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Data-Driven Development of an Elderly Training Package Using the GCC Model

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Abstract

This study aimed to design and assess the effectiveness of an elderly training package for first-year students at Yibin University, China, based on the GCC Model for geriatric rehabilitation. The goal was to integrate theoretical knowledge with practical skills in geriatric care, using data-driven approaches to evaluate its impact on student learning outcomes. A purposive sample of 17 experts and 30 first-year students enrolled in geriatric rehabilitation courses participated in the study. Data were collected through a combination of in-person surveys, telephone interviews, and email interviews using the Delphi Method. The training package focused on critical aspects of geriatric care, including aging-related health issues, physical rehabilitation, psychological support, and social integration. Additionally, it incorporated technology, practical simulations, case studies, and feedback mechanisms to enhance healthcare professionals' skills. Data analysis demonstrated a significant improvement in students' knowledge and practical abilities post-intervention, with moderate satisfaction expressed by both experts and students regarding the effectiveness of the package. The study underscores the importance of blending theoretical learning with hands-on experience, utilizing data-driven evaluation methods to assess the impact on educational outcomes. These findings provide valuable insights for the development of effective geriatric care training models that combine data science and educational practices to optimize learning in healthcare education.

Keywords: Elderly Training Package, GCC Model, Geriatric Rehabilitation, China

1. Introduction

The aging population in China, driven by historical events and socio-economic policies, has led to a significant rise in the number of elderly citizens, while declining birth rates have reduced the younger population responsible for supporting this demographic shift [1], [2]. This trend poses substantial challenges for China's pension and healthcare systems, necessitating reforms in infrastructure and policy to address the growing needs of the elderly. The aging population has also reshaped family dynamics and caregiving responsibilities, prompting the government to prioritize comprehensive rehabilitation programs and specialized training for geriatric care professionals. The 20th National Congress of the Communist Party of China reaffirmed the importance of advancing medical education and training to meet the needs of the aging population, emphasizing the global imperative to improve the health and well-being of older adults as a cornerstone of social development [3].

Enhancing the health of older adults is a multifaceted approach that not only extends their lifespan but also reduces public healthcare spending and long-term care costs, alleviating social financial strain. Health interventions targeting the elderly significantly reduce the prevalence of chronic diseases and ease the burden on healthcare systems. Healthier older adults can maintain greater autonomy, reduce caregiving responsibilities for families, and foster intergenerational harmony. Furthermore, promoting social connectedness among older adults has profound effects on their overall well-being. Research indicates that strong family ties and social relationships mitigate loneliness and depression, which are prevalent among the elderly, particularly in long-term care settings [4]. The COVID-19 pandemic exacerbated these issues, as physical separation from family members negatively impacted the mental health of older adults in nursing homes [5]. Fostering social connections enhances emotional and psychological health, leading to decreased healthcare utilization and lower long-term care costs [6]. The economic implications of improved health in older adults are equally

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significant. Studies show that social engagement and community participation improve health outcomes, correlating with reduced healthcare expenditures [7]. For example, home modifications that promote independence can decrease the need for formal care services, lowering overall costs [8]. Innovative healthcare delivery models, such as telenursing, also provide effective care while reducing financial burdens on families and healthcare systems. Additionally, the quality of life among older adults is closely tied to their health status and social engagement. Factors such as social participation and economic activity positively influence self-rated health [9], suggesting that interventions enhancing social and economic engagement can improve health outcomes and reduce demand for healthcare services.

The Chinese Longitudinal Healthy Longevity Survey (CLHLS) provides a comprehensive dataset for examining healthy aging trends among older adults in China from 2002 to 2014. This longitudinal study, which includes a diverse sample of participants aged 65 and older, highlights key factors influencing the health and longevity of China's elderly population. A second-order factor model incorporating physical, functional, mental, and social health characteristics was used to assess the latent variable Health_elders, revealing an upward trend in health status among older adults over the years [10]. Structural equation modeling demonstrates that Health_elders improved significantly during 2002, 2005, 2011, and 2014, supporting the concept of healthy aging. This trend is particularly pronounced among male and urban-residing elderly populations, who report higher average health levels compared to their female and rural counterparts. However, the 60-74 age group faces challenges such as poor health and restricted social involvement, underscoring the need for targeted interventions.

Lifestyle factors, including diet and physical activity, play a crucial role in promoting healthy aging. Studies utilizing CLHLS data have shown that dietary habits significantly influence health outcomes, including cognitive function and the risk of chronic diseases [11]. For instance, increased consumption of plant-based foods has been linked to a reduced risk of cardiovascular diseases among elderly Chinese. Similarly, engaging in physical exercise is associated with lower rates of cognitive impairment, emphasizing the importance of an active lifestyle. Social engagement also plays a vital role, as participation in leisure activities helps mitigate feelings of loneliness, a common issue among the elderly. CLHLS data reveal that older adults who engage in social activities report better mental health and overall well-being [12], highlighting the necessity of fostering social connections and community involvement.

Cognitive health is another critical aspect of aging, and the CLHLS has provided valuable insights into the prevalence of cognitive decline among older adults. Factors such as vitamin D levels and lifestyle choices significantly impact cognitive health [13]. The association between cognitive impairment and all-cause mortality underscores the importance of addressing cognitive health as part of a broader strategy for promoting healthy aging [14].

The rapid growth of China's elderly population, which reached 241 million by the end of 2017—an increase of 11 million (nearly 5%) in one year—poses significant challenges to the healthcare system. This demographic shift has accelerated the need for qualified geriatric healthcare professionals and innovative healthcare solutions. In response, China has initiated several healthcare reforms, including reducing outpatient clinic volumes for routine care, developing primary care networks, and establishing Boao, Hainan Province, as a special zone for healthcare development. Academic geriatric medicine has also seen significant advancements, such as the establishment of the National Center on Geriatrics at Beijing Hospital and the Nanshan Summit on Aging Medicine in 2018. These developments reflect the government's commitment to addressing the complex and evolving needs of an aging population.

