



Research on the Model of Digital Learning for Elderly People in the Context of Lifelong Education

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Abstract. With the proliferation of mobile internet technologies, the digital demands for lifelong education have been escalating progressively. Consequently, the pressing issue arises as to how to furnish elderly learners with flexible digital learning opportunities, facilitating their adaptation to societal shifts and fostering their social integration. To address this, the present study delves into the existing challenges and research significance of digital lifelong education for the elderly, subsequently proposing a digital learning model tailored specifically for this demographic. Rooted in a robust theoretical foundation and guided by meticulous design principles, this model aims to provide a theoretical framework for constructing digital learning models for the elderly. It endeavors to stimulate innovation and advancement in digital educational methodologies tailored to seniors, thereby laying a firmer foundation for their lifelong learning journey.

Keywords: Lifelong Education; Digital Demand; Elderly; Digital Learning Model.

1 Introduction

In recent years, numerous countries have enacted policies and initiatives, highlighting the significance and opportunities of digital learning for the elderly. These efforts aim to promote educational equity and personalized learning, ensuring that seniors do not lag behind in the digital age and can reap the benefits and opportunities offered by digital technologies. The emergence of the digital divide among the elderly [1], a phenomenon that underscores their lack of access to information and opportunities, as well as inadequate technological proficiency amidst the rapid advancements in digital technology, is pervasive globally, particularly acute within the older population. Due to age-related factors and historical reasons, many seniors encounter difficulties in grasping information technology and lack practical experience, resulting in their marginalization within the digital society and impacting their social interactions and daily life quality. Against the backdrop of lifelong education, investigating digital lifelong education for the elderly holds profound significance. It not only provides seniors with more tailored and flexible learning avenues, enabling them to continuously acquire new knowledge, enhance skills, and pursue interests, thereby adapting to societal changes but also actively advocates a positive and proactive lifestyle [2]. Through digital

learning, the elderly can participate more extensively in socio-cultural activities, engage with younger generations, thereby broadening their social circles and enhancing life satisfaction. Crucially, this fosters a better integration of seniors into society, enabling them to embrace the convenience and joys of the digital era.

2 Design Philosophy of Digital Learning Models for the Elderly

The design philosophy of the digital learning model for the elderly revolves around learners, learning environments, and learning resources [3]. These three elements are interconnected and mutually influential, as depicted in Fig. 1. Learners are positioned as the core of the elderly learning model, requiring personalized and user-friendly learning experiences within digital learning environments. Given the characteristics and needs of elderly learners, particular attention is needed in the selection and presentation of learning content, the design and interaction of learning environments, and the provision and guidance of learning resources. The relationships between learners and learning content, as well as between learners and learning environments, directly impact the effectiveness and experience of learning. Therefore, in designing digital learning models for the elderly, emphasis should be placed on these interrelationships to ensure that learners can access learning resources suitable for their needs in a conducive learning environment, thereby achieving personalized learning objectives.

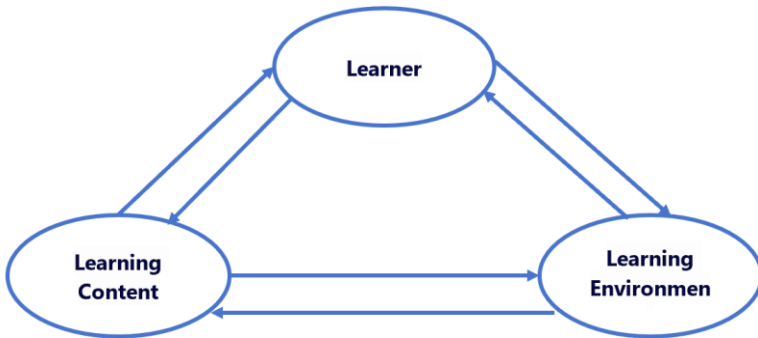


Fig. 1. Three Essential Elements of the Model

3 Analysis of the Learning Process in Elderly Digital Learning Models

The elderly digital learning model is underpinned by the theoretical frameworks of constructivism [4], connectivism [5], lifelong learning, and theories of meaningful learning. At the core of these theories lies the encouragement for learners to actively engage in knowledge construction as a means of comprehending the world. Elderly learners can draw upon their individual experiences to develop novel understandings and knowledge structures. Nevertheless, the efficacy of learning is prone to variations

influenced by contextual and cultural differences. Consequently, guidance in knowledge construction is paramount, with a heightened emphasis on the significance of communication, collaboration, and discussion to facilitate comprehension and problem-solving. In essence, this model encompasses four integral phases: preparation, implementation, evaluation, and analysis, as depicted in Fig. 2.

