An Analysis on the Preference of Early Childhood Teachers in Horticultural Activities Based on Conjoint Analysis

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ABSTRACT

Background and objective: This study conducted a conjoint analysis on early childhood teachers to find out their preferences in horticultural activities that are used as a means of education in early childhood education.

Methods: For the conjoint analysis, five attributes of horticultural activities were selected. Attribute 1 was method of horticultural activities, divided into two levels: exclusive and integrated horticultural activities. Attribute 2 was object of horticultural activities, divided into three levels: fruit crops, vegetable crops, and floricultural crops. Attribute 3 was activity type, divided into three levels: big and small group, free choice, and outdoor play. Attribute 4 was place for horticultural activities, and divided into two levels: indoors and outdoors. Attribute 5 was time for horticultural activities, divided into two levels: 30 minutes and 30–60 minutes. The orthogonal design was used to extract 20 profiles, after which we conducted a survey on 320 early childhood teachers and analyzed the valid responses from 257 teachers.

Results: The preference of early childhood teachers showed highest importance in object (29.1%), followed by activity type (23.2%), activity method (17.4%), time (16.1%), and place (14.2%) (Pearson's $R = .591$, $p = .008$). By level of each attribute, the importance was high in exclusive horticultural activities for activity method, big and small group for activity type, vegetable and floricultural crops for object, indoors for place, and 30 minutes for time.

Conclusion: The horticultural program preferred by early childhood teachers is comprised of big and small group activities using vegetable and floricultural crops, carried out indoors for 30 minutes as an exclusive class.

Keywords: attribute, big and small groups, vegetable crops

Introduction

According to the 'Revised Kindergarten Curriculum 2007' by the Ministry of Education, Science and Technology, the purpose of early childhood education leading the 21st century knowledge and information era is to 'cultivate Koreans that respect and care for people and nature' (Ministry of Education Science and Technology[MEST], 2007). With the awareness that 'nature is the source of education', the need for education in nature is also widely perceived by recent institutions of early childhood education (Lee, 2011).

Early childhood is the period in which the basis of all development areas is formed, and as the value system and attitudes formed in this period affect the life attitudes in the future, it is important to build up an upright character and sociality starting from early childhood, which increases interest in nature-friendly education in early childhood education settings (Kim, 2010).

Studies are actively conducted in Korea regarding nature-friendly education for preschoolers. It is found that an ecological program for early childhood helped preschoolers use their emotions, perceive and care for other people's

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emotions, control their feelings and impulse, and improve intelligence (Kang and Park, 2010), and playing in the forest was effective in improving scientific inquiry skills and life respect attitude of preschoolers (Lee and Choi, 2015). Children aged 5 showed improvement in community spirit, intimacy, sense of belonging and participation by playing in the forest (Jang and Chung, 2018), and playing in the forest had a positive effect on reducing daily stress of children aged 4-5 (Lee, 2014). There was also a study determining the reduction of preschoolers' stress after playing in the forest by examining the change in cortisol levels (Yun et al., 2019). Forest activities of preschoolers aged 5 had a significant effect on increasing positive vocabulary and decreasing negative vocabulary of preschoolers (Jang et al., 2019). There are also many other studies summarizing and analyzing findings on the effects of nature-friendly education related to preschoolers, such as a meta-analysis on the effect of preschoolers' forest activities (Cho et al., 2016) and a research trend analysis on forest activities for preschoolers (Kim et al., 2019).

Studies on horticultural activities of preschoolers are conducted in various ways in terms of children's emotional and intellectual aspect. Horticultural activities for preschoolers using green plants as a mediator improved sub-factors of their emotional intelligence with statistical significance, such as using self-emotion and perceiving and considering others' emotions (Jung et al., 2017), while also having a positive effect on improving preschoolers' emotional intelligence and reducing daily stress (Park and Huh, 2010). Horticultural activities also had effect in improving preschoolers' nature-friendly attitude toward the environment, scientific attitude and inquiry skills, and emotional intelligence (Jeong et al., 2009). Horticultural activities using a four-season ornamental rooftop garden showed a significant effect on preschoolers' intellectual development (Jeong et al., 2014). There are also studies determining the effects of horticultural activities by differentiating the objects used by preschoolers such as kindergarteners' preference of herbal plants (Shin et al., 2012). Horticultural activities of 4-year-old children using colored food vegetables helped children more naturally respond to the colors of the vegetables and fruits than the control group and reduced the tendency to avoid eating vegetables (Son et al., 2015).