China's aging population is increasingly shifting towards home-based care, informal care, and healthy aging, driven by the erosion of traditional family care structures, funding shortages, and staff shortages in formal care settings. This transition reflects broader societal changes, including urbanization and modernization, which have transformed family structures from extended to nuclear arrangements, leaving fewer family members available to provide care. Older adults in rural areas are more likely to rely on family care, while those in urban settings often prefer institutional care, reflecting disparities in resource availability and support systems. The rise of empty-nest households, where older adults live alone, further isolates them from familial support, exacerbating the need for alternative care solutions [15].

Funding shortages in China's public healthcare system compound these challenges. As the elderly population grows rapidly, the demand for care services far exceeds the financial resources allocated to long-term care. This funding gap has led to a reliance on informal care, primarily provided by family members, which, while increasing healthcare

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utilization among the elderly, places significant strain on caregivers. The sustainability of this model is questionable, as the burden on family caregivers often leads to their own health deterioration and increased stress levels [16].

Staff shortages in formal care settings further complicate the situation. China's elderly care workforce is under-resourced, with a significant gap between the demand for care services and the availability of trained professionals. Projections indicate that the demand for nursing staff will continue to rise, necessitating urgent reforms to attract and retain workers in the elderly care sector [17]. Without addressing these staffing issues, the quality of care for older adults may decline, pushing more individuals towards home-based and informal care solutions.
In response to these challenges, there is a growing emphasis on promoting healthy aging through community-based services that support older adults in their homes. Studies have shown that the perceived availability of home- and community-based services is linked to reduced depression among older adults, highlighting the importance of accessible support systems. Community home elderly care services, which integrate health and social services, are emerging as viable alternatives that allow older adults to maintain their independence while addressing their care needs. These services not only provide immediate care but also foster social participation, which is crucial for mental and emotional well-being [18].

The research goal of this study is to develop and evaluate an Elderly Training Package for first-year students at Yibin University, based on the GCC Model for Geriatric Rehabilitation. This training package aims to synthesize theoretical knowledge and practical skills in geriatric rehabilitation, creating a comprehensive learning model that integrates key psychological theories such as Gagné's Theory, Constructivism, and Constructionism. By focusing on mental processes, experiential learning, and social context, the study seeks to enhance students' competencies in geriatric rehabilitation, preparing them to address the multifaceted health needs of the elderly. The training package will cover essential topics such as aging, physical rehabilitation, psychological support, social integration, and communication skills, utilizing hands-on learning methods like simulations and case studies.

The significance of this research lies in its potential to address the growing demand for skilled geriatric rehabilitation professionals in China. By developing a standardized and effective training model, this study aims to improve the quality of geriatric rehabilitation education, ensuring that students are well-prepared for clinical practice. The findings will contribute to the broader goal of enhancing elderly care in China, reducing the burden on healthcare systems, and promoting healthy aging. Furthermore, this research has the potential to inform policy decisions and educational reforms, providing a scalable model that can be adapted to other institutions and regions. Ultimately, this study seeks to foster a new generation of healthcare professionals capable of meeting the challenges posed by China's aging population, thereby improving the quality of life for older adults and supporting sustainable social development.

2. Literature Review

2.1. Constructivism in Learning

This study explores the role of active learning in education using constructivist and implicit knowledge theories. Active learning plays a crucial role in education, particularly in the context of training programs for the elderly. By integrating constructivist and implicit knowledge theories, educational frameworks can be designed to enhance engagement, retention, and practical skill development among older learners. Constructivism posits that learners construct knowledge through experiences and interactions with their environment, emphasizing the importance of active participation and hands-on learning. In the context of elderly training, this means moving away from traditional, passive teaching methods toward interactive approaches that encourage discussion, problem-solving, and experiential learning [19]. For instance, facilitators in elderly training programs can create environments where older adults actively engage in activities that allow them to apply new knowledge in real-world contexts, fostering deeper understanding and retention.

Implicit knowledge, or tacit knowledge, refers to skills and understandings acquired through experience that may not be explicitly articulated. This type of knowledge is particularly relevant in elderly training programs, where practical skills and experiential learning are paramount. Research by [20] highlights how implicit knowledge can be developed through creative practices, such as musical improvisation, which parallels the hands-on learning experiences beneficial for older adults. By incorporating activities that allow for experiential learning, training programs can help elderly learners internalize skills and knowledge without the pressure of formal assessment, making the learning process more intuitive and effective.

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The integration of active learning strategies is also critical in training programs aimed at improving caregivers' competencies in elderly care. For example, [21] found that training on geriatric fundamentals significantly improved nurses' knowledge and attitudes toward aging, demonstrating the effectiveness of active learning methodologies such as role-playing and simulations. These strategies not only enhance caregivers' understanding of geriatric care but also prepare them to address the complex needs of elderly populations more effectively.

2.2. The Delphi Technique

The Delphi technique is a systematic group communication tool that facilitates consensus-building among experts, particularly in fields such as healthcare and education. This method is especially valuable for addressing complex problems where diverse opinions and expertise are required to reach a common understanding or decision. The process typically involves multiple rounds of anonymous questionnaires sent to a panel of experts, with feedback provided after each round to refine responses and converge toward consensus. This iterative approach reduces individual bias and encourages experts to re-evaluate their perspectives based on collective feedback, ultimately leading to optimized solutions [22].

