

Learning Elements for Digital Literacy among Elderly: A Scoping Review

Najmi Najiha Mohd Zaid ¹, Muhammad Fairuz Abd Rauf ², Nahdatul Akma Ahmad^{*3},
Azaliza Zainal ⁴, Fariza Hanis Abdul Razak ⁵, Tengku Shahrom Tengku Shahdan ⁶

¹ Faculty of Education and Social Sciences, Universiti Selangor, Bestari Jaya, Selangor, Malaysia.

² Faculty of Communication, Visual Art and Computing, Universiti Selangor, Bestari Jaya, Selangor, Malaysia.

^{3*} Faculty of Computer and Mathematical Sciences, Universiti Teknologi Mara, Perak Branch, Perak, Malaysia.

⁴ Faculty of Computer and Mathematical Sciences, Universiti Teknologi Mara, Shah Alam, Selangor, Malaysia.

Email : ¹ najminajih@gmail.com, ² mfairuz@unisel.edu.my, ^{3*} nahdatul@uitm.edu.my, ⁴ azaliza@unisel.edu.my,
⁵ fariza062@uitm.edu.my, ⁶ drtengku@gmail.com

ABSTRACT

Elderly learning is needed to be implemented in today's world as the number of elders is increasing quickly, followed by the development of technology that is expanding non-stop. Encouraging the elders to participate in elderly learning or life-long learning programs is considered a necessity, as quite a number of older adults do not know how to manage their devices. This scoping review aims to conduct a preliminary assessment of available literature on learning elements for older adults mastering technology. This scoping review was based on the PRISMA review protocol. A total of 1085 studies were identified using Scopus and Web of Science databases. The selection of eligible studies was made based on a set of inclusion and exclusion criteria set. Results showed that only 15 eligible studies were reviewed to identify the learning elements and devices used to facilitate elderly learning that previous researchers have used. The review determined that communication is one of the most important elements for and implementation in elderly learning sessions.

Index Terms— cognitive theory of aging, learning elements, life-long learning, older adults.

I. INTRODUCTION

According to past research, the number of individuals in the Asia region aged 65 years and above will increase to more than double by 2040. The figures were based on the existing amount of 7.8% as of 2015 [1]. Alongside the increasing number of elderly populations, the number of greying societies is also increasing because of the proliferation of digital devices. Due to the extending life longevity in this constantly changing world, there are often situations where the elders are met up with challenges that they have never experienced throughout their lives. This includes the digital aspects and health-related conditions that shift as they grow older [2] - [4].

In the Cognitive Theory of Aging, as individuals grow older, their ability to mentally process something decreases, thus affecting both cognitive performances' quality and quantity [4]. As defined in the APA Dictionary of Psychology, Cognition refers to the mental process involved in obtaining information and knowledge. Some of the involved processes are thinking skills, understanding skills, memorization skills, and problem-solving skills [6].

The elderly generation nowadays faces a digital divide. In this situation, there is an evident gap between different groups of people's abilities to use and access devices and a group with minimal experience or ability to use the devices [7]. This could be due to the fact that the elderly in today's world had little to no exposure to devices as they were growing up, leading to the paucity of digital literacies among the elders, thus having a lack of interest in learning how to use the devices [9].

Acquiring information and knowledge to enhance digital literacy among older adults is relevant to past researchers as it has been proven to heighten social engagement among the elderly [8]. The increase in their social support has reduced the elders' feeling of emptiness and avoided depressiveness. Acquiring digital literacy could also include the older adults in lifelong learning programs, thus achieving active aging [10] - [11], [3].

Though technology has been proven to improve the well-being of elders, the fact is that older adults mostly have a stigmatized view of technology. As [12] and [13] mentioned, barriers to and difficulties of the elders to interact with technology are often associated with the decline of physical and cognitive abilities. They also mentioned that some elders think of themselves as a group of people who are too old to learn how to use technology.

A study conducted by [12] highlighted a few of the concerns commonly thought of by the elderly community towards technology. In their paper, [14] stated that some of the elderly who refuse technology could be due to fear of learning something new. The overwhelming feeling of having to keep up with the development of technology is that they could lose personal contact with humans if they engage too much with technology. Some of them include being concerned about other peoples' opinions about an elderly using technology, as the elderly could be operating the device at a

relatively slower pace than everyone else. Hence, it causes the elders to feel self-conscious about their ability, thus refusing to use technology as a whole.

