, Hulleman et al. (2008) and Stornes and Ommundsen (2004) detected that initial interest and master goals toward the learning content can serve as predictors to subsequent informal learning settings.

5. METHOD

5.1. Participants

In total, ninety-eight Educational Technology master program students ($N = 98$) voluntarily responded to an online survey while they were taking various online courses in a Southwestern U.S. four-year public research university. More than half of the participants were male ($n = 55, 56.12\%$). The majority of them were Caucasian American ($n = 82, 83.67\%$). As to the age composition, more than ninety percent of them were evenly split into three age groups (i.e., 26 -35, 36 - 45, & 45+). More detailed demographic information of the participants is listed in Table 1.

Table1. Demographic Information of Participants ($N = 98$)

Variable	Frequency	Percent
Gender		
Male	55	56.12
Female	43	43.88
Ethnicity		
Caucasian	82	83.67
African American	2	2.04
Latino	2	2.04
Asian & Pacific Islander	10	10.20
American Indian & Alaska Native	2	2.04
Age		
18 – 25	7	7.14
26 – 35	31	31.63
36 – 45	33	33.67
45 +	27	27.55

5.2. Measurement of Research Variables

The revised Online Self-Regulated Learning Questionnaire (OLSQ) (Barnard-Brak et al., 2010) was administered to measure various research variables.

5.2.1. Predictor Variables

The predictor variables were six types of self-regulated learning skills in online courses: (a) Goal setting, (b) environment structuring, (c) time management, (d) task strategies, (e) help seeking, and (f) self-evaluation. They were measured by the total scores from various numbers of items on a 7-point Likert scale with 1 as strongly disagree and 7 as strongly agree.

5.2.2. Criterion Variables.

The criterion variables were the extent to which participants used self-regulated learning skills to support their (1) formal learning, (2) nonformal learning, and (3) informal learning. Each criterion variable was measured by the total scores from four items on a 7-point Likert scale with 1 as strongly disagree and 7 as strongly agree.

5.3. Data Analysis

Data analyses were conducted using the IBM SPSS Statistics 22. Prior to analysis, preliminary analyses were performed to ensure that there were no outliers and missing values. For this purpose, frequency values, Mahalanobas distance and Cook’s values were checked and no concern was found.

5.3.1. Linear Regression Analyses

Linear regression analyses (Cohen, Cohen, West, & Aiken, 2003; Norusis, 2012) were conducted to assess the predictive relationship between one predictor variable and each of the criterion variables respectively. In total, eighteen simple regression models were fitted to the data to address the research questions of interest.

5.3.2. Significance test

The one-tailed *t* test of the regression coefficient of a predictor was used to assess the linear predictive relationship between that particular predictor and a criterion variable (Cohen et al., 2003; Norusis, 2012). Due to the number of significance tests, the alpha level in all significance tests was set at .01 instead of .05 to control the experiment wise type I error rate (Hinkle, Wiersma, & Jurs, 2003).

5.3.3. Effect Size Index

In each simple regression model, the squared multiple correlation coefficient (R^2) (Cohen et al., 2003; Norusis, 2012) was computed to estimate the proportion of variance in a criterion variable associated with, then predictable by a predictor variable.

6. RESULTS

6.1. Descriptive Statistics of the Research Variables

The descriptive statistics of six aspects of self-regulated skills are listed in Table 2. In general, participants had the highest self-regulated learning skill in environment structuring with the average score of 6.07 per item but a lowest self-regulated learning skill in task strategies with the average score of 4.13 per item. The descriptive statistics of the use of self-regulated learning skills to support three types of lifelong learning are listed in Table 3. Overall, the participants in this study seemed to be similar in terms of the extent to which they used self-regulated learning skills to support various types of lifelong learning.

Table2. Descriptive Statistics of the Predictor Variables (N = 98)

Variable	n of items	M	M/n of items	Mdn	SD	Min	Max.
Goal setting	9	50.05	5.56	50.00	6.17	37.00	63.00
Environment structuring	5	30.34	6.07	31.00	4.13	11.00	35.00
Task strategies	9	46.59	5.18	46.00	8.93	21.00	63.00
Time management	5	28.94	4.13	30.00	4.97	12.00	35.00
Help seeking	6	27.81	4.64	28.00	7.19	8.00	8.00
Self-evaluation	6	30.32	5.05	30.00	6.92	15.00	15.00

Note. Survey items were constructed with a 7-point Likert scale ranged from 1 as strongly disagree to 7 as strongly agree; M/n of items: Mean scores divided by the number of items measuring each predictor variables.