One of the primary advantages of the Delphi technique is its ability to gather insights from geographically dispersed experts without the need for face-to-face meetings, thus reducing costs and logistical challenges. This is particularly relevant in healthcare settings, where specialists may be located in different regions. For instance, [23] utilized the Delphi method to validate a nursing care protocol for family caregivers of elderly patients post-stroke, demonstrating its effectiveness in achieving expert agreement through iterative rounds of consultation. Such applications highlight the technique's role in developing evidence-based practices that can improve patient care.

The Delphi technique's structured approach allows for the collection of both qualitative and quantitative data, making it a versatile tool for various research contexts. It is widely accepted in healthcare education research for obtaining consensus on clinical, educational, and policy issues, underscoring its importance in shaping educational curricula and training programs. This adaptability makes it particularly suitable for addressing the unique challenges faced by healthcare professionals, especially in geriatric care.

In the context of elderly care, the Delphi technique has been instrumental in identifying and prioritizing essential components of care programs. For example, [24] conducted a Delphi study to construct educational content focused on life-and-death issues for the elderly, achieving consensus among experts from multiple disciplines. This not only highlights the technique's effectiveness in developing targeted educational materials but also its role in addressing sensitive topics relevant to aging populations. This illustrates how the Delphi method can facilitate collaboration among various stakeholders, leading to more comprehensive and inclusive healthcare solutions.

The Delphi technique's iterative nature allows for the refinement of ideas and proposals based on expert feedback, which is crucial in fields like healthcare where guidelines and protocols must be evidence-based and adaptable to changing circumstances. For example, [25] used the Delphi method to gather clinician and patient perspectives on remote care delivery during the COVID-19 pandemic, illustrating how consensus can guide the adaptation of healthcare services in response to emerging challenges.

Beyond healthcare, the Delphi technique has been widely applied in educational research and curriculum design. It is particularly effective in identifying key competencies and skills for curriculum development, as well as exploring emerging trends and anticipating future developments. The Modified Delphi Technique, a variation of the traditional method, streamlines decision-making by incorporating specific criteria or using targeted expert panels. This approach is especially useful in instructional design, where it has been employed to validate theoretical constructs and develop robust, empirically grounded models. For instance, it has been used to design competency-based education frameworks and to create interdisciplinary instructional models that integrate multiple perspectives.

2.3. The Modified Delphi Technique

A crucial tool for developing innovative instructional design frameworks, incorporating expert feedback, validating theoretical constructs, and promoting collaboration. As educational environments evolve, it will continue to shape instructional design [26]. The first questionnaire in Round One of Delphi techniques gathers expert opinions and sets the foundation for consensus-building. It identifies and prioritizes key issues, variables, or criteria for refinement. The primary objective is to solicit open-ended responses, allowing participants to express their views freely. This approach is valuable in exploratory studies with an undefined scope. The first questionnaire design balances depth, clarity, and flexibility to accommodate diverse expert inputs. Feedback mechanisms ensure continuous refinement of research

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questions and opinions, leading to a robust and reliable consensus. A carefully curated panel of experts enhances the validity and generalizability of the findings. The second questionnaire in Round Two validates emerging themes, enhancing reliability and credibility. The structured approach maintains depth while remaining manageable. It sets the stage for further refinement and convergence, ultimately leading to a well-substantiated consensus.

The third round of questionnaires in the Delphi technique verifies and confirms detailed questions and priorities from earlier rounds, ensuring comprehensive and well-substantiated outcomes. It solidifies consensus among experts, refines judgments, and enhances results' robustness. The primary objective is to confirm priorities, eliminating ambiguities or inconsistencies. Experts reassess issue importance based on group feedback and rankings. This iterative process leads to more accurate and reliable outcomes. The structured third round maintains focus and clarity with a highly organized questionnaire that distills previous round findings. Its success depends on questionnaire clarity and facilitator guidance toward consensus. The fourth round of the Delphi technique concludes the iterative process, shifting focus from exploring new information to solidifying agreement. It confirms experts' collective judgment and ensures cohesive and reliable outcomes. Feedback loops guide convergence, allowing adjustments to individual judgments based on group input. Diversity diminishes, leading to a more unified set of conclusions. The primary objective is to reach agreement or consensus, finalizing priorities and recommendations. Anonymity minimizes dominant individuals' influence and ensures equitable contributions. A formal acknowledgment of consensus provides a clear outcome for decision-making or further research. This convergence and consensus process completes the Delphi process and prepares outcomes for implementation or dissemination. The final report of a Delphi study summarizes the iterative process, including findings, consensus, and disagreements. It consolidates results and analyzes expert opinions, providing valuable insights for stakeholders. The report translates expert consensus into practical outcomes, supports policy development, strategic decisions, and research. The literature emphasizes the importance of this final phase.

2.4. Framework of Core Concepts

Curriculum standardization is crucial for establishing consistent educational standards and ensuring equitable access to essential knowledge and skills, particularly in fields like elderly care training. This approach not only enhances the quality of education but also addresses the growing need for competent caregivers due to an aging population. By standardizing caregiver training, policymakers can ensure that all caregivers receive consistent foundational education, improving care quality across institutions [27]. While standardization promotes consistency, quality, and efficiency, it can also limit innovation and create compatibility challenges, especially for smaller organizations. However, advancements in digital technologies, such as blockchain and artificial intelligence, are revolutionizing the standardization process by enhancing transparency and efficiency. Critics argue that rigid standardization may overlook diverse student needs, but recent research suggests integrating technology and data-driven approaches to balance uniformity with flexibility, fostering more adaptive and inclusive curricula.

