Self-directed learning and assessment in a crisis context: the COVID-19 pandemic as a case study

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Abstract

The COVID-19 pandemic has forced schools to close and shift to remote education. However, this might create new challenges, as students might have poor self-directed learning skills to keep up with the learning process from home. Although many studies have focused on remote education during said pandemic, there is limited information on the strategies implemented to support and encourage self-directed learning and assessment. Therefore, in this study – focusing on a case in China – focus group interviews were conducted to collect data from different stakeholders on the implemented self-directed learning strategies during the COVID-19 pandemic. The results might help different education stakeholders in future to effectively maintain education in crises, leading to better learning outcomes.

KEYWORDS: Self-Directed Learning, Assessment, Crisis, COVID-19, Online Learning.

1. Introduction

The spread of COVID-19 has had a significant impact on teaching and learning worldwide, as classes had to be halted and, in some cases, have moved online (Carter Jr et al., 2020; Singh, 2020; Zhu & Liu, 2020; Zuo et al., 2020). This led to challenges with regard to students working autonomously and how assessments should be approached. The importance of self-directed learning (SDL) is expressed in the literature on how teaching and learning have been approached during this time of the pandemic (Singh, 2020). This article's unique contribution to the scholarship of SDL is exploring aspects of self-directedness in terms of assessment within the context of school-level education in China during the COVID-19 pandemic.

It is essential to define SDL to conceptualize assessment in this context. Knowles (1975, p. 18) defines SDL as follows:

> "*a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes*".

From the definition above, the importance of student agency is clear in terms of determining how their learning and assessment should take place and what resources are necessary. Furthermore, the role of others in this process is also noted. To this end, the role of peers, parents and teachers relates to SDL and is highly relevant for this research. SDL can be considered a process within the education context but also a learner

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characteristic (Brockett & Hiemstra, 2019). From this description, learner agency, but also actively taking responsibility for learners, are evident. Other specific characteristics include self-discipline, curiosity, motivation to learn and self-confidence. Furthermore, self-management aspects are highlighted. Learner agency is central to SDL, and it is evident that learner-centeredness is also pertinent to the COVID-19 context (Singh, 2020). Appropriate infrastructure and support are needed to foster SDL in online environments (Zhu & Liu, 2020). Furthermore, it is evident that lack of self-direction can have a negative effect on readiness for online learning (Chung et al., 2020).

Assessment is also an important part of the process in the SDL context. In this regard, Gibbons (2002, p. 12) says the following:

> "*In SDL, assessment is an essential means of learning and learning how to learn: improvement flows from students' critical assessment of their own activities*."

Importantly, for SDL, learners must be involved in different aspects of assessment, including planning and structuring, in addition to actually doing the assessment (ibidem). Self-assessment is also considered an integral step (ibidem).

Especially in online settings, learners can self-assess and self-monitor their progress (Zhu et al., 2020). Costa and Kallick (2004) provide an overview of how self-assessment capacity can be developed among learners. In our research, the issue of self-assessment was also briefly explored. As with SDL generally, the focus is on learners; therefore, assessment should also reflect the shift from a teacher-centered to a learner-centered approach.

Within this theoretical context, the nature of SDL and self-assessment was explored, focusing on a case in China. The following research question was the impetus for this research:

How can self-directed learning and self-assessment be supported and encouraged in times of crisis?

2. Related Work

Online assessment is proven to be a difficult link in the educational chain (Appiah & Van Tonder, 2018). For years, online settings have evolved quietly, with significant progress since early 2020. For instance, Moodle and Sakai – two major learning management systems – follow the same educational approach and basic framework as in their beginnings (Asamoah, 2020; Yassine et al., 2016). Despite the need for a revolutionary breakthrough in online learning and teaching methodology, many tools have been developed to provide additional services in an add-on scheme that does not change but rather complements the frameworks. Furthermore, since a year ago (2019/2020), along with the pandemic, the situation has changed, as many universities found the need for a transition to an online setting. This need has collaterally forced an adaptation of face-to-face methodologies to online learning and teaching deployments (Owolabi, 2020). However, the key open issues concerning e-learning remain unaltered, namely: student engagement; student performance estimate; drop-out prevention; teacher motivation; prevention of teacher burnout; teacher expertise in digital competences (Carver-Thomas & Darling-Hammond, 2019; eds. Christenson et al., 2012; Reschly, 2020), to name but a few.