Table3. Descriptive Statistics of the Criterion Variables (N =98)

Variable	n of items	MM	Dn	SD	Min	Max
Use of SRL skills to support formal learning	4	19.41	20.00	7.36	4	28
Use of SRL skills to support nonformal learning	4	17.39	17.50	7.49	4	28
Use of SRL skills to support informal learning	4	18.68	20.00	7.23	4	28

Note. SRL: Self-regulated learning; Survey items were constructed with a 7-point Likert scale ranged from 1 as strongly disagree to 7 as strongly agree.

6.2. Use of Self-regulated Learning Skills to Support Formal Learning as the Criterion Variable

The predictive utility of each of the six aspects of self-regulated learning skills (i.e., goal setting, environment structuring, time management, task strategies, help seeking, and self-evaluation) for use of self-regulated learning skills to support formal learning was suggested by the *t* test results in regression analyses (see Table 4). The proportion of the variance in the criterion variable predictable by each aspect of self-regulated learning skills (i.e., R^2) ranged from .08 to .23 and suggested a moderate to strong predictive relationship (Cohen, 1988). Moreover, the signs of the related regression coefficients supported the theoretically expected positive linear relationships between each statistically significant predictor and the use of self-regulated learning skill to support formal learning.

Table4. Six Simple Regression Models with the Use of Self-regulated Learning Skills to Support Formal Learning as the Criterion Variable

Predictor variable	β	t	df	R^2
Goal setting	.34	2.95**	96	.08
Environment structuring	.87	5.46**	96	.24
Time management	.38	5.11**	96	.21
Task strategies	.59	4.25**	96	.16
Help seeking	.41	4.26**	96	.16
Self-evaluation	.51	5.41**	96	.23

Note. B = unstandardized regression coefficient; t = t one-tailed test statistic; df = degrees of freedom; R^2 = squared multiple correlation coefficient.

** $p < .01$

6.3. Use of Self-regulated Learning Skills to Support Nonformal Learning as the Criterion Variable

Four aspects of self-regulated learning skills (i.e., environment structuring, time management, help seeking, and self-evaluation) were predictive of use of self-regulated learning skills to support nonformal learning (see Table 5). The actual values of the R^2 , ranged from .09 to .16, supported a moderate predictive relationship between each of those four aspects of self-regulated learning skills and the criterion variable (Cohen, 1988). The above predictive relationships were positive as theoretically expected based on the actual signs of the related regression coefficients.

Table5. Six Simple Regression Models with the Use of Self-regulated Learning Skills to Support Nonformal Learning as the Criterion Variable

Predictor variable	β	t	df	R^2
Goal setting	.21	1.76	96	.03
Environment structuring	.55	3.14**	96	.06
Time management	.34	4.30**	96	.16
Task strategies	.32	2.10	96	.04
Help seeking	.36	3.91**	96	.14
Self-evaluation	.35	3.35**	96	.11

Note. B = unstandardized regression coefficient; t = t one-tailed test statistic; df = degrees of freedom; R^2 = squared multiple correlation coefficient.

** $p < .01$

6.4. Use of Self-regulated Learning Skills to Support Informal Learning as the Criterion Variable

The results supported environment structuring, time management, help seeking, and self-evaluation to be useful predictors for use of self-regulated learning skills to support informal learning (see Table 6). In addition, the R^2 values suggested moderate predictive relationships with 17% to 24% of the variance in the criterion variance accounted for by each of the aforementioned predictors (Cohen). Based on the signs of the related regression coefficients, the direction of the predictive relationships was also consistent with the theoretical expectation as being positive.

Table6. Six Simple Regression Models with the Use of Self-regulated Learning Skills to Support Informal Learning as the Criterion Variable

Predictor variable	β	t	df	R^2
Goal setting	.26	2.22	96	.05
Environment structuring	.71	4.36**	96	.17
Time management	.39	5.39**	96	.23
Task strategies	.30	2.05	96	.04
Help seeking	.50	5.55**	96	.24
Self-evaluation	.45	4.66**	96	.18

Note. B = unstandardized regression coefficient; t = t one-tailed test statistic; df = degrees of freedom; R^2 = squared multiple correlation coefficient.

