Empirical Study on elderly learners' needs and obstacles in network learning by "3C products"

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Abstract. This study treated elderly learners at Open University of Kaohsiung who participated in online distance learning as samples. By a literature review and questionnaire survey, it probed into elderly learners' perceived reactions and feedback for network learning using consumer electronics products and analyzed the general situation and relationship between elderly learners' needs and obstacles in network learning with consumer electronics products. By empirical research, this study investigated a total of 472 elderly learners aged at least 55 years old in elderly programs at Open University of Kaohsiung, for-credit continuing education courses, and on-the-job courses of universities in different counties and cities around Taiwan. This study found that elderly learners with a lower educational level encounter more significant learning obstacles in network learning using consumer electronics products. In addition, this study found that when elderly learners' needs to apply consumer electronics products are higher, their network learning obstacles will be lower. Based on the findings, this study suggested that it shall help elderly learners with lower educational level reinforce learning knowledge and competence to apply consumer electronics products to avoid obstacles for network learning.

1 Introduction

1.1 Research motives

3C refers to computers, communication (mostly mobile), and consumer electronics[1]. Many studies have found that the elderly mainly apply 3C products and IT to entertainment, communication, shopping, learning, and health care, and the quality and satisfaction with life of the elderly are improved due to the use of digital information technology[2-8].

Dorin (2007) argued that online learning made it possible for the elderly with illnesses or difficulty in moving to study at home, and benefited elderly learners living in remote areas or too busy to attend offline courses. Furthermore, Dorin emphasized that current online learning environments contain audio and video functions, meaning the elderly could interact with others and realize informal learning and social contact. Githens (2007) pointed out that, when designing digital learning materials for the elderly, teachers should pay special attention to technical issues, usability issues, the curriculum design framework, and the application of new technology. Renaud and van Biljon (2008) interviewed the elderly aged between 60 and 92 to learn the factors influencing their use of digital tools, where

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such factors included social impact, usefulness, supporting facilities, and ease of learning and use, and proposed the Senior Technology Acceptance and Adoption Model (STAM).

However, Lin (2002) asserted that learning obstacles were caused by a lack of confidence, thinking oneself too old, lack of learning motivation, easily becoming nervous or anxious, and psychological factors. Huang (2004) deemed that the learning problems of the elderly included: health problems, response time, slow movement, failing eyesight and hearing, and poor memory. Chen (2006) probed into physical barriers, mental disorders, and learning disabilities. Tsai and Yeh (2009) considered some elderly learners of the Songnian University as their subjects, and discovered that the learning obstacles of elderly learners included: psychological, physiological, institutional, curriculum and teaching, and situational. In addition, Chiang (2006) believed that network learning of the elderly led to learning obstacles in physics, psychology, family, and basic computer abilities; in particular, failing eyesight was the greatest obstacle in learning.

Elderly learners have great demands and many chances to use 3C products in their lives and study; however, their gradually aging sensory functions inevitably cause learning obstacles. Therefore, this study attempts to understand the needs of and obstacles in network learning with "3C products" for elderly learners, and effectively assists them in using 3C products via diversified and suitable methods, overcoming learning obstacles, meeting learning demands, and improving learning outcomes, which are the motivations of this study.

1.2 Research motives

Based on the aforementioned research motivations, the purposes of this study are described, as follows:

1.2.1 This study intends to explore the learning characteristics of elderly learners.

1.2.2 This study aims to learn the needs of and obstacles in network learning with "3C products" for elderly learners.

1.2.3 According to the research results, this study attempts to propose feasible strategies to help elderly learners effectively use "3C products" to overcome their learning obstacles, meet their learning needs, and achieve their learning goals.

1.3 Research method

This study first employs literature review to collect important literature, such as books, journals, magazines, and papers on learning characteristics, as well as the needs of and obstacles in using "3C products" for the network learning of the elderly; summarizes and analyses such literature to form the basic concepts; summarizes the opinions and suggestions of scholars and experts, and develops a "Questionnaire on the Application of "3C Products" by the Elderly to Network Learning". This study investigates the elderly learners of the Open University of Kaohsiung through the questionnaire, and based on the statistics and analysis of the data collected, learns the status quo of the needs of and obstacles in using "3C products" for the network learning of the elderly. Copies of the questionnaire are distributed via paper and electronic forms.