Assessment in education plays a key role in curriculum development, evaluating students' knowledge, skills, and performance through formative and summative assessments, feedback, and observations. Effective assessment fosters critical thinking and problem-solving while providing insights into student learning. Innovations in technology and data analytics enhance the fairness and reliability of assessments, enabling educators to gain deeper insights into student progress and tailor instruction accordingly. Similarly, course evaluation focuses on the effectiveness of a course from the perspectives of students, instructors, and stakeholders, ensuring a comprehensive approach to improving course design and delivery. Additionally, evaluations of teaching methods and assessment strategies, as discussed by [28], are critical for enhancing teaching effectiveness and student experiences. Moreover, involving students in assessment design, encourages self-regulated learning and leads to more meaningful course evaluations. Closely related, process evaluation examines program implementation to assess its effectiveness, integrating comprehensive approaches to improve educational and social programs. The advancements in these evaluation methods, grounded in educational research, ensure that courses and programs meet student needs and achieve desired outcomes.

Basic Activities of Daily Living (ADLs), such as bathing, dressing, grooming, toileting, transferring, and eating, are essential for maintaining independence and quality of life, especially among older adults and individuals with disabilities. These activities are closely linked to functional capabilities, which encompass physical, cognitive, and emotional abilities that enable individuals to perform daily tasks. Maintaining functional capabilities, including ADLs, improves health outcomes, enhances independence, and reduces reliance on caregiving. Research highlights the critical role of caregiver education in supporting ADL performance. Research [29] emphasizes the need for training programs to equip family caregivers with the necessary skills to promote independence and prevent accidents. However, unmet needs for ADL assistance are prevalent, particularly among older adults with dementia, and can exacerbate health

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conditions [30]. Addressing these unmet needs through targeted interventions is crucial for improving health and quality of life. Furthermore, educational background can influence ADL performance, particularly in individuals with cognitive impairments, suggesting the need for tailored interventions. Interventions such as physical therapy, cognitive training, assistive devices, and environmental modifications play an essential role in maintaining functional independence and improving ADL performance.

Elderly sports rehabilitation in China is increasingly recognized as crucial for enhancing the physical and cognitive health of the aging population, particularly in light of the country's rapidly aging demographic. Sports rehabilitation courses for older adults focus on improving physical health, functional capabilities, and well-being through structured physical activity, including aerobic, strength, flexibility, and balance training. These courses are tailored to the unique needs of older adults, promoting active aging and mitigating age-related declines. Personalized approaches, such as those integrating technology and sports rehabilitation robotics, are essential for addressing the challenges of declining physical abilities and a shortage of rehabilitation staff [31]. Preventing sports injuries through education on safe practices and appropriate exercise regimens is critical for effective rehabilitation [32]. Additionally, the promotion of structured exercise programs and continuous evaluation of their impact are essential for maintaining safety and ensuring the programs' feasibility and sustainability.

2.5. Evaluation Indicators Of The Geriatric Exercise Rehabilitation Course

Evaluating senior exercise rehabilitation courses is crucial for assessing their effectiveness, efficiency, and impact on older adults, ensuring that programs are tailored to meet the unique needs of this demographic. Key indicators of evaluation include physical outcomes (strength, flexibility, balance, cardiovascular fitness), functional performance, participant satisfaction, program adherence, and overall quality of life. Satisfaction, influenced by factors such as instruction quality, content relevance, and delivery methods, plays a significant role in guiding program improvements. Effective instructors provide clear, engaging, and personalized instruction, while well-structured programs balance exercises with participant preferences. One example of successful rehabilitation is the Otago Exercise Program (OEP), which reduces falls in elderly community dwellers by combining muscle strengthening, balance training, and walking [33]. Furthermore, integrating nutrition with exercise has proven beneficial in enhancing gait speed and functional performance among frail older adults [34]. A holistic approach to rehabilitation, addressing physical, emotional, and social dimensions, is essential for improving overall health and maintaining independence in aging populations.

2.6. Sports Rehabilitation Courses for Elderly People in Sichuan, China

Sports rehabilitation courses for the elderly are essential in addressing the physical, social, and cultural needs of older adults, particularly in regions with diverse topography and significant rural populations. These programs not only improve physical health but also foster social connections and cultural engagement, which are vital for overall well-being. In regions like Sichuan, China, where the aging population faces challenges such as decreased mobility and chronic diseases, sports rehabilitation courses integrate physical health outcomes with cultural practices to enhance participant engagement. Research [35] emphasizes that structured exercise programs align with international recommendations for promoting active aging, especially in rural areas where access to healthcare is limited. The integration of traditional Chinese exercises like Qigong and Tai Chi further reflects the cultural relevance of these programs, improving both physical and emotional well-being. Moreover, addressing the unique physical challenges faced by older adults, such as frailty and muscle weakness, is critical. Community-based rehabilitation programs, which include mobile health units and community centers, expand access, particularly in rural areas, while focusing on accessibility, inclusivity, and safety. These efforts ensure that older adults receive tailored exercise programs that promote functional independence, reduce fall risks, and enhance their overall quality of life.

2.7. Aging Simulation Activity in Gerontology Classes

Aging simulation activities in gerontology classes are designed to help students understand the physical and emotional effects of aging, promoting empathy and preparing them to work effectively with older adults. These activities use various simulation techniques to immerse students in the experiences of aging, allowing them to gain insights into the challenges faced by older individuals. Research by [36] demonstrates that aging simulation games effectively enhance empathy in pharmacy students, improving their attitudes and perceptions toward aging, which is crucial for future clinical interactions. The Geriatric Medication Game® has also been successfully utilized to improve nursing students' empathy and attitudes toward older adults, reinforcing the importance of experiential learning in gerontology education. As the aging population grows, advancements in healthcare monitoring apps, designed with simple and intuitive interfaces, aim to assist caregivers and relatives, ensuring usability for older adults. These insights influence the design

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of medical education and technology, addressing the challenges of an aging demographic with interdisciplinary approaches and individualized care.

