

Evaluation of educational school meal programs in Gyeonggi province, South Korea*

Lee, Youngmi¹ · Kim, Oksun² · Lee, Uiok³ · Kwon, Sooyoun^{4†}

¹Department of Food and Nutrition, Myongji University, Yongin 17058, Korea

²Department of Food and Nutrition, Jangan University, Hwaseong 18331, Korea

³School Meals Division, Gyeonggi Provincial Office of Education, Suwon 16279, Korea

⁴Department of Food and Nutrition, Honam University, Gwangju 62399, Korea

ABSTRACT

Purpose: School meal programs should be part of the educational process to promote good eating habits for students. The purpose of this study was to develop an evaluation scale for educational school meal programs and evaluate the achievement level of educational school meal programs using the developed scale. **Methods:** The evaluation scale for educational school meal programs consisted of 23 items in eight categories and was developed using content validity ratio (CVR) analysis and analytic hierarchy process (AHP) by 15 related experts. The results of a survey on nutrition teachers or dietitians at 91 elementary, middle, and high schools in Gyeonggi province, South Korea were analyzed to evaluate the achievement levels of educational school meal programs. **Results:** Overall, total average score was 45.7 out of 100, with significant differences among schools ($p = 0.005$). Elementary schools (51.9) showed a higher average score than middle (41.5) and high schools (37.1). The score for the category of regular nutrition and dietary education was the lowest (5.7 out of 33.7). In addition, school meal environment (5 out of 10), educational activities through school meal time (9.2 out of 19), and extra-curricular experiential activities (3.5 out of 10) also showed inadequate levels. **Conclusion:** The results show that the overall level of educational school meal programs is not adequate and needs to be improved, especially at middle and high schools. Government support policies need to be implemented to encourage educational activities related to school meal programs.

KEY WORDS: school meal program, education, evaluation, scale

INTRODUCTION

School meal services were first introduced in Korea in the 1950's as relief meals with the aid of the United Nations Children's Fund (UNICEF). Afterwards, in 1981, the School Meals Act was introduced and the Nutrition Teacher System was implemented in 2006. A nutrition teacher is supposed to perform the role of a teacher and counselor on nutrition in addition to a manager of foodservice operations in school. In other words, school meal programs should perform a dietary education role to promote good eating habits for students as well as a foodservice role to provide meals of good quality to support healthy growth and development. The educational role of school meal programs was also specified in the related law. In the Korean School Meals Act, the purpose of

school meal services is defined as "to contribute to the development of health of body and mind and to the improvement of people's dietary lives" and the "nutrition and dietary education, provision of information, and nutrition counseling" was included in the assignments of nutrition teachers.¹

Previous studies have shown that children are encouraged to choose healthy foods and learn good dietary habits through school meals and related dietary education.²⁻⁶ Moreover, almost all of Korean elementary, middle, and high school students (99.8% in 2015) eat school lunches each school day.⁷ Therefore, school meal program could be an excellent means of education to promote healthy eating habits for Korean school-aged children.

In other major countries, school meal programs are recognized as an educational activity. For example, Italy

Received: September 23, 2016 / Revised: October 12, 2016 / Accepted: January 6, 2017

*This work was funded by Gyeonggi Provincial Office of Education.

†To whom correspondence should be addressed.

tel: +82-62-940-5428, e-mail: soonara@honam.ac.kr

© 2017 The Korean Nutrition Society

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

integrates the nutritional dimension of the food served in schools into a wider cultural framework that emphasizes the educational purposes of school meals. In 1998, for example, the Ministry of Agriculture implemented an educational program, called “Cultura che Nutre (Culture that Feeds)”, which educates school children to a healthy diet through the implementation of school projects that emphasize the values of seasonality and territoriality in the context of food.⁸ The Department of Education of the UK proposed actions that allow children to learn about food in schools in the School Food Plan.^{9,10} In Japan, the School Lunch Act introduced in 1954 was revised in 2008 and its aim was changed to “promoting Shokuiku (food education)”. The school meal program itself is an educational activity in Japan.¹¹

However, the educational role of the Korean school meal program is performed only narrowly. Many studies pointed out problems of unsatisfactory accomplishment of nutrition and dietary education in schools.¹²⁻¹⁵ A review on nutritional education in elementary schools¹³ reported that class and nutrition teachers repeated the same contents with only limited educational material. In addition, nutrition and dietary education was conducted just as a one-time event in many schools, whereas regular classes incorporated into the school curriculum or extra-curricular activities were very poor. Most of the nutrition teachers conducted education using indirect methods such as school newsletters or posting on the bulletin board. Nutrition counseling with students was also performed at a very low rate. Meanwhile, the number of nutrition teachers is still less than 50% of the total number of the schools required to hire them.⁷ In the rest of the schools, dietitians were hired instead of nutrition teachers and school dietitians conducted less nutrition and dietary education than nutrition teachers did.¹² All these results suggest that policies to promote the educational role of school meal programs need to be established and related empirical studies should be performed.