Furthermore, there are studies applying horticultural activities in combination with other fields. As a result of implementing an integrated art and horticulture program for preschoolers with physical disabilities, there was a statistically significant difference in improvement of interpersonal relations (Kim, 2015). A meta-analysis on the experimental effects of horticultural programs in the master's and doctoral dissertations in Korea conducted on kindergarteners to high school students showed that the programs relatively had a positive effect, which was especially high in the cognitive function of kindergarteners (Lee and Jeong, 2018). As such, various studies are testing the effects of preschoolers' horticultural activities.

Meanwhile, as a result of analyzing the frequency and content of horticultural activities using 696 activities in 11 teacher's guidebooks for the 5-year-old Nuri Curriculum, it was found that the activities were concentrated on certain life topics mediated by video clips and photos and images of plants rather than real ones based on science, or merely talking indoors in big and small groups, which shows the lack of horticultural activities in the regular curriculum for early childhood (Choi et al., 2020). As suggested by the report that preservice early childhood teachers could overcome the difficulties as a teacher and gain confidence by developing and teaching the 'Forest Character Program' in association with a daycare center that is an institution of industry-education cooperation (Kang, 2016), horticultural activities perceived and experienced by early childhood teachers are important, but there is insufficient research on activities preferred by early childhood teachers.

Therefore, this study sets the attributes and levels of horticultural activities and extracts profiles through the orthogonal design of conjoint analysis. After conducting a survey on kindergarten and daycare center teachers with the profiles, a conjoint analysis is conducted on the results by attribute and level, comprehensively analyzing the preference in horticultural activities. The results are used to determine the early childhood teachers' perception and preference in horticultural activities, thereby providing basic data to implement a horticultural program in the regular curriculum of preschoolers.

Research Methods

Questionnaire design

Conjoint analysis is a typical method used to analyze consumer utility in marketing, predicting the product that will be chosen by the customer by estimating the utility given to each attribute of the product. Conjoint analysis was developed in mathematical psychology and generally refers to the method of mathematically analyzing consumer preferences for multi-attribute stimuli formed by experimental design (Ha, 2012). In conjoint analysis, the subject has a few important attributes, and each attribute is presumed to have a few levels or values. This study conducted a survey on early childhood teachers to implement horticultural activities in the regular curriculum for early childhood education based on the Nuri Curriculum. The survey was conducted online, and demographic characteristics of the subjects and key information of horticultural activities related to early childhood were set considering multiple levels of each attribute for conjoint analysis.

This study set five attributes of horticultural activities for conjoint analysis (Table 1). In the meta-analysis of research papers to verify the effect of horticultural therapy (Jang et al., 2010), the method of horticultural activities was set as growing plants, decorating plants and integrated activities. First, as the method of horticultural activities, growing and decorating plants based on the children's level

was set as the horticultural activity in Attribute 1, and integrated horticultural activities were selected as Level 2, which are activities that integrate other fields like music, art and science with horticultural activities. Attribute 2 is selected based on the types of activities presented in 696 individual activities in 11 teacher's guidebooks by topic in the 5-year-old Nuri Curriculum (Kim and Woo, 2014, Choi et al., 2020). Types of activities were divided into three levels: big and small group type in which children form groups for activities, free choice type in which children can choose the activity they want by giving them options so that they are provided with educationally meaningful activities, and outdoor play type in which they participate in activities outdoors. Attribute 3 was in three levels of fruit crops, vegetable crops, and floricultural crops as the subjects of horticultural activities. Attribute 4 selected two levels of indoors and outdoors as the venue for horticultural activities. Attribute 5 was in two levels of 30 minutes and 30-60 minutes as the time for horticultural activities.

Analyzing the importance of attributes and estimating part worth

There were total 72 cases ($2 \times 3 \times 3 \times 2 \times 2$) of profiles that can be presented according to five key attributes such as method, type, object, place, and time as well as the levels of each attribute in the survey, but evaluation is impossible in reality as it is too much pressure for the respondents to evaluate the preference of all these profiles. Therefore, to adequately reduce the number of stimuli, orthogonal design of SPSS statistical program was used to extract total 20 profiles including 4 profiles for verification (holdout) (Table 2). Profiles for verification are included to verify the validity of prediction by comparing the consistency with actually designed profiles (Heo, 2015).

The part-worth function model was applied to estimate the worth of the survey. The part-worth function model measures utility with the assumption that each attribute and level has individual part worth (Ha, 2012), and it was applied as each level of the attributes of horticultural activities can be presumed to have individual part worth (Fig. 1).

