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A Study on the Influence of Learning Operational Management Quality Factors and Perceived Learning Achievement and Learning Engagement Based on Elderly Learners

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ABSTRACT

This study is a research conducted on the influence of the elderly learners based learning operation management quality factors, learning achievement, and engagement in terms of lifelong education for the ICT era. They also have physical health and learning ability to perform both the online and offline education (blended learning) at an average age of 66.3 years for a total of 68 senior citizens enrolled at K Broadcasting and Communication Middle School located in K province.

Examining the relationship between the learning operation management quality factors and the learning engagement of the elderly for online learning of regular middle school curriculum, the learning content was the most important factor. This implies that education must be provided according to the intellectual level of the learner, and education needs to be conducted in line with the learner's eye level based on the learning content which satisfies the learner's requirements. Furthermore, the greater the learner's learning engagement, the greater the perceived learning achievement, as it was investigated. Hence, it would be necessary to provide various support services in the course of learning to ensure that the learners can engage themselves in learning.

This study is meaningful in that it places emphasis on the need of expanding lifelong education for the elderly and discusses it as an expanded concept that can contribute to addressing social problems caused by an unprecedented increase in the global population and improving the quality of life for the elderly. In the future studies, it is recommended that a detailed study on the effect of education on the quality of life of the elderly through the comparative studies between the elderly who attend regular school and the general elderly who do not (welfare center, college for senior citizens, and individual study, etc.) be carried out.

1. Introduction

1.1 The need for research

The proportion of the elderly in Korea, which was 3.1% in 1970, increased by approximately 5.6 times to 17.3% as of 2022, experiencing a rapid increase in the elderly population (KOSIS, 2022). Beginning with the elderly society in 2018, as of August 2019, 7.23 million first generation baby boomers joined the elderly population in 2020 (KOSIS, 2021), and the dependency ratio for the elderly in 2009 was 14.4%, and 24.6% as of 2022, and it is predicted that Korea will enter into a "super-aged society" by 2025 (KOSIS, 2022).

According to a research report published by the Ministry of Health and Welfare (2021), 84% of the elderly in Korea suffer from one or more chronic diseases, and 82.1% of whom are dependent on prescription drugs for 3 months or longer. The elderly population living under economic difficulties in unhealthy conditions has the burden of adapting to the rapidly changing social conditions (Ministry of Health and Welfare, 2021). For instance, in a rapidly changing society, the elderly who experience difficulties in their health and economic ability to adapt are uncovering negative emotional experiences including depression, anger, and frustration, and such negative emotional experiences are affected by various stresses, social and leisure activities, thereby forming a vicious cycle of emotions and creating anxiety in the future (Nam et al., 2016). In the modern age of information and communication technologies (ICT), that is, it has diversification, acceleration, and above all, unpredictable properties, and the artificial intelligence is added to the society where 'convergence of technology and humans' has emerged as a hot topic. The elderly are also asked to play a role in understanding and learning the changes of this time and responding appropriately towards the given situation. Towards this end, the experience of using computers and smartphones and the ability to handle such devices are required for the social adaptation (Jong et al., 2018).

The academic achievement of the elderly does not stall at individual leisure activities and lifelong education, yet also has a positive effect on the health of the elderly, as reported, and the morbidity rate of dementia is lowered in the elderly who are learning. In Korea, 1 out of 4 elderly in their 80s suffer from dementia, and by affecting the prevention of depression, which is prevalent in 1 out of 4 adults, it provides the basis for improving the quality of life for the elderly. The health status and psychological well-being of the elderly affect their happiness, and the health status referred to means the subjective health, and the subject of judgment is the elderly. It is the intrinsic factor for the elderly to highly evaluate their own health as well as their learning achievement (Lee & So, 2019). In this respect, the lifelong education for the elderly helps them understand the information age, cultivate core competencies through their interaction with others, and feel engaged in learning and a sense of accomplishment. In that context, in a situation where contactless learning methods are applied given the epidemic of COVID-19 infection, the online elderly learners based learning offers an important meaning, and a qualitative research study on learning is needed for the elderly.

This study seeks to present a method for promoting the elderly learners based learning and securing learning efficiency through the evaluation of the impact of the elderly learners based learning.