In addition, e-assessment and online feedback remain two of the challenging, unresolved issues in this context (Alruwais et al., 2018; Moscinska & Rutkowski, 2018). Online feedback in a structured, sensible and effective way is not an easy task. When it comes to feedback, there is a cause-and-effect relationship. For instance, immediate feedback yields a good result when providing a positive report of user performance (Kaur, 2020). Also, significant progress has been made on isolated actions along learning flow. Some systems allow for the design and implementation of such feedback (Burgos & Van Nimwegen, 2009). Tutoring a student also means giving timely feedback; schoolteachers and university professors are usually good at such feedback and have shown to be quick learners (Pan & Shao, 2020; Van Nimwegen et al., 2006).

However, online assessment, although closely related to online feedback, is a completely different matter: it deals with a full framework of core competences, functional-specific competences, learning objectives, learning results, metrics and rubrics, orchestrated in a sensible way to attest that original expectations and thresholds have been satisfactorily met and are accreditable in online settings (Guerrero-Roldán & Noguera, 2018). E-assessment – whether summative or formative, or both – must be fully integrated with the learning flow to provide not only fair measurement and user tracking but also an organized and efficient system to improve performance (Mohamadi, 2018). In this context, assessment means another resource to support learners, not just to evaluate their progress (Mora et al., 2016). In online settings, assessment becomes the cornerstone to achieve the expected competences or to develop the designated skills, as students deem comments and scores a crucial part of the dialogue with teachers/professors. Furthermore, assessment helps to conclude the learning cycle and to understand more about one's performance and how to do better (Cakiroglu et al., 2017; Liu et al., 2018; Seifert & Feliks, 2019).

A further aspect of importance for this research is self-assessment. Self-assessment involves various different possible activities pertaining to assessing functioning of students by themselves and this can be considered as

a formative assessment process and a form of feedback (Andrade, 2019). Boud (2013) highlights the importance of self-assessment for the learning process. While Yan (2020) establishes the importance of self-assessment for self-regulated learning which by implication also confirms its relevance for SDL.

SDL seems to be a timely approach to face situations of isolation (wanted or unwanted, like the COVID-19 pandemic lockdowns), as it deals with common features like user authentication (Okada et al., 2019). According to Du Toit-Brits (2021) SDL requires embracing an SDL culture, addressing students' needs, creating a feeling of security and sense of belonging, employing active instructional procedures and using appropriate learning resources. SDL also implies a focus on learning-oriented assessment emphasizing assessment as being integral to the learning process and hence moving from assessment of learning to assessment for and as learning (Lubbe & Mentz, 2021). Furthermore, within the context of SDL-oriented assessment, aspects around metacognition, motivation, and, self-regulation are also relevant (Lubbe & Mentz, 2021).

As is noted above, motivation is important for SDL and for the assessment context relevant to this article. In this regard, it is imperative to distinguish between intrinsic and extrinsic motivation. As SDL is underpinned by self-determination theory (Van der Walt, 2016), the approach to motivation is also framed by this theory in this article. Within this view, Ryan and Deci (2020) describe intrinsic motivation as relating to something being done due to inherent interest or enjoyment while extrinsic motivation pertains to other often external reasons other than a person's inherent satisfaction.

SDL also deals with psychological features, like feeling lonely, or social relationship challenges. Both students and teachers find it hard to overcome the feeling of isolation along with the lack of an estimate deadline. As the rest of the population, uncertainty plays a significant role when any member of the educational community must schedule their daily life and still meet the expected performance (Irawan et al., 2020). Nonetheless, SDL requires a fine e-assessment strategy to become more effective and reinforced. Moreover, the pandemic has brought SDL into the spotlight, as SDL brings an excellent approach to the imposed problem of isolation worldwide. However, assessment in online, isolated environments is still a problem, as it requires a combination of normalization to become effective and fair and contextualization to be become sensitive to particular situations (García-Peñalvo et al., 2020; Khan & Jawaid, 2019). Regular mechanisms do not seem to work completely when adapted to specific needs, and there is a growing interest in and demand for a clear solution to be satisfactorily implemented.

3. Method

This study – in which it was aimed to qualitatively explore how self-directed learning and assessment can be supported and encouraged in times of crisis – was conducted within the interpretivist paradigm (Bakkabulindi, 2015).

Data were collected by means of focus group interviews, which is a type of group interviewing that focuses on communication between the different identified research participants for data generation (Kitzinger, 1995). Focus group interviews use group interaction in conjunction with researcher prompts rather than just turn-taking for questions. In such interviews, participants are expected engage with one another by asking questions and discussing different views (ibidem). Given the emergency, focus group interviews were the best way to generate data and find possible solutions. In view of the COVID-19 pandemic, focus group interviews were conducted by means of a group video-conferencing system (Zoom) and obtained the raw data through webinars.