Table 1. Attribute and levels of horticultural activities for conjoint analysis

No.	Attribute	Levels
1	Activity method	Horticultural activity
		Integration horticultural activity
2	Activity topics	Large and small group
		Free selection
		Outside play
3	Object	Fruit crops
		Vegetable crops
		Floricultural crops
4	Place	Indoor
		Outdoor
5	Time	30 min.
		30-60 min.

Table 2. Profile properties of horticultural activities

Profile no.	Object ^z	Activity method ^y	Activity topics ^x	Place	Time(minute)	Profile status ^w
1	Fl	Ih	F	Outdoor	30~60	Design
2	Fr	H	F	Outdoor	30~60	Design
3	Ve	H	Ls	Outdoor	30~60	Design
4	Ve	H	F	Outdoor	30	Design
5	Fr	H	O	Outdoor	30	Design
6	Fr	Ih	O	Outdoor	30~60	Design
7	Ve	Ih	O	Indoor	30~60	Design
8	Fr	H	F	Indoor	30	Design
9	Fl	H	F	Indoor	30~60	Design
10	Fr	Ih	Ls	Indoor	30	Design
11	Fr	Ih	F	Indoor	30~60	Design
12	Fr	H	Ls	Indoor	30~60	Design
13	Ve	Ih	F	Indoor	30	Design
14	Fr	Ih	F	Outdoor	30	Design
15	Fl	Ih	Ls	Outdoor	30	Design
16	Fl	H	O	Indoor	30	Design
17	Ve	Ih	Ls	Indoor	30	Holdout
18	Ve	H	O	Indoor	30~60	Holdout
19	Ve	H	F	Outdoor	30~60	Holdout
20	Fl	Ih	F	Indoor	30	Holdout

^zFL = floricultural crops; Fr = fruit crops; Ve = vegetable crops.

^yIh = integration horticultural activity; H = horticultural activity.

^xF = free selection; Ls = large and small group; O = outside play.

^wDesign = profile extracted from orthogonal design; Holdout = profile for verification.

$$S_j = \sum_{p=1}^t f_p(y_{jp})$$

s_j : Preference for product j

f_p : Respondent's partial value function for attribute level y_{jp} of attribute p

y_{jp} : Attribute level of attribute p of product j

Fig. 1. Part-worth function model. Reprinted from “The validity of conjoint models with the attributes and their levels determined by the respondents”, by C.S. Ha, 2012, Doctoral dissertation, Kyung Hee University, Suwon, Korea, p. 16.

Survey and analytical procedures

The survey to implement horticultural activities in the regular early childhood curriculum based on the Nuri Curriculum was conducted on early childhood teachers on-line for 40 days from May 15 to June 25, 2020. 20 profiles were presented for the teachers to prioritize them based

on preference, scoring them 10-9 points if most preferred, 8-7 points if preferred, 6-5 points for neutral, 4-3 points for not preferred, and 2-1 points for least preferred. 257 subjects were used in the final analysis out of 320 respondents, excluding 45 with unclear or insincere responses. Conjoint analysis was conducted after statistical treatment according to the rules of the part-worth function model using IBM SPSS v.19.0 program. Correlation among the attributes was verified by Pearson's correlation coefficient.

Results and Discussions

Demographic characteristics

The demographic characteristics of the participants are as follows. 90 participants had 4 years or less experience

Table 3. Classification of survey respondents

Item	Type	N(%)	Total number(%)
Years of work experience	4 years or less	90 (35.02)	257 (100%)
	5-9 years	79 (30.74)	
	More than 10 years	85 (33.07)	
	Other ^z	3 (1.17)	
Educational level	Associated Degree	148 (57.59)	257 (100%)
	Bachelor's degree	77 (29.96)	
	Master Degree	21 (8.17)	
	Doctor Degree	5 (1.95)	
	Other ^y	6 (2.33)	
Program type	Public kindergarten	13 (5.06)	257 (100%)
	Private kindergarten	126 (49.03)	
	Child Care Center	118 (45.91)	
Teacher certificate	Level 1 Orthodox Teacher	124 (48.25)	257 (100%)
	Level 2 Orthodox teacher	132 (51.36)	
	Other ^z	1 (0.39)	
Class age	3 years	121 (47.08)	257 (100%)
	4 years	51 (19.84)	
	5 years	84 (32.68)	
	Other ^x	1 (0.39)	

Note. N = 257.

