

A comparison of two differential methods for nutrition education in elementary school: lecture- and experience-based learning program

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BACKGROUND/OBJECTIVES: This research was conducted to compare lecture- and experience-based methods of nutritional education as well as provide fundamental data for developing an effective nutritional education program in elementary schools.

SUBJECTS/METHODS: A total of 110 students in three elementary schools in Jeollanam-do were recruited and randomly distributed in lecture- and experience-based groups. The effects of education on students' dietary knowledge, dietary behaviors, and dietary habits were analyzed using a pre/post-test.

RESULTS: Lecture- and experience-based methods did not significantly alter total scores for dietary knowledge in any group, although lecture-based method led to improvement for some detailed questions. In the experience-based group, subjects showed significant alteration of dietary behaviors, whereas lecture-based method showed alteration of dietary habits.

CONCLUSIONS: These outcomes suggest that lecture- and experience-based methods led to differential improvement of students' dietary habits, behaviors, and knowledge. To obtain better nutritional education results, both lectures and experiential activities need to be considered.

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INTRODUCTION

Dietary education programs for elementary school children are critical, as they engage in energetic physical activities and show hearty appetites [1,2]. Unhealthy dietary habits acquired at an early age can affect a child's body composition, increase risk of chronic diseases in adulthood, and elevate socio-economic costs. Therefore, a proper school curriculum should include systemic nutritional education programs [3]. However, there have been few studies developing effective methods for nutritional education in South Korea. The current nutritional education curriculum in Korean elementary schools does not include systemic and structured plans, as passive methods such as letters to the family or presentations have been preferred. Direct in-class education programs comprise only approximately 20% of the total nutritional education curriculum [4,5].

Dale's Cone of Experience organizes information in relation to memory. In this model, verbal symbols such as spoken words may be ineffective compared to experience, whereas verbal symbols may be more practical to obtain a large amount of information. On the other hand, the most effective methods at the bottom involve direct, purposeful learning experiences

such as hands-on or field experience. This suggests that practical, hands-on experience in a real-life context will allow students to learn most effectively. However, experience has time and effort costs compared to verbal symbols. For this reason, the pros and cons of these two methods need to be considered when selecting educational media for learning [6,7,8]. However, few studies have compared the efficacies of these two methods for improving nutritional education.

The goal of this study was to compare the effects of two nutritional education methods on students' dietary habits using verbal symbols and hands-on/field practice (lecture- and experience-based methods). The results obtained from this research may provide data to improve current nutritional education programs in elementary schools.

SUBJECTS AND METHODS

Subjects

A total of 110 students (4th, 5th, and 6th grades) in three elementary schools in Jeollanam-do Province were recruited and randomly distributed into two groups: lecture- and experience-based nutritional education groups. There was no significant

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Table 1. General characteristics of subjects

		Lecture-based	Experience-based	χ^2
Gender	Boy	34 (61.8)	27 (49.1)	0.279
	Girl	21 (38.2)	28 (50.9)	
Grade	4 th	16 (29.1)	16 (29.1)	0.973
	5 th	24 (43.6)	25 (45.5)	
	6 th	15 (27.3)	14 (25.4)	

Values are number of subjects (%)

difference between the two groups in distribution of gender or grade (Table 1).

Development of educational program and data collection

Lecture- and experience-based educational programs shared identical contents with respect to dietary knowledge, eating behaviors, and dietary habits but with differential approaches (lecture- and experience-based). These methods were reviewed by three experts in nutritional education. To examine the impacts of these two educational methods, students' dietary knowledge, dietary behaviors, and dietary habits were analyzed using a pre/post-test. The pretest was taken on June 20, 2012, which was 1 week before the programs started. To evaluate the effects of the educational program, a follow-up survey was conducted 12 weeks after the programs finished.

Education methods

Both lecture- and experience-based educational programs consisted of five sessions: 'Learn my eating behavior', 'Eat breakfast', 'Choose healthy snacks', 'How to wash hands properly', and 'How to prevent obesity'. Each lecture-based session took 20 minutes. The experience-based sessions were administered to five groups of between 4-6 students. Each experience-based session took 20 minutes, and each topic was rotated from one group to another in every session. Experience-based educational program included action-learning activities such as role-playing and games without teacher-centered contents. The educational contents of each session were as follows.