Fifty-two participants (37 males and 15 females) from public schools, where 37 are teachers and 15 are parents, were sampled by means of convenience sampling and were invited to participate in the focus group interviews. Considering the differences of ICT infrastructure between different schools and regions of China, all the participants were invited from both cities and rural areas. Particularly, 75% of the participants were from the cities, and only 25% of the participants were from rural areas. This unbalanced distribution could be explained by the technical difficulties that people in rural areas might face to join online activities (e.g., courses, meetings, etc.). The goal was to collect data from stakeholders with different perspectives on the strategies implemented to support SDL during the COVID-19 pandemic.

Two questions were used to stimulate the discussion and collect data, namely: (1) What self-directed learning and assessment strategies were used online (for teachers) or at home (for parents) to maintain the learning process? and, (2) Have you used any tools or software to facilitate the process, if yes, please mention them?

The researchers adhered to the *Ethical Guidelines for Educational Research* of the British Educational Research Association (2011). Ethical approval for this study was obtained from the Smart Learning Institute of the Beijing Normal University (BNU), and permission was granted by the participants' institutions before data collection commenced. Moreover, participation in this research was voluntary, and the participants were informed that they could withdraw from the research process at any stage. The participants granted informed consent so that the Zoom discussion could be recorded, analyzed and reported. Additionally, the authors explicitly mentioned that all data and results

would be anonymized and used for research purposes only.

4. Results

This section provides an overview of the general strategies for SDL and assessment, as well as self-assessment strategies specifically.

4.1 Strategies for Self-directed Learning and Assessment

The general strategies that emerged from the data were grouped according to the different types of research participants. Therefore, the first part of the sub-section comprises inputs from teachers, while the second part of the sub-section covers the perspective of parents.

TEACHER PERSPECTIVE

Recommendation 1: Linking the learning and assessment process with the inner needs of students

According to one teacher, to keep learners self-directed, especially during crises, teachers should not rely on technology only. However, they should always link the learning and assessment process with students' inner motivation. For instance, teachers can suggest that obtaining a diploma would be helpful to be a successful person in the future and may support others in a crisis like the COVID-19 pandemic. This would give learners the inner motivation to study hard and to do their best. One teacher supported this, saying,

> *"it is not only about technology for an (sic) effective self-regulated learning ... teachers should also pay attention to the psychological and inner needs of learners".*

Several teachers recommended that students be called by phone to check on them and to keep encouraging them to learn, as this could be motivational.

One teacher also shared a story about a female college student from the Sichuan Province in China. After the snow had damaged the phone cables, the student had to sit stiffly in the snow for at least two hours, looking for a 4G signal to attend an online course from a 3 800-meter-high mountain just to keep up with the course. According to this teacher, the student was motivated to keep up with the course despite the challenges she faced.

This finding ties in with the importance of motivation for SDL (Regan, 2003). Each student's context is different; this emphasizes the need for student agency and the fact that students should take charge of their own learning. This recommendation also ties in with the next recommendation.

Recommendation 2: Parents should be the motivators of the learning process

Teachers believed parents are a core element in maintaining education from home and they have more influence than technology to keep their children self-directed. Therefore, they encouraged parents to keep an eye on their children's schedule, remind them of their assessments and to encourage them to learn every day. Several teachers mentioned that moral support and encouragement are needed for students to maintain education, especially in times of crisis, where the student's mind is occupied with other things, such as health and safety. Several teachers further mentioned that parents helped students learn by, for instance, solving some problems they encountered while finishing their homework.

Moreover, motivation is such an essential aspect of SDL, it is included in Garrison's (1992) comprehensive model of SDL. According to Garrison,

> *"[m]otivation plays a very significant role in the initiation and maintenance of effort toward learning and the achievement of cognitive goals"* (p. 26).

Hence, efforts by teachers and parents, as described above, can be advantageous in said context. In addition, the role and affordance of parents as "human resource" (Knowles, 1975), especially in the context of a pandemic, are evident.

Recommendation 3: Use of smart and flexible technologies

Several teachers mentioned that, since the learning process often occurs online during crises, online tools could be used to facilitate learning from home. One teacher mentioned that several tools, such as timers, could be used to help students control learning time, for instance. In addition, other teachers mentioned that they used some learning tools, such as ClassIn, which send automatic reminders to students of their learning schedule and assessment deadlines. This can help students to keep up with the learning process. In addition to traditional course materials – which included videos, readings, and assessments – the teachers relied on Massive Open Online Courses (MOOCs), which provided interactive user forums that helped to build a community for them and their students. MOOCs allow for engagement between self-organized students by means of participation, which, in turn, relates to their set learning goals, their prior knowledge and skills, and common interests. Other teachers, on the other hand, mentioned that including tools in the learning process should be done carefully to not make students tired of using different tools for different subjects, especially during crises.