2 Exploration of the influence of the learning characteristics of the needs and obstacles of the network learning of elderly learners

2.1 Learning characteristics of elderly learners

Due to their physical, psychological, and social states, as well as periodic development tasks, elderly learners are affected by physical aging, life phenomena, development stages, social culture, and psychological maturity; hence, their learning is unique. Huang (2004) suggested that there were 10 kinds of learning characteristics of the elderly: learning motivation was triggered by events or transition in life; the learning contents were mostly practical; the learning framework was question-

centered; there was low confidence in learning; low learning pressure; lifelong learning ability; close place to study; learning during the daytime; comprehensive and top-down learning methods; the learning goal was to find the significance and value of life. Wei et al. (2008) assumed that: the learning of the elderly was learner-centered, their purpose was to adapt to changes; they dislike too much pressure caused by learning activities; they explored the significance of life; their learning effect was to promote healthy aging.

Tsai (1996), Wu (1997), Chang et al. (2002), Wei et al. (2008), Chen (2013), and Wu et al. (2014) deemed that elderly learners had the characteristics of instant learning motivation, lifelong and continuous learning, unique learning style, learning to solve practical issues, influenced by life experience, self-concept positioning, and self-orientation. In fact, adult and underage learners are greatly different in learning background factors, such as the learning of prerequisite knowledge, experience, physical and mental status, and learning motivation. Thus, teachers must teach students in accordance with their aptitude, allow students to have meaningful learning results, and help them meet their learning needs and realize their learning goals.

Chang (2007) pointed out that, in order to achieve the purpose of the adaptive teaching of the elderly, flexible curriculum teaching principles were important to successfully teach the elderly, including: (1) flexible learning time; (2) flexible learning methods; (3) flexible learning progress; (4) flexible learning guidance plan; and (5) flexible learning assessment. As elderly learners require more help and encouragement from their teachers and peers, suitable teaching methods shall be adopted in line with the characteristics and learning contents of students. Adaptive teaching represents social fairness and justice, meaning the status of each student should be considered, and those lagging behind are not overlooked, as all elderly learners could benefit from learning. Huang and Chang (2010) asserted that adaptive education allowed students to learn according to their unique characteristics and needs, develop their potentials, and realize themselves. As elderly learners have diversified learning characteristics and different experiences, abilities, interests, aptitude, cultures, and styles, different teaching methods shall be adopted. Hence, teachers must teach in accordance with the different characteristics of elderly learners, in order that all elderly learners can meet their learning needs and effectively reach their goals.

Chang and Chen (2013) and Tseng (2004) argued that, in terms of physiology, elderly learners suffered from failing eyesight and hearing, long response time, declining memory, and worse excretory system. In terms of psychology, they had stable intellectual development, strong self-esteem, low confidence in learning, active participation in learning, and the learning motivations of interests and social contact. Moreover, they preferred to engage in practical learning activities and did not stress speed. In terms of society, their learning goals were to complete development tasks and enrich their social and life experiences. Lin (2002) deemed that the personal backgrounds of elderly learners, such as age, education, and residence, would also affect their learning motivations. Tsai and Juan (2011) determined the learning needs of the elderly that should be considered in activity design or planning.

McClusky (1971) held that education intervention could improve the quality of life of the elderly, and classified the learning needs of the elderly as: handling, performance, contribution, influence, and surpassing needs. Hu (2012) believed that, with respect to the design of learning activities for the elderly, in addition to normal scenario analysis, needs assessments should be conducted. Through questionnaires, interviews, observations, testing, seminars, opinions of experts, and review of research reports, materials for needs assessment should be collected, in order to collect various information and observe and assess the learning behaviors of the elderly. Thus, if one considers the learning patterns and needs of the elderly in the design and planning of a curriculum, it would facilitate better understanding of the needs of elderly learners and the appropriate design of adaptive teaching strategies.