In the 'Learn my eating behavior' session, body composition assessment and obesity test were performed for each participating student 1 week before the program started. The results of tests were distributed to the students before the programs started. The 24-hour recall method was used to design one meal sample for every student, and the meals were analyzed using the Computer Aided Nutritional Analysis Program (CAN-PRO ver. 4.0, Seoul, 2011). This analysis and the two previous test results

were used for one-to-one counseling with every student. In the counseling session, the sample meal of each student was compared to the dietary recommended intake for upper grade elementary students in Korea in order to help the student revise his or her own meal.

In the 'Eat breakfast' session, students were taught the pros of eating breakfast and cons of skipping breakfast. Each student designed his or her own breakfast with the Food Balance Wheels for one meal. Students were encouraged to discuss and help each other edit and revise excessive or insufficient nutrients in their meals.

The 'Choose healthy snacks' session covered sub-topics such the definition of fast food, pros and cons of snacks, and how to choose healthy snacks. After the session, students practiced what they had learned through a fishing game by separating given images of foods into healthy and unhealthy groups. Healthy ones were marked with green and unhealthy with red. Further, students learned about healthy traditional Korean foods that can be substituted for unhealthy foods they used to consume.

In the 'How to wash hands properly' session, students watched an instructional video provided by the Ministry of Food and Drug Safety focused on the need to wash hands, when to wash hands, and how to wash hands properly. After the session, students practiced what they learned in a fluorescence dye experiment. Specifically, students placed their hands in a fluorescent dye and then checked their hands in a fluorescence view box. After washing their hands with soap, they checked their hands again in the view box. The instructor corrected the hand-washing habits of students whose hands retained fluorescence residue.

The 'How to prevent obesity' session included topics such as the cause of obesity, preventive methods against obesity, and diseases and illnesses caused by obesity. The students participated in the Fat vest experience, which simulates the 'look' and 'feel' of excess body fat. Each student wore a Fat vest and engaged in activities such as hula-hooping, jumping rope, foot bag juggling, and body flexibility tests in order to experience the physical discomfort associated with obesity. Further, students learned the importance of proper diet and cardiovascular activities in preventing obesity.

Educational contents and experienced items in five sessions are summarized in Table 2.

Measurement techniques

To assess the effect of each nutritional education method,

Table 2. Contents of lecture- and experience-based learning programs

Session	Educational contents for both lecture- and experience-based learning programs	Tools for experience-based learning program	Time (m)
Learn my eating behavior	Nutritional balance, healthy meal, dietary reference intakes, Weight-control behavioral principle	Choose plastic food replicas for one meal and one-to-one counseling with educator	20
Eat breakfast	The pros of eating breakfast and cons of skipping breakfast	Design his or her own breakfast using food balance wheels	20
Choose healthy snacks	The definition of fast food, pros and cons of snacks, and how to choose healthy snacks	Play fishing game to differentiate given images of food into healthy and unhealthy foods with red.	20
How to wash hands properly	Why to wash hands, when to wash hands, and how to wash hands properly	Practice washing hands using monitoring apparatus with fluorescence dye	20
How to prevent obesity	The cause of obesity, preventive methods against obesity, and diseases and illnesses caused by obesity.	Experience physical discomfort wearing fat vest (hula-hoops, jump-ropes, foot-bags, and body flexibility tests)	20

a survey was administered as a measurement technique. The survey questionnaires were designed in collaboration with the Jeolla-Namdo Department of Health Promotion and Administration based on previous research by Lee [5] and Jin [4]. The questionnaires covered topics such as dietary knowledge, dietary behaviors, and dietary habits. The questionnaire consisted of 10 categories and 51 questions.

Dietary knowledge: This section consisted of 10 questions testing students' knowledge of balanced meals, relationship between breakfast and body composition, definition of snacks, preventive dietary behaviors for obesity, essential foods for body composition and immunity function, empty-calorie foods, calcium-rich foods, traditional seasonal foods, and traditional fermented foods. A correct answer was given 1 point; a wrong one, 0.

