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Original Article

Development of Interactive Multimedia Learning in Aging Education

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Abstract

Objective: The purpose of this study was to develop and apply a web-based interactive multimedia instruction in aging education for college students. **Methods:** The development of the program involved the coordinated actions of the researcher as a content expert and a multimedia designer responsible for animation, simulation, and game production. An adaptation of the model for developing interactive multimedia, described by Ribbons(1998), was used to guide program construction: Analysis - Planning - Design - Production - Operation - Evaluation phase. **Results:** The interactive multimedia program was entitled as *virtual aging* and composed of a total of 8 interactive multimedia lessons. Interactive learning activities consisted of simulations, games, as well as online pedigree and life timeline drawing to facilitate the cognitive and emotional interactional learning of aging process. **Conclusion:** Interactive multimedia could be an effective teaching media of aging education and be used in a variety of learners including health care professionals caring for older adults as well as lay persons. ***(Journal of Korean Society of Medical Informatics 13-3, 221-226, 2007)***

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Ⅰ. Introduction

Due to the rapid increase in average life spans, Korean society has become rich with persons over the age of 65. Young generations today will face decisions that can enhance the independence and quality of their longer future life spans. In response to this social demand, the need to include education about aging in curricular for young ages has been acknowledged and recommended recently[1]. Rapid increase of old population has prompted an interest in preparing the young generation to better lead the future aged society. Aging education is an important method of sensitizing the young generation to the need of aging society[2].

Interactive multimedia instruction is one method that can be used to supplement or replace the off-line class education[3]. Especially, aging education for college student is one area that could benefit from the use of interactive multimedia based instruction to attract the users who are used to e-learning environment[4]. Interactive multimedia instruction allows the user to control the computer education, so they may learn at their own pace, provide an interactive learning environment in which materials can be targeted or tailored, and provide a variety of multimedia formats including graphics, animation, and simulation[5].

It has been demonstrated that the people's retention capacity depends on the sense used to grasp the information, and the memory from interaction can be better remembered than the memory only from audiovisual one way input. Interactive multimedia has been established a new model for providing information and education throughout the world. Especially interactivity is the greatest advantage that multimedia contributes to teaching. The introduction of animation and graphics is intended to substitute the experiential learning in the traditional class room environment filling the gap caused by the lack of time, space, and equipments; in this way, processes that would otherwise require complicated experimental environment can be transmitted to the students in virtual form[6].

As aging education is required to deliver contents related to the dynamic aging process and health behaviors such as exercise and nutrition, an interactive multimedia learning with simulation and games can be one of the most efficient educational methods to provide virtual experience of aging. Thus, the purpose of this study was to develop and apply web-based interactive multimedia in aging education for the college students.

II. Materials and Methods

The development of the program involved the coordinated actions of the researcher as a content expert, a multimedia designer responsible for animation, simulation, and game production. An adaptation of the model for developing interactive multimedia, described by Ribbons(1998)[7], was used to guide program construction. During the initial planning stage, learners' needs on interactive multimedia for experiential aging education were investigated through reviewing previous researches and surveying 100 college students who took the gerontology course before. Aging-related education programs, teaching materials, and websites in Korea and other countries were examined for content analysis.

Based on the result of the content, technical, and environmental need analysis, the following topics were selected to be developed using interactive multimedia: Anatomy, physiology, and changes over time in the brain & cognition (including brain development and its relation with dementia), the eye & vision, ear & hearing, bone & motion, teeth & oral health; Intergenerational relationships (including taking personal histories and developing timelines); Nutrition & aging (including food dairy and food pyramid analysis); and Stereotypes and biases of aging in different media.

In the design phase, content was classified into texts, images, animations, simulations, and games. Links among sites were also designed. Information of physical changes in aging process was designed mainly using images and simulation. Information of psychosocial changes in aging process was classified into texts, animation, and games. The main screen was designed to show the site map and to provide accesses to interactive learning, discussions, bulletin boards, and links. Post-learning discussion and Q

& A were designed to solicit students' impressions of the virtual experience and facilitate interface. For motivation design, preview of each learning activity was provided in order to stimulate students' interests in learning activity. Functions to evaluate students' learning progress were designed including quizzes, online test, assignment, discussion, and activity participation check.