Firstly, the learning preparation stage is crucial. The elderly digital learning model predominantly revolves around online self-directed learning, necessitating seniors to acquaint themselves with the learning environment, master operational skills and prerequisites, and preview course content. By analyzing the characteristics of aging individuals, personalized learning pathways and knowledge systems are tailored to enable flexible learning aligned with their interests and needs.

Subsequently, the learning implementation phase commences. This stage encompasses content development and scheduling, guided by clear task objectives that delve into the dynamics and performance of elderly learners. As learning progresses, detailed demonstrations and problem resolutions are conducted, accompanied by group discussions to foster deeper comprehension and internalization of knowledge. Concurrently, learning behavior data is continuously recorded for tracking and analyzing effectiveness. The content is tailored to the lives of seniors, with appropriate difficulty levels, encompassing practical skills such as electronic device usage, health management, and social media engagement, while also accommodating individual interests and needs through diverse formats (text, images, videos, etc.) to cater to varying preferences. The learning plan is broken down into small steps to ensure sustained and coherent learning, with adjustments made based on progress and feedback to maintain continuity. The content difficulty escalates progressively, spanning beginner, introductory, advanced, and advanced+ levels, thereby satisfying diverse learning requirements.

The subsequent phase involves learning evaluation, which comprehensively assesses the learning outcomes of elderly individuals through a multifaceted approach encompassing coursework, tests, project presentations, and question-and-answer sessions. This evaluation is closely aligned with learning objectives and course content, accurately gauging the extent of knowledge acquisition, skill application, information processing capabilities, digital literacy enhancement, and the employment of learning strategies. To optimize the learning experience, we regularly solicit feedback from elderly learners to understand their perceptions and satisfaction levels, ensuring that teaching activities are tailored to their needs. Additionally, we track learning progress and behavioral patterns, documenting key indicators such as participation rates and time invested. These data not only reflect learning dynamics but also serve as a basis for evaluating learning persistence and enthusiasm. This feedback and tracking mechanism provides robust support for enhancing teaching quality and ensuring the sustainability of learning.

Ultimately, the learning analysis phase is conducted, which involves precise measurement, collection, and analysis of data pertaining to elderly learners and their learning environments. The aim is to gain insights into the essence of the learning process and optimize the learning ecosystem[6]. This data serves as a valuable resource for instructional refinement and personalization, facilitating the evolution of teaching towards greater granularity and customization. Through in-depth analysis, the digital model can

precisely adjust strategies to cater to the needs of elderly learners, thereby enhancing teaching effectiveness and learning experiences.

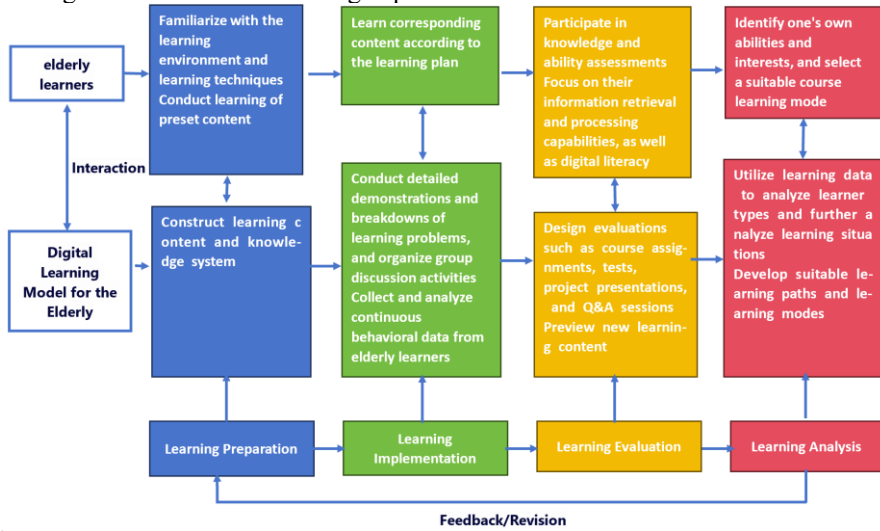


Fig. 2. Analysis of Learning Process

4 Framework Design for a Digital Learning Model for the Elderly

When constructing a digital learning model tailored for elderly learners, it is crucial to adhere to model design concepts that are in harmony with the learning process of this demographic. The model framework should adopt a hierarchical design approach [7], which clarifies the functions and responsibilities of each layer, facilitating efficient collaboration among teams during development, maintenance, and optimization. This hierarchical design also facilitates localized updates and modifications, minimizing the impact on the overall model and enhancing its maintainability [8]. The elderly digital learning model framework is condensed into seven layers: Theoretical Layer, Physical Layer, Technology Layer, Presentation Layer, Business Layer, Persistence Layer, and Data Layer. The specific functions and inter-layer relationships are detailed in Fig. 3.