Dietary behaviors: This section consisted of 11 questions examining students' compliance for dietary guidelines using questions. The subjects were asked to give their frequency of consuming healthy foods such as vegetables, daily products, meat, fish, egg, soybeans, tofu, and fruits as well as that of indulgence foods, snacks, soft drinks, and fast food, in addition to general eating behaviors such as salt contents, eating rate, regular daily meal schedules, and overeating.

The points were scaled based on students' frequencies: 5 points for 6 or 7 times a week, 3 points for between 3-5 times, and 1 point for 0-2 times. Cronbach's α of the questionnaires for dietary behavior was .72.

Dietary habits

This section consisted of 13 questions examining the dietary habits of subjects in order to determine the daily routine of dietary behaviors. The questions focused on the following subjects: eating breakfast regularly, eating balanced meals, consuming snacks, exercising, considering losing weight, checking nutrition facts before purchasing food, shaping proper dietary behaviors, eating disliked but healthy foods, and eating foods with gratitude and pleasure. Again, points were scaled based on students' frequencies of performing proper dietary habits: 5 points for 6 or 7 times a week and 1 point for none. For the 'meals taste better than snacks' question, points were given

based on students' answers: 5 points for 'Always' and 1 point for 'Never'. For 'Wash hands after using the bathroom' question, 5 points were given to 'more than 10 seconds' and 1 point for 'do not wash hands'. For using chopsticks, 5 points were given for proper usage and 1 point for improper usage. The questions on negative dietary habits, including 'Complain of no favorite food in meal', 'Eat snacks more often', and 'Prefer snacks to meals', were inversely scored. Cronbach's α of the questionnaires for dietary behavior was .68.

Statistical analysis

Statistical analysis was performed using IBM SPSS statistics 21 (IBM corporation, Somers, NY, USA). Categorical data are presented as percentages (numbers) and continuous data are presented as mean \pm SD. Proportions were compared by Fisher's exact test. The differences between the values before and after each nutritional education method were tested by a paired t-test. $P < 0.05$ was considered statistically significant.

RESULTS

Change in dietary knowledge

Changes in dietary knowledge in response to educational methods are presented in Table 3. In the lecture-based group, average scores for dietary knowledge did not significantly differ before/after education. However, knowledge regarding 'What is a balanced meal?' ($P < 0.01$), 'Which of three meals provide the most energy for the brain and body?' ($P < 0.01$), and 'What is a traditional food with high contents of helpful lactobacillus and dietary fiber that prevents constipation?' ($P < 0.05$) significantly changed after education using the lecture-based method. The experience-based group did not show significant changes in total scores for knowledge (from 7.55 to 7.51). However, knowledge relating to 'Which of the choices are empty-calorie junk food?' significantly decreased ($P < 0.05$). These findings suggest that the lecture-based method was more effective in improving dietary knowledge compared to the experience method.

Table 3. Changes in dietary knowledge in response to educational methods

Questions	Lecture-based		t	Experience-based		t
	Before	After		Before	After	
What is a balanced meal?	0.27 (0.45)	0.55 (0.50)	-3.11**	0.51 (0.51)	0.51 (0.51)	0.00
What happens to our body if we skip breakfast?	0.75 (0.44)	0.82 (0.39)	-0.89	0.85 (0.36)	0.84 (0.37)	0.26
Which choices are not snacks?	0.44 (0.50)	0.55 (0.50)	-1.06	0.49 (0.51)	0.55 (0.50)	-0.65
What are incorrect dietary habits that prevent obesity?	0.53 (0.50)	0.44 (0.50)	0.93	0.56 (0.50)	0.64 (0.49)	-0.81
Which of three meals provide most energy for brain and body?	0.71 (0.46)	0.93 (0.26)	-3.03**	0.85 (0.36)	0.93 (0.26)	-1.27
Which food provides essential nutrients for our body and enhances immunity?	0.65 (0.48)	0.69 (0.47)	-0.42	0.80 (0.40)	0.78 (0.42)	0.23
Which of choices are empty-calorie, junk foods?	0.36 (0.48)	0.44 (0.50)	-0.75	0.53 (0.50)	0.33 (0.47)	2.28*
Which is a calcium-rich food?	0.67 (0.47)	0.71 (0.46)	-0.36	0.75 (0.44)	0.78 (0.42)	-0.44
What is a traditional holiday that is called Hangawi when we eat Song-pyeon?	0.85 (0.36)	0.95 (0.23)	-1.53	0.84 (0.37)	0.82 (0.39)	0.26
What is a traditional food with high contents of helpful lactobacillus and dietary fiber that prevents constipation?	0.38 (0.49)	0.22 (0.42)	2.02*	0.56 (0.50)	0.53 (0.50)	0.35
Total	6.44 (2.57)	7.15 (2.25)	-1.46	7.55 (2.49)	7.51 (2.17)	0.08