It is evident from the participants' feedback that several tools can contribute to creating an environment where

learning time as well as the content and process can be monitored. However, from the responses, it was clear that, in many cases, with a monitoring emphasis by teachers, the learning process might not always be as learner-centered as it could be. Yet, through the introduction of said tools, students can be empowered to make use of the tools themselves to support their own learning process.

Recommendation 4: Creating learning groups

Teachers mentioned that designing collaborative learning and assessment activities in using social networks and creating learning groups could help students to be self-directed. In groups, students could start reminding each other of homework or ask some questions about the course, according to one teacher. This type of interaction can encourage students to learn more and to start asking questions if they have something that they need to learn about. Other teachers also mentioned that learning groups in crises are particularly important to help avoid online isolation and maintain social interaction between students. For instance, several teachers reported that they used WeChat, which can be used as a simple and easy learning platform to support fostering collaborative learning.

The suggested learning groups prove to be an ideal means towards supporting collaborative learning. The importance of SDL and collaborative learning as 21st-century skills and their mutually supportive role are evident (Lee et al., 2014). Only by creating opportunities for students to interact – and in the COVID-19 context, this would be through online platforms – can students use peers as resources in the learning process.

Recommendation 5: Selecting an individual strategy based on the subjects to learn

The teachers mentioned that students can learn different subjects, such as language and mathematics, where each subject has its own approach. Consequently, students need to make their own individual learning plans per subject. For example, as regards language learning, one needs to read extracurricular books for at least one hour a day. Similarly, mathematics would involve other skills and tasks related to computing ability. From the feedback by the participants, it was evident that students had unique and subject-specific approaches to how they handled learning and assessment.

To select relevant strategies for different subjects and skills to be acquired, students need to take charge, set their own goals, and identify relevant strategies.

PARENTAL PERSPECTIVE

Recommendation 6: Create weekly plans and put them up in visible places

Parents mentioned that good planning can reduce learning stress for both them and their children. They recommended creating a written weekly schedule, where students outline what-to-learn goals, tasks and deadlines. Hence, there is parental support, but clear student agency determines the process. Said schedule could be put up in several visible places at home, such as on the fridge, or on students' bedroom wall. In this way, students can always remember their schedule. Parents also mentioned that it was their responsibility to create good daily habits at home, including ensuring enough sleeping hours, exercises to stay healthy, leisure and learning. This can help students to stay healthy and motivated to learn. Furthermore, parents mentioned that a notebook is the simplest tool that can be used to create a learning plan. It is evident that, regardless of the level and subjects, students can determine their own short-term and medium-term learning plans and can adapt their learning and assessment accordingly. This is highly relevant in this context, as sub-discipline teaching is quite prominent in Chinese education. In conclusion, the creation of learning plans was shown to be an effective tool to drive assessment as learning in a context in which SDL could be fostered.

Recommendation 7: Creating an encouraging environment and rewarding students

Parents also highlighted the importance of creating a quiet and encouraging environment at home in which students can feel safe and motivated to learn. The parents mentioned that, without motivation, students would not have the "will" to learn even with their teachers. Other parents also suggested that students should be rewarded to keep them self-motivated to learn from home and to do their best. One parent mentioned that rewards and encouragements have a significant impact on the mental state of students, especially during crises. It was found that interaction between parents and their children alleviated anxiety among students while staying at and learning from home for long periods. Despite some literature advising against the emphasis of rewards towards supporting learning (Ryan & Deci 2020), the data in this research clearly showed how incentives can be supportive in encouraging students in these specific circumstances. The affordances of rewards found in this research, is in line with other discourses on rewards and engagement in the educational context (McKernan et al. 2015).

Recommendation 8: Developing "leadership" and "positive" attitudes in students

According to the parents, one of the successful elements of SDL is developing a "leadership" attitude in their children. In this case, they encourage their

children to take the lead and be responsible for their learning process instead of waiting for the teacher. Such an attitude is crucial in order for students to always take initiative to learn and seek solutions whenever they face challenges or difficulties. Parents also stated that a "positive" attitude should be further developed in students by, for instance, explaining to them that facing difficulties is part of life, even when learning, and that giving up is not a choice and we should always keep on working to find a solution.