Instructional strategies are understood as any strategy or techniques exercised by a teacher or instructor to help their learners better understand what is being taught [15]. Applying instructional strategies can create a learning environment that is more acceptable and pleasant for the learners to learn in a more comfortable way that allows them to move at their own pace. It can also encourage the learners to become more active in their learning and pursue their knowledge [17].

II. METHODS

In order to identify and locate the studies that could provide information regarding instructional strategies to aid the learning process for elderly learners, a scoping review was conducted following the scoping review framework by [18]. This scoping review explores a wide range of related literature, thus providing information to researchers, practitioners related to instructional strategies for elderly learning. Five (5) methodological steps, which are (a) identifying the research question, (b) identifying relevant studies, (c) study selection, (d) charting the data, and (e) summarizing the data, were followed during the completion of this scoping review paper.

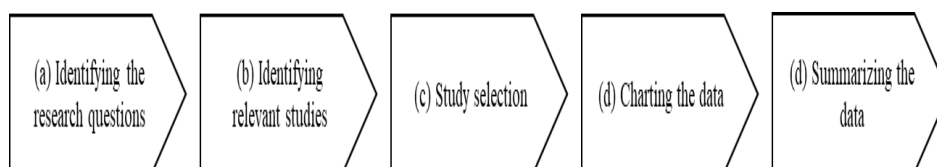


Fig. 1. Methodological Framework [18]

A. Identifying the research questions

The first stage of the scoping review process is determining the research questions and then aligning them to conduct the review [18]. According to [19], when referring to the Population-Concept-Context (PCC) framework, the research questions can be categorized into separate components, thus can help formulate a search strategy and thus answer the questions created.

Since this review aims to identify suitable instructional strategies that could help older adults learn technological devices better, this review will be guided by the following questions: 1) What learning elements were identified from past researchers on elderly learning? 2) What were the devices that were used to facilitate the learning session? and 3) What were the key findings that have been obtained by past researchers regarding the topic of elderly learning?

B. Identifying relevant studies

The identification process included searching through Scopus and Web of Science (WoS) databases for relevant studies. A search string was created for each database, and the strings consisted of the keywords and related terms of this current review. Table 1 below shows the search string that was used to identify the relevant studies.

Table 1. The search strings

Search Directory	Search String
WoS	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*")) 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*"))
Scopus	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*"))

C. Study Selection

The search resulted in many studies from both databases. In order to obtain eligible studies to be included in this review, a screening process to remove duplicated studies was conducted. The second screening process involves the title and abstract of each of the studies screened to determine which studies to be reviewed.

The selection of eligible studies was made based on a set of inclusion and exclusion criteria that has been created. Table 2 below shows the inclusion and exclusion criteria that were followed during this process.

Table 2. Inclusion and exclusion criterion

Inclusion criteria	Exclusion criteria
1. Published between years 2017-2021	1. Does not touch on elderly learning
2. Article publication	2. Too focused on health applications
3. English language	3. Too technology centralized
	4. Does not touch on elderly learning technology
	5. Published in other forms than articles

D. Charting the data

Once the studies that fit the inclusion criterion have been shortlisted, the studies were brought to the next stage, where data abstraction will be carried out. Referring to [18], the data, which includes the author(s) and year of publication, the title of the article, age of participants, learning elements that were used upon the elders, the devices used, and the key findings were organized in a summarization table, as seen in table 3.