As it has become increasingly common to apply digital network systems to learning, more and more elderly learners must access networks to obtain information [30]. Ren (1999), and Wu and Tsai (2006) assumed that teachers, peers, and family members should help elderly learners develop better network usage strategies, offer encouragement and feedback, help them hold positive attitudes regarding the use of the Internet, improve their efficiency, confidence, and times in using the Internet,

and facilitate them to obtain better outcomes. Lee (2008) pointed out that, when elderly learners felt they could study according to their own way, plan, and judgment, their efficiency in using the Internet would be improved, which helped the learners to study better.

Lu and Lu (2005) held that the Open University of Kaohsiung, which is an adult education institution that implements remote adult education, can design its teaching strategy in the following ways: (1) It could provide digital network services and diversified teaching environments. Digital network services could offer digital network teaching and discussion, in order to enrich teaching environments and allow learners to have individual choices; (2) It could offer a digital platform, cooperate with off-campus institutions, promote lifelong education, promote the digital learning platform through the cooperation of industry and education, and offer continuing education opportunities to the public; (3) It could store electronic teaching materials that are convenient for learners to read anytime, and learners and teachers can update the contents anytime to improve interactions with each other; (4) A learning process system could be established for digital learning, in order that the learning process of students can be clearly recorded on learning websites to form individual learning profiles; and (5) A digital learning network could integrate administrative and teaching organization systems, and combine administrative and teaching resources, in order that the various departments of a school could unite to improve teaching and administration efficiency.

However, through interviews with teachers of elderly learners, Lai (2016) deemed that elderly learners still preferred the face-to-face learning method. The interviewed teachers pointed out that, one of the important factors for the elderly to study was social contact and exchange with teachers and peers, meaning complete online learning environments lack interpersonal interaction. Elderly learners tend to feel isolated and lack the support of peers. Moreover, as elderly learners were not confident using technologies, they required the help of teachers; hence, it was better for digital courses to become teaching aids, and the elderly could preview or review the online courses prepared by teachers at home. In addition, as elderly learners suffer from apparent aging physiological functions, it was better to make digital courses simple and intuitive, meaning most of the course contents should be images, text should be large, and operational steps should be reduced. In this way, elderly learners could confidently operate and browse digital courses.

2.2 Needs of and obstacles in the network learning of elderly learners

Gagne (1977) used the relevant learning theory to develop a teaching model, and emphasized the establishment of teaching procedures through motivation, understanding, memory, apperception, execution, and feedback. Therefore, the processes of elderly learners participating in flipped learning activities include: First, understanding learning needs, assessing the category of learning needs, collecting and proposing learning goals and activities; second, setting up learning goals with order and levels based on the individual difference principle; third, practical and useful learning activity contents, and combining courses contents with the previous experience of students to maintain learning motivation; finally, evaluating learning outcomes via self-evaluation and peer exchange. In this way, learning needs can be met, as elderly learners are assisted to have peak learning experiences and realize the ideal learning goal of "self-realization". In addition to the awareness of becoming a lifelong learner, participating in various learning groups and cultivating friendly interpersonal interactions are also major factors supporting the elderly to participate in flipped learning [37].

Tsai (1995) proposed the principle of assessing the learning performance of adults, which is applicable to the elderly, deemed that evaluation should be based on teaching goals, diversified evaluation methods should be adopted, and the learning characteristics of individuals should be taken into consideration. Both learning processes and results should be considered in evaluation. The interpretation of evaluation should stress comparison with oneself rather than others, meaning scores and levels should not be overly stressed, and learners should be able to participate in the evaluation to obtain the sense of achievement, as based on the evaluation results. Additionally, if the elderly already have experience in using intelligent products, when coupled with cloud services, the elderly could record their thoughts on learning through an online learning platform (in the form of video or text),

and teachers and peers could provide feedback via the platform. Moreover, the platform could provide links to relevant video and audio websites, in order that the elderly could browse all learning resources and exchange and share with their peers online.