On the other hand, the educational part of the school meal program was suggested as one of the major factors that could have a positive effect on the improvement of students’ satisfaction with school meals. Lim and Yang¹⁶ found that students with experiences with nutrition education are significantly more likely to be satisfied with school meals than those without experience. A similar result was reported in a study concerning students’ satisfaction with school meals in Gyeonggi province.¹⁷ Yoon et al.¹⁸ also suggested

that nutrition education could be a useful strategy to improve students’ satisfaction with school meal services based on their research results.

Some researchers proposed various educational duties as assignments for school nutrition teachers and dietitians, such as nutrition education during school lunch time, operation of a nutrition counseling center, nutrition education through extra-curricular activities or discretionary activities, team teaching with other teachers, nutrition counseling with parents and residents of the community, and development of materials for nutrition education.^{19,20} However, there were few studies showing an in-depth analysis of the scope of educational school lunch programs.

Some standardized evaluation scales of school meal program have been developed, however, these scales mainly focused on the overall operational management.^{21,22} No studies have been performed to evaluate the achievement level of educational school meal programs, as a standardized scale for evaluation had not been developed yet. Related studies need to be done to effectively integrate the educational school lunch program. Therefore, this study aimed to develop an evaluation scale for educational school meal programs and to apply this scale to evaluate the achievement level of elementary, middle, and high schools in Gyeonggi province.

METHODS

Development of an evaluation scale for educational school meal program

Selection of evaluation items

Through literature review and focus-group interviews with related experts, 40 items in 8 categories were included as possible items in the evaluation scale for educational school meal programs; 3 items in compliance with the School Meals Act, 10 items in compliance with guidance for school meal operations by the Ministry of Education, 1 item on hygiene and safety management, 2 items on the school meal environment, 6 items on regular nutrition and dietary education, 7 items on educational activities during school meal time, 6 items on extra-curricular experiential activities, and 5 items on a support condition. The expert group consisted of 15 individuals; 7 nutrition teachers in elementary, middle, and high school, 4 school meal program-related administrators from the Gyeonggi province. Office of Education, 3 professors specialized in nutrition education,

institutional foodservice, and education, respectively, and 1 specialist in dietary education.

To verify the validity of each evaluation item, CVR (content validity ratio) analysis was conducted with the expert group. CVR analysis, proposed by Lawshe²³ has been used to establish and quantify content validity in diverse fields. The CVR is a linear transformation of the ratio of the number of panel members judging an item to be “essential” compared to the total number of panel members. It is calculated in the following way: $CVR = (n_e - (N/2)) / (N/2)$, where n_e is the number of panel members indicating that the item is “essential”, and N is the total number of members on the panel. For CVR analysis, each panel was asked about the validity of each item on a 5-point scale (1 = very unnecessary, 5 = very essential). Based on the results, the final evaluation items were selected to include CVR scores that were greater than the minimum acceptable value.²³

Analytic hierarchy process

To prioritize the evaluation categories, analytic hierarchy process (AHP) was performed with the same expert group. The AHP is a theory of measurement that uses pairwise comparisons and relies on the judgments of experts to derive priority scales.²⁴ It is one of the most widely used multiple criteria decision-making tools. It provides a methodology to calibrate the numeric scale for the measurement of quantitative as well as qualitative performances.²⁵ A method of pairwise comparison between 8 evaluation categories was used on a 9 point scale, which is mostly used because of high reliability.²⁴ Using the Eigenvalue Method, the weight of each category was estimated, and then each weight was converted into a percentage. The consistency ratio (CR) was calculated and a value of the $CR \leq 0.1$ was considered acceptable.²⁶

Evaluation of educational school meal program

Research subjects

To evaluate the level of the educational school meal program using the developed evaluation scale, we sampled 112 elementary, middle, and high schools in Gyeonggi province, South Korea, equivalent to about 5% of all schools in the province. The chosen schools were selected by taking into consideration the number of schools in each administrative district of Gyeonggi province, using stratification and convenience sampling methods.