III. RESULTS

The search conducted using the two databases resulted in 1085 studies, where 505 studies were from the Web of Science (WoS) database, and the remaining 580 studies were from the Scopus database. The first screening stage resulted in the elimination of 1005 studies published before 2017, not in the English language. It was not in the form of article publication, leaving 80 studies that are potentially relevant for this study. After removing 15 duplicates, 65 studies were left to be screened for their eligibility by title and abstract. The screening process resulted in the exclusion of 50 studies, where four of the studies were not able to obtain their full text, 22 studies did not touch on elderly learning, five studies were too focused on health applications, two studies were focused on the technology development, 13 studies did not touch on elderly learning technology, and four of the remaining paper were not published in the form of an article

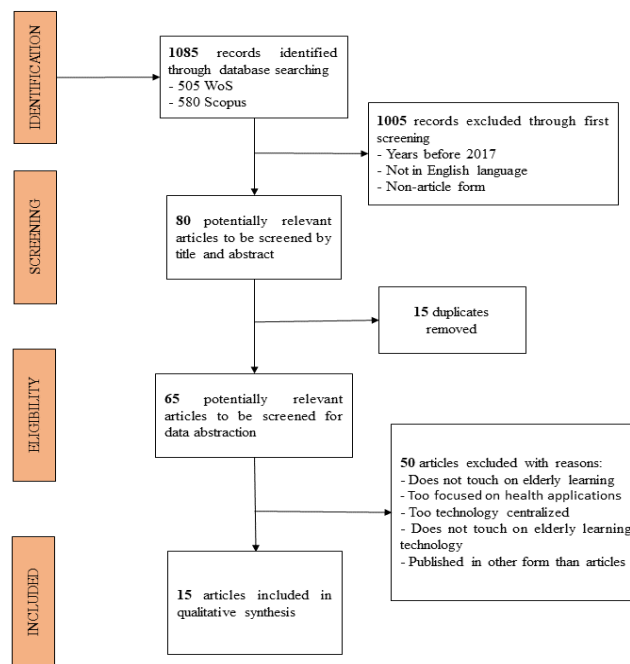


Fig. 2. Flow Diagram of the Scoping Review

Table 3. Characteristics of included studies

Reference s	Title of article	Age of particip ants	Learning elements	Devices used	Key findings
[20]	A tablet for healthy ageing: the effect of a tablet computer training intervention on cognitive abilities in older adults	65 – 75 years old	Engaging challenging activities	in Tablet	By engaging themselves with mentally challenging activities such as training to use tablets, it could help increase elders' processing speed. One of the methods to reduce or delay cognitive shifts due to aging is to acquire new skills during the later age of life. Adopting to new technologies is one of them.
[21]	Overcoming the digital divide with a modern approach to learning digital skills for the elderly adults	55 - 75 years old	Integration of games in lesson Learning to play games Participants played in a pair, collaboration with the partner	of Touchscre en tablet	Adoption of skills can happen faster in a fun and relaxed learning environment. The feeling of having fun while playing games van contribute to elderly learners' developing positive emotions and motivations to learn digital technology devices better, thus removing their fear of technologies and minimizes the digital gap that currently exists.
[22]	Play, learn, connect: older adults' experience with a multiplayer, educational, digital bingo game	60 years and older	Learning while playing	Customize d digital Bingo game	Elderly has been found to enjoy playing with others as this creates a more fun learning environment where communication and teamwork are emphasized, thus strengthening social relationships among the elderly learners.
[23]	Investigating older adults' decisions to use mobile devices for learning, based on the unified theory of acceptance and use of technology	55 – 79 years old	Collaborative environment Intergenerational learning	Mobile computing devices for learning	Social influence is one of the prominent factors that affect acceptance of technology devices among elderly people. Intergenerational learning activities allows the elderly learners to learn and do activities together with their family members, thus making technology learning a more fun and non-forced activity for the elders.