Through fostering a sense of student agency, students can be supported in becoming self-directed learners. In addition, the participants' views also echoed some of the self-directed learner characteristics noted by Guglielmino (1977).

4.2 Self-assessment Strategies

The importance of self-assessment for SDL is clear from the literature (Gibbons, 2002), and the issue of self-assessment was also raised by the parents. Teachers mentioned that they and/or parents should guide students to set new goals and allow them to formulate realistic action plans to support motivation and ultimately self-assessment.

The teachers further mentioned that, through self-assessment, students can: (1) identify their own learning gaps, hence, know what they should improve; (2) set learning goals to achieve; (3) revise homework or assignments; and (4) track their own learning progress. Furthermore, teachers mentioned different types of strategies that could be used to easily conduct self-assessment (see Table 1).

Another teacher said:

> "*learning doesn't just happen because we get an A. We learn when we reflect on why we were or weren't successful, and how we can make changes going forward to reach a different outcome*".

The teachers further mentioned that different subjects have various cognitive goals.

Importantly, students at different levels and in different contexts should be supported to assume different approaches to learning and assessment. For younger students, parental support should be more extensive and should actively create opportunities for self-reflection. In the case of students with higher levels of self-monitoring, it might be easier for them to conduct self-reflection by themselves by means of different mediums such as diaries or mind maps. For older students in junior and senior middle schools, self-reflection might be more related to subject knowledge, and they can deepen their knowledge through this reflective practice. In addition, teachers mentioned that several tools could be used for self-assessment that parents and students should consider (see Table 2).

5. Discussion

In times of crisis, as in the case of the COVID-19 pandemic, learning might be shifted to be remotely from home. However, students might lack the needed skills to be self-directed learners. This can affect the learning experience and learning outcomes. Therefore, in this paper, strategies and tools that can be used to foster self-directedness and assessment in crises were highlighted. These strategies were suggested by different stakeholders, namely teachers and parents.

It is clear from the results that, while technology can facilitate SDL and assessment, teachers and parents still need to pay attention to the mental state of students, especially during crises, to keep them motivated and eager to learn from home. Despite technological advancements, human-to-human interaction is still crucial to maintain education from home. The research findings can help the educational community provide better learning experiences, especially in times of crisis during which face-to-face learning may be difficult. Additionally, to develop SDL, self-monitoring and self-assessment (see Table 3 for the difference between these concepts) should be considered.
Additionally, digital citizenship is a set of values that must be reflected in students' behavior. Teachers and parents should help them understand those values, but students must embrace them and act upon them, even when they are not being monitored by anyone. When students take the lead in teaching these values to each other and support each other in implementing good digital citizenship practices, they take on an active SDL role that creates personal ownership and investment in those values. They become intrinsically motivated rather than extrinsically motivated, which is more likely to lead to long-term retention and change when it comes to ways of learning. Digital citizenship can be defined as the use of technology that is safe, is conducted ethically, responsibly and informed (Sheykhjan, 2017). Under this concept, many different skills and literacies are relevant and would also have implications for online assessment. In this regard, ethical behavior in terms of safety, privacy, security and conduct are relevant in conjunction with relevant communicative and information literacy skills.

6. Conclusion

This article explored SDL and assessment within the crisis context of the COVID-19 pandemic in China. Importantly, this research found that while technology can be supportive of SDL and assessment, teachers and parents have to pay attention to the mental state of students in order to keep the students motivated and eager to learn from home.

An important advantage of supporting SDL, is the fact that students are supported to take the lead and develop agency in terms of their learning. Furthermore, in this

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	Rubrics	Test	Concept map
Descriptions	"Rubrics are a valuable tool for self-assessment. Because rubrics not only list the success criteria but also provide descriptions of levels of performance, students can use them to monitor and evaluate their progress during an assessment task or activity." (Assessment for Learning, n.d.)	A test will help students to conduct self-evaluation. For students in lower grades, the recommended types of questions include multiple options and fill-in-the-blank quizzes, and free-response questions should be designed to allow students to upload photos of their answers.	"A concept map organises facts, concepts, ideas or terms in a visual or diagrammatic way so that the relationship between the individual items is made clearer." (Assessment for Learning, n.d.)
Target user	Middle school and senior grade primary school students	All	Middle school and senior grade primary school students
Learning scenario	Multi-situations; Parents could work with kids to create the rubric, or it could be provided by the teacher	Knowledge mastering assessment	Sum up the learning in a period; organize knowledge

Table 1 - Typical self-assessment strategies.