^zIntern teacher, ^yDuring one's bachelor's degree or a two-year college graduate, ^xIntegrated class of three to five years of age.

(35.02%), followed by 85 participants with 10 years or more experience (33.07%), 79 with 5-9 years of experience (30.74%), and 3 others (1.17%) (Table 3). Others included interns. 164 participants (63.81%) had at least 5 years of experience as a teacher, which suggests that they might have responded to the questionnaire with general awareness of horticultural activities. By education level, 148 participants graduated a 2-year or 3-year college (57.59%), followed by 77 participants who graduated a 4-year college (29.96%), 21 with a master's degree (8.17%), others (2.33%), and 5 with a doctoral degree (1.95%). Others included interns currently attending a 2-year or 4-year college. By type of workplace, 126 participants worked in a private kindergarten (49.03%), 118 in a daycare center (45.91%), and 13 in a public kindergarten (5.06%). For teaching certificate, 132 were certified as Teacher Level 2 (51.36%), 124 as Teacher Level 1 (48.25%), and 1 other (0.39%). Other included an intern teacher who does not have a teaching certificate yet. By class age, 121 participants were teaching

the 3-year-old class (47.08%), 84 teaching the 5-year-old class (32.68%), 51 teaching the 4-year-old class (19.84%), and 1 other (0.39%). Other included the case in which the class was run as an integrated class for 3-year-olds and 4-year-olds.

Preference of early childhood teachers by attribute of horticultural activities

The survey respondents were to choose the activity with highest utility calculated as the sum of part worth by attribute level of each profile selected including the profiles for verification (maximum utility rule) (Heo, 2015). Preference of early childhood teachers by attribute of horticultural activities statistically treated according to the part-worth function model is as shown in Table 4. As a result of analyzing preference of early childhood teachers by attribute of horticultural activities, it was found that importance by attribute was object 29.1%, activity type 23.2%, activity method 17.4%, time 16.1%, and place 14.2% (Pearson's $R = .591$,

Table 4. Preference of horticultural activities for kindergarten teachers.

Attribute	Levels	Part utility ^z	Importance(%) ^y	Pearson's R (<i>p</i>)
Activity method	Horticultural activity	.076	17.4	.591 (.008)
	Integration horticultural activity	-.076		
Activity topics	Large and small group	.019	23.2	
	Free selection	-.008		
	Outside play	-.011		
Object	Fruit crops	.021	29.1	
	Vegetable crops	.156		
	Floricultural crops	-.177		
Place	Indoor	.010	14.2	
	Outdoor	-.010		
Time	30 min.	.079	16.1	
	30~60 min.	-.079		

^zEstimation of part utility by conjoint analysis, ^yEstimation of importance by conjoint analysis.

$p = .008$, Table 4). Early childhood teachers showed highest importance in what object is used in horticultural activities among fruits, vegetables and flowers, which indicates that, in designing a horticultural program, it is necessary to first consider selecting the object of horticultural activities, and then consider activity type such as big and small group, free choice, or outdoor play. Preference by level for objects was vegetable crops (part utility[Pu] = .156), fruit crops (Pu = .21), and floricultural crops (Pu = -.177), indicating that the participants preferred vegetable crops most. This study classified herbal plants as horticultural plants. According to Shin et al. (2012), kindergarteners that participated in horticultural activities using herbal plants most preferred growing herbs in pots, followed by making herbal ice cream. It seems it would be desirable to use plants that are ornamental and edible like herbal plants. Preference for place of horticultural activities (14.2%) showed the lowest importance among the attributes, proving that the venue (whether indoors or outdoors) is not a top-priority factor to consider in proposing a horticultural program for preschoolers. As for preference by level of each attribute, the teachers preferred big and small groups for type of activities, and vegetable crops for object of activities. They also preferred indoors for place, and 30 minutes for time.