The Theoretical Layer integrates the core principles of Connectivism, Constructivism, Lifelong Learning, and Meaningful Learning, serving as the theoretical foundation for model construction. This layer establishes educational principles that guide the functional design of the Business Layer, ensuring the effective implementation of learning objectives and strategies.

The Physical Layer establishes the hardware foundation for the model, supporting the operation across multiple devices (desktops, laptops, tablets, and mobile phones), ensuring network stability and speed, thereby enabling elderly learners to access education anytime, anywhere. It collaborates with the Technology Layer to guarantee the seamless deployment and smooth operation of the model.

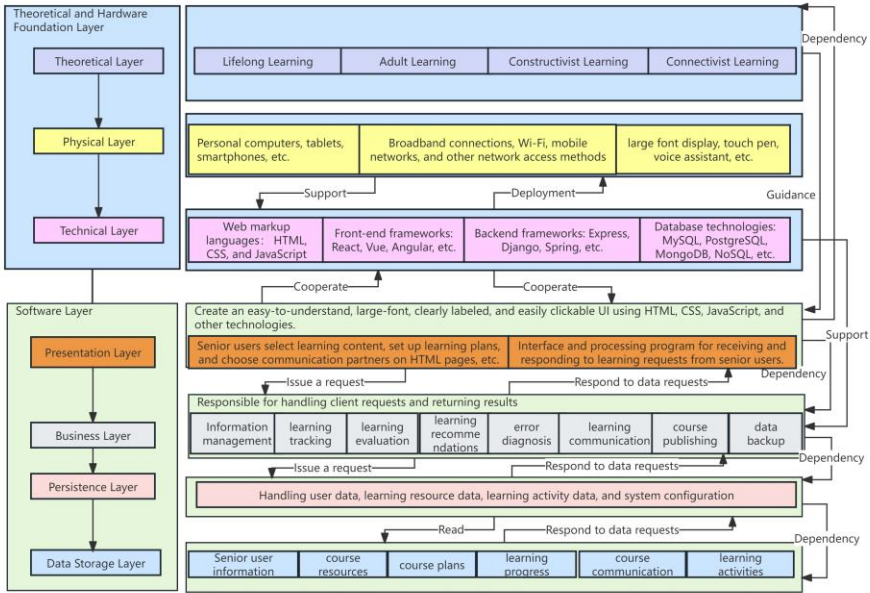


Fig. 3. Framework Structure for Digital Learning for Seniors

The Technology Layer encompasses a range of crucial technologies, including front-end and back-end development, API interfaces, databases, mobile development, data analysis and intelligent recommendations, security and privacy protection, as well as cross-platform compatibility. These technologies, being mature and user-friendly, provide robust support for the model design. It works closely with the Business Layer to ensure that the technology fulfills the learning needs of elderly learners.

The Presentation Layer focuses on user interaction, encompassing interface, interaction, and experience design. It receives user input requests, displays learning content, user information, and learning feedback, while forwarding operational requests to the Business Layer. In collaboration with the Technology Layer, it ensures the user interface is friendly and efficient for elderly users, showcasing the full functionality of the model.

The Business Layer serves as the core of the model, handling business logic and functions, encompassing elderly user authentication, learning resource management, tracking of learning activity progress, and personalized learning recommendations. It fosters the creation of a learning community, leveraging conversational frameworks to construct knowledge networks, thereby promoting knowledge construction and deepening, ultimately enhancing learning outcomes through collaboration. Guided by the Theoretical Layer, it ensures the achievement of business objectives.

The Persistence Layer specializes in data reading, writing, and persistence, storing elderly user data, learning resources, activity data, and system configurations in persistent media. It collaborates closely with the Database Layer to guarantee the secure storage of learning data.

The Data Layer comprehensively stores user information, learning resources, activities, states, and customized learning data, providing a robust data foundation for elderly learners. It encompasses capabilities for storage, retrieval, and modification, along with backup and recovery mechanisms. Interacting seamlessly with the Business and Presentation Layers, it supports operational functions and user presentations.

The tight integration and collaboration among these layers are central to the smooth operation of the elderly digital learning model. They work in unison to ensure harmony between functional requirements, technical implementations, and user experiences, crafting an efficient and convenient digital learning space tailored for elderly learners [9].