Tools for self-evaluation			
Category	**Name**	**Form**	**Introduction**
Test	Yuantiku http://www.yuantiku.com/	APP	Yuantiku provides the examinations over the years of nationwide junior and senior middle schools
	Uda https://cn.udacity.co+m/	APP	A question-centered, personalized English learning application
	Xueba100 http://www.xueba100.com/	APP	A question bank with search engine
	17zuoye https://ucenter.17zuoye.com	APP	17zuoye provides online assignments and thematic exercises
	Liulishuo https://www.liulishuo.com/	APP	An English learning application combined with advanced auto-scoring engine of spoken English
	The exercises/papers purchased by students themselves	Paper products	Exercises/papers provide thematic training
	ALEKS https://www.aleks.com/	Website	An evaluation system for learning process, covering various subjects
Rubrics	Learning Contract	Document	A plan of learning activities negotiated/designed jointly by learners and instructors
	CSI Graphic	Graphic	"C" represents Color (student may choose a color representing the essence of their idea); "S" represents Symbol (student may choose a symbol representing the essence of their idea); "I" represents Image (student may choose an image representing the essence of their idea)
	KWL	Form	K-W-L – what I already know; what I want to know; and what I learned
Concept map	XMind https://www.xmind.cn/	PC App	A mind mapping tool
	MindManager https://www.mindmanager.cn/	PC App	A mind mapping tool
	Inspiration	PC App	A mind mapping tool suitable for brainstorming
	Mubu https://mubu.com/	Website	A tool to organize thoughts by outlines and mind maps
	Coggle https://coggle.it/	Website	An online collaborative mind mapping tool
	ProcessOn https://www.processon.com/	Website	An online collaborative drawing platform

Table 2 - Examples of self-assessment tools.

	Self-monitoring	In common	Self-evaluation
What	Checking and adjusting one's ongoing performance.	Performance	Judging how well one has learned and performed so far.
	Metacognitive strategy	Metacognitive strategy	Metacognitive strategy
Why	To measure effectiveness during a task. To change, adjust, and improve learning practices in order to succeed.	To improve	Identify strengths and weaknesses to improve next time.
When	Ongoing during a learning sequence	NA	In the end of a learning sequence

Table 3 - Differences between self-monitoring and self-assessment.

evident from this research. It is also relevant to note that the development of the skills supporting learning together with self-direction could have application value in students' further studies and work life.

Despite the important contribution that this study provides pertaining to the strategies that should be applied to foster SDL and assessment, there were several limitations that should be acknowledged and further investigated. For instance, this study was purely qualitative, and no quantitative results were presented. Also, we did not investigate the impact of applied SDL strategies on learning outcomes. Future research could focus on the following: (1) investigating the impact of the reported SDL strategies on learning motivation and outcomes; (2) the most appropriate SDL strategies or tools that could be implemented with different learning subjects (e.g., Mathematics, English, etc.) and modes (e.g., synchronous, asynchronous, etc.); and (3) developing an SDL competency framework where a systematic review is conducted first to determine the necessary competencies for SDL – such a framework may then be validated by experts using the Delphi method (at least two rounds).

References

Alruwais, N., Wills, G., & Wald, M. (2018). Advantages and challenges of using e-assessment. *International Journal of Information and Education Technology*, *8*(1), 34-37.

Andrade, H. L. (2019). A critical review of research on student self-assessment. *Frontiers in Education, 4*:1–13. https://doi.org/10.3389/feduc.2019.00087

Appiah, M., & Van Tonder, F. (2018). E-Assessment in Higher Education: A review. *International Journal of Business Management & Economic Research*, *9*(6), 1454-1460.

Asamoah, M. K. (2020). Reflections and refractions on Sakai/Moodle learning management system in developing countries: A case of Ghanaian universities' demand and supply perspective analyses. *African Journal of Science, Technology, Innovation and Development*, *12*(2), 243-259.

Assessment for Learning (n.d.), Strategies to enhance student self-assessment. https://www.assessmentforlearning.edu.au/professional_learning/student_self-assessment/student_strategies_enhance.html

Bakkabulindi, F. E. K. (2015). Positivism and interpretivism: Distinguishing characteristics, criteria and methodology. In C. Okeke, & M. van Wyk (Eds.), *Educational research: An African approach* (pp. 19–38). Oxford University Press.

Boud, D. (2013). *Enhancing learning through self-assessment*. Routledge.

British Educational Research Association. (2011). Ethical guidelines for educational research. https://www.bera.ac.uk/researchers-resources/publications/ethical-guidelines-for-educational-research-2011

Brockett, R. G., & Hiemstra, R. (2019). *Self-direction in adult learning: Perspectives on theory, research and practice*. Routledge.

