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# A STUDY OF THE IMPACT OF HORTICULTURAL ACTIVITIES ON PRIMARY SCHOOL CHILDREN'S SELF-CONCEPT, WELL-BEING AND EFFECTIVENESS

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## Introduction

### *Horticultural Activities*

Horticulture is defined by the "Oxford Advanced Learner's Dictionary" as "the study or practice of growing flowers, fruit and vegetables." In the 1980s, scholars proposed human issues in horticulture (HIH), which aimed to examine the interaction between human beings and plants (Relf, 1992a; Relf & Lohr, 2003). Relf (1992b) defined the interaction as "human beings' physical, psychological or social reaction after active or passive interaction with plants." The scope of HIH is extremely broad, and includes the effect of plants on health, horticultural therapy and the therapeutic environment, environmental governance and environmental education. Subjects related to HIH include psychology, environmental psychology, social science, medical science, etc. (Rappe, 2005). Regarding education, studies related to HIH have demonstrated that, in the natural environment, students learn to promote themselves, solve conflicts, share, cooperate and negotiate with each other (McCurdy, Winterbottom, Mehta & Roberts, 2010). The learning goals of horticultural activities usually refer to the promotion of health, the correction of negative behavior, the reinforcement of confidence, the improvement of social skills, etc. (Klemmer, C.D., Waliczek, M.T., & Zajicek, M.J., 2005; Lohr & Pearson-Mims, 2005). The contribution of horticulture has been demonstrated in education. In addition, the physical and psychological effectiveness is prominent. Horticultural therapy fulfills specific therapeutic goals set by professional horticultural therapists, focusing on cases and using plants and horticultural activities (Haubenhofer, D.K., Elings, M., Hassink, J., & Hine, R.E., 2010). Through the engagement in horticulture, users can actually see, touch, smell and even eat the products. In doing so, the significance of existence. An appropriate level of sweat and hard work is physically healthy.

**Abstract.** *This study adopts both quantitative and qualitative methods. There are 23 subjects in the experimental group and the control group. The experimental group received the "Green Giant Growth Group" test once a week for a total of 7 times. The measurement tools were scale of self-concept, Chinese well-being and horticultural effectiveness. With respect to data analysis, the researcher adopted descriptive statistics and analysis of covariance. Feedback and interviews were included in the qualitative analysis. According to the findings of this study, horticultural activities can enhance students' self-concept, sense of control, self-satisfaction, sense of achievement and social skills. Based on the results of interviews, by participating in horticultural activities, students increase their interpersonal relationship skills. Their behaviors match social norms, and they are more responsible, open-minded and peaceful. In line with previous research findings, this study proposes suggestions for future researchers to apply horticultural activities in education or guidance.*

**Keywords:** *horticultural activities, horticultural effectiveness, horticultural therapy, self-concept, well-being.*

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After the activity, there are harvests, which can lead to a sense of achievement. It takes time from cultivation to the maturity of young sprouts, and the passage of time creates expectations concerning the life of the plants. It is the characteristic of horticultural therapy (Chen, Y.R., Xie, X.Q., Shi, F.L., & Lee, L.Y., 2010). American Horticultural Therapy Association[AHTA] (2013) has suggested that horticultural therapy can reinforce memory, responsibility, physical balance, problem-solving ability, etc. It can be practiced by people of all ages, backgrounds and abilities.

In this study, by horticultural practice, students experience nature, approach plants and cultivate quality to develop a more positive attitude toward life.

#### *Self-Concept, Well-Being and Horticultural Effectiveness*

Self-concept means that, in the interaction with others, through self-awareness (e.g., personality, appearance, capacity, interest and emotion) and various kinds of learning and experience in life and interaction, people form the evaluation of and views on personal concept and behavior (Mead, 1962). Byrne (1984) suggested that self-concept includes personal attributes, emotion, attitude and behavior. It has many dimensions, and it changes with individuals' growth, socialization and interaction with others. Byrne (1988) suggested that social comparison is critical in self-concept development. Students tend to treat their classmates as control group to form their own self-concept. Human beings are social animals, and they value relationships. When individuals have a high degree of social interest, they will be psychologically healthier (Sweeney, 2009). Horticultural therapy is considered a successful method. Horticultural activities create a non-threatening environment, and they emphasize relaxing work content. Furthermore, they are practiced in a social community (Haubenhofner, et al., 2010).

Well-being is translated as happiness. In academia, the most commonly cited definition is proposed by Andrew and Withey (1976), that is, well-being was the overall evaluation of satisfaction with life and the intensity of positive and negative emotions perceived. The definition indicates a relationship between individuals' subjective cognition and well-being and the effect of emotion on well-being (Lu, 1997). Studies on well-being with respect to HIH mainly refer to health factors, including the objective measurement of the effects on health or the subjective perception of quality of life (Park, S., Mattson, R.H., & Kim, E., 2004). According to the World Health Organization[WHO] (2011), "mental health is defined as a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community."

