

ICONSPADU 2021**International Conference on Sustainable Practices, Development and Urbanisation****SUSTAINABILITY LEARNING FOR OLDER ADULTS THROUGH
TECHNOLOGY USE: A SYSTEMATIC LITERATURE REVIEW**

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Abstract

Digital technology influences our lives in various ways. Today, the escalating pace of social, economic, and technological changes at home, at work, in the community, and in global society creates a perpetual need for everyone, including older adults, to engage in lifelong learning habits. When it comes to learning and using technology, older adults are often stereotypically described as a homogenous group that lags, causing them to have low or no interest, experience anxiety, or lack self-confidence. A standard view is that older citizens are usually hesitant and worried about using technological devices such as computers or smartphones and feel nervous and timid about their ability to use the latest technology. This paper aims to look into past research on how advanced technologies create sustainable learning opportunities for older adults. This study is conducted following the guidelines of RepOrting standards for Systematic Evidence Syntheses (ROSES), explicitly designed for systematic reviewing and mapping for environment management. The ROSES protocol aims to aid researchers in distinguishing a variety of physical, mental, emotional, and social barriers that affect older adults' ability to use information technology effectively.

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1. Introduction

In today's world, the number of individuals in the older people category is increasing at a noticeably rapid pace. According to Klimova et al. (2021), this demographic trend is expected to continue as time goes on. With the aging society in mind, many countries have been actively promoting technology usage among the older generation (Wu et al., 2016) since the world faces rapid development of technology and devices. Since technology is an item that is incorporated into most of our daily activities, having digital literacy and using the devices appropriately is considered a necessity (Cerna et al., 2018).

Lifelong learning is a concept where educational opportunities are open to not only young generations but also for older people to gain knowledge and obtain education, even though being in the older adults category (Lee et al., 2019). The inclusion of older adults in education is also a part of the 17 Sustainable Development Agenda, which is the fourth goal, quality education, where lifelong learning is to be enhanced and promoted (Ofei-Manu & Didham, 2018; SDG, 2015). According to Lee (2015), sustainable development for older people is essential as it can promote various learning strategies and activities for older adult learners. In ensuring that older adult learners obtain efficient training in their lifelong learning programs, acknowledging their capabilities and limitations should be considered (Mitzner et al., 2008).

Past researchers have found that several older people face neurological disorders, such as cognitive decline and other age-related problems, which could affect older peoples' performances in carrying out their daily activities (Kadariya et al., 2019). Other barriers, whether physical, mental, emotional, or even social aspects, affect the older adults' ability to use technological devices (Lee & Kim, 2018). The implementation of instructional strategies into the learning sessions with the older adult learners can mitigate the barriers that the elders face. As mentioned by Oakleaf and VanScoy (2010) in their research, instructional strategies can maximize efficiency in the learning process of an individual.

2. Research Methods

This study conducted a systematic review, using RepOrting Standards for Systematic Evidence Syntheses (ROSES) as guidance to study past research, specifically to identify the barriers that are commonly associated and faced by older adult learners and the strategies that have been used by past researchers as their approach to push through the barriers and conduct successful knowledge transmission of older adult learners in optimally using technologies.

Following the ROSES guide, this study first began with formulating a research question that will act as the outline of this current study. Next is the systematic searching strategy, which has three sub-processes, the first one being the identification process, where this process involves searching articles for articles in selected databases using a search keyword that is formulated that is relevant to the topic of the study. The search string can be seen in Table 1. Moving on to the second process, which is the screening process, where the articles obtained from the prior process were screened according to a set of inclusion criteria that has been determined. Since two databases were used for searching the articles, any duplicated titles were removed from the findings of this process. After obtaining articles that suit the inclusion criteria, the articles were manually filtered by the researcher for eligibility by reading the title and abstract

of the screened articles. Only relevant articles were selected for the next process, quality appraisal. This process is where the researcher assesses and evaluates the content quality of the eligible articles and ranks the articles in their respective qualities (high, medium, or low quality) and which to be included in the review.

Once the process had been completed, the eligible articles were dissected to obtain relevant information for this current study. The result of the systematic literature review was recorded and will be presented in the following chapter.