Preference in horticultural activities according to career experience of early childhood teachers

As a result of analyzing preference by attribute of horticultural activities according to career experience of early childhood teachers, it was found that teachers with 4 years or less experience showed highest importance in object (26.04%), followed by time (25.01%), activity method (21.33%), place (18.75%), and activity type (8.87%) (Table 5). Those with 5-9 years of experience showed highest importance in object (44.25%), followed by time (26.12%), activity method (17.38%), place (10.42%), and activity type (4.98%). Those with at least 10 years of experience showed highest importance in object (51.98%), followed by activity method (22.85%), time (3.91%), place (6.28%), and activity type (4.98%). Others showed highest importance in object (49.12%), followed by place (29.83%), activity type (10.53%) activity method (5.26%), and time (5.26%). The importance was high in object regardless of career experience, and the percentage was 51.98% for at least 10 years of experience, 44.25% for 5-9 years, and 26.04% for less than 4 years, indicating that teachers with more career experience tended to think that selection of the object is more important for preschoolers' horticultural activities than activity method, type, place, and time. Early childhood teachers with much career experience are also experienced with big and small group activities, free choice activities and

Table 5. Preference of horticultural activities according to the career of kindergarten teachers

Attribute	Levels	Career of kindergarten teachers									
		4 years or less (n = 90)		5-9 years (n = 79)		More than 10 years (n = 85)		Other (n = 3)		Total (n = 257)	
		Pu	I (%)	Pu	I (%)	Pu	I (%)	Pu	I (%)	Pu	I (%)
Activity method	Horticultural activity	.0569		.0752		.1015		-.0625		.0759	
	Integration horticultural activity	-.0569	21.33	-.0752	17.38	-.1015	22.85	.0625	5.26	-.0759	21.92
Activity topics	Large and small group	.0269		.0063		.0172		.1667		.0190	
	Free selection	-.0204	8.87	-.0095	1.83	.0098	4.98	.0833	10.53	-.0078	4.36
	Outside play	-.0065		.0032		-.0270		-.0833		-.0112	
Object	Fruit crops	.0204		-.0348		.0804		-.1389		.0214	
	Vegetable crops	.0593	26.04	.2089	44.25	.1907	51.98	.6528	49.12	.1556	48.02
	Floricultural crops	-.0796		-.1741		-.2711		-.5139		-.1770	
Place	Indoor	-.0500		.0451		.0279		.3542		.0097	
	Outdoor	.0500	18.75	-.0451	10.42	-.0279	6.28	-.3542	29.83	-.0097	2.80
Time	30 min.	.0667		.1131		.0618		.0625		.0793	
	30~60 min.	-.0667	25.01	-.1131	26.12	-.0618	13.91	-.0625	5.26	-.0793	22.90

Note. Pu = part utility, estimation of part utility by conjoint analysis; I = importance, estimation of importance by conjoint analysis.

outdoor play that are commonly carried out in kindergartens, which is why the importance is measured low, whereas objects such as fruits, vegetables and flowers are considered important in horticultural activities and may change preschoolers' activities significantly, thereby giving highest importance to object. Importance was highest in object regardless of career experience of early childhood teachers, indicating that they consider object most important in choosing horticultural activities. Moreover, by level of fruits, vegetables and flowers, all of the teachers with 4 years or less experience (Pu = .0593), 5-9 years (Pu = .2089), 10 years or more (Pu = .1907), and others (Pu = .6528) showed higher preference for vegetable crops than fruit and floricultural crops. As a result of analyzing the current state of horticultural education and perception of early childhood teachers, it was found that teachers most preferred edible plants (62.8%), followed by arbors and shrubs (10.5%), and flowering plants (9.3%) (Chi et al., 2018), which is similar to the result that preference and importance of vegetable crops, which are edible herbaceous plants, turned out to be high.

Preference in horticultural activities according to education level of early childhood teachers

As a result of analyzing preference by attribute of horticultural activities according to education level of early childhood teachers, it was found that teachers who graduated a 2 or 3-year college showed highest preference for object (29.36%), followed by time (28.47%), activity type (23.48%), activity method (16.73%), and place (1.96%) (Table 6). Those who graduated a 4-year college showed highest preference for object (50.40%), followed by activity type (26.75%), activity method (12.39%), time (9.70%), and place (0.76%). Those with a master's degree showed highest preference for object (51.66%), followed by activity method (31.27%), place (9.47%), activity type (4.75%), and time (2.85%). Those with a doctoral degree showed highest preference for object (32.43%), followed by activity method (22.52%), place (20.72%), activity type (19.82%), and time (4.50%). Others showed highest preference for activity type (32.56%), followed by object (26.75%), place (19.77%), time (17.45%), and activity method (3.48%). All the teachers who graduated a 2 or 3-year college, a 4-year college, have a master's or doctoral degree except 'others' showed highest importance in object. By level, those who graduated a 2 or 3-year college, a 4-year college, have a

Table 6. Preference of horticultural activities according to the educational background of kindergarten teachers