This researcher teaches at the Open University of Kaohsiung, and during the first semester of the 2016 school year, conducted informal semi-structural interviews with eight elderly learners over the age of 60, and proposed the launch of a "large face-to-face" (a mixed teaching activity integrating online remote teaching and four face-to-face classes in one semester) course at the university. This method allows students to best accept, adapt to, and absorb the teaching contents and methods of teachers. The opinions of the interviewed students are comprehensively summarized. Some students hoped that teachers could provide attractive oral explanations, ask questions for students to discuss and solve, give plenty of time to students to think and finish homework, and conduct case studies. In addition, they hoped that teachers could demonstrate the operation of computers, where students could be divided into groups to complete homework together, audio and video materials could be added to digital teaching materials, outdoor fieldtrips could be organized, and the presentation of learning achievements and results could be arranged.

The key factors for the success of the network learning of elderly learners include: First, they will achieve better performance if they can adjust their own study progress. Second, if teachers can effectively organize teaching materials in terms of space and time, correlation, and contents, elderly learners will improve their outcomes. Third, through various media, such as combinations of text, information, images, and stories, students will form links to new and previously learned knowledge, which is suitable for individual learning modules. Fourth, it is a must for teachers to help elderly learners understand their own needs and offer them meaningful contents. Finally, teachers shall use as few as possible unified assessment criteria, instead, they can use several assessment methods, such as self-evaluation, to reduce the sense of frustration of the elderly, and offer support and praise, which is the best feedback for elderly learners [38].

3 Research hypotheses and tools

3.1 Research Hypotheses

Based on the above literature review, this study proposes the following hypotheses in terms of the needs of and obstacles in network learning with "3C products"for elderly learners:

H1: There are significant differences in the needs of and obstacles in network learning with "3C products" among elderly learners with different backgrounds.

H2: Elderly learners are highly correlated in terms of the needs of and obstacles in network learning with "3C products".

3.1 Research Tools

On the basis of the above-mentioned literature review, this study summarizes and edits the Questionnaire on the Application of "3C Products" by the Elderly to Network Learning, and invites practitioners teaching elderly learners, as well as researchers and experts on elderly education, to serve as the experts of this study and review the validity of the questionnaire. Regarding the practitioners teaching elderly learners, a total of three teachers are invited from an elderly university, a community university, and an Evergreen school. Regarding the scholars for education of the elderly, seven scholars are invited from National Kaohsiung Normal University, National Pingtung University, National Pingtung University of Science and Technology, Lunghwa University of Science and Technology, Aletheia University, National Open University, and Open University of Kaohsiung.

This study selects samples from elderly learners over 55 years old from the Open University of Kaohsiung attending elderly university programs, promotes education programs, and regular university programs. Copies of the questionnaire are randomly distributed to learn their gender, age,

education, major, and profession. In terms of the reasons for using 3C products for network learning, there are seven questions on adaption to the trend of digital times, fast learning, effective learning, convenience in exchange and interaction with teachers and classmates, no need to go to school, preference for computer or mobile products, and compliance with network education rules. Regarding the obstacles in network learning, there are seven questions on being unfamiliar with operational procedures, insufficient knowledge of the functions of a computer or mobile, poor eyesight, poor hearing, lack of actual interaction with teachers and classmates, not enough physical strength to operate for a long time, and difficulty in operating courses. The data collected through the questionnaire are used to verify the hypotheses of this study, while the results are utilized to improve the network learning of elderly learners using 3C products, help them smoothly solve problems, meet their learning needs, and effectively achieve their learning goals.