Values are Mean (SD)

* $P < 0.05$, ** $P < 0.01$

Table 4. Changes in dietary behaviors by two education methods

Dietary behaviors	Lecture-based		t	Experience-based		t
	Before	After		Before	After	
Eat vegetable in every meal	4.26 (1.19)	4.22 (1.19)	0.17	3.80 (1.25)	4.02 (1.21)	-0.95
Drink more than two glasses of milk everyday	3.30 (1.48)	3.52 (1.30)	-0.88	3.47 (1.44)	3.51 (1.45)	-0.14
Eat meat, fish, and egg everyday	3.23 (1.34)	3.26 (1.24)	-0.17	3.62 (1.27)	3.80 (0.37)	-0.78
Eat soybeans or tofu everyday	2.67 (1.39)	2.81 (1.47)	-0.59	3.00 (1.51)	3.63 (1.50)	-2.15*
Eat more than one types of fruit everyday	3.33 (1.49)	3.52 (1.36)	-0.74	3.89 (1.49)	4.26 (1.25)	-1.43
Eat less salt	2.59 (1.52)	2.52 (1.45)	0.23	2.09 (1.32)	2.56 (1.42)	-1.72
Eat slowly	3.72 (1.25)	3.38 (1.36)	1.50	3.04 (1.52)	3.11 (1.56)	-0.24
Eat disliked food as well as favorite food	3.04 (1.48)	3.07 (1.40)	-0.16	2.96 (1.44)	3.34 (1.40)	-1.30
Eat or drink less snack, soft drinks, and fast food	3.00 (1.35)	3.52 (1.30)	-2.08*	3.11 (1.41)	3.51 (1.29)	-1.53
Have a regular three-meal-a-day schedule	3.89 (1.33)	3.89 (1.33)	0.00	3.76 (1.47)	4.16 (1.14)	-1.71
Do not overeat	3.41 (1.47)	3.59 (1.38)	-0.63	3.44 (1.53)	3.65 (1.28)	-0.83
Total	3.31 (0.57)	3.39 (0.63)	-0.63	3.29 (0.73)	3.59 (0.80)	-1.96*

Values are Mean (SD)

* $P < 0.05$

Table 5. Changes in dietary habits with two educational methods

Dietary habits	Lecture-based		t	Experience-based		t
	Before	After		Before	After	
Eat scheduled and balanced breakfast	4.08 (1.06)	4.21 (1.09)	-0.70	4.22 (1.21)	4.33 (1.02)	-0.49
Complain of no favorite food in meal	3.21 (1.23)	3.71 (1.35)	-2.01*	3.56 (1.23)	3.65 (1.27)	-0.38
Eat snacks more often	3.00 (1.27)	3.31 (1.06)	-1.55	3.13 (1.02)	2.85 (1.24)	1.16
Prefer snacks to meals	3.44 (1.22)	3.51 (1.12)	-0.30	3.57 (1.14)	3.76 (1.28)	-0.71
Wash hands before eating	3.78 (1.06)	4.16 (0.83)	-1.87	4.17 (1.06)	4.39 (0.86)	-1.17
Wash hands after using bathroom	4.00 (1.07)	4.33 (0.81)	-1.77	4.43 (0.93)	4.57 (0.69)	-0.91
Always exercise to maintain current weight	3.65 (1.25)	3.96 (0.91)	-1.37	3.82 (1.04)	4.09 (1.14)	-1.27
Think I need to go on a diet	2.67 (1.38)	2.20 (1.33)	1.80	2.62 (1.50)	2.45 (1.45)	0.60
Check nutritional facts before purchasing food	2.96 (1.08)	3.40 (1.09)	-1.99	3.20 (1.30)	3.76 (1.22)	-2.37*
Have fairly good ideas for good, healthy food	3.42 (1.13)	3.81 (1.07)	-1.79	3.24 (1.11)	3.64 (1.21)	-1.69
Eat disliked but healthy food for health	3.41 (1.12)	3.86 (1.10)	-2.01*	3.13 (1.20)	3.78 (1.16)	-2.71**
Have gratitude for eating	4.00 (1.07)	4.29 (0.92)	-1.43	3.73 (1.03)	3.95 (1.08)	-1.07
Use chopsticks with proper manners	3.79 (1.17)	4.24 (1.08)	-1.97	3.48 (1.17)	3.81 (1.27)	-1.30
Total	3.50 (0.55)	3.74 (0.47)	-2.43*	3.57 (0.52)	3.76 (0.54)	-1.74