In the production phase, the structure of the program was organized into a sequence of lessons and user friendliness considering difficulties of content, and the technological possibility of implementation. The program was developed in Windows environment using HTML, JavaScript, Flash action, photoshop, and so on. Simulations were designed for virtually experiencing aging process of visual, hearing, and cognitive function. Games were designed to facilitate learning of healthy eating and exercise habits. Animation and self image producer were used for exploring life line, image of the elderly, and making the student's pedigree.

In the operation phase, produced content was uploaded on the web and linked with the online teaching-learning support center of K University. Learners had the login process in the main page and needed to be approved by the instructor to use the site and then could access lessons and activities.

During the evaluative phase, the evaluation survey assessed student perception of the learning environment. Specifically, it consisted of 14 statements, with seven statements for each of the two categories: instructional values and instructional function. Learners were required to respond to each statement a five point Likert-type scale where 5 equals strongly agree and 1 equals strongly disagree. The students also had discussions on experience with aging simulation and games after activities.

III. Results

The interactive learning consists of 8 multimedia lessons. Within each lesson, the visuals on screen included colorful still images and animations. They were created for this multimedia environment and were relevant to the instructional content on page. Navigation of the lessons was sequential from Lesson 1 to Lesson 8 and no lesson could be skipped. Within each lesson, the learners had the choice to advance to the next screen, replay the current screen, or go back to the previous screen. The learners were afforded as much time as they wanted to process the information on each screen. The learning environment contained a number of features including (1) its size was

Figure 1. Main page of Interactive Multimedia Aging Education

800 x 600 pixels; (2) a listing of all lessons, with showing which lesson was completed by students; (3) navigational aid, indicating what lesson the learner was in, the total number of pages in the lesson, and the current page; (4) a control panel containing a back button, a replay button, and a next button that enabled the learner to move back a single screen, replay the current screen including animation or move to the next screen, respectively. Each instruction explores aging process of vital organs and sense organs, and the related health problems using simulation, animation, and games.

The main screen provides menus such as interactive multimedia lessons, discussion room, bulletin boards, learning material room, survey, and link(Fig. 1). If a menu is clicked, the corresponding page appears. In addition, the menu always appears on the upper bar so that the user can select a different menu easily.

The interactive multimedia program was entitled as *virtual aging* and composed of a total of 8 interactive multimedia lessons. Interactive learning activities consisted of simulations (e.g., vision impairment glasses) (Fig. 2), games (e.g., an online board game designed to illustrate the impact of genetics and environment including nutrition and exercise on healthy bone

Figure 2. Simulation of visual impairment glass

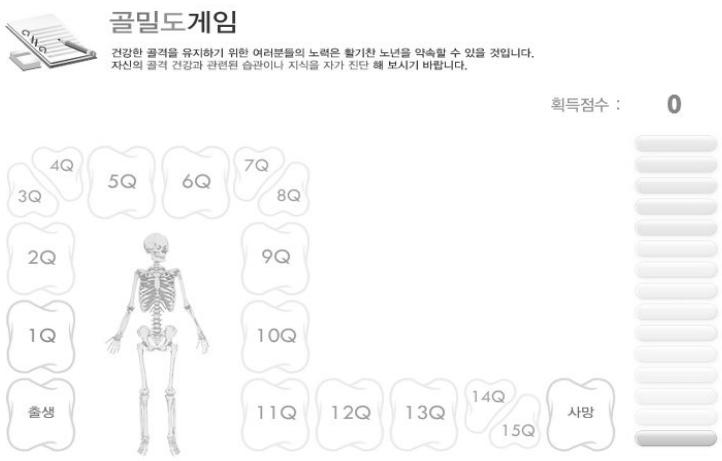

Figure 3. Online board game of bone health

development, and kinetic activities) (Fig. 3), as well as online pedigree and life timeline drawing to facilitate the cognitive and emotional interactional learning of aging process.