4 Research results

4.1 Descriptive statistical results

Table 1. Questionnaire on the Application of "3C Product" by the Elderly to Network Learning

Variable	Group	Number of people	Percentage	Cumulative Percentage
Gender	Male	248	52.5	52.5
	Female	224	47.5	100.0
Age	55--59 years old	444	94.1	94.1
	60--64 years old	13	2.8	96.8
	Above 65 years old	15	3.2	100.0
Educational background	Below (including) junior high school	18	3.8	3.8
	Senior high school and vocational school	202	42.8	46.6
	College and university	210	44.5	91.1
	Graduate school	42	8.9	100.0
Department	Department of Law & Political Science	72	15.3	15.3
	Department of Industrial and Business Management	70	14.8	30.1
	Department of Technology Management	182	38.6	68.6
	Department of Culture and Arts	14	3.0	71.6
	Department of Mass Communication	19	4.0	75.6
	Department of Foreign Languages and Literature	25	5.3	80.9
	Unselected	90	19.1	100.0
Occupation	Farming, forestry, fishing animal husbandry	6	1.3	1.3
	Manufacturing	19	4.0	5.3
	Business and service	101	21.4	26.7
	Information technology	19	4.0	30.7
	Civil servants	262	55.5	86.2
	Unemployed	44	9.3	95.6
	Retired	21	4.4	100.0

N=472

The descriptive statistical results of this study are shown in Table 1. In terms of gender, there are 248 males, accounting for 52.5% of the total subjects, and 224 females, accounting for 47.5%. Regarding age, most of the subjects (444) are between "55 and 59 years", accounting for 94.1%; followed by 15 over "65 years", accounting for 3.2%; and 13 between "60 and 64 years", accounting for 2.8%. Regarding education, most of the subjects (210) graduated from "college or university", accounting for 44.5%; followed by 202 from "senior high school and vocational school", accounting for 42.8%;

42 from "graduate school", accounting for 8.9%; and 18 "below (including) junior high school", accounting for 3.8%. Regarding major, most of the subjects (182) are from the "Department of Technology Management", accounting for 38.6%, followed by 14 from the "Department of Culture and Arts", accounting for 3.0%. Regarding occupation, most of the subjects (262) are "civil servants", accounting for 55.5%; followed by 101 from "industrial and commercial sectors", accounting for 21.4%; and 6 from "farming, forestry, and fishing animal husbandry", accounting for 1.3%.

4.2 Confirmatory factor analysis results

4.2.1 Validation of convergence validity

Confirmatory factor analysis (CFA) is a part of SEM analysis. Thomopson (2004) proposed that, as a measurement model could correctly reflect the accuracy of a dimension, it was necessary to analyze the measurement model before SEM analysis. The overall model evaluation of this study is based on the Kline (2005) two-stage correction method. First, the goodness-of-fit of the measurement model is evaluated, and the results show that the goodness-of-fit is acceptable. Then, this study evaluates the overall SEM model [46]. According to Hair, Anderson, Tatham, and Black (2009) and Fornell and Larcker (1981), CFA measurement standards include: (1) Factor load greater than .50; (2) composition reliability greater than .60; (3) average variance extraction greater than .50. The CFA analysis results of this study indicate that the factor load of the dimensions is between .0.69 and .87. Composition reliability is between .91 and .93. Average variance extraction is between .59 and .66 (as shown in Table 2). The results imply that the dimensions of this study have convergence validity.

Table 2. Summary of the data for convergence validity verification

Estimated Model Parameters						**Convergence Validity**			
Potential variable	Observational variable	Non-standardized factor load	Standard error S.E.	t-value	P	Standardized factor load	SMC	C.R	AVE
Network learning need	A01	1				.85	.72	.93	.66
	A02	1.07	.04	24.42	***	.87	.76		
	A03	1.10	.05	24.16	***	.87	.75		
	A04	1.06	.05	22.67	***	.83	.69		
	A05	0.87	.05	18.38	***	.73	.53		
	A06	0.95	.06	17.17	***	.69	.48		
	A07	0.94	.04	21.96	***	.82	.67		
Network learning obstacle	B01	1				.74	.55	.91	.59
	B02	0.99	.06	16.25	***	.75	.56		
	B03	1.02	.06	16.72	***	.77	.59		
	B04	1.02	.06	16.73	***	.77	.59		
	B05	0.94	.06	16.61	***	.77	.59		
	B06	1.08	.06	18.08	***	.83	.69		
	B07	1.04	.06	16.39	***	.76	.57		

***P<.001

4.2.2 Validation of discriminant validity

AMOS provides two kinds of confidence interval estimation methods, the Bias-corrected Percentile Method and Percentile Method [45]. This study uses the bootstrap confidence interval method to test the discriminant validity of the dimensions. Repeated estimation is conducted 1,000 times under 95% confidence. If the correlation coefficient among the dimensions is smaller than 1, then the dimensions have discriminant validity [43, 45, 54]. The estimation results of this study are shown in Table 3. The

confidence interval among the dimensions is smaller than 1, thus, the dimensions have discriminant validity.