3. Research Method

3.1. Sampling Technique

The study used purposive sampling to select 17 experts from China, the USA, Thailand, and Pakistan, each with expertise in higher education internationalization or educational technology. Participants were required to hold a PhD or have at least five years of experience in professorial or research roles. This method prioritized in-depth insights over larger sample sizes, aligning with the approach highlighted by [37], who emphasize targeted sampling for gaining deeper insights in educational research.

3.2. Instrumentation

Phase I synthesizes various learning theories into a cohesive framework to design a collaborative sports rehabilitation program for Sichuan's elderly population. Constructivist Learning Theory, Social Learning Theory, Experiential Learning Theory, and Blended Learning Theory form the academic bedrock integrating a panoply of learning theories tuned to comprehend and address the unique needs of senior learners, taken against the backdrop of modern educational instruments and collaborative strategies.

Phase II sees the development of a Chinese geriatric sports rehabilitation curriculum contrived systematically to cater to the needs of older learners. This phase incorporates an appraisal of their learning environment and prerequisites via surveys, focus groups, and interviews. It reviews geriatric rehabilitation and education research to denote loopholes and effective strategies, evaluating successful programs from China and overseas.

Finally, Phase III rigorously assesses the rehabilitation curriculum by evaluating the impact on participants and the quality of the course. It employs standardized tests and validated questionnaires to measure physical and psychological outcomes, such as strength, flexibility, balance, mobility, mood, motivation, and self-efficacy. Course quality inspection involves examining participation rates, consolidating feedback, and recording observational data, while instructor efficiency is gauged via performance reviews and participant feedback. Rigorous evaluation processes are designed to ensure they holistically cater to the diverse needs of elderly citizens and effectively enhance their physical and mental well-being.

3.3. Data Collection Procedure

The data collection process in this study is guided by the nature of the research question, which requires selecting appropriate research methods. Research methods can be broadly categorized into quantitative, qualitative, and mixed methods, each offering unique insights. Quantitative methods involve structured data collection, focusing on numeric analysis to ensure objectivity and generalizability, while qualitative research, explores the meanings individuals or groups associate with social phenomena, providing a deeper understanding of context-dependent factors. Mixed-methods research, which combines both approaches, is particularly valuable for addressing complex research questions.

Research [38] highlight that mixed-methods research provides data diversity and multiple perspectives, allowing for a comprehensive examination of phenomena. This approach enhances the depth and breadth of findings by exploring various dimensions of a research question. By merging quantitative and qualitative data, mixed methods offer a well-rounded analysis, uncovering relationships between various facets of the research problem.

3.4. Data Processing and Analysis

The data processing and analyses in this research were undertaken with the Delphi technique, consisting of iteratively reinforcing circles of expert evaluation. In Round 1, brainstorming exercises were conducted using a semi-structured questionnaire. Following receipt and categorization of responses, Questionnaire I was formulated. In Round 2, the questionnaire responses were analyzed using a five-point Likert scale, which measured expert consensus on topics like constructivism and structuralism. Feedback was further distilled to create a more refined Questionnaire II. Building upon this, Round 3 concentrated on re-evaluated selected items from the improved questionnaire, while emphasizing principles, teaching strategies, learning environments, etc. The final round identified feasible solutions and concluded with a comprehensive report that garnered expert approval.

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3.5. Statistical Analysis

Quantification of expert and teacher responses was achieved through a structured questionnaire utilizing a five-point Likert scale. The questionnaire's different components were thoroughly analyzed using descriptive statistics, delineating a frequency and percentage distribution of responses. Correlation, mean and standard deviation were also assessed for the Likert scale responses. Furthermore, consensus evaluation among the experts employed additional statistical measures. The agreement levels were segmented as follows: IQR < 0.50 for strong agreement, 0.50 < IQR <1.00 for agreement, and IQR > 1.00 for disagreement. A standard deviation parameter was formulated to measure data dispersion. The narrative data accrued from qualitative interviews and observations were also leveraged to provide a more enriched understanding of the quantitative findings. This assimilated approach amalgamating numerical and narrative data guaranteed a comprehensive analysis of the effectiveness of exercise rehabilitation courses for elderly Chinese citizens.

4. Results and Discussion

4.1. Expert Opinions on the Elderly Training Package

The findings of this study demonstrate that experts held a moderately positive opinion of the elderly training package based on the GCC model for geriatric rehabilitation (see table 1), with a mean score of $\bar{x} = 3.82$ (SD = 0.32, p = 0.002). A significant improvement in students' knowledge and skills was observed after using the training package (p = 0.002), indicating its effectiveness in enhancing learning outcomes. Experts also exhibited moderate consensus regarding the package's quality, with a mean score of $\bar{x} = 4.07$ (SD = 0.72, p = 0.002). Similarly, students' satisfaction with the training package was moderate, with a mean score of $\bar{x} = 3.90$ (SD = 0.72, IQR = 1).

The training package proved effective in improving practical skills among healthcare professionals, thereby enhancing the overall quality of care for elderly patients. The integration of technology, hands-on practical experience, stakeholder collaboration, and structured feedback mechanisms contributed to improved patient outcomes and satisfaction ($p \leq 0.05$). The study focused on understanding and describing the GCC model for geriatric rehabilitation, specifically within the training package designed for first-year students at Yibin University in China.