1.2 The purpose of the study

This study is a research study intended to examine and understand the effects of the learning operation management quality factors, perceived learning achievement, and the learning engagement among the elderly enrolled at K Broadcasting and Communication Middle School located in K province, which is operated by the Korean Educational Development Institute, and its purpose is to provide the basic data for the expansion and settlement of lifelong learning as an alternative towards a healthy life for the elderly.

2. Design & Method

2.1 Design

This study is one conducted on the influence of the elderly learners based the learning operation management quality factors and the perceived learning achievement and engagement with a view to expand the basis of lifelong education for the elderly at a time when the importance of contactless education has been facilitated due to the COVID-19 infection. The research model is as follows (Figure 1).

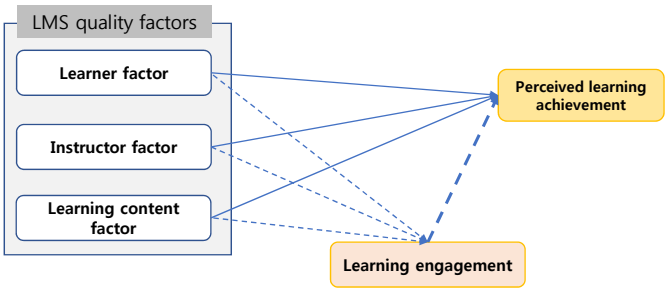

Fig. 1. Research model

2.2 Participants

The need to study the factors to consider the learning achievement and engagement in the online education targeting elderly students (60-79 years old) of K Broadcasting and Communication Middle School located in K province was explained, and the selected subjects who agreed thereto were selected. It took approximately 20 minutes to fill out the questionnaire, and a gift certificate was handed out. The subjects were informed that they had the right to stop even during the survey. The learning operation management quality factors were measured by classifying them into the learner factors, instructor factors, and the learning content factors. Research hypotheses were developed as follows, and an effort was made to examine and understand the effects of each learning operation management quality factor, perceived learning achievement, and the engagement. (Table 1) The

limiting factor for the study design is the fact that the age of the participants is 60 years or older, and the level of education is for the elderly who are performing middle school learning after graduating from elementary school. However, the discussion would be reasonable since the purpose of the study is to contribute to the expansion of lifelong learning by discovering the conditions that online learning can be possible even in the contactless education situation of the elderly.

Table 1. Research hypotheses

Classification	Hypotheses
H1	Learner factor will have a positive (+) effect on the perceived learning achievement.
H2	Learner factor will have a positive (+) effect on the engagement.
H3	Instructor factor will have a positive (+) effect on the perceived learning achievement.
H4	Instructor factor will have a positive (+) effect on the engagement.
H5	Learning content factor will have a positive (+) effect on the perceived learning achievement.
H6	Learning content factor will have a positive (+) effect on the engagement.
H7	Perceived learning achievement will have a positive impact on the learning engagement.

2.3 Date collection

This study was conducted after undergoing the deliberation of and securing an approval of the IRB (1041455-201912-HR-006-02) from the K-School Institutional Bioethics Committee for the elderly who take elderly learners based lectures. The research data were collected through the questionnaires from 73 students who attended K middle school in K province during September through December 2020, and who carried out the online and offline education (blended learning) at the same time. Among which, the data from 68 people were analyzed except for the 5 copies of inappropriate data.

2.4 Variables and measurement

A structured questionnaire was used for the research tool. The questionnaire was consisted of 16 general characteristics of subjects, 4 learner factors, 5 instructor factors, 5 learning content factors, 4 perceived learning achievements, and 27 learning engagement questions, for a total of 60 questions.

Table 2. Variables number

Classification	General characteristics	Learner factor	Instructor factor	Learning content factor	Perceived learning achievement	Learning engagement	Total
No. of questions	16	4	4	5	4	27	60

2.4.1 Learning operation management quality factors

In this study, the learning operation management quality measurement factors were examined

by classifying them into the learner factors, instructor factors, and the learning content factors.

2.4.1.1 Learner factor

The learner factor was used for the purposes of measuring the level of positive curiosity about the participant's learning. As a measurement method, 'Strongly agree' was analyzed as 5 points based on 5 points on the Likert's scale, and 'Not at all' was evaluated as 1 point. Higher total scores and higher averages indicate higher levels of curiosity about learning. There were a total of 4 items, Cronbach's α = .921 at the time of development, and Cronbach's α = .863 in this study.