5 Essential Keys to Implementing Diversified Interest Learning in Elderly Digital Learning Models

To effectively cater to the diverse interests and learning needs of seniors within a digital learning model, it is imperative to adhere to the model design principles outlined in this paper and adopt the hierarchical design approach proposed herein.

Firstly, we systematically amassed a substantial amount of primary data through a multifaceted approach that integrates community activity feedback, questionnaire surveys conducted at senior universities, and online data collection. This endeavor aimed to gain a profound understanding of seniors' diverse cultural backgrounds, rich work experiences, and, crucially, to precisely dissect their digital skill needs in daily life[9]. Furthermore, we delved deeply into the interest preferences of the elderly population across multiple domains, including but not limited to cultural arts, health and wellness, technological applications, handicrafts, and historical humanities. This comprehensive exploration laid a solid foundation for the subsequent construction of our digital learning model, ensuring its relevance and responsiveness to the diverse interests and requirements of senior learners.

Secondly, we established a correlation between hobbies and learning resources. We categorized these resources into two primary groups: firstly, those pertaining to technological applications, which are essential for seniors to navigate the increasingly digitalized landscape of modern society [10]. Within this category, we designed learning modules centered on smartphone operation, online shopping, telemedicine consultations, digital financial management, and social networking, accompanied by concise, illustrated operation manuals and video tutorials. Secondly, we focused on resources tailored to individual interests, encompassing a wide array of topics such as calligraphy, painting, music appreciation, and traditional opera performance in the realm of cultural arts; traditional Chinese medicine, nutritional balance, and sports rehabilitation in health and wellness; craftsmanship including knitting, paper cutting, and pottery; as well as local history, ancient culture studies, and biographical accounts of notable figures within the historical and humanities spectrum. To this end, we gathered and integrated high-quality educational materials, including electronic courses featuring artists' portfolios, classical music appreciation, health preservation guides, detailed recipes, and scientific exercise routines, complemented by engaging instructional videos and

practical toolkits. This comprehensive approach ensures the diversity and richness of learning resources, catering to the diverse interests of senior learners.

Subsequently, we devised a multi-level curriculum system for each learning theme, encompassing beginner, intermediate, and advanced levels, tailored to the actual circumstances of senior learners [11]. This allows learners to autonomously select a suitable course level based on their individual needs and interests, and upon completion, they are awarded electronic certificates as recognition of their learning achievements. Furthermore, we incorporated a flexible learning pace adjustment mechanism, empowering learners to modulate their study rhythms according to their comprehension abilities and even switch between learning themes freely during the learning process. Concurrently, each learning theme is equipped with a dedicated community platform, fostering an environment where senior learners are encouraged to share their learning insights, exchange experiences, and even form interest groups or participate in team projects. This social interaction mechanism not only ignites their passion for learning but also effectively alleviates feelings of loneliness, reinforcing their sense of social belonging and group cohesion.

Ultimately, in pursuit of fostering a comfortable and efficient learning environment, we have meticulously planned from both hardware and software perspectives. On the hardware front, we have equipped the facilities with large-screen monitors, ergonomic keyboards and mice, height-adjustable desks and chairs, as well as emergency safety measures, all of which are aimed at ensuring the physical comfort and safety of senior learners. As for software, our focus has been on enhancing user-friendliness through interface simplification, font enlargement, integration of voice assistants, and the implementation of a one-click assistance feature. These measures are designed to lower the entry barriers for seniors, elevate their adaptability and interest in the digital learning landscape, and ultimately facilitate their sustained learning endeavors and profound engagement within the educational ecosystem [12].

6 Conclusions

In summary, the research on the elderly digital learning model aims to facilitate convenient learning pathways for senior learners, empowering them to navigate the ever-evolving internet landscape. This paper delves into the challenges faced in elderly digital learning, explores its significant practical implications, and establishes a multifaceted theoretical foundation rooted in various learning theories. Adhering to the principles of model design, we have constructed a seven-tier framework for the elderly digital learning model, laying a solid groundwork for its implementation and application. Looking ahead, we anticipate deeper explorations and applications of this model, aiming to spark innovations in elderly educational methodologies and broaden the horizons of lifelong education for seniors. Through continuous refinement of the model, we endeavor to unlock a broader learning realm for elderly learners, enhancing their learning outcomes and experiences, enabling them to maintain vitality in their learning pursuits and fulfilling the aspirations of self-enrichment and lifelong learning. This endeavor

represents not only a revolution in elderly education but also a vital step towards creating more learning opportunities and possibilities for the senior population.

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