The related materials such as videos, audios, photographs and images were provided through the learning material rooms in order to reinforce, supplement and deepen the contents of learning. In addition, linkage with other aging related websites was provided.

Table 1 shows the evaluations. The students rated the overall instructional value of the interactive multimedia aging education as being very good or excellent especially in entertaining, having control, being easy to understand, and holding attention function. Most students showed high satisfaction on instructional function. However, the letter size, speed, and interface were rated lower satisfaction compared to evaluation of graphics and multimedia.

Table 1. Evaluations of the interactive multimedia aging education

Category	Item	Mean
Instructional Value	Entertaining	4.30
	Easy to understand	4.20
	Convenient	3.90
	Satisfied	4.00
	Have control	4.00
	Accurate	3.90
	Hold attention	4.20
Instructional Function	Appropriate letter size	3.80
	Speed to follow	3.90
	Attractive graphic	4.10
	Variety of multimedia	4.20
	Exact learning guide	4.00
	Fast upload & download	3.80
	Appropriate interface	3.70

IV. Discussion

In response to social demand to cope with rapid aging and changes in education paradigm in the information age, the present study developed a web based interactive multimedia of aging education for the college students. The study results reveal that the web based instruction with multimedia on aging education is an effective learning tool for college students.

Consistent with previous reports[8)9)10)], the present investigation found that experience with interactive multimedia instruction was interesting and holding attention of the students. The students responded animations entertaining and the animated elderly agent look familiar and they consider this character a positive role model of successful aging. Adding an animated pedagogical elderly image on the screen may foster affective learning if the animation conducts instructionally valuable motion such as being a visual interactor to facilitate student sympathetic thinking of aging.

Computer simulation can clarify instruction by allowing students to visualize complex, dynamic process in an interesting presentation. Especially, in this study, linking the activities with students' experience of the elderly people in their actual life heightens the quality of the post-simulation discussion; therefore, student experiences in the aging activities are easily related to their daily encounters with older people at home and community. The virtual experience and post simulation discussion clearly served to stimulate student thought and provided insight into the physical and cognitive challenges that many elderly patients with chronic disabilities face as other aging simulations have been found to promote insight and positive attitudes about aging[11)].

One of highest satisfaction reported in the evaluation is related with the control student have over animations. Most of the animations have controls that allow the user to stop, resume, go to the beginning, go to the end, go one step forward or one step back. These devices allow the students to control the visualization and adapt the animation to their learning rate. Flash allows the user to control the animations[12)].

Another strong point of interactive multimedia learning is that, as they are located in a web server, they can be accessed easily at any time. Furthermore, the students consider that having material they can access as many times as they want constitutes an enormous advantage.

As opposed to the positive characteristics, the obstacles to the producing and learning process were also found. The main problem when working with interactive multimedia instruction is that in spite of the control

students have over the visualization and speed, it cannot be considered equal to a complete asynchronous communication. In order to have a communication channel with the instructor at all time, the instructor's e-mail address, Q & A, and bulletin board were activated in this study. Some students found it difficult to follow the explanation given in the instruction while others, on the contrary, considered that the speed of the explanation was too slow. One possible solution to this problem is to break down the contents into smaller units so that the student can pass from one to another more or less quickly. In the case of very colorful animations with sound, some students lost track of the explanations and were distracted by the movements of the images. This is due to a design that aims to be too entertaining and does not have a proper balance between distraction and the information it transmits.

This interactive technology design process and content could be used in a variety of learners including health care professionals and other professionals caring for older adults as well as lay persons. Especially, it is imperative that health care professionals need to raise the standard of care for older adults because of increasing number of elderly patients. Using interactive web based learning is an innovative educational approach to meet this demand by incorporating geriatric content into information technology. Based on the findings of this study, further investigation is required to evaluate the effect of the interactive multimedia for aging education. Remaining questions to address include the following:

- How would the interactive multimedia compare with other teaching method for aging education?
- How would interactive multimedia only learning compare with blending multimedia and traditional offline learning?

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