Attribute	Levels	Educational background of kindergarten teachers											
		2-3 year univ. (n = 148)		4 year univ. (n = 77)		Master Degree (n = 21)		Doctor Degree (n = 5)		Other (n = 6)		Total (n = 257)	
		Pu	I (%)	Pu	I (%)	Pu	I (%)	Pu	I (%)	Pu	I (%)	Pu	I (%)
Activity method	Horticultural activity	.0650	16.73	.0519	12.39	.1964	31.27	.3125	22.52	.0312	3.48	.0759	21.92
	Integration horticultural activity	-.0650		-.0519		-.1964		-.3125		-.0312		-.0759	
Activity topics	Large and small group	.0929		-.0979		-.0298		.2500		-.3264		.0190	
	Free selection	-.0034	23.48	-.0281	26.75	.0000	4.75	.0500	19.82	.0694	32.56	-.0078	4.36
	Outside play	-.0895		.1261		.0298		-.3000		.2569		-.0112	
	Fruit crops	-.0225		.0346		.2381		.0167		.1806		.0214	
Object	Vegetable crops	.1253	29.36	.1937	50.40	.1726	51.66	.4417	32.43	.1181	26.75	.1556	48.02
	Floricultural crops	-.1028		-.2284		-.4107		-.4583		-.2986		-.1770	
Place	Indoor	.0076	1.96	-.0032	0.76	.0595	9.47	.2875	20.72	-.1771	19.77	.0097	2.80
	Outdoor	-.0076		.0032		-.0595		-.2875		.1771		-.0097	
Time	30 min.	.1106	28.47	.0406	9.70	-.0179	2.85	.0625	4.50	.1563	17.45	.0793	22.90
	30~60 min.	-.1106		-.0406		.0179		-.0625		-.1563		-.0793	

Note. Pu = part utility, estimation of part utility by conjoint analysis; I = importance, estimation of importance by conjoint analysis.

doctoral degree preferred vegetable crops, while those who have a master's degree preferred fruit crops. As for activity method, teachers in all education levels preferred exclusive horticultural activities to integrated activities. As a result of analyzing the current state of horticultural education for preschoolers and perception of teachers, it was found that at least a majority of institutions for early childhood education preferred to integrate horticultural education with science or other subjects rather than providing it separately on its own (Chi et. al., 2018), which is different from the result of this study. In this study, teachers preferred to have horticultural activities separately as a single class, which is due to the improved awareness and importance of horticultural activities. All the teachers turned out to prefer exclusive horticultural activities: 2 or 3-year college (Pu = .0650), 4-year college (Pu = .0519), master's degree (Pu = .1964), and doctoral degree (Pu = .3125). This shows that teachers with a master's degree and doctoral degree more prefer exclusive horticultural activities than those who graduated a 2 or 3-year college and a 4-year college, showing a difference depending on education level. As for time, teachers with a master's degree preferred 30-60 minutes, while those who graduated a 2 or 3-year college and a 4-year college, those with a doctoral degree, and others preferred 30 mi-

nutes, showing a difference depending on education level.

Preference in horticultural activities according to workplace of early childhood teachers

The Nuri Curriculum is a national-level curriculum comprised of five key areas such as physical exercise/health, communication, social relationship, artistic experience, and nature exploration, designed to promote basic abilities and upright character necessary for 5-year-old children (MEST, 2012). Currently, both kindergartens and daycare centers are adopting the Nuri Curriculum as a regular curriculum. As a result of analyzing preference by attribute of horticultural activities according to workplace of early childhood teachers, it was found that public kindergarten teachers showed highest importance in activity method (35.83%), followed by time (19.17%), activity type (17.50%), place (14.16%), and object (13.33%) (Table 7). Private kindergarten teachers showed highest importance in object (35.39%), followed by time (28.21%), activity method (17.87%), activity type (15.70%), and place (2.83%). As a result of examining the importance perceived by daycare center teachers, they showed highest importance in object (53.44%), followed by time (20.64%), activity method (18.58%), place (4.59%), and activity type (2.75%). All of public kindergarten, pri-

Table 7. Preference of horticulture activities according to the type of kindergarten