Table 1. Search String

Database	Search string
ERIC	Teaching strategies OR learning strategies OR teaching approaches OR learning approach AND elderly OR elderly learners OR adults OR adult learners OR senior citizen TS= (("effect*" OR "benefit*" OR "advantage*" OR "outcome*") AND ("instruction* strateg*" OR "instruction* design*" OR "instruction* method*" OR "teach* strateg*" OR "learn* strateg*" OR "teach* method*" OR "learn* method*" OR "learn* design*" OR "teach* design*" OR "education* technique*" OR "teach*" OR "learn*" OR "instruct*"))
SCOPUS	AND ("old* adult*" OR "old* learn*" OR "elder* learn*" OR "senior learn*" OR "senior citizen*") AND ("learn*" OR "education*") AND ("digital techno*" OR "digital*" OR "techno*" OR "gadget*" OR "ICT" OR "information communication technology*"))
Web of Science	TITLE-ABS-KEY (("effect*" OR "benefit*" OR "advantage*" OR "outcome*") AND ("instruction* strateg*" OR "instruction* design*" OR "instruction* method*" OR "teach* strateg*" OR "learn* strateg*" OR "teach* method*" OR "learn* method*" OR "learn* design*" OR "teach* design*" OR "education* technique*" OR "teach*" OR "learn*" OR "instruct*") AND ("old* adult*" OR "old* learn*" OR "elder* learn*" OR "senior learn*" OR "senior citizen*") AND ("learn*" OR "education*") AND ("digital techno*" OR "digital*" OR "techno*" OR "gadget*" OR "ICT" OR "information communication technology*"))
Semantic Scholar	Instructional strategies OR learning strategies AND elderly learners OR adult learning OR elderly education

3. Findings

The identification process was conducted on the databases Education Resources Information Centre (ERIC), Scopus, Web of Science (WOS), and Semantic Scholar, and a total of 2188 articles were obtained as results of the search string constructed. After articles had been identified, the screening process was conducted to eliminate articles that did not fit into the criteria that had been determined. The inclusion criteria are that the articles must be published within the years 2017 to 2021. This is to ensure the findings of the articles are up to date with current settings. Next, the articles must be published in a journal article publication, and the articles must be in the English language. This is to avoid any mistranslation and any confusion arising during the article reviewing. After the screening process, 1959 articles were excluded, and after a second round of screening to look for duplicate articles, 35 articles were excluded, leaving a total number of 265 articles to proceed to the next stage.

The 265 articles were brought to the next process, eligibility, where the articles were assessed by reading through the title and abstract. Two hundred twenty-seven articles were excluded as they emphasized general learning rather than older adult learning, unrelated to older adult learning, emphasized more on older adult wellbeing rather than older adult learning, published in a book chapter, or did not state any strategies for older adult learning. After finishing the eligibility process, 38 articles fit the criteria and were eligible to go through the next process for the abstraction of data and analysing the articles. This can be seen in Figure 1.