** $p < .01$

7. DISCUSSIONS

This study adduced evidence that self-regulated learning can predict all digital formal, nonformal, and informal learning but *goal setting and nonformal learning*; *time management and nonformal learning*; *goal setting and informal learning*; and *time management and informal learning*. The findings are in harmony with those reported in previous research (Carneiro; Lefrere, & Steffens, 2011; Rogers, 2019) in which participants exhibited a high level of autonomy for a sustainable education. Besides, self-regulated learning skills empower students to take their learning into their “own hands” as reported in Posch and Steiner’s study (2006, p. 283). The present study further highlighted that an emphasis on the ability to regulate one’s own learning is essential for today’s era of information and knowledge acquisition, which requires lifelong learning skills (Kotaman, Balci, & Aydin, 2018). It concluded that learners with high SRL skills might not need to have full-ranged positive digital lifelong learning knowledge and skills, particularly exerting goal setting and time management to achieve ideal nonformal and informal learning. The results can be explicated from three areas: unfamiliarity with nonformal learning; ambiguous perceptions on lifelong learning; and lack of recognition of lifelong learning.

7.1. Unfamiliarity with Nonformal Learning

Learning that occurs outside the formal learning system is not well comprehended by learners; particularly nonformal learning could be ambiguous and indistinct to learners. If learners are unfamiliar with nonformal learning, it is less likely they will set relevant goals and allocate sufficient time to regulate their learning. This is further supported by the results that goal setting skills were the 2nd highest while time management skills were the lowest in all six SRL sub-skills. At the workplace nonformal learning such as non-credited workshops, courses, and seminars is generally mandatory and the organization, rather than each individual learner, determines learning goals. Learning outcomes for nonformal learning are unclear to learners. Since nonformal learning is the intermediate concept which lies between formal and informal learning, both individuals and organizations can initiate it. Lifelong learning agencies should make lifelong learners aware that they can negotiate to make nonformal learning outcomes more visible and personal; therefore, they can fully employ their SRL skills. Studies suggest that “the needs of students are better met by non-formal education which enables them to know themselves and the world better (Shala, 2016, p. 120).” In general, non-formal education focuses on the student, it is open and flexible to needs and interests of students, and is quick to respond to the changing needs of individuals and societies.

7.2. Ambiguous Perceptions on Lifelong Learning

Learners’ ambiguous perceptions of lifelong learning further explain that goal settings and time management are not the predictors to nonformal and informal learning. Learners may perceive if learning is not formal, it is informal. Nonformal and informal learning may not be regarded as critical to their lifelong learning. Therefore, goal settings and time management skills seem to be less indispensable due to unclear learning goals and outcomes. In addition, online learning platforms may blur the lines among formal, nonformal, and informal learning. Learning does not occur in formal and physical classrooms anymore, particularly. Open, network, ubiquitous, and mobile learning technologies make all forms of digital lifelong learning occur anywhere, anytime, and in any context at a more personal level. In fact, accurately apprehending the importance of nonformal learning could be the key link to connect formal and informal learning. It will make digital lifelong learning more comprehensive.

7.3. Lack of Recognitions

The lack of recognition for nonformal and informal learning could be probable explanations of students not engrossing in both types of learning intentions. OECD (2014) indicated that any learning occurring outside of formal learning is dismissed and not valued by students and general publics. It is necessary for educators and educational institutions to take the leadership to offer nonformal learning instructions and to recognize them creatively, such as comprehensive learning records (CLR) (IMS Global Learning Consortium, 2020) in conjunction with the applications of blockchain to formally and creditably award students (Capece, Ghiron & Pasquale, 2020). With alternative recognition,

learners have a benefic influence on their digital lifelong learning now and later in life. All learning should be largely made visible, valued, and recognized. To be recognized, nonformal and informal learning should be assessed further flexibly and alternatively.

7.4. Recommendations

Educational institutions and educators commonly overlook recognizing nonformal learning and informal learning. It signals the need for innovative pedagogies and curricula in designing effective digital lifelong learning to prepare learners by scaffolding their digital SRL skills. To bridge the chasm between formal and informal learning, educational institutions should re-examine the existing curricula and consider integrating nonformal learning environments to facilitate SRL skills for digital lifelong learners. Many educators and educational institutions should re-investigate and re-assess their curricula and instructional strategies to prepare learners to become digital lifelong learners with competent SRL skills in the provided formal and nonformal learning environments.

Educators should embrace the core values of promoting human capacity that accentuate digital socio-cultural learning theory promote personalized, self-inquired, and meaning-making learning activities. In other words, experiential learning and learning experiential design are able to address digital lifelong learners' emergent needs (Barrus et al, 2016). In fact, educators expressed they do not know how to integrate SRL into their regular teaching (Dignath-van Ewijk & van der Werf, 2012). Sautelle et al., (2015) advocated that competent teachers should be equipped with proficient SRL skills, and knowledge while supporting lifelong learners to secure theirs.