[24]	Perceived benefits from non-formal digital training sessions in later life: views of older adult learners, peer tutors, and teachers	53 – 90 years old	Peer tutoring	N/A	Peer tutoring for elderly learning can result in creating successful relationships among the elderly, besides could maintain the elders' well-being and the development of their digital literacy skills.
[16]	Reimagining senior centres for Purposeful aging: perspectives Of diverse older adults	70 years and older	Encourages participation during the lesson Intergenerational learning	Smartphones with broadband access	Including younger people in senior centre programs could make the program a more fruitful approach. Children, grandchildren, and those of the younger generations are mentioned as the elderly's sources of technology support.
[25]	Lifelong learning: Formal, non-formal and informal learning in the context of the use of problem-solving skills in technology-rich environments	N/A	Problem solving Formal and informal learning	N/A	For life-long learning programs to be more effective, implementation of informal, personalized and self-directed sessions could be more effective.
[26]	The Kinect project: group motion-based gaming for people living with dementia	63 – 92 years old	Group activity Playing games	Motion-based technology (Xbox Kinect)	Playing games in a group can allow the elders to learn in a fun environment, enhance socialization and engage with each other besides encouraging them to get more involved with leisure activities.
[27]	Introducing computer-based concept mapping to older adults	58 – 75 years old	Introduction to topic using slides (audio-visual aids) In-group activity	Concept Map-Editor database (on a computer)	Allowing the elderly learners to express themselves and their creativity while introducing them to a new device can enhance their desire and motivation to be more engaged in their learning process.
[28]	Willingness and performance of older adults using Information and Communication Technologies for cognitive activity and social interaction	60 years and older	Familiarization with social devices through technology Cognitive training	Online social platforms Online cognitive games	Allowing the elderly to use social platforms in different ICT tools (computers/ tablets/ smartphones) and then supporting their participation regardless of their level of knowledge encourages them to use the devices more.

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|------|---|--------------------|--|---|---|
| [29] | Implementing an interdisciplinary intergenerational program using the Cyber Seniors® reverse mentoring model within higher education | N/A | Intergenerational learning | N/A | <p>As intergenerational learning involves the elderly learners to learn with those of younger age, elderly can rely on the youngsters to update them on the current technologies as for them, the group of young people knows how to handle technology better.</p> |
| [30] | Role of cognitive prompts in video caregiving training for older adults: optimizing deep and surface learning | 54 – 92 years old | Video-based learning | Videos (with and without cognitive prompts) | <p>Effective deployment of cognitive strategies like cognitive prompts can significantly enhance the cognitive functionality of technology in elderly learning.</p> <p>By embedding cognitive prompts in the video, the elderly were able to direct their attention to key information in the learning content.</p> <p>By embedding cognitive prompts in the videos, the elderly learners were able to meaningfully relate the content to their prior knowledge through a schema-activation process.</p> <p>Cognitive functionality of the technology like videos can be greatly enhanced when taking such factors as cognitive strategies into consideration when designing and developing technology-based training for older adults.</p> |
| [31] | Senior technology exploration, learning, and acceptance (STELA) model: from exploration to use – a longitudinal randomized controlled trial | 66 – 100 years old | Familiarization and training to use devices

Computer and Internet training intervention | Computer and Internet (primarily email) | <p>It is important to let them have opportunities and support to try using the internet.</p> <p>it is important to provide support for older adults when they encounter difficulties using the internet.</p> <p>in order to increase older adults' technology adoption rates, it is essential to improve their attitudes towards using the technology, increase the opportunities to try the technology, and also help them realize the perceived benefits of using the technology.</p> |

					providing adequate training programs and support to help them explore the technology will help facilitate their learning process.
[11]	Psychological factors that affect the acceptance and need for ICT services for older adults with chronic diseases	65 – 75 years old	Familiarization of using devices (smartphones) to update their daily activities, mainly relating to health	ICT-based healthcare devices	Since older adults have a high degree of fear and reluctance regarding the use of digital devices, ICT services must be easy to operate, and older adults must receive the required training to facilitate familiarization.
[32]	Faculty perceptions of engaging older adults in higher education: The need for intergenerational pedagogy	N/A	Intergenerational learning	N/A	The development of intergenerational learning pedagogy is needed as it helps instructors to create an environment that allows intergenerational discussion of diverse opinions and experiences for all learners. Older adults often participate in lifelong learning for the love of learning, wanting to remain intellectually and mentally active and to forge social friendship or networks

Hence, only 15 studies were left to be eligible for the data abstraction process and included in this review.

RQ 1: What learning elements were identified from past researchers on elderly learning?

Among the 15 studies reviewed, two of the studies mentioned integrating games into the lesson. Another two studies supported the element as they discussed how elderly learners learn while playing games during the lesson. Four of the studies used learning together, which could also be mentioned as collaborative learning or group-learning was implemented into the learning session with elderly learners. Peer tutoring was also an element used upon elderly learning and encouraging the elderly learners to participate in the lesson actively, more so in activities that are challenging for the elders' range of age. Intergenerational learning, where elders learn with people of the younger generations were used as an element of learning, as mentioned by four studies. Familiarization elements such as training to use digital devices were mentioned in four elements. The usage of teaching aids, usually audio-visual, are utilized in two of the previous studies. Finally, one study emphasized formal and informal learning and having a problem-solving learning method as its main element.