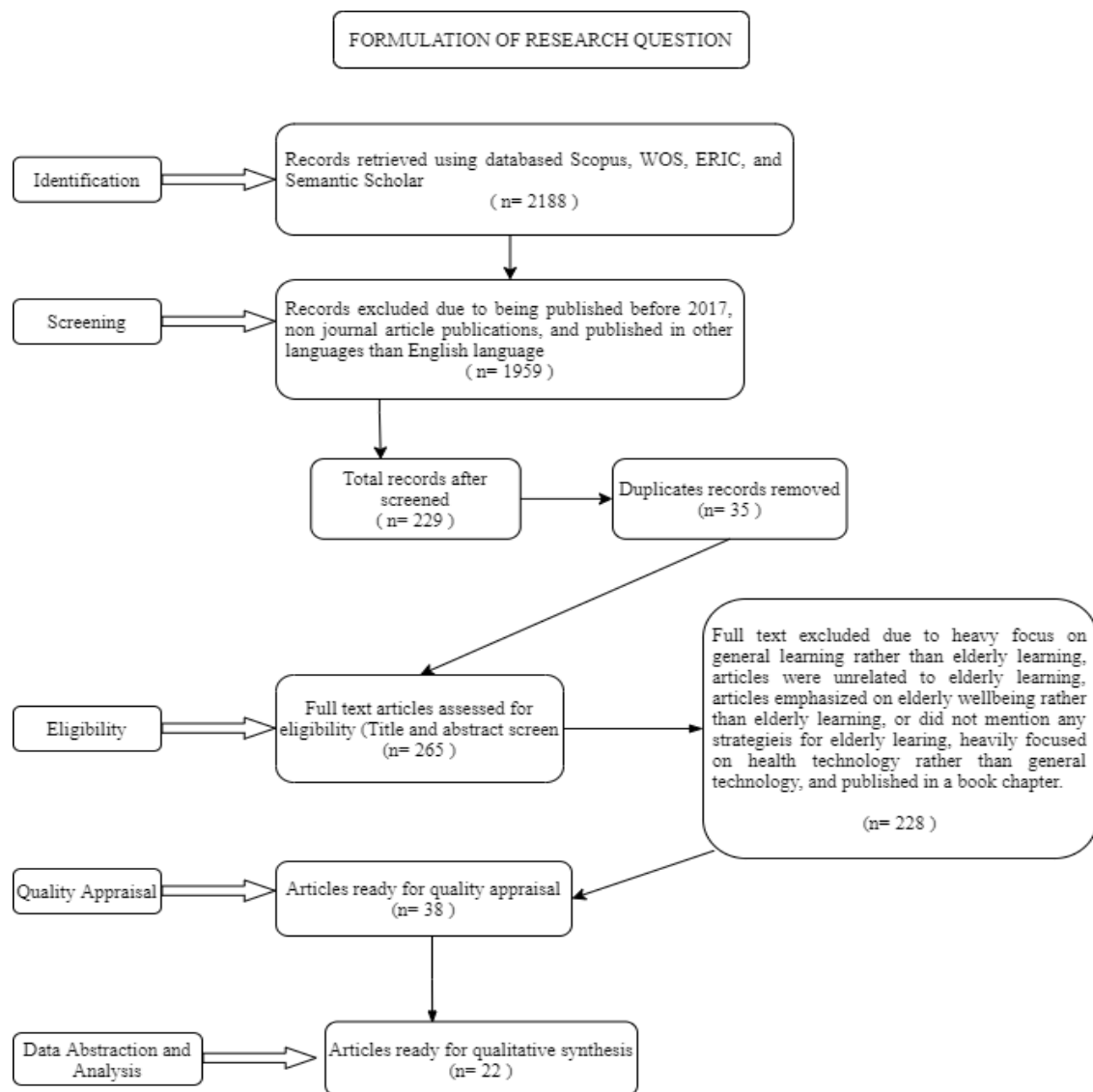


Figure 1. The flow diagram of formulation of the research question

Based on the data extraction from the eligible articles, six (6) themes, the first one being collaborative that consists of group learning, encouraging participation and engagement besides implementing intergenerational learning as the approaches that could be conducted to implement

collaborative learning, as it has been discovered that learning Information and Communication Technologies (ICTs) happens better in a collaborative learning environment (Herrera-Pavo, 2021). The next strategy discovered is using teaching aids, such as audio-visual aids during the learning session with adult learners. Putting in games as activities during learning can also create sustainable learning for older adults and for the learning to become more effective.

The third strategy is understanding the learners' individuality and learning styles in order for them to gain knowledge better. This includes considering the learners' preferred learning time, understanding the learners' needs, allowing self-directed learning, learning in an informal setting, and enhancing experience-based learning. The fourth strategy is crucial in creating sustainability learning for older adults, which is the external support surrounding the older adult learners. This includes creating a fun and motivational environment to encourage the learners to be more active in their learning, other than providing feedback to keep the learners in check with their progress, also providing comments or compliments. Lastly, past researchers have found that older adults learn better when they find the content of learning offered to them is relevant to them, thus making relevance the sixth and final strategy identified from the systematic literature review conducted.

Table 2. Themes and subthemes

Studies	Year	Collaborative learning				Use teaching aids		Learner preferences					Learning styles			External support			Relevance
		GRL	PN	E	IL	AV	GI	LT	ULN	SDL	IFL	EBL	PL	GL	RPT	FE	ME	F	R
1	Allen et al.									/								/	
2	Blažič and Blažič						/		/			/			/				/
3	Chen et al.	/										/							
4	Dauenhauer et al.	/		/								/							
5	Dove and Astell	/												/		/			
6	Formosa		/																
7	Hansen et al.	/				/		/											
8	Kayes and Kayes	/							/		/							/	
9	Lai												/			/			/
10	Lee and Hsu					/								/			/		
11	Lee and Kim	/		/	/			/	/									/	
12	Lin and Wei								/				/						
13	Mattera et al.		/									/				/			
14	Mihai									/									
15	Muñoz-Rodríguez et al.	/																	
16	Nygren et al.								/	/	/								
17	Olvaes-Cuhat	/				/								/				/	
18	Pappas et al.					/			/	/	/		/					/	
19	Seah et al.			/	/		/												
20	Tsai et al.														/	/			
21	Tyler et al.	/								/	/		/						/
22	Ugwuoke et al.									/									