Measures

Out of the 8 evaluation categories developed, the scores for compliance with the School Meals Act, compliance with guidance for school meal operations by the Ministry of Education, and compliance with hygiene and safety management were adopted from the results of a 2014 report on operation and hygiene-safety management check-ups by the Ministry of Education. The scores of the other 5 categories were assessed through a survey with nutrition teachers or school dietitians of the chosen schools using a self-administered questionnaire.

The questionnaire comprised general information about the respondents and the chosen schools, the current status of nutrition and dietary education programs, and the support condition for educational school meal programs. The section on general information of the respondents included questions about gender, age, position, career, and educational level. The questions regarding number of meals and method of food distribution were included in the part on general information regarding the chosen schools. In the section on the current status of nutrition and dietary education programs, we asked for the implementation of regular nutrition and dietary education classes and extra-curricular experiential activities. The frequency of educational activities during school meals times was also inquired after on a five-point scale (1 = rarely, 2 = 1-2 times per semester, 3 = 1-2 times per month, 4 = 1-2 times per week, and 5 = daily). The section on the support condition for educational school meal programs comprised questions inquiring after the level of support, cooperation, and participation in educational school meal programs from the principal, teachers, parents, and students. The items in the support condition were measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

The questionnaire was sent to participants by post and the completed questionnaires were returned by post. Out of 112 questionnaires distributed, 93 were returned (83% response rate). After excluding 2 questionnaires from schools in which an operation and hygiene-safety management check-up in 2014 by the Ministry of Education was not conducted because of the schools only being founded in 2015, a total of 91 questionnaires were analyzed (43 elementary schools, 33 middle schools, and 15 high schools). The survey was conducted in December, 2015. The study protocol was reviewed and approved by the Institutional Review Board of Honam University (1041223-201603-

HR-005).

Analysis

We used EXCEL 2010 in the CVR analysis and weighted calculation of AHP. The results of the evaluation of the educational school meal programs were compared among school levels (elementary, middle, and high schools). To verify the differences among school levels, χ^2 analysis or one-way ANOVA and Duncan's multiple comparison was

conducted using SPSS/WIN 21.0. A Kolmogorov-Smirnov test was conducted to test normality of distribution of the evaluated scores.

RESULTS

Development of the evaluation scale

The results of the CVR analysis of 40 evaluation items are shown in Table 1. As the minimum acceptable CVR

Table 1. Results of CVR analysis of evaluation items

Evaluation category	No	Evaluation item	CVR
Compliance with the school meals act	1	Compliance with ingredient standards	0.73
	2	Compliance with nutritional standards	0.87
	3	Compliance with quality and safety standards	0.73
Compliance with guidance for school meal operations by the Ministry of Education	4	Limitation of using chemical seasoning and frying foods	0.73
	5	Labeling of ingredients' origin and nutritional value of menus	0.73
	6	Advising healthy eating behavior	0.73
	7	Nutrition counseling for students	0.60
	8	Educational activities to decrease food waste	0.60
	9	Provision of dietary information to students, teachers, and parents	0.60
	10	Operation of council for school meal program	-0.20
	11	Parents' participation in inspection of ingredients and monitoring	0.20
	12	Collection of opinions to improve satisfaction for school meal service	0.47
	13	Conduction of survey on school meal service and disclosure of survey results	0.47
Hygiene and safety management	14	Hygiene and safety management	0.73
School meal environment	15	Placement of nutrition teacher	0.60
	16	Place and method of food distribution	0.07
Regular nutrition and dietary education	17	Incorporation into curriculum	0.60
	18	Discretionary class	0.60
	19	After-school class	0.07
	20	Club activities	0.87
	21	Nutrition counseling class for parents	0.20
	22	Dietary education center	-0.07
Educational activities during school meal time	23	Information provision about ingredients	0.73
	24	Information provision about cooking methods	0.33
	25	Information provision about food culture	0.60
	26	Information provision about hygiene and safety	0.60
	27	Education about table manners	0.73
	28	Provision of traditional festival foods	0.33
	29	Provision of special menus	0.07
Extra-curricular experiential activities	30	Farm visit	-0.07
	31	Cooking class	0.87
	32	School gardening	-0.07
	33	Other field trips	0.47
	34	Operation of <i>jangdokdae</i>	0.07
	35	Other experiential activities	-0.20
Support condition	36	Cooperation and support of principals	0.87
	37	Cooperation and support of teachers	0.73
	38	Interest and support of parents	0.60
	39	Participation of students	0.73
	40	Job satisfaction of school dietitian or nutrition teacher	0.33

value is 0.49 when the panel number is 15,²³ the items with scores higher than 0.49 were selected. As a result, 23 items were included in the final evaluation scale, excluding 17 items of which the CVR value was less than 0.49. In particular, items such as “compliance with nutritional standards,” “club activities,” and “cooperation and support of principals” were evaluated as more essential among the selected items, with the highest CVR value. In contrast, the items such as “dietary education center,” “farm visit,” and “school gardening” were identified as the least essential among the excluded items.