Table 3. Bootstrap correlation coefficient 95% confidence interval

Parameter			Estimation	Bias-corrected		Percentile method	
				Lower Bound	Upper Bound	Lower Bound	Upper Bound
Network learning need	<-->	Network learning obstacle	-.06	-.12	-.02	-.12	-.01

4.2.2 Verification of goodness-of-fit

The goodness-of-fit indices of this study are based on Wu (2007), Hsu (2010), Bagozzi and Yi (1988), and Hair et al. (1998). $\chi 2$ Test, $\chi 2$-to-degree of Freedom Ratio, Goodness-of-fit Index (GFI), Adjusted Goodness-of-fit Index (AGFI), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Incremental Fit Index (IFI), Non-Normed Fit Index (NNFI), and Normed Fit Index (NFI) are adopted as the indicators to verify the overall goodness-of-fit of the model. When the SEM samples exceed 200, it is prone to have too big a chi-square value ($\chi 2=(n-1)Fmin$). In other words, too many samples will increase the chi-square value, resulting in rejection of the p-value [44-45]. Bollen and Stine (1992) proposed Bootstrap for model correction. As the chi-square value becomes smaller after correction, all the goodness-of-fit indices shall be re-calculated. See Table 4 for the results. All the goodness-of-fit values of the model in this study meet the criteria.

Table 4. Model goodness-of-fit indices

Goodness-of-fit Indexes	Standard Value		Model Goodness-of-fit
χ^2	The smaller the better	118.11	Passed
χ^2/df	<3	1.55	Passed
GFI	>.9	.98	Passed
AGFI	>.9	.96	Passed
RMSEA	<.08	.03	Passed
TLI (NNFI)	>.9	.99	Passed
CFI	>.9	.99	Passed
NFI	>.9	.98	Passed

4.3 Differences in the needs and obstacles of network learning with 3C products for elderly learners with different backgrounds

The purpose of t-testing the independent samples is a statistical method that first calculates the average values of the two independent sets of samples, and then, deduces if the average values of the two parent mean values have significant difference [47]. This study utilizes t-testing to analyze the differences in the variables of adults of different genders using 3C products for network learning. One-way ANOVA tests a single variable affected by different levels, and observes whether the mean values of the variables have significant differences [47]. If the test results show that the F value reaches a significant level, it means that the average of at least one group has significant difference; therefore, it is necessary to conduct "Post Hoc" analysis to confirm the difference [41].

4.3.1 Difference analysis of the influence of gender on the variables of needs and obstacles of network learning

Regarding the difference analysis of the influence of gender on the variables of needs and obstacles of network learning, t-tests of independent samples imply that gender does not have significant difference in the averages of learning needs (t= -.66, p=.51) or network learning obstacles (t=.05, p=.96). In other words, there are no significant differences in the variables of the learning needs and obstacles of different groups using 3C products for network learning.

4.3.2 Difference analysis of the influence of age on the variables of needs and obstacles of network learning

Regarding the difference analysis of the influence of age on the variables of needs and obstacles of network learning, one-way ANOVA implies that age has significant differences in learning needs (F= 7.88*, p=.00). Scheffe post hoc comparison shows that the F value of "over 65 years old" is greater than that of "between 55 and 59 years old", and reaches significant difference. The average of network learning obstacle (F=.67, p=.51) shows no significant difference. In other words, there are no significant differences in the variables of the learning needs and obstacles of different ages of elderly using 3C products for network learning.