2.4.1.2 Instructor factor

The instructor factor was used for the purposes of the learner measuring the instructor's positive teaching level. To measure how positively the learner feels about the instructor's lecture, 'Strongly agree' was analyzed as 5 points based on 5 points on the Likert scale as a measurement method, and 'Not at all' was evaluated as 1 point. Higher total scores and higher averages indicate higher levels of curiosity about learning. For a total of 4 items, the reliability level at the time of development was α = .921, and Cronbach's α = .920 in this study.

2.4.1.3 Learning content factor

The learning content factor was surveyed for the purposes of evaluating how well the learner's learning content meets their eye level. That is, the level of interest triggered was measured since the understanding and level of the learning to be performed were appropriate in line with the learner's level. As for the measurement method, 'Strongly agree' was analyzed as 5 points based on 5 points on the Likert scale, and 'Not at all' was evaluated as 1 point. For a total of 4 items, it was Cronbach's α = .821 at the time of development, and Cronbach's α = .828 in this study.

2.4.2 Perceived learning achievement

The perceived learning achievement of Kang (Kang, 2009) was revised and supplemented to measure the participant's sense of achievement, and whether learning needs were satisfied was used for the question content. As for the measurement method, 'Strongly agree' was analyzed as 5 points based on 5 points on the Likert scale, and 'Not at all' was evaluated as 1 point. For a total of 4 items, the reliability level at the time of development was α = .967, and Cronbach's α = .883 in this study.

2.4.3 learning engagement

The tool used to measure the state of learning engagement in this study was designed by Jackson & March (Jackson & March, 1996) and the learning engagement level test tool applied for the computer based learning activities by Chan & Repmen (Chan & Repmen, 1999), and a total of 27 items modified by Cho & Han (Cho & Han, 2010) were used. As a measure of 'How engaged

the participants are in learning' as an item, they were consisted of questions about the interest in learning, positive participation, and concentration, etc. As a measurement method, 'Strongly agree' was analyzed as 5 points based on 5 points on the Likert scale, and 'Not at all' was evaluated as 1 point. The reliability of the measurement tool was Cronbach's α = .940, and the reliability coefficient in this study was Cronbach's α = .906.

2.5 Data analysis

The data collected were analyzed by using the statistical program of SPSS 23.0 as follows.

First, the average and standard deviation of general characteristics, learner factors, instructor factors, learning content factors, perceived learning achievement, and learning engagement of the subjects of this study were investigated.

Second, the relationship between the subject's learner factor, instructor factor, learning content factor, perceived learning achievement, and learning engagement factor was analyzed by the Pearson's correlation coefficient.

Third, in order to explain the factors affecting the subject's learner factor, instructor factor, learning content factor, perceived learning achievement, and learning engagement, the factors which emerged significantly in the analysis were included as the response variables and were analyzed by performing the stepwise multiple regression. The significance level for verification was set to $p < .001$.

3. Results

3.1 General characteristics of the subjects

Examining the general characteristics of the participants of this study, the distribution status by age was in the respective order of 63 years old (16 people, 23.5%), 62 years old (7 people, 10.3%), and 66 and 67 years old (6 people, 8.8%), respectively. Furthermore, the average age is 66.3 years, with a minimum age of 60 years and a maximum of 79 years (Table 3).

Table 3. Status of the participants by age

Classification	Mean	Standard deviation	Dispersion	Minimum value	Maximum value
Content	66.368	4.5018	20.266	60.0	79.0

Examining the environmental information, male (12 people, 17.6%), female (56 people, 82.4%), and cohabitation type were surveyed in the respective order of family (31 people, 45.6%), couple (24 people, 35.3%), single person household (13 people, 19.1%). Examining the health status, 49 people (72.1%) said that they 'Exercise' and 58 people (85.3%) said that the 'Do not drink' (Table 4).