As the values of consistency ratio (CR) of all the panel members were less than 0.1, we accepted all the judgements. As a result of AHP, the first priority was placed on the category of regular nutrition and dietary education (weighted value is 33.7%), followed by educational activities during school meal time (weighted value is 19.0%), and the support condition (weighted value is 15.2%). The full score of each category was converted to the weighted value in order for the perfect total score to be 100 points. Table 2 shows the given scores for each category.

Evaluation of the educational school meal program

General characteristics of subjects

The general characteristics of the respondents are presented in Table 3. Among 91 respondents, 43 were from elementary, 33 from middle, and 15 from high schools. All the respondents were female and the average age was 38.6 years. With regard to position, the proportions of nutrition teachers versus dietitians were mostly even, corresponding to 50.5% and 49.4%, respectively. However, it was observed that the proportion of nutrition teachers decreased as the school level increased, although there was no significant correlation. The average career length of school nutrition teachers or dietitians was 10.7 years and about half of them had a master’s degree.

The general characteristics related to the school meal programs of the schools are shown in Table 4. The average feeding number was 800, with a significant difference between school levels ($p = 0.025$). About 57.1% of schools distributed the meals in fixed amounts and only 4.4% distributed the meals with the self-control method. The distribution method was significantly different among school levels ($p < 0.001$). The partial self-control distribution method was mostly used in high school (80.0%), however fixed amount distribution was more common in elementary schools (76.7%).

Evaluation of the educational school meal program

Table 5 shows the evaluated scores of the schools. Overall, the total average points were 45.7 out of 100. There was such a disparity in the evaluated scores among schools; the lowest was 21.1 and the highest was 88.2. In addition, the total average points were significantly different between school levels ($p = 0.005$). Elementary schools (51.9) recorded a higher score than middle (41.5) and high schools (37.1) ($p < 0.05$). However, there was no significant difference between middle and high schools.

Overall, the score for the category of regular nutrition and dietary education was the most insufficient among the 8 evaluation categories, equivalent to 5.7 out of 33.7. Extra-curricular experiential activities (3.5 out of 10), educational activities during school meal time (9.2 out of 19), and school meal environment (5 out of 10) also showed inadequate levels.

Significant differences between school levels were observed in the categories of regular nutrition and dietary education ($p < 0.001$) and in the support condition ($p < 0.001$). In the category of regular nutrition and dietary education, the average score of elementary schools (8.9) was higher than middle (2.4) and high schools (3.7) ($p < 0.05$). However, the score of middle and high schools were

Table 2. Results of AHP analysis of evaluation scale

Evaluation category	Ranking	Weighting value
Compliance with the school meals act	8	3.5
Compliance with guidance for school meal operations by the Ministry of Education	7	4.0
Hygiene and safety management	6	4.6
School meal environment	4	10.0
Regular nutrition and dietary education	1	33.7
Educational activities during school meal time	2	19.0
Extra-curricular experiential activities	4	10.0
Support condition	3	15.2

Table 3. General characteristics of respondents

Characteristics	Elementary schools (n = 43)	Middle schools (n = 33)	High schools (n = 15)	Total (n = 91)	p-value ¹⁾
Gender					
Female	43 (100)	33 (100)	15 (100)	91 (100)	
Age					
20 ~ 29	3 (7.0)	9 (27.3)	3 (20.0)	15 (16.5)	0.250
30 ~ 39	15 (34.9)	10 (30.3)	3 (20.0)	28 (30.8)	
40 ~ 49	22 (51.2)	13 (39.4)	7 (46.7)	42 (46.2)	
≥ 50	3 (7.0)	1 (3.0)	2 (13.3)	6 (6.6)	
Average	39.7 ± 6.8	36.4 ± 7.5	40.1 ± 7.6	38.6 ± 7.3	0.099
Current position					
Nutrition teacher	24 (55.8)	16 (48.5)	6 (40.0)	46 (50.5)	0.549
Dietitian	19 (44.2)	17 (51.5)	9 (60.0)	45 (49.5)	
Working career					
< 5	5 (11.6)	10 (30.3)	4 (26.7)	19 (20.9)	0.530
5 ~ 10	18 (41.9)	10 (30.3)	4 (26.7)	32 (35.2)	
11 ~ 15	5 (11.6)	6 (18.2)	3 (20.0)	14 (15.4)	
16 ~ 20	11 (25.6)	4 (12.1)	3 (20.0)	18 (19.8)	
≥ 21	4 (9.3)	3 (9.1)	1 (6.7)	8 (8.8)	
Average	11.7 ± 6.7	9.4 ± 6.6	10.5 ± 6.7	10.7 ± 6.7	0.337
Educational level					
College graduate	5 (11.6)	3 (9.1)	0 (0.0)	8 (8.8)	0.501
University graduate	19 (44.2)	12 (36.4)	5 (33.3)	36 (39.6)	
Master's degree	19 (44.2)	18 (54.5)	10 (66.7)	47 (51.6)	