RQ 2: What were the devices that were used to facilitate the learning session?

Based on the eligible studies, four (n=4) studies did not mention the type of devices they have used, thus resulting in the N/A as referred to in the table. The use of tablets, digital games, smartphones, game devices, such as Kinect Xbox, and social media was each used once in 5 different studies respectfully. Computing devices that include concept mapping, emails, slideshows, and health-related features were used in four respectful studies that have been reviewed.

RQ 3: What were the key findings that have been obtained by past researchers regarding the topic of elderly learning?

Based on the 15 studies reviewed, four of them implemented intergenerational learning as their delivery method. Based on the scoping review conducted, intergenerational learning is a relatively well-known learning element. It was also evident that elderly learners enjoy the learning element as they feel comfortable learning with those younger than them

but far more knowledgeable regarding the technology devices. The findings also showed how interaction is one of the most important aspects to consider when conducting elderly learning sessions, besides having a comfortable and relaxing learning setting. Lastly, providing familiarity among the elderly with technology could also provide a settling feeling for the elderly to learn the technology, thus removing their cyberphobia habits.

IV. DISCUSSION

As previous research has proven the possibility of an individual face decreasing in their cognitive ability, encouraging the elders to participate in elderly learning, also known as life-long learning programs, can bring many benefits regarding the well-being of these individuals. As mentioned before, communication is one of the most important elements of teaching elderly learners. One of the elements of communication for elderly learning is through intergenerational learning, as seems to be a prominent element that could be carried out when teaching the elderly, especially when relating to technology devices. Intergenerational learning is a process where younger people teach older adults, and as mentioned by the studies reviewed, refers to the children or grandchildren of the elders themselves. It has been proven that the elderly learn to use the technology devices better when learning with younger generations. The younger generations appear more knowledgeable of the topic, have much patience when teaching, and do not look down on the elderly. These are some of the reasons mentioned why the elders prefer intergenerational learning as their element of learning.

Another element of communication that has been effective for elderly learning technology is conducting group activities or collaborative learning. Previous researchers have mentioned how collaborative learning helps the elderly gain information more effectively than learning by themselves without anyone as a reference. In contrast to the intergenerational learning element, collaborative learning is when the elderly learners learn with one another, usually to solve problems. The elderly could work together to solve a problem by learning together, thus strengthening their cognitive and problem-solving skills. They have adapted the in-lesson problem into real-life situations.

Technology training programs that focus on elders have shown positive improvements in digital literacy among older adults [16]. They also quoted that when a learning element caters to the elders' needs and preferences, it could encourage the elderly learners to participate more actively in the learning sessions [17]. According to [18], they found that after the elders finish their technology learning session, the elders have shown a more positive attitude towards technology and are excited to use them. They also reported that the self-confidence of the elders increased a lot and would like to start using the technological devices independently in the future.

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AUTHORS PROFILE



Najmi Najiha Mohd Zaid graduated in B. Ed. (Hons.) in TESL from UNISEL and currently pursuing Masters in Education (by Research) from UNISEL. Her research interest involves Instructional Strategies for Elderly Learning Technology. Participated in e-poster conferences from IConSpADU and APCCSID and won silver place.



Muhammad Fairuz Abd Rauf is the director of the Centre for Information and Communication Technology (CICT), lecturer and researcher at the Faculty of Communication Visual Art and Computing in Universiti Selangor. Holds a Bsc in Information Technology and Master in Information Technology (Project Management), both from Universiti Selangor. He is a doctoral candidate undertaking PhD in Computing, also in Universiti Selangor.



Nahdatul Akma Ahmad received Doctor of Philosophy (IT) in 2018, Master's in Science (Information Technology)(MSc. IT) in 2008 from MARA University of Technology and Bachelor in Computer Science majoring in Industrial Computing (BSc. Comp) in 2003 from Universiti Teknologi Malaysia.