Attribute	Levels	Type of kindergarten							
		Public kindergarten (n = 13)		Private kindergarten (n = 126)		Child Care Center (n = 118)		Total (n = 257)	
		Pu	I (%)	Pu	I (%)	Pu	I (%)	Pu	I (%)
Activity method	Horticultural activity	.2067		.0531		.0858		.0759	
	Integration horticultural activity	-.2067	35.83	-.0531	17.87	-.0858	18.58	-.0759	21.92
Activity topics	Large and small group	-.0353		.0450		-.0028		.0190	
	Free selection	-.0833	17.50	.0033	15.70	-.0113	2.75	-.0078	4.36
	Outside play	.1186		-.0483		.0141		-.0112	
Object	Fruit crops	.0833		-.0245		.0636		.0214	
	Vegetable crops	-.0128	13.33	.1174	35.39	.2150	53.44	.1556	48.02
	Floricultural crops	-.0705		-.0929		-.2786		-.1770	
Place	Indoor	.0817		-.0084		.0212		.0097	
	Outdoor	-.0817	14.16	.0084	2.83	-.0212	4.59	-.0097	2.80
Time	30 min.	-.1106		.0838		.0953		.0793	
	30~60 min.	.1106	19.17	-.0838	28.21	-.0953	20.64	-.0793	22.90

Note. Pu = part utility, estimation of part utility by conjoint analysis; I = importance, estimation of importance by conjoint analysis.

vate kindergarten, and daycare center teachers preferred exclusive horticultural activities, which is the same case as career experience and education level of the teachers and is related to the increase in the awareness and interest for horticultural activities. However, an additional survey must be conducted to verify the specific reasons. There was no consistency in preference for activity type, object, place, and time among public kindergarten, private kindergarten, and daycare center teachers.

Preference in horticultural activities according to certificate of early childhood teachers

If one has a Teacher Level 2 certificate and at least 3 years of field experience, he or she is qualified to receive Teacher Level 1 training, after which he or she is promoted to Teacher Level 1 (Im and Lee, 2011). As a result of analyzing preference in horticultural activities according to certificate, it was found that Teacher Level 1 showed highest importance in object (46.16%), followed by activity method (31.03%), time (21.73%), place (8.15%), and activity type (2.94%) (Table 8). Teacher Level 2 showed highest importance in object (45.09%), followed by time (20.78%), activity method (19.49%), activity type (9.34%), and place (5.31%). Both Teacher Level 1 and Teacher Level 2 con-

sidered object as the most important attribute. By level, the preference was highest for vegetable crops. As for the second-highest preference, Teacher Level 1 preferred activity type, and Teacher Level 2 preferred time, showing a difference between the two.

Preference in horticultural activities according to the age of children in class

As a result of analyzing preference of horticultural activities according to the age of children in class which the teachers are in charge of, it was found that the teachers in charge of a 3-year-old class showed highest importance in object (38.83%), followed by activity method (27.56%), place (12.57%), time (12.35%), and activity type (8.66%) (Table 9). Those in charge of a 4-year-old class showed highest importance in time (50.37%), followed by place (20.31%), activity type (8.27%), and activity method (1.50%). Those in charge of a 5-year-old class showed highest importance in object (65.53%), followed by time (16.59%), activity method (9.94%), place (6.15%), and activity type (3.79%). For time, all of the teachers in charge of a 3-year-old class, 4-year-old class, and 5-year-old class preferred 30 minutes. This is a result of considering the time in which preschoolers can concentrate.

Table 8. Preference of horticultural activities according to kindergarten teacher's certificate

Attribute	Levels	Teacher's certificate							
		Level 1		Level 2		Other		Total	
		Orthodox Teacher (n = 124)		Orthodox teacher (n = 132)		(n = 1)		(n = 257)	
		Pu	I (%)	Pu	I (%)	Pu	I (%)	Pu	I (%)
Activity method	Horticultural activity	.0937		.0573		.3125		.0759	
	Integration horticultural activity	-.0937	31.03	-.0573	19.49	-.3125	17.86	-.0759	17.11
Activity topics	Large and small group	-.0007		.0303		.9583		.0190	
	Free selection	.0134	2.94	-.0246	9.34	-.4167	42.86	-.0078	3.40
	Outside play	-.0128		-.0057		-.5417		-.0112	
Object	Fruit crops	-.0054		.0448		.2500		.2500	
	Vegetable crops	.2083	46.16	.1102	45.09	-.3750	17.86	.1556	48.14
	Floricultural crops	-.2030		-.1550		.1250		-.1770	
Place	Indoor	.0363		-.0156		.0625		.0097	
	Outdoor	-.0363	8.15	.0156	5.31	-.0625	3.57	-.0097	2.19
Time	30 min.	.0968		.0611		.3125		.1793	
	30~60 min.	-.0968	21.73	-.0611	20.78	-.3125	17.86	-.0793	29.15

Note. Pu = part utility, estimation of part utility by conjoint analysis; I = importance, estimation of importance by conjoint analysis.