1) p value by χ^2 -test or ANOVA
n (%) or Mean ± SD

Table 4. General characteristics of subject schools

Characteristics	Elementary schools (n = 43)	Middle schools (n = 33)	High schools (n = 15)	Total (n = 91)	p-value ¹⁾
Feeding number (lunch)					
< 500	10 (23.3)	5 (15.2)	0 (0.0)	15 (16.5)	0.077
500~999	22 (51.2)	21 (63.6)	7 (46.7)	50 (54.9)	
≥ 1,000	11 (25.6)	7 (21.2)	8 (53.3)	26 (28.6)	
Average	739.3 ± 342.9 ^a	782.4 ± 297.4 ^a	1,011.5 ± 364.2 ^b	799.8 ± 341.0	0.025
Food distribution method					
Self-control	2 (4.7)	1 (3.0)	1 (6.7)	4 (4.4)	< 0.001
Fixed amounts	33 (76.7)	17 (51.5)	2 (13.3)	52 (57.1)	
Partial Self-control	8 (18.6)	14 (42.4)	12 (80.0)	34 (37.4)	

1) p value by χ^2 -test or ANOVA
a,b: significantly different at p < 0.05 using ANOVA and Duncan's multiple range test
n (%) or Mean ± SD

not significantly different. The support condition category showed basically the same results; the average score of elementary schools (12.0) was higher than high schools (8.3). In the other six categories, no significant differences among school levels were observed.

On the other hand, the evaluated scores were not normally distributed according to the result of the Kolmogorov-

Smirnov test. It was caused by skewness of scores toward the lower values.

DISCUSSION

It is indisputable that the school setting provides a valuable opportunity to influence children's health through

Table 5. Results of evaluation of educational school meal programs

Evaluation category	Elementary schools (n = 43)	Middle schools (n = 33)	High schools (n = 15)	Total (n = 91)	p-value ¹⁾
Compliance with the school meals act (3.5 points)	3.36 ± 0.38	3.29 ± 0.54	3.34 ± 0.41	3.33 ± 0.45	0.76
Compliance with guidance for school meal operations by the ministry of education (4 points)	3.44 ± 0.50	3.38 ± 0.47	3.41 ± 0.53	3.41 ± 0.49	0.87
Hygiene and safety management (4.6 points)	4.42 ± 0.10	4.43 ± 0.10	4.35 ± 0.24	4.41 ± 0.13	0.16
School meal environment (10 points)	5.53 ± 4.97	4.80 ± 5.02	3.96 ± 5.02	5.00 ± 4.98	0.56
Regular nutrition and dietary education (33.7 points)	8.88 ± 9.35 ^b	2.38 ± 5.44 ^a	3.74 ± 9.17 ^a	5.68 ± 8.60	< 0.001
Educational activities during school meal time (19 points)	9.54 ± 2.11 ^b	9.36 ± 2.73 ^{ab}	8.04 ± 2.87 ^a	9.23 ± 2.51	0.13
Extra-curricular experiential activities (10 points)	4.65 ± 5.05	2.73 ± 4.52	2.00 ± 4.14	3.52 ± 4.80	0.09
Support condition (15.2 points)	12.04 ± 2.17 ^b	11.17 ± 2.67 ^b	8.26 ± 2.90 ^a	11.10 ± 2.80	< 0.001
Total (100 points)	51.86 ± 18.12 ^b	41.53 ± 15.45 ^a	37.11 ± 18.17 ^a	45.68 ± 18.06	0.005
Score range	26.45 ~ 88.15	22.71 ~ 74.17	25.11 ~ 86.90	21.11 ~ 88.15	