4.3.3 Difference analysis of the influence of education background on the variables of needs and obstacles of network learning

Regarding the difference analysis of the influence of education background on the variables of the needs and obstacles of network learning, one-way ANOVA implies that different education backgrounds do not lead to significant differences in the averages of learning needs (F= 1.32, p=.29). In other words, there are no significant differences in the variables of the learning needs of different education backgrounds of elderly using 3C products for network learning. However, different education backgrounds lead to significant differences in the averages of learning obstacles (F= 6.35*, p=.00). Scheffe post hoc comparison shows that, the F value of "Senior high school and vocational school" is greater than those of "College and university" and "Graduate school". There is no significant difference between "College and university" and "Graduate school", which implies that elderly learners with lower education backgrounds face more apparent network learning obstacles.

4.3.4 Difference analysis of the influence of major on the variables of needs and obstacles of network learning

Regarding the difference analysis of the influence of major on the variables of needs and obstacles of network learning, one-way ANOVA implies that different majors do not lead to significant differences in the averages of learning needs (F= 2.12, p=.51). In other words, there are no significant differences in the variables of the learning needs of different majors of elderly using 3C products for network learning. However, different majors lead to significant differences in the averages of learning obstacles (F= 3.34*, p=.00). Scheffe post hoc comparison does not show significant difference.

4.3.5 Difference analysis of the influence of occupation on the variables of needs and obstacles of network learning

Regarding the difference analysis of the influence of occupation on the variables of the needs and obstacles of network learning, one-way ANOVA implies that occupation has significant differences in learning needs (F= 2.15*, p=.45). Scheffe post hoc comparison does not show significant difference. The average of network learning obstacles (F=.79, p=.58) shows no significant difference. In other words, there are no significant differences in the variables of the learning needs and obstacles of different occupations of elderly using 3C products for network learning.

4.4 Verification of hypotheses

Verification of the hypothesis shows that there are significant differences in the needs and obstacles of the networking learning of elderly learners using "3C products" and with different backgrounds, meaning there are significant differences when the elderly have different education backgrounds. The learning obstacles of elderly learners graduated from "Senior high school and vocational school" are significantly greater than those from "College and university" and "Graduate school". According to the calculation results of Table 5 and Figure 2, the path value of learning needs and obstacles of elderly learners using "3C products" for network learning is -0.06, which reaches a significant level, indicating that there is negative correlation between learning needs and obstacles. In summary, the verification results of the hypotheses are, as follows: Hypothesis 1: It is valid that there are significant differences in the needs and obstacles of networking learning of elderly learners using "3C products" and with different backgrounds. Hypothesis 2: It is valid that there is significant correlation between the learning needs and obstacles of elderly learners using "3C products" for network learning.

Table 5. Empirical results of hypotheses

Hypothesis	Path Relation			Path Value	C.R.	*p*	Hypothesis Valid
2	Network learning obstacle	<-->	Network learning need	-.06	-2.59*	**	Validity