7.4.1. Instructions

Research has suggested different educational instruction models should be applied to advance learners to develop competent SRL skills in different digital lifelong learning. From the instruction perspective, teaching strategies, knowledge obtaining, personal development, and content and instructions accessing are pivotal for digital lifelong education (Enriquez, 2017). Online learning strategies for lifelong learning should be grounded in "student-centered teaching," "concept-based curriculum design," "heutagogy," and "openness." More specifically, these four strategies could be integrated into formal learning environments that prepare necessary SRL skills and knowledge for nonformal and informal learning, particularly after completing the formal learning requirements. While examining satisfaction and content, professors, community, and planning, Gutiérrez-Santiuste, Gámiz-Sánchez, and Gutiérrez-Pérez (2015) found that students in formal learning are more satisfied with community created. In addition, students in nonformal learning take on a more energizing role. It should not be mistaken that community building is not crucial to a nonformal and informal learning environment. Perhaps, different types of communities should be built and facilitated. Conceivably innovative types of community are to be built, created, facilitated, and personalized by learners.

7.4.2. Open Learning

Open learning, emanated from open education, should be integrated into digital lifelong learning that emphasizes the concepts of more open, flexible, personalized, social, networked in accessing content, pedagogy, curriculum, credential. Innovative learning designs, such as MOOCS, gamification, OERs, microcredential learning, accelerated learning, personal learning environment (PLE) (Yen et al., 2019), require learners with strong SRL skills (Gašević et al., 2014).

To educational institutions, promoting open learning would prepare lifelong learners to exercise their SRL skills in formal and informal learning through curricular or co-curricular approaches to ensure their current and future effective nonformal and informal learning. Learning should be driven by learners. Educators should be preparing all learners with open pedagogy to achieve as competent "self-regulated learners," therefore they can constantly assess, reflect, adjust their learning strategies to reach their intended skills and knowledge (Dumont, Istance, & Benavides, 2010). These skills and knowledge are extended to the management of social, emotional learning. In fact, Dabbagh and Kitsantas (2012) attributed the management of Personal Learning Environment (PLE) as the key skill and pedagogy to all three types of lifelong learning respectively.

7.4.3. PLE

Personal learning environment (PLE) is a vital pedagogy to engage lifelong learners to exert their digital SRL skills to personalize their learning networks, constituents of people, tools, and resource networks. Grounded in open pedagogy, open network learning will afford lifelong learners to leverage their SRL skills to build and to manage their PLEs for current and future learning. Digital lifelong learners can transform themselves from online learners to network learners who are able to build and to fashion intricate and deep-seated social fabric of learning networks and communities.

7.5. Future Research

Broader future research inquiries should accentuate on which circumstances the learning that has not been recognized can be codified, and lead to the awarding of a document and how these recognizing instructions may relate to SRL skills. Researchers should continue exploring any forms of recognitions of nonformal and informal learning to promote effective digital lifelong learning, ranged from degree, certificates, e-Portfolio, competencies, open badges, (Booth, 2014; Guder, 2013; Simões et al., 2013), and comprehensive learning records (CLR) (IMS Global Learning Consortium, 2020).

In addition, research should focus on nonformal learning therefore allowing some flexibility between formal and informal learning, which must be strictly defined to be operational, by being mutually exclusive, and avoid overlap. With clear discernment and awareness on nonformal learning, lifelong learners and agencies would have better cognizance of the roles that nonformal and informal learning play. Self-directed inquiries that survey vast information on the Internet where students control what and how they will learn prove necessary. Winne (2017) scrutinized that implications for future research include reconceptualizing "error variance" as arising partially due to SRL and capitalizing on software technologies that massively increase access to data about how and to what effects learners self-regulated learning.

8. CONCLUSIONS

This study evidences the importance of self-regulated learning and three types of digital lifelong learning. It is necessary for the agencies, educational institutions and governments, to prepare digital lifelong learners by making learners more aware of the importance and aims of nonformal and informal learning; and by acknowledging lifelong learning outcomes. Prearranging proficient digital self-regulated lifelong learners should transcend merely engaging learners in self-regulated instructions and activities (Endedijk et al., 2014). Open education and open learning are the belief while SRL, open network learning, and PLE are the critical skills, strategies, and practices to prepare competent digital lifelong learners. Emerging digital lifelong learning literacy, beyond online learning skills, includes competent SRL skills, effective open network learning proficiencies, and strategic personal learning environment building skills. It is inevitable responsibility for educational institutions to assist students to harness these new digital lifelong literacies through formal and nonformal learning instructions. These gained-skills would empower lifelong learners to achieve their self-realization and goal-realization to enrich their life. Educators should subscribe to open pedagogy that employs lifelong learners to customize and to personalize their learning experiences.

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