Kuo (2010) classified the effectiveness of horticultural therapy into five categories: physical fitness (physically), positive emotions (physiologically), clear mind and consciousness (cognitively), having "good friends" (socially) and economically free (economically). Common advantages refer to physical rehabilitation, the release of pressure and anxiety, the enhancement of confidence and self-esteem, responsibility, a sense of achievement, self-control, social capacity, dementia and the cultivation of horticultural skills.

#### *Studies Related to Horticultural Activities, Self-Concept, Well-Being and Horticultural Effectiveness*

The researchers reorganize the studies on effectiveness of horticultural activities on self-concept. Kuo (2011) used 30 grade 4 and grade 5 students as subjects and practiced horticultural activities on Wednesdays for 12 weeks. The content included growing cabbages, sunflowers, making salads and designing and potting. In each unit, different questionnaires were adopted for pretest and posttest. Two weeks before the end of the activities, questionnaires were sent to parents to examine the children's behavioral changes. According to the findings, students' imagination, creativity, team work and confidence were considerably reinforced. A total of 64% of parents suggested that the children made higher grades of in nature during the semester; 60% of parents found that their children were happier; and 56% of parents suggested that their children became more confident.

Robinson and Zajicek (2005) studied the relation between horticulture and self-esteem and used 281 U.S. students in Texas as subjects. After the experimental group (190 subjects) participated in 1 year of horticultural activities, they had significant differences from the control group (91 subjects) and they made significant progress in team cooperation and self-understanding.

Laaksoharju, Rappe, and Kaivola (2012) used 130 seven- to twelve year-old children in Helsinki, Finland, from 2008 to 2010 as subjects and recorded 37 four hour sessions of horticultural summer camp activities using a by qualitative method. The researchers demonstrated that, through horticulture, children could learn social skills and work ethic and establish friendship, affection and confidence.



Gatto, Ventura, Cook, Gyllenhammer, and Davis (2012) used 104 grade 4 and grade 5 students as subjects (34 subjects in the experimental group and 70 subjects in the control group) for horticultural activities that were held 90 minutes each week for a total of 12 weeks. Before and after the activities, the researchers tested motivation for healthy diet and self-efficacy and demonstrated that the two groups had a significant difference in motivation for healthy diet. Although they did not have significant difference in self-efficacy, the experimental group made progress in the posttest by 3.3 points, in comparison to pretest. The control group only increased by 0.4 points.

Chen, Lou, and Shih (2013) used 31 grade 3 students as subjects in a 15-week study. A horticultural course was taught, last 80 minutes every week. In a 40-minute weekly computer course, a PowerPoint of the horticultural activities was created. One week before and after the activities, the subjects were tested on a scale of attitude toward life. The researchers found participants' that participants' relationships with themselves, with others, with the environment and with nature were significantly reinforced. The participants recognized their advantages and became more responsible. They had more harmonious interpersonal relationships and loved animals and plants more.

Collins and O'Callaghan (2008) used 18 low-income elderly people with an average age as 85.17 as a study involving subjects for horticultural activities that were held 2 hours a week for a total of 4 weeks. The researchers conducted pretests and posttests measuring self-rated happiness, and the results showed a significant difference.

Kam and Siu (2010) randomly allocated 22 patients with mental illness to an experimental group and a control group. The experimental group (10 subjects) participated in 10 sessions of horticultural therapy activity over 2 weeks. The control group (12 subjects) received training in workshops traditionally performed in mental health facilities. The pretest and posttest were conducted using the Depression Anxiety Stress Scale (DASS) and Personal Wellbeing Index (PWI-C). The findings showed that the two groups had significant difference in DASS, meaning that horticultural activity can effectively lower anxiety, depression and stress. Although the two groups did not show significant differences on the PWI-C, in interviews, participants suggested that the activity helped them release stress, improve social skills, be respected and enhance confidence.

According to the previous studies, participants have confidence in participating and enjoy horticultural activities.

### *Research Focus*

Based on the literature review, the purposes of the present study are as follows:

1. To examine the effect of horticultural activities on elementary school students' self-concept;
2. To examine the effect of horticultural activities on elementary school students' well-being;
3. To examine the effectiveness of horticultural activities on elementary school students;
4. To examine elementary school students' motives, feelings and change of participation in the "Green Giant Growth Group".

## **Methodology of Research**

### *Participants*

For the "Green Giant Growth Group", this study recruited Grade 3 to Grade 6 students in one primary school of Pingtung. Applications included parental' consent. After interviewing children to ascertain their motives for participation and their expectations, the researcher selected 23 students for the experimental group, including 6 grade 5 (4 males and 2 females), 11 grade 4 (5 males and 6 females) and 6 grade 3 (4 males and 2 females) children. The homeroom teachers for grades 3, 4 and 5 recommended 23 students as the control group, including 6 grade 5 (3 males and 3 females), 11 grade 4 (5 males and 6 females), 6 grade 3 (3 males and 3 females) children. The group leader was the third researcher in this study and graduated from the department