*P<.05 **P<.01

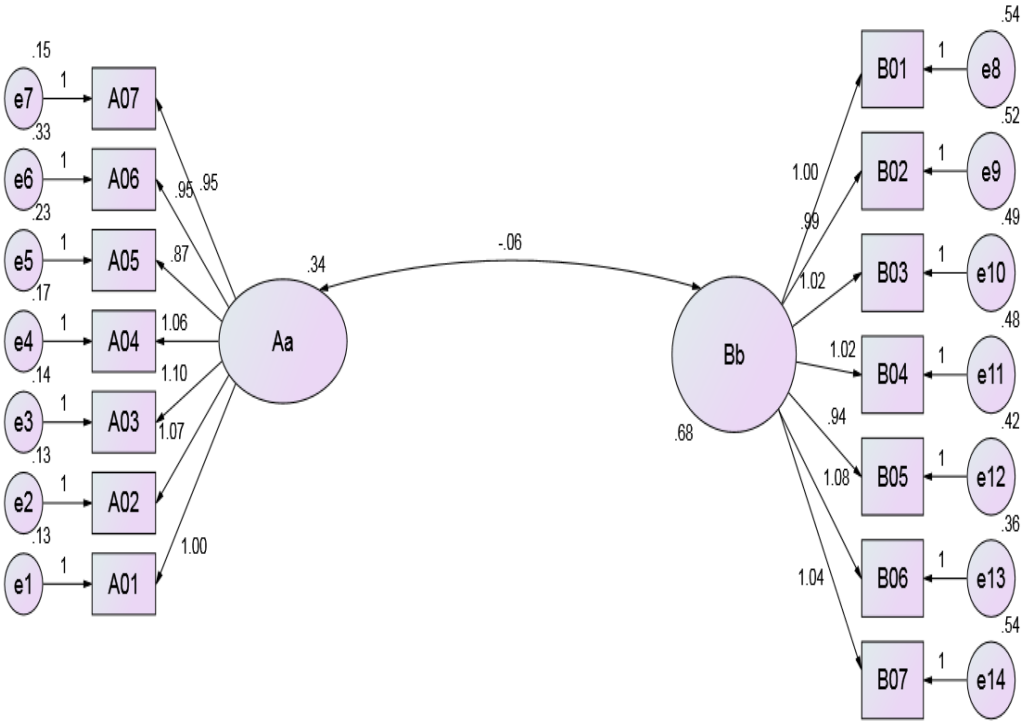

Figure 1. Statistical model of the learning needs and obstacles of elderly learners using "3C products" for network learning.

5 Conclusion and suggestions

According to findings of this study, elderly learners with a lower educational level encounter more significant obstacles in network learning when applying consumer electronics products. Therefore, the

reinforcement of individual learning guidance can help elderly learners with a lower educational level to use consumer electronics products and strengthen their familiarity and convenience to apply consumer electronics products in network learning to lower their learning difficulties and enhance learning effectiveness. In addition, it can develop consumer electronics-based learning tools and devices suitable for elderly learners and provide them with the optimal learning aids to enhance the convenience of consumer electronics products for elderly learners in learning. In the process of design and manufacturing of teaching materials for network learning, Open University of Kaohsiung should be concerned with elderly learners' degeneration of their physiological functions and develop online digital learning materials with complete audio and light effects to lower their network learning obstacles. Programs could be based on a blend of face-to-face teaching and network modules in order to upgrade their learning participation and activeness.

The institutions and instructors engaged in the education of the elderly must first understand the basic knowledge of elderly learners, and then diagnose and analyze their learning needs and possible obstacles during network learning, in order to determine suitable course targets, plan learning guidance, re-plan existing courses and teaching materials, ask elderly learners to preview at home, and encourage them to finish preview tasks before the face-to-face classes. Next, according to the physical and metal statuses of elderly learners, digital network teaching materials can be prepared, and learning records can be maintained to help guide students. Third, mind maps covering the key points of a course should be developed, and classroom discussion topics should be prepared. Fourth, elderly learners should be encouraged to study online audio and video materials. Lastly, elderly learners should be encouraged to express their opinions via digital learning tools and actively provide feedback in order to stimulate elderly learners' learning enthusiasm and motive. Hence, when elderly learners enjoy participating in learning activities and their learning needs are satisfied, they will effectively accomplish the learning objectives.

"It is never too late to learn" is more than a slogan, but a practice advancing with the times. It has been said that knowledge is power. Higher education backgrounds bring about more learning opportunities, richer knowledge, and technologies, as well as more effective solutions to problems and obstacles in study and life. Hu (2015) pointed out that education for elderly learners could be conducted via the following steps: establishing an atmosphere beneficial for study→ creating a mechanism for mutual planning→ diagnosing learning needs→ developing education goals→ designing a model of learning experiences→ guiding learning activities based on appropriate technologies and teaching materials→ assessing learning outcomes and re-diagnosing learning needs. Based on above, by stressing the learning needs of the elderly, improving the design specifications and operating models of consumer electronics products, and providing suitable network learning systems and aids, it is possible to help elderly learners use consumer electronics products, enjoy gaining knowledge online, solve various problems and obstacles, reinforce learning effectiveness, and successfully pursue keys of intelligence in life.

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