Burgos, D., & Van Nimwegen, C. (2009). Games-based learning. Destination feedback and adaptation: a case study of an educational planning simulation. In T. M. Connolly, M. H. Stansfield, & L. Boyle (Eds.), *Games-based learning advancements for multi-sensory human computer interfaces* (pp. 1048-1059). IGI Global.

Cakiroglu, U., Erdogdu, F., Kokoc, M., & Atabay, M. (2017). Students' Preferences in Online Assessment Process: Influences on Academic Performances. *Turkish Online Journal of Distance Education*, *18*(1), 132-142.

Carter Jr, R. A., Rice, M., Yang, S., & Jackson, H. A. (2020). Self-regulated learning in online learning environments: strategies for remote learning. *Information and Learning Sciences*, *121*(5/6). https://www.emerald.com/insight/content/doi/10.1108/ILS-04-2020-0114/full/pdf

Carver-Thomas, D., & Darling-Hammond, L. (2019). The trouble with teacher turnover: How teacher attrition affects students and schools. *Education Policy Analysis Archives*, 27(36), 1-32, https://doi.org/10.14507/epaa.27.3699

Christenson, S. L., Reschly, A. L., & Wylie, C. (Eds.). (2012). *Handbook of research on student engagement*. Springer.

Chung, E., Subramaniam, G., & Dass, L. C. (2020). Online Learning Readiness among University Students in Malaysia amidst COVID-19. *Asian Journal of University Education*, 16(2), 46-58. https://files.eric.ed.gov/fulltext/EJ1267359.pdf

Costa, A. L., & Kallick, B. (2004). *Assessment strategies for self-directed learning*. Sage.

Du Toit-Brits, C. (2021). The influence of the learning environment on promoting self-directed learning. In E. Mentz, D. Laubscher & J. Olivier (Eds.), *Self-Directed Learning: An imperative for education in a complex society* (pp. 25-44). AOSIS. https://doi.org/10.4102/aosis.2021.BK279.02

García-Peñalvo, F. J., Corell, A., Abella-García, V., & Grande, M. (2020). Online assessment in higher education in the time of COVID-19. *Education in the Knowledge Society*, 21. https://doi.org/10.14201/eks.23013

Garrison, D. R. (1992). Critical thinking and self-directed learning in adult education: An analysis of responsibility and control issues. *Adult Education Quarterly*, 42(3), 136-148.

Gibbons, M. (2002). *The self-directed learning handbook: Challenging adolescent students to excel*. Jossey-Bass.

Guerrero-Roldán, A. E., & Noguera, I. (2018). A model for aligning assessment with competences and learning activities in online courses. *The Internet and Higher Education*, 38, 36-46.

Guglielmino, L. M. (1977). Development of the self-directed learning readiness scale [PhD thesis]. University of Georgia.

Irawan, A. W., Dwisona, D., & Lestari, M. (2020). Psychological Impacts of Students on Online Learning During the Pandemic COVID-19. *KONSELI: Jurnal Bimbingan dan Konseling*, 7(1), 53-60.

Kaur, K. (2020). Incorporating immediate feedback in formative learning checks using H5P. *Pacific Journal of Technology Enhanced Learning*, 2(1), 34-34.

Khan, R. A., & Jawaid, M. (2020). Technology enhanced assessment (TEA) in COVID 19 Pandemic. *Pakistan Journal of Medical Sciences*, 36(COVID19-S4), S108.

Kitzinger, J. (1995). Introducing focus groups. *British Medical Journal*, 311(7000), 299-302. https://doi.org/10.1136/bmj.311.7000.299

Knowles, M. S. (1975). *Self-Directed Learning: A Guide for Learners and Teachers*. Follett.

Lee, K., Tsai, P. S., Chai, C. S., & Koh, J. H. L. (2014). Students' perceptions of self-directed learning and collaborative learning with and without technology. *Journal of Computer Assisted Learning*, 30(5), 425-437.

Liu, X., Li, L., & Zhang, Z. (2018). Small group discussion as a key component in online assessment training for enhanced student learning in web-based peer assessment. *Assessment & Evaluation in Higher Education*, 43(2), 207-222.