Values are Mean (SD)

* $P < 0.05$, ** $P < 0.01$

Change in dietary behaviors

Table 4 presents changes in dietary behaviors caused by the two educational methods. In the experience-based group, total score for dietary behaviors significantly improved from 3.29 to 3.59 ($P < 0.05$). The score for 'Eat soybeans or tofu everyday' increased after education ($P < 0.05$). In contrast, the score for dietary behaviors did not change in the lecture-based group, although the score increased for 'Eat or drink less snacks, soft drinks, and fast food' ($P < 0.05$). The result indicates that the experienced-based method may effectively improve children's dietary behaviors.

Change in dietary habits

Table 5 presents changes in dietary habits by the two educational methods. The lecture-based group showed a significantly increased total score for dietary habits from 3.50 to 3.74 ($P < 0.05$). The scores for questions such as 'Complain of no favorite food in meal' and 'Eat disliked but healthy foods for health' significantly increased after lecture-based education ($P < 0.05$).

The total scores of the experience-based group did not change. Scores for 'Check nutrition facts before purchasing food' and 'Eat disliked but healthy foods for health' significantly increased in the experienced-based group ($P < 0.05$ and 0.01). Overall, the lecture-based method had obvious effects on students' dietary habits.

DISCUSSION

The current study was designed to compare how two educational methods based on verbal symbols (lecture-based) and hands-on/field practice (experienced-based) affect children's dietary knowledge, behaviors, and habits.

Neither the lecture- nor experienced-based method significantly altered overall levels of dietary knowledge. However, the lecture-based method did increase knowledge of the effects of traditional food and eating a regular and balanced meal for health, whereas the experienced-based method decreased knowledge of empty-calorie junk food. This suggests that a

short-term, focused lecture-based method can improve knowledge better than the experiment-based method. The lecture-based method also significantly improved students' dietary habits. An individual's dietary habits are formed over the long-term with multiple environmental factors such as family dietary plans, knowledge, and habits. The experience-based educational program has been the preferred teaching method compared to lecture-based method. However, students have shown a desire for teacher-centered methods previously [9]. The knowledge obtained by intensive lecture-based education may be more effective in getting students to recognize the need for improved dietary habits by providing a logical and academic background.

On the other hand, the experience-based method significantly altered students' dietary behaviors. Dietary behaviors are an important part of nutritional education since they provides general guidelines for planning healthy diets. The experience-based method may be more effective in translating theoretical guidelines into a real-life context through role-playing and games compared to lecture-based methods [10].

There are several potential limitations that need to be discussed prior to the completion. These include our relatively small sample sized data set ($n = 110$). Despite this small sample size, the study population showed significant findings that are worthy of further study. Additionally, the association between each educational method and response category is unclear and remains to be verified. Despite these limitations, the present study generated interesting findings with respect to nutritional education, and so further studies with better structures and larger sample sizes will support and expand upon the current findings.

In the current study, the lecture- and experience-based education methods resulted in significant improvement in various categories. The lecture-based method was more effective in imparting dietary knowledge and improving dietary habits, whereas the experience-based method resulted in significant

positive changes in dietary behaviors. These results imply that to increase the effect of nutritional education, both lecture- and experience-based methods need to be considered.

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