Table 4. Demographic characteristics of the participants

Classification			Frequency	%	Classification			Frequency	%
Environmental information	Gender	Male	12	17.6	Relevance for health	Drinking	Don't drink	58	85.3
		Female	56	82.4			Drink	10	14.7
		Total	68	100.0			Total	68	100.0
	Religion	Atheist	40	58.8		Smoking	Non-smoking	64	94.1
		Religious	28	41.2			Smoking	4	5.9
		Total	68	100.0			Total	68	100.0
	Cohabitation type	Family	31	45.6		Exercise	Not exercising	19	27.9
		Married couiple	24	35.3			Exercising	49	72.1
		Single	13	19.1			Total	68	100.0
		Total	68	100.0		Subjective health	Not healthy	7	10.3
	Anyone to trust and rely on	Spouse	44	64.7			Average	34	50.0
		Children	18	26.4			Relatively healthy	25	36.8
		Friends	1	1.5					
		Siblings	5	7.4			Very healthy	2	2.9
		Total	68	100.0			Total	68	100.0

3.2 Learning operation management quality factors, perceived learning achievement and learning engagement

Examining the mean and standard deviation of each variable selected for this study, the instructor factor (3.994), learner factor (3.864), and the perceived learning achievement (3.695) were investigated in their respective order. Since the participants have a physical environment where they can participate in K middle school's blended learning, their health is excellent. The instructor factor considers the learner's situation, and the instructor's consideration for learning and the creation of a learning environment will influence the learner's learning and provide an opportunity to participate in learning. These are the participants with a high interest in learning as the learners themselves enter the broadcasting and communication middle school and participate in the learning process. The deviation for each factor was distributed between 0.4332 and 0.6324 (Table 5).

Table 5. Descriptive statistics for each factor

Classification	Learner factor	Instructor factor	Learning content factor	Perceived learning achievement	Learning engagement
Mean	3.864	3.994	3.691	3.695	3.479
Standard deviation	0.520	0.632	0.554	0.492	0.433

3.3 Correlation between key variables

3.3.1 Correlation between each factor

Next, the Pearson's correlation coefficient between each factor was investigated. Examining the correlation between the learning operation management quality factors, the instructor factor and

the learning content factor were investigated in their respective order of 0.715, the instructor factor and learner factor 0.659, and the learner factor and learning content factor 0.609, respectively.

The influence of the learning content factor and the learning engagement was investigated in the respective order of 0.681, instructor factor and learning engagement 0.613, and learner factor and learning engagement 0.580, respectively. The correlation between each factor suggested in the study was over 0.580, which was found to be very high and significant. Furthermore, the impact of the learning engagement and the perceived learning achievement was 0.482, providing a significant correlation (Fig. 2).

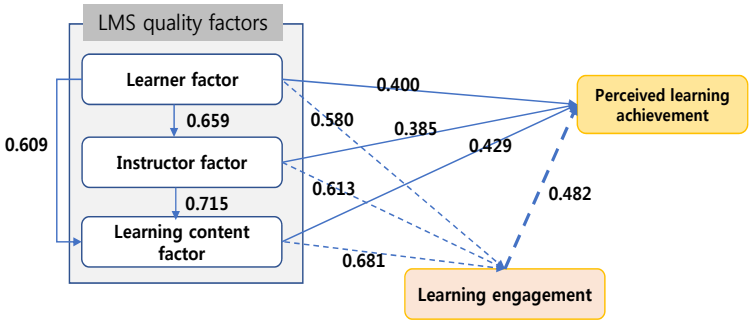

Fig. 2. Pearson's correlation coefficient between each factor (based on $p < .001$).

3.3.2 Results of the regression analysis of the learning operation management quality factors, perceived learning achievement, and the engagement

Through the linear regression analysis performed, the linear correlation between the perceived learning achievement and the learning engagement where each dependent factor (learner factor, instructor factor, and learning content factor) was set as an independent factor was investigated. The analysis of the results demonstrated that the learner factor, the instructor factor, and the learning content factor had a positive (+) correlation with the learning engagement, which is 0.606, 0.812, 0.791 (Table 6).

Table 6. Regression between each factor (based on $p < .001$)

Path		Hypotheses	Non-standardized coefficient	Standardized coefficient	t	P	Results
Learner factor	Perceived learning achievement	H1	0.165	0.156	1,375	0.174	Dismissed
	Learning engagement	H2	0.606	0.505	4,441	0.000	Adopted
Instructor factor	Perceived learning achievement	H3	0.150	0.117	1,052	0.297	Dismissed
	Learning engagement	H4	0.812	0.556	5,012	0.000	Adopted
Learning content factor	Perceived learning achievement	H5	0.148	0.131	1,280	0.205	Dismissed
	Learning engagement	H6	0.791	0.618	6,032	0.000	Adopted

Among the research hypotheses designed for this study, the learning operation management quality factors provide a significant effect for the learner engagement.