Table 9. Preference of horticulture activities by kindergarten teachers according to age of kindergarten students in charge

Attribute	Levels	Age of kindergarteners									
		3 years		4 years		5 years		Other		Total	
		(n = 121)		(n = 51)		(n = 84)		(n = 1)		(n = 257)	
		Pu	I (%)	Pu	I (%)	Pu	I (%)	Pu	I (%)	Pu	I (%)
Activity method	Horticultural activity	.1348		.0049		.0312		.3125		.0759	
	Integration horticultural activity	-.1348	27.56	-.0049	1.50	-.0312	9.94	-.3012	17.59	-.0759	21.92
Activity topics	Large and small group	.0530		-.0310		-.0109		.9583		.0190	
	Free selection	-.0213	8.66	.0229	8.27	-.0020	3.79	-.4167	43.00	-.0078	4.36
	Outside play	-.0317		.0082		.0129		-.5417		-.0112	
Object	Fruit crops	.0324		-.0359		.0377		.2500		.0214	
	Vegetable crops	.1739	38.86	.0817	19.56	.1806	65.53	-.3750	17.91	.1556	48.02
	Floricultural crops	-.2063		-.0458		-.2183		.1250		-.1770	
Place	Indoor	.0615		-.0662		-.0193		.0625		.0097	
	Outdoor	-.0615	12.57	.0662	20.31	.0193	6.15	-.0625	3.58	-.0097	2.80
Time	30 min.	.0604		.1642		.0521		.3125		.0793	
	30~60 min.	-.0604	12.35	-.1642	50.37	-.0521	16.59	-.3125	17.91	-.0793	22.90

Note. Pu = part utility, estimation of part utility by conjoint analysis; I = importance, estimation of importance by conjoint analysis.

Conclusion

Most studies analyzed the current state of horticultural education for preschoolers and the perception of teachers by deriving survey items and analyzing the responses pro-

vided by the respondents, but this study examined and analyzed the preference of early childhood teachers in horticultural activities through conjoint analysis. Conjoint analysis is a typical method used to analyze consumer utility in marketing, predicting the product that will be chosen by

the customer by estimating the utility given to each attribute of the product. There are other cases in which conjoint analysis is used aside from marketing, such as measuring the economic value of improving accuracy of the weather system and forecasting model, and studying the selection factors for global cold chain transport route using conjoint analysis. This study revised the attributes according to the level of preschoolers based on the importance of horticultural activities presented by previous studies, thereby extracting five attributes and selecting the levels for each attribute. Attribute 1 is method of horticultural activities, divided into two levels: exclusive horticultural activities and integrated horticultural activities. Attribute 2 is object of horticultural activities, divided into three levels: fruit crops, vegetable crops, and floricultural crops. Attribute 3 is activity type, divided into three levels presented in the analysis of horticultural activities in the 5-year-old Nuri Curriculum teacher's guidebook: big and small group, free choice, and outdoor play. Attribute 4 is place of activities, divided into two levels: indoors and outdoors. Attribute 5 is time for activities, divided into two levels: 30 minutes and 30-60 minutes. The orthogonal design was used to extract 20 profiles, after which we conducted a survey on 320 early childhood teachers and analyzed the valid responses from 257 teachers.

The preference of early childhood teachers showed highest importance in object (29.1%), followed by activity type (23.2%), activity method (17.4%), time (16.1%), and place (14.2%) (Pearson's $R = .591$, $p = .008$, Table, 4). By level of each attribute, the importance was high in exclusive horticultural activities for activity method, big and small group for activity type, vegetable and floricultural crops for object, indoors for place, and 30 minutes for time. In sum, the horticultural program preferred by early childhood teachers is comprised of big and small group activities using vegetable and floricultural crops, carried out indoors for 30 minutes as an exclusive class.

This study has significance in that, first, it has examined and analyzed the preference of early childhood teachers in horticultural activities using conjoint analysis. We could determine the attributes and levels preferred by early childhood teachers in horticultural activities by setting the attributes and levels of activities and conducting a survey based

on conjoint analysis. Second, the results can be used as the basic data for developing a horticultural program, which is insufficient in the Nuri Curriculum that is a regular curriculum for preschoolers. Further research must be conducted to develop a horticultural program based on the Nuri Curriculum using the results of this study and validate the program with preschoolers at an actual institution for early childhood education.

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