Lubbe, A. & Mentz, E. (2021). Self-directed learning-oriented assessment and assessment literacy: Essential for 21st century learning. In E. Mentz & A. Lubbe (Eds.), *Learning through assessment: An approach towards Self-Directed Learning*. (pp. 1–25). AOSIS. https://doi.org/10.4102/aosis.2021.BK280.01

McKernan, B., Martey, R.M., Stromer-Galley, J., Kenski, K., Clegg, B.A., Folkestad, J.E., Rhodes, M.G., Shaw, A., Saulnier, E.T. and Strzalkowski, T. (2015). We don't need no stinkin'badges: The impact of reward features and feeling rewarded in educational games. *Computers in Human Behavior*, 45, 299-306.

Mohamadi, Z. (2018). Comparative effect of online summative and formative assessment on EFL student writing ability. *Studies in Educational Evaluation*, 59, 29-40.

Mora, N., Caballe, S., & Daradoumis, T. (2016). Providing a multi-fold assessment framework to virtualized collaborative learning in support for engineering education. *International Journal of Emerging Technologies in Learning (iJET)*, 11(07), 41-51.

Moscinska, K., & Rutkowski, J. (2018). Effective computer-assisted assessment: Challenges and solutions. In *2018 IEEE Global Engineering Education Conference (EDUCON)*, April (pp. 969-978). IEEE.

Okada, A., Whitelock, D., Holmes, W., & Edwards, C. (2019). e-Authentication for online assessment: A mixed-method study. *British Journal of Educational Technology*, 50(2), 861-875.

Owolabi, J. O. (2020). Virtualising the School During COVID-19 and Beyond in Africa: Infrastructure, Pedagogy, Resources, Assessment, Quality Assurance, Student Support System. *Technology,*

Culture and Best Practices, Advances in Medical Education and Practice, *11*, 755-759.

Pan, X., & Shao, H. (2020). Teacher online feedback and learning motivation: Learning engagement as a mediator. *Social Behavior and Personality: An International Journal*, *48*(6), 1-10.

Regan, J. A. (2003). Motivating students towards self-directed learning. *Nurse Education Today*, *23*(8), 593-599.

Reschly, A. L. (2020). Dropout Prevention and Student Engagement. In A. Reschly, A. Pohl, & S. Christenson (Eds.), *Student Engagement* (pp. 31-54). Springer. https://doi.org/10.1007/978-3-030-37285-9_2

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary educational psychology*, 61, 101860.

Seifert, T., & Feliks, O. (2019). Online self-assessment and peer-assessment as a tool to enhance student-teachers' assessment skills. *Assessment & Evaluation in Higher Education*, *44*(2), 169-185.

Sheykhjan, T. M. (2017). *Internet Research Ethics: Digital Citizenship Education*. https://files.eric.ed.gov/fulltext/ED586165.pdf

Singh, D. K. (2020). Self-directed learning strategy as the need of the hour during COVID-19 pandemic. In R. Sarkar (Ed.), *Education in the 21st century: emerging issues and the way forward*. Namya.

Van der Walt, H. (2016). The feasibility of grafting self-directed learning theory onto capability

theory. In E. Mentz & I. Oosthuizen (Eds.), *Self-directed learning research*. (pp. 1-34). AOSIS. http://dx.doi.org/10.4102/aosis.2016.sdlr14.01

Van Nimwegen, C. C., Burgos, D., Van Oostendorp, H. H., & Schijf, H. H. (2006). The paradox of the assisted user: guidance can be counterproductive. In *Proceedings of the SIGCHI conference on human factors in computing systems*, April (pp. 917-926). https://doi.org/10.1145/1124772.1124908

Yan, Z. (2020). Self-assessment in the process of self-regulated learning and its relationship with academic achievement. *Assessment & Evaluation in Higher Education, 45*(2), 224-238.

Yassine, S., Kadry, S., & Sicilia, M. A. (2016). A framework for learning analytics in Moodle for assessing course outcomes. In *2016 IEEE Global Engineering Education Conference (EDUCON)*, April (pp. 261-266). IEEE.

Zhu, M., Bonk, C. J., & Doo, M. Y. (2020). Self-directed learning in MOOCs: exploring the relationships among motivation, self-monitoring, and self-management. *Educational Technology Research and Development*, *68*, 2073-2093. https://doi.org/10.1007/s11423-020-09747-8

Zhu, X., & Liu, J. (2020). Education in and After Covid-19: Immediate Responses and Long-Term Visions. *Postdigital Science and Education*, *2*, 695-699. https://doi.org/10.1007/s42438-020-00126-3

Zuo, L., Dillman, D., & Miller Juve, A. (2020). Learning at-home during COVID-19: A multi-institutional virtual learning collaboration. *Medical Education*. https://doi.org/10.1111/medu.14194