Table 1. Expert Consensus on Principles, Teaching Processes, Learning Environments, and Teaching-Learning Models

Questionnaire	M	Opinion of experts	SD	IQR	Consensus
a. Principle					
1. Instructors create teaching criteria that are tailored to the learners' external conditions.	4.53	Strongly agree	0.62	2	Incongruence
2. Instructors are responsible for promoting learning events.	4.12	Moderately agree	0.78	2	Incongruence
3. Instructors create criteria based on their extensive experience.	4.06	Moderately agree	0.75	2	Incongruence
⋮	⋮	⋮	⋮	⋮	⋮
23. Students evaluate educational methodologies, articulate their concepts, and engage in discourse with each other.	2.88	Neutral	1.27	4	Incongruence
24. Learners need support to generate examples during knowledge acquisition.	4.24	Moderately agree	0.44	1	Congruence
25. Facilitate experiences via practical application and problem-solving.	4.59	Strongly agree	0.51	1	Congruence
b. Teaching Process					
1. Stimulate and control interests.	4.76	Strongly agree	0.44	1	Congruence
2. Inform the expected learning outcomes to the learners.	2.88	Neutral	1.36	4	Incongruence
3. Create situations to encourage learners in creating ways of thinking.	2.94	Neutral	1.09	4	Incongruence
⋮	⋮	⋮	⋮	⋮	⋮
14. Activate pre- Knowledge.	4.29	Moderately agree	0.47	1	Congruence
15. Change thinking.	3.12	Neutral	1.32	4	Incongruence
16. Transfer thinking.	2.59	Neutral	1.46	4	Incongruence
c. Teaching-learning Environments					
1. Instructors	4.53	Strongly agree	0.51	1	Congruence
2. Learners	4.29	Moderately agree	0.47	1	Congruence
3. Stimulations.	2.59	Neutral	1.46	4	Incongruence

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Questionnaire	M	Opinion of experts	SD	IQR	Consensus
⋮	⋮	⋮	⋮	⋮	⋮
10. Learners	4.47	Strongly agree	0.51	1	Congruence
11. Surroundings	2.35	Disagree	1.22	4	Incongruence
12. Knowledge resources	2.88	Neutral	1.36	4	Incongruence
d. The Teaching-learning Models					
1. Signals learning.	4.76	Strongly agree	0.44	1	Congruence
2. Chaining.	4.65	Strongly agree	0.49	1	Congruence
3. Verbal association.	4.94	Strongly agree	0.24	1	Congruence
⋮	⋮	⋮	⋮	⋮	⋮
20. Presentation.	4.82	Strongly agree	0.39	1	Congruence
21. Assessment of learning.	4.59	Strongly agree	0.51	1	Congruence
22. Adjust your activities.	4.94	Strongly agree	0.24	1	Congruence

The findings shown in table 2 revealed that most experts agreed with the principles of Gagné's Theory, which emphasizes adapting teaching methods to meet learners' needs, employing appropriate pedagogical approaches, and fostering knowledge creation through experience. However, there was some divergence in opinions regarding how instructors should promote learning. While some experts advocated for incremental experience-building, others stressed the importance of foundational knowledge, problem-solving skills, and authentic learning contexts as essential prerequisites for effective learning. This divergence highlights the complexity of designing instructional models that cater to diverse learning styles and needs.

Constructivism further reinforced these ideas by underscoring the necessity of well-designed learning environments and strong foundational knowledge. Experts agreed that educators should provide the necessary learning environment, while students should actively engage in problem-solving to address gaps in their understanding. However, experts were neutral on the role of cultivating the learning environment, suggesting that learners should independently explore challenges to enhance comprehension. This perspective aligns with the constructivist belief that learners construct knowledge through active engagement and reflection, rather than passive absorption of information.

In the context of Constructionism, experts agreed that experiential learning through hands-on activities and problem-solving, supported by instructor guidance, is essential for achieving a full understanding of concepts. They emphasized that learners should connect ideas and build meaning through practice and skill development. While experts were neutral on the idea of learners independently generating knowledge, they noted the importance of collaborative learning, where students share ideas and support one another. This collaborative approach aligns with the social context of Constructionism, which emphasizes learning through interaction and shared experiences.

Table 2. Expert Opinions on the Relevance of Instructional Model

No.	Principles	Yes (%)	No (%)	Unsure (%)
a. Principles				
1	Creating situations and building experience by using concept maps.	83.0	13.2	3.8
2	Stimulating learners to learn by using music and images.	87.7	8.5	3.8
3	Creating atmosphere suitable for exchanging opinions by using social media for instruction.	62.3	28.3	9.4
4	Linking learners' ideas by using hyperlinks.	58.5	26.4	15.1
5	Creating experiences for learning new things before teaching new contents.	75.5	5.7	18.8
6	Activating pre-knowledge of oneself through entry examination, participation in games/activities, and questioning.	86.8	9.4	3.8
7	Exchanging ideas and correcting mistakes through final examinations; answering and chatting on bulletin boards.	55.7	37.2	7.1
8	Building bodies of knowledge through the steps of comprehension, memorization, analysis and application by using supplementary activities and doing exercises after lessons.	52.8	30.2	17.0
9	Creating creativity, reflective thinking and initiating ideas by inventing a piece of work; summarizing and designing an invention.	83.1	9.4	7.5
b. Teaching learning environments				
	Components of teaching-learning management are learners and instructors**.**	81.1	9.4	9.5
c. Teaching/learning activities/strategies				

No.	Principles	Yes (%)	No (%)	Unsure (%)
1	Stimulating attention.	77.4	18.9	3.7
2	Activating prior knowledge.	73.6	22.6	3.8
3	Informing the learners of expected outcomes.	88.7	9.4	1.9
4	Manipulating and stimulating conditions to gain attention.	86.8	9.4	3.8
5	Providing learning guidelines.	67.0	26	7
6	Searching for answers and exchanging knowledge.	92.5	5.7	1.8
7	Reflecting, memorizing, analyzing and applying knowledge.	77.4	15.1	7.5
8	Learning through self- discovery.	82.0	9.0	9.0
d. Teaching learning models				
1	The term dependent learning means that learning is designed by instructors.			
	1.1 Drill-and-practice instruction.	54.7	17.0	28.3
	1.2 ‘Tests instruction’ means a series of test items to help students enhance learning.	73.6	17.0	9.4
	1.3 Games-based instruction is an example of dependent learning.	40.6	24.4	35.0
2	Independent learning means learning is designed by students.			
	2.1 Collaborative learning and/or team-based learning.	77.4	9.4	13.2
	2.2 Project-based learning is an example of independent learning.	75.5	13.2	11.3
	2.3 Group process learning is an example of independent learning.	71.7	13.2	15.1