1) p value by ANOVA

a,b: significantly different at p < 0.05 using ANOVA and Duncan's multiple range test

Mean ± SD

policy measures, education, and food provision. In particular, school meals should be part of the educational process to teach students healthy food choices and promote good eating habits.²⁷⁻²⁹ However, the results of the current study presented some problems and showed an urgent need for improvements related to school meal programs from an educational perspective. As a result of evaluating the achievement level of educational school meal programs, the total average score did not even reach to 50 out of 100, with significant differences among school levels. The results indicate that the educational role of school meal programs was not conducted on a satisfactory level, at least in schools in Gyeonggi province, especially in middle and high schools.

The weight of the regular nutrition and dietary education category was estimated as the highest among the 8 categories of the developed evaluation scale for educational school meal programs. It could be said that regular educational activities, not just as a one-time event, are the most important factor to achieve the educational goal of school meal programs. As some researchers pointed out, in order to implement the educational school meal program successfully, nutrition education needs to be actively incorporated into the school curriculum.^{30,31} Nevertheless, the score evaluated for this category showed the most insufficient level. This result could be linked to the low proportion of nutrition teachers, just over 50% in this study, which was one of evaluation items of the developed scale. School dietitians could not conduct nutrition education

effectively because they were not nutrition teachers.³² In fact, relatively low attention had been given to school-based nutrition education in Korea until the Nutrition Teacher System was initiated in 2006.¹⁸ A total of 4,767 nutrition teachers were employed by schools as of 2015⁷; however, the numbers are still less than 50% of the total number of schools. Therefore, to improve the educational role of school meal programs, nutrition teachers need first to be placed in every school.

On the other hand, there is not obligation for nutrition education in school curricula, although the Korean School Meals Act prescribes nutrition education as a role of school nutrition teachers. Consequently, job duties of nutrition teachers focus more on meal service than nutrition education and the current school-based nutrition education mainly depends on the intention of principals and nutrition teachers.¹⁸ Standards for nutrition and dietary education in schools, such as minimum hours of classroom instruction, need to be established.

School-based nutrition education should focus not only on the provision of nutrition information, but also on the development of skills and behaviors related to areas such as experiential activities like cooking class, school gardening, and exhibitions.^{27,33,34} Experiential nutrition education improved cognitive behaviors that may mediate healthy food choices.³⁵ In our study, the cooking class score was only 3.5 out of 10. There are many studies proving that school-based cooking class improves children's eating habits.³⁵⁻³⁷ Additionally, the nutrition education that

Korean students wanted most was the cooking class.³² Therefore, regular cooking classes need to be implemented in schools more.

From a long term perspective, other activities such as school gardens need to be introduced as a way to positively influence dietary habits. A previous study showed that school gardens as a component of nutrition education could increase fruit and vegetable knowledge and cause behavior changes in children.³⁸ Other studies also reported that school-based gardening illustrated some positive effects on nutrition knowledge and behavior.^{39,40}

Above all, to support educational activities of nutrition teachers or school dietitians, support and cooperation of school authorities, teachers, and parents and active participation of students is essential, because the lack of interest of school authorities was one of the major factors in the absence of nutritional education.⁴¹ In our study, the level of cooperation of school authorities and parents and of students' participation was much below the average in high schools. Cooperation system between nutrition teachers or school dietitians and school authorities need to be constructed especially in high schools.

The results of the current study showed that educational activities during school meal times were also inactive and the provision of information was focused more on nutritional information. School-based nutrition education should also focus on the development of behaviors related to areas such as social and cultural aspects of food and eating. These areas are conducive to healthier food choices.³¹ Thus, the school meal time should be utilized for educating cultural aspects of food and table manners.

Most of all, we should give attention to the fact that the problem seems to be more serious in middle and high schools than in elementary schools. At this point government policy support is needed for qualitative development of an educational school meal program, preferentially in middle and high schools.

This study has some limitations. We developed the evaluation scale based on opinions of several experts. To establish the support policy standard for the educational school meal program, an evaluation scale is imperative. Thus, a more in-depth and broad study concerning the development of a more accurate evaluation scale should be performed. As we applied the developed scale to chosen schools in Gyeonggi province, caution is required in generalizing the results to all schools. However, the results

of the current study are meaningful, considering the fact that 19.5% of Korean schools locate in Gyeonggi province. Another limitation is that the achievement level of the nutritional school meal program was evaluated mostly depending on the results of a self-administered survey. Therefore, more in-depth follow-up studies should be conducted using more accurate methods to obtain conclusions with a wider representation. As non-normality of distribution of the evaluated scores was also another limitation, methods for standardizing the evaluation scale need to be developed. Notwithstanding these limitations, this study has importance as the first research to evaluate the achievement level of nutritional school meal programs and the results can suggest ways to improve the educational performance of school meal programs.