Collaborative learning		Use teaching aids		Learner preference		Learning styles		External support		Relevance	
GRL	= Group learning	AV	= Audio-visual aids	LT	= Learning time	PL	= Practical learning	FE	= Fun environment	R	= Relevance
PN	= Participation	GI	= Game integration	ULN	= Understand learners' needs	GL	= Guided learning	ME	= Motivating environment		
E	= Engagement			SDL	= Self-directed learning	R	= Repetition	F	= Feedbacks		
IL	= Intergenerational learning			IFL	= Informal-learning						
				EBL	= Experience-based learning						

4. Discussion

A total number of 22 articles and studies were reviewed with the objective of identifying instructional strategies that could be applied to elderly learners in order to create a learning experience that is more sustainable, following one aspect of the sustainable development goals, which is to provide quality education for people of all ages. Based on the systematic literature review conducted, studies by (Chen et al., 2021; Dauenhauer et al., 2018; Dove & Astell, 2019; Formosa, 2021; Hansen et al., 2020; Kayes & Kayes, 2021; Lee & Kim, 2018; Mattera et al., 2021; Muñoz-Rodríguez et al., 2020; Olvares-Cuhat, 2018; Seah et al., 2018) along with Tyler et al. (2020) reported the use of collaborative learning studies, which includes group learning, participation, engagement and intergenerational learning as the methods of learning applicable under collaborative learning strategy.

A study by Blažič and Blažič (2019) was among the studies that used and integrated the usage of teaching aids as one of the strategies that could help the elderly learn, by including games in the lessons involving elderly learners, the same method was also used by Seah et al. (2018). Besides the aforementioned studies, Hansen et al. (2020), Lee and Hsu (2021); Olvares-Cuhat (2018); and Pappas et al. (2019) also used teaching and learning aids in their lessons, the only difference is that these studies integrated audio-visual aids in their lessons.

Learner preferences are something that is important to be acknowledged by the instructors and educators when teaching their learners. Some preferences include the learning time of the learners, understanding the needs of the targeted learners, and preferred approaches and methods of learning, which include either informal learning setting, self-directed learning, or experience-based learning methods. These strategies and methods can be found in studies from (Allen et al., 2021; Blažič & Blažič, 2019; Chen et al., 2021; Dauenhauer et al., 2018; Hansen et al., 2020; Kayes & Kayes, 2021; Lee & Kim, 2018; Lin & Wei, 2021; Mihai, 2021; Nygren et al., 2019; Pappas et al., 2019; Tyler et al., 2020) and also by Ugwuoke et al. (2021).

Styles and behaviours of learning is also identified as the strategies of learning implemented for elderly learners. It includes practical learning, which is mentioned by two studies- Blažič and Blažič (2019) and Mattera et al. (2021). Another learning style obtained from the systematic reviewing is guided learning, which was used in studies by Lai (2020); Lin and Wei (2021); Pappas et al. (2019); and Tyler et al. (2020). The last style of learning discovered is repetition, which is included in the studies from Dove and Astell (2019) and Olvares-Cuhat (2018).

The fourth instructional strategy obtained is providing some sort of external support for the elderly learners, so that they feel more motivated and excited to participate in the learning process. One type of external support is conducting lessons in an environment that is fun and lively (Blažič & Blažič, 2019; Tsai et al., 2019), motivating and encouraging (Dove & Astell, 2019; Lai, 2020; Mattera et al., 2021; Tsai et al., 2019), and also by providing feedbacks in the form of acknowledgements and comments to the learners (Allen et al., 2021; Kayes & Kayes, 2021; Lee & Kim, 2018; Olvares-Cuhat, 2018; Pappas et al., 2019).

The sixth and final instructional strategy that was obtained from the systematic literature reviewing is relevance, which is to make sure that the contents of the lesson that will be shared with the elderly

learners are appropriate and applicable to them, people in the older category. This strategy was mentioned in three out of the 22 studies, which are studies from Blažič and Blažič (2019), Lai (2020), and by Tyler et al. (2020).

5. Conclusion

In referring to the fourth Sustainable Development Goals, quality education is something that everyone, including the older adults, deserves to experience and to have. In a world where technology is developing at a noticeable speed, making use of technology as a platform to gain knowledge is something that everyone should take advantage of. As an effort to create sustainable learning for older adults through technology use, systematic strategies need to be implemented to ensure the older adults can use technology to their fullest. In this review, six strategies were identified, along 18 with subthemes that can act as approaches to be used upon older adults learning technology use. By integrating appropriate strategies of teaching and learning for the older adult learners, lifelong learning can be promoted better, thus making the goal of every individual, including the older adults, to obtain quality education will easily be achieved.

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