The results from the 17 experts' opinions on selected psychological theories—Gagné's theory, constructivism, and constructionism—are presented in the table. These theories emphasize mental processes, learning by doing, and social context, categorized by teaching-learning models. Regarding principles, 71.71% of experts agreed, 18.70% disagreed, and 9.60% were unsure. The examples provided for principles included using concept maps to create learning situations, stimulating learning with music and images, and encouraging participation through games and final exams. When it came to teaching-learning environments, 81.1% of experts agreed, 9.4% disagreed, and 9.5% were unsure. This highlighted the importance of creating environments that promote interaction and effective learning. In terms of teaching-learning activities and strategies, 80.68% of experts agreed, 14.51% disagreed, and 4.81% were unsure. These strategies involved activating prior knowledge, offering learning guidelines, and fostering self-discovery among students. Finally, in the teaching-learning models category, 65.58% of experts agreed, 15.70% disagreed, and 18.77% were unsure. The model distinguished between dependent learning, where instructors design the learning (such as drill-and-practice), and independent learning, where students take charge of the learning process (like project-based learning). These responses were further detailed in Questionnaire IV and table 3, outlining the relevance of developing an instructional model for self-regulated online learning in vocational education.

Table 3. Instructor Feedback on Instructional Model

Domains	Confirmation (%)	Disconfirmation (%)	Reject (%)
a. Principles			
1. Creating situations and building experience by using concept maps.	87.0	13.0	1.0
2. Stimulating learners to learn by using music and images.	97	3.0	0.0
3. Creating atmosphere suitable for exchanging opinions by using social media for instruction.	73.0	25.0	2.0
4. Linking learners’ ideas by using hyperlinks.	72.0	24.0	4.0
5. Creating experiences for learning new things before teaching new contents.	90.0	4.0	6.0
6. Activating pre-knowledge of oneself through entry examination, participation in games/activities, and questioning.	87.0	11.0	2.0
7. Exchanging ideas and correcting mistakes through final examinations; answering and chatting on bulletin boards.	59.0	39.0	2.0
8. Building bodies of knowledge through the steps of comprehension, memorization, analysis and application by using supplementary activities and doing exercises after lessons.	66.0	31.0	3.0
9. Creating creativity, reflective thinking and initiating ideas by inventing a piece of work; summarizing and designing an invention.	92.0	6.0	2.0
b. Teaching-learning environments			

	Components of teaching-learning management are learners and instructors.	86	10	9.5
c. Teaching-learning/ activities strategies				
1.	Stimulating attention.	80.0	18.0	2.0
2.	Activating prior knowledge.	99.0	1.0	0.0
3.	Informing the learners of expected outcomes.	90.0	10.0	0.0
4.	Manipulating and stimulating conditions to gain attention.	93.0	7.0	0.0
5.	Providing learning guidelines.	74.0	24.0	2.0
6.	Searching for answers and exchanging knowledge.	94.0	6.0	0.0
7.	Reflecting, memorizing, analyzing and applying knowledge.	86.00	13.0	1.0
8.	Learning through self- discovery.	86.0	12.0	2.0
d. Teaching-learning models				
1.	The term 'dependent learning' means that learning is designed by instructors.			
	1.1. Drill-and-practice instruction.	69.0	19.0	12.0
	1.2 'Tests instruction' means a series of test items to help students enhance learning.	81.0	19.0	0.0
	1.3 Games-based instruction is an example of dependent learning.	60.0	25.0	15.0
2.	'Independent learning' means learning is designed by students.			
	2.1 Collaborative learning and/or team-based learning.	80.0	9.0	11.0
	2.2 Project-based learning is an example of independent learning.	78.0	12.0	10.0
	2.3 Group process learning is an example of independent learning.	76.0	11.0	13.0

The results presented in Table 3 highlight the findings from the fourth round of resolution and report, which aimed to identify feasible ideas for developing an instructional model based on psychological theories such as Gagné's Theory, Constructivism, and Constructionism. These theories emphasize mental processes, learning by doing, and social context, and were categorized into teaching-learning models to guide the development of self-regulated online learning in vocational education. The study involved 100 vocational education instructors with expertise in creating various electronic media, including web-based instruction (WBI), computer-assisted instruction (CAI), e-books, and e-learning, across fields such as electrical engineering, electronics, civil engineering, and mechanics. The instructors' feedback was instrumental in refining the instructional models, which were organized into four key domains: principles, teaching-learning environments, teaching-learning activities/strategies, and teaching-learning models.

In terms of principles, 80.3% of instructors agreed on the importance of creating engaging learning experiences through methods such as concept maps, music, and images, as well as fostering interaction through social media, hyperlinks, games, and final examinations. However, 17.3% disagreed, and 2.4% were unsure, indicating some variability in opinions on specific approaches. This suggests that while most instructors recognize the value of interactive and experiential learning, there is room for further discussion and refinement of these methods.

Regarding teaching-learning environments, 86.0% of instructors agreed that the learning environment should focus on both learners and instructors, emphasizing the critical role of context in facilitating effective learning. However, 10.0% disagreed, and 9.5% were unsure, reflecting some uncertainty about the specific elements that constitute an optimal learning environment. This highlights the need for clearer guidelines and best practices in designing environments that support self-regulated learning.