SUMMARY

This study was to develop an evaluation scale for educational school meal programs and to evaluate the achievement level of educational school meal programs using the scale developed. 23 items in 8 categories were included the evaluation scale for educational school meal programs. In term of evaluation of the educational school meal program, total 91 nutrition teachers or dietitians in Gyeonggi province, South Korea were responded. As a results, the total average score of evaluation of educational school meal programs was 45.7 out of 100. There was significant differences among schools ($p = 0.005$). Both Regular nutrition and dietary education ($p < 0.001$) and in the support condition ($p < 0.001$) were also significant differences between school levels.

REFERENCES

1. Ministry of Education (KR). Korean school meals act [Internet]. Seoul: Ministry of Government Legislation; 2013 Nov 23 [cited 2016 Jul 25]. Available from: <http://www.law.go.kr>.
2. Kim SA. Effect of nutrition education of school lunch programs: on dietary pattern of elementary school children in Pusan area. *J Korean Soc Food Nutr* 1990; 19(4): 356-374.
3. Han HY, Kim EK, Park KW. Effects of nutrition education on nutrition knowledge, food attitude, food habits, food preference and plate waste of elementary school children served by the national school lunch program. *Korean J Nutr* 1997; 30(10): 1219-1228.
4. Oh YM, Kim MH, Sung CJ. Effects of school lunch program on nutritional knowledge and attitude, and dietary behavior of Korean middle school students. *Korean J Community Nutr* 2005; 10(2):