3.3.3 Results of the regression analysis performed of the perceived learning achievement and the engagement

As a result of the linear regression analysis performed, the perceived learning achievement and the learning engagement factor had a positive (+) correlation, providing a correlation of 0.482 with each other, and the effect of Y (learning engagement) = 0.548X (perceived learning achievement) +1.789 is provided. The significance probability is based on $p < .001$ (Table 7).

Table 7. Regression analysis (a. Dependent variable: perceived learning achievement; predicted value: learning engagement)

Classification	Model	R	R squared	Revised R squared	Standard error of the estimated value	Durbin-Watson
Model summary	1	.482[a]	.232	.221	.43446	2.559
Variance analysis						
Classification	Sum of squares	Degree of freedom	Mean squared	F	Significance probability	
Regression model	3.773	1	3.773	19.990	.000[b]	
Residual	12.458	66	.189			
Total	16.231	67				
Coefficient						
Classification		Non-standardized coefficient		Standardized coefficient	t	Significance probability
		B	Standard error	Beta		
(Constant)		1.789	.429		4.166	.000
EngagementMean		.548	.123	.482	4.471	.000

4. Summary

In 2013, the broadcasting and communication middle school was founded in order to satisfy the academic achievement related needs of the educationally underprivileged class and for lifelong education. The ratio of the elderly without education was 33.0% in 2008, 24.3% in 2017, and 10.6% in 2020, respectively, and the ratio of high school graduates or higher was 17.2% in 2008, 24.8% in 2017, and 34.3% in 2020, respectively, and hence, it would be necessary to pay closer attention to the broadcasting and communication middle and high schools. Compared to the existing students of Korea National Open University or cyber university, the period of interruption was longer and the level of basic academic ability was lower, yet they demonstrated high attendance rates and efforts to continue their studies (Yang et al., 2014). Furthermore, the methods of distance learning, including mobiles, have become a significant burden for the elderly learners. However, the school satisfaction and life satisfaction are considered as major variables in confirming their educational performance since they

are complex in human life such as physical, emotional, social, and economic (Oh et al., 2007).

Kim & Keum (Kim & Keum, 2015) is the only research related to distance learning for the Korea Broadcasting and Communication Middle School through data search at the National Assembly Library. They tried to prove the performance of education by verifying as to whether the mobile efficacy affects the school and life satisfaction, yet as a result, they did not find a correlation. Hence, this study aimed at the elderly learners and evaluated as to whether the learning operation management quality factors (learner factors, instructor factors, and learning content factors) contribute to the learning engagement and secure implications for the influence on the implications for the ICT based elderly learners' education. While there is no study related to such, there is a limit to discussing it, however, it is meaningful in that it is the first attempt to study the influence of learning achievement and engagement for the elderly learner based learning operation management quality factors. It is also meaningful in that it is a study at the point where the education of elderly learners as an alternative for the world's unprecedented speed of aging and social problems must be treated importantly. In this study, a total of 68 participants surveyed the content that the elderly learners felt in learning in the process of experiencing the learning of the middle school course in 2020. Moreover, the learning operation management quality measurement factors were measured by classifying them into the learner factors, instructor factors, and the learning content factors.

4.1 Characteristics of group

A total of 68 participants were targeted, and the participants for this study were aged between 60 and 79 years, with an average age of 66.3 years, who reportedly have the physical health and learning skills to learn the online and offline education (blended learning) at K school. It was also reported that depressive symptoms worsened with the increasing age among the elderly in Korea, reaching 8.4% between 65 and 69 years old and 24% over 85 years old (Ministry of Health and Welfare, 2021). Considering that the depressive symptoms are a disease that reveals a vicious cycle of isolation and loneliness, the average age of broadcasting and communication middle school is 66.3 years old, and hence, it is considered to have a positive effect on relieving depressive symptoms. Examining the environmental information, male (12 people, 17.6%), female (56 people, 82.4%), and cohabitation tyhpe were in the respective order of family (31 people, 45.6%), and couple (24 people, 19.1%).