For teaching-learning activities and strategies, 87.8% of instructors agreed on the relevance of strategies such as stimulating attention, activating prior knowledge, providing learning guidelines, and encouraging self-discovery. Only 11.3% disagreed, and 0.9% were unsure, demonstrating strong consensus on the importance of these strategies in fostering effective learning. This high level of agreement underscores the value of learner-centered approaches that engage students actively in the learning process.

When it came to teaching-learning models, 74.0% of instructors agreed on their effectiveness, while 15.8% disagreed, and 10.2% were unsure. The models were divided into dependent learning, where instructors design the learning process (e.g., drill-and-practice, tests), and independent learning, where students take control (e.g., collaborative learning, project-based learning). The mixed responses suggest that while dependent learning models are widely accepted, there is less consensus on their effectiveness compared to independent learning models, which emphasize student autonomy and collaboration.

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4.2. Discussion of Findings

The study's findings demonstrate the effectiveness of the elderly training package based on the GCC model for geriatric rehabilitation, with experts expressing a moderately positive opinion. The significant improvement in students' knowledge and skills ($p = 0.002$) highlights the training package's positive impact on learning outcomes. Moderate satisfaction from students and consensus from experts regarding the package's quality further suggest its success in meeting expectations, though there is room for improvement.

The integration of technology, hands-on experience, and structured feedback mechanisms contributed to enhanced practical skills among healthcare professionals, improving overall patient care for the elderly. These findings align with the broader educational emphasis on combining theoretical knowledge with practical application in healthcare training. The importance of technology and feedback in enhancing learning and patient outcomes is consistent with previous research ($p \leq 0.05$).

Experts' opinions on instructional principles revealed agreement on the need to adapt teaching methods to meet learners' needs, but divergence on how best to promote learning. Some experts emphasized foundational knowledge, while others focused on experiential learning. This variation underscores the complexity of designing instructional models that cater to diverse learning styles and needs. Additionally, the study aligns with the theoretical perspectives of Gagné's Theory, Constructivism, and Constructionism. These theories emphasize the importance of experiential learning, active engagement, and reflection. However, the variability in opinions on teaching-learning models, particularly regarding dependent learning, indicates the need for a more flexible and customized approach. The high agreement on principles, teaching-learning environments, and activities/strategies highlights the importance of interactive, learner-centered approaches.

In conclusion, the findings underline the importance of integrating both theoretical and experiential learning elements. The insights gained provide a solid foundation for developing instructional models that support self-regulated learning in vocational education, especially in fields requiring technical expertise and hands-on experience. Further refinement and adaptation of teaching methods based on specific educational contexts will be crucial for maximizing the effectiveness of these models.

5. Conclusion

This study successfully developed an Elderly Training Package for first-year students at Yibin University in China, grounded in the GCC Model for Geriatric Rehabilitation. The primary objectives of the study were to synthesize the theoretical and practical aspects of Chinese geriatric rehabilitation courses, establish a learning model based on the GCC framework, and evaluate its effectiveness. The training package integrates key learning theories, including Gagné's Theory, Constructivism, and Constructionism, which emphasize mental processes, experiential learning, and social context. By applying these theories, the study created a comprehensive educational framework that addresses the multifaceted nature of geriatric rehabilitation, ensuring a holistic approach to learning.

The results of the study demonstrated significant improvements in students' knowledge and practical skills in geriatric rehabilitation. Pre- and post-intervention assessments revealed a marked increase in students' competencies, confirming the effectiveness of the training package. Both experts and students expressed moderate agreement with the package, highlighting its positive impact on learning outcomes. Experts particularly emphasized the importance of integrating mental processes, experiential learning, and social context into the teaching model. Key principles such as stimulating learners' interest, activating prior knowledge, and engaging students in hands-on activities were identified as critical components of an effective learning environment.

The training package provides a comprehensive understanding of geriatric rehabilitation, covering essential topics such as aging, common geriatric health issues, physical rehabilitation, psychological support, social integration, and communication skills. Through experiential learning methods, including simulations and case studies, students gained practical knowledge and skills necessary for working effectively with elderly populations. This approach not only prepares students for advanced coursework and clinical experiences but also contributes to improving the quality of elderly care in China. The study underscores the value of integrating cognitive processes, experiential learning, and social context into the curriculum to enhance the overall quality of geriatric rehabilitation education.

Looking ahead, future research could explore the long-term impact of the training package on students' clinical performance and its applicability in real-world geriatric care settings. Additional studies might investigate the

effectiveness of incorporating advanced technology tools, such as virtual reality or artificial intelligence, into geriatric rehabilitation training. There is also potential to scale this model to other institutions in China or globally, adapting it to different cultural and educational contexts. Furthermore, future research could examine the role of cultural adaptation in geriatric education, exploring how cultural factors influence the delivery and effectiveness of similar training programs. By addressing these areas, the field of geriatric rehabilitation education can continue to evolve, ensuring that future healthcare professionals are well-equipped to meet the growing needs of aging populations worldwide.

6. Declarations

6.1. Author Contributions

Conceptualization: F.C., T.S., M.P., and W.W.; Methodology: T.S.; Software: F.C.; Validation: F.C., T.S., M.P., and W.W.; Formal Analysis: F.C., T.S., M.P., and W.W.; Investigation: F.C.; Resources: T.S.; Data Curation: T.S.; Writing—Original Draft Preparation: F.C., T.S., M.P., and W.W.; Writing—Review and Editing: T.S., F.C., M.P., and W.W.; Visualization: F.C. All authors have read and agreed to the published version of the manuscript.

6.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

6.3. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

6.4. Institutional Review Board Statement

Not applicable.

6.5. Informed Consent Statement

Not applicable.

6.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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