- 163-173.
5. Jeong Y, Woo T, Lee KH. Effect evaluation of nutrition education for improving preferences to Korean traditional foods in upper grades schoolchildren. *Korean J Food Nutr* 2014; 27(6): 1119-1131.
 6. Ko KM, Kim SB. Effects of nutrition education providing school lunch by personalized daily needed food exchange units for adolescent athletes in Jeonbuk province. *Korean J Community Nutr* 2016; 21(1): 25-36.
 7. Ministry of Education (KR). Status of 2014 school meal program [Internet]. Sejong: Ministry of Education; 2015 Jun 1 [cited 2016 Jul 25]. Available from: <http://www.moe.go.kr>.
 8. Morgan K, Sonnino R. Empowering consumers: the creative procurement of school meals in Italy and the UK. *Int J Consum Stud* 2007; 31(1): 19-25.
 9. Dimbleby H, Vincent J. The school food plan [Internet]. Manchester: Department for Education; 2013 [cited 2016 Jul 25]. Available from: <https://www.gov.uk/government/publications/the-school-food-plan>.
 10. Schabas L. The school food plan: putting food at the heart of the school day. *Nutr Bull* 2014; 39(1): 99-104.
 11. Tanaka N, Miyoshi M. School lunch program for health promotion among children in Japan. *Asia Pac J Clin Nutr* 2012; 21(1): 155-158.
 12. Hong YS, Lee JH. Current status and strategic plan of nutrition education comparing nutrition teachers with dietitians in schools, Gyeonggi area. *Korean J Community Nutr* 2013; 18(3): 233-242.
 13. Jung KA. The review of the researches on the nutritional education state in the elementary school. *J Korean Pract Arts Educ* 2013; 19(1): 117-145.
 14. Lee MY, Choi KS. Current status and activation needs for student nutrition counseling among elementary and middle-high school dietitians. *Korean J Community Living Sci* 2013; 24(4): 497-515.
 15. Oh NG, Gwon SJ, Kim KW, Sohn CM, Park HR, Seo JS. Status and need assessment on nutrition & dietary life education among nutrition teachers in elementary, middle and high schools. *Korean J Community Nutr* 2016; 21(2): 152-164.
 16. Lim SS, Yang JS. A study on the satisfaction of school meals about elementary, middle and high school's students in Jeonbuk area: an ordered probit analysis. *Korean J Org Agric* 2013; 21(4): 539-554.
 17. Ko SK, Kim DW, Kang HS, Ahn KA. Analysis of influence factors for improving satisfaction with school meal in Gyeonggi area. Suwon: Gyeonggi Institute of Education; 2014.
 18. Yoon J, Kwon S, Shim JE. Present status and issues of school nutrition programs in Korea. *Asia Pac J Clin Nutr* 2012; 21(1): 128-133.
 19. Kwak DK. Roles of school nutrition teachers. *Nutr Diet* 2003; 250: 15-17.
 20. Yim KS. How should the school nutrition education change? Proceedings of 2007 Spring Conference of the Korean Society of Community Nutrition; 2007 May 11; Seoul. Seoul: Korean Society of Community Nutrition; 2007.
 21. Lee MA. Development and standardization of the evaluation tool for the school food service program in Korea [dissertation]. Seoul: Yonsei University; 2005.
 22. Choi MK. Development of a school foodservice menu evaluation tool & manual. Seoul: Ministry of Education and Science Technology; 2012.
 23. Lawshe CH. A quantitative approach to content validity. *Pers Psychol* 1975; 28(4): 563-575.
 24. Saaty TL. Decision making with the analytic hierarchy process. *Int J Serv Sci* 2008; 1(1): 83-98.
 25. Vaidya OS, Kumar S. Analytic hierarchy process: an overview of applications. *Eur J Oper Res* 2006; 169(1): 1-29.
 26. Saaty TL. How to make a decision: the analytic hierarchy process. *Eur J Oper Res* 1990; 48(1): 9-26.
 27. Pérez-Rodrigo C, Klepp KI, Yngve A, Sjöström M, Stockley L, Aranceta J. The school setting: an opportunity for the implementation of dietary guidelines. *Public Health Nutr* 2001; 4(2B): 717-724.
 28. Pilant VB; American Dietetic Association. Position of the American Dietetic Association: local support for nutrition integrity in schools. *J Am Diet Assoc* 2006; 106(1): 122-133.
 29. Weaver-Hightower MB. Why education researchers should take school food seriously. *Educ Res* 2011; 40(1): 15-21.
 30. Rasmussen VB, Rivett D. The European network of health promoting schools: an alliance of health, education and democracy. *Health Educ* 2000; 100(2): 61-67.
 31. Pérez-Rodrigo C, Aranceta J. School-based nutrition education: lessons learned and new perspectives. *Public Health Nutr* 2001; 4(1A): 131-139.
 32. Bae IS, Shin KH, Lee YK, Lee SK. Perception of the elementary school dietitians and students on nutrition education to set up the roles of nutrition teacher: centered on Daegu City and Gyeongbuk Province. *J Korean Diet Assoc* 2005; 11(4): 393-404.
 33. Nicklas TA, Johnson CC, Farris R, Rice R, Lyon L, Shi R. Development of a school-based nutrition intervention for high school students: Gimme 5. *Am J Health Promot* 1997; 11(5): 315-322.
 34. Perez-Rodrigo C, Aranceta J. Nutrition education for schoolchildren living in a low-income urban area in Spain. *J Nutr Educ* 1997; 29(5): 267-273.
 35. Cunningham-Sabo L, Lohse B. Impact of a school-based cooking curriculum for fourth-grade students on attitudes and behaviors is influenced by gender and prior cooking experience. *J Nutr Educ Behav* 2014; 46(2): 110-120.
 36. Edens NK, Sharma S, Folkens S, Wojtowicz A, Ranjit N, Evans A. Experiential cooking and nutrition education program improves fruit and vegetable liking, vegetable consumption, and cooking at home in elementary and middle school children. *FASEB J* 2016; 30(S1): 676.13.
 37. Hersch D, Perdue L, Ambroz T, Boucher JL. The impact of cooking classes on food-related preferences, attitudes, and behaviors of school-aged children: a systematic review of the evidence, 2003-2014. *Prev Chronic Dis* 2014; 11: E193.
 38. Parmer SM, Salisbury-Glennon J, Shannon D, Struempfer B. School gardens: an experiential learning approach for a nutrition education program to increase fruit and vegetable knowledge, preference, and consumption among second-grade students. *J Nutr Educ Behav* 2009; 41(3): 212-217.
 39. Graham H, Feenstra G, Evans AM, Zidenberg-Cherr S. Davis school program supports life-long healthy eating habits in children. *Calif Agric (Berkeley)* 2004; 58(4): 200-205.
 40. McAleese JD, Rankin LL. Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents. *J Am Diet Assoc* 2007; 107(4): 662-665.
 41. Kim GM, Lee YH. A study on nutrition management of dietitian for school lunch program in Seoul and Incheon provinces. *J Korean Diet Assoc* 2003; 9(1): 57-70.