4.2 Analysis of the learning operation management quality factors

In this study, the learning operation management quality factors were surveyed by classifying them into the learner factors, instructor factors, and the learning content factors. The perceived learning achievement was the highest as the learning content factor (0.429**), followed by the learner factor (0.400**) and the instructor factor (0.385**). The relevance to the learning engagement was highest in the learning content factor (0.681**), followed by the instructor factor (0.613**) and the learner factor (0.580**). Unlike the method of conducting education in a general environment, the elderly learners need to be considered for learning, and among them, the instructor factor (average

3.994) was highly investigated, and the lectures customized for the learner's eye level were investigated as an important factor. In particular, examining the results of the linear regression analysis performed, the learning operation management quality factors, learner factors, instructor factors, and the learning content factors provide a linear positive (+) effect on the learning engagement. In order to secure learner's engagement, the learning operation management quality factors are very important for the elderly based education.

In the linear regression analysis of the perceived learning achievement and the engagement, the perceived learning achievement and the engagement demonstrated a positive (+) effect. This demonstrates the fact that the greater the perceived learning achievement, the greater the engagement in learning. When the individual participants focused on their studies and performed class work, the perceived academic learning achievement increased, and it means that various support for the learners to engage themselves must be provided.

Table 8. Influence of the learning operation management quality factors, perceived learning achievement, and the engagement

Classification		Learner factor	Instructor factor	Learning content factor	Perceived learning achievement	Learning engagement
Descriptive statistics	Mean	3.864	3.994	.6324	3.695	3.479
	Standard deviation	.5209	.6324	.5544	.4922	.4332
Influence	Perceived learning achievement	0.400**	0.385**	0.429**		
	Engagement	0.580**	0.613**	0.681**		

** : P < 0.01

4.3 Implications

Analyzing the results of this study, the H2, H4, H6, and H7 hypotheses were adopted. Examining the impact of the learning operation management quality factors and the learning engagement aspects, the learning content factor is the most important, and education must be conducted according to the learner's knowledge related background (table 8).

Table 9. Research hypotheses

Classification	Hypotheses	Results
H1	Learner factor will have a positive (+) effect on the perceived learning achievement.	Dismissed
H2	Learner factor will have a positive (+) effect on the learning engagement.	Adopted
H3	Instructor factor will have a positive (+) effect on the perceived learning achievement.	Dismissed
H4	Instructor factor will have a positive effect on the learning engagement.	Adopted
H5	Learning content factor will have a positive (+) effect on the perceived learning achievement.	Dismissed
H6	Learning content factors will have a positive (+) effect on the learning engagement.	Adopted
H7	Perceived learning achievement will have a positive impact on the learning engagement.	Adopted

The participants of this study are the elderly people who are carrying out middle school courses,

and are continuing their studies in an environment where they were not able to perform their studies given the lack of opportunities during their youth. Hence, since they have an environment where the amount of learning for basic education is insufficient, they can be largely affected by the difficulty of the learning content. Furthermore, the fact that the learner factor emerged as an important factor is presumed to have had a very positive effect on the learning achievement by the desire for learning personally perceived in life. Hence, it is apparent that the education for elderly learners is especially customized for the learner's eye level, and the enthusiasm of the learner who participates in it provides a lot of influence on the learning achievement.

5. Conclusion and suggestion

In conclusion, this study demonstrates the fact that learning content is an important factor when educating the elderly learners, and the teaching method that is line with the learner's eye level is an important factor based on the learning content which satisfies the learner's requirements. In the linear regression analysis performed of the perceived learning achievement and the engagement, the perceived learning achievement and the engagement demonstrated a positive (+) relationship of influence, and the greater the perceived learning achievement, the greater the engagement in learning. When the individual participants focused on their studies and performed class work, the academic perception of learning achievements increased, and it would be necessary to develop various support services to ensure that the learners can engage themselves in learning.

Such a customized learning may help promote the quality of life for the elderly learners by securing their self satisfaction through appropriate education for the elderly learners who have a healthy environment for setting goals and achieving them on their own. Furthermore, it would be possible to reduce the morbidity of diseases such as dementia by reducing the decline in the cognitive functionality. According to a research report by the Ministry of Health and Welfare (2021), 11.9% of the elderly in Korea participate in lifelong education, with an average of 9 hours per month (Ministry of Health and Welfare, 2021). Based on the results of this study, it is hoped that the statistical value of only 0.9% of the learning activities of the elderly will be improved.

This study is meaningful in that it places emphasis on the need of expanding lifelong education for the elderly and discusses it as an expanded concept which may help contribute to addressing social problems of the low birth rate and the elderly society while improving the quality of life for the elderly. In the future studies, it is recommended that a detailed study be conducted on the effect on the quality of life of the elderly who attend school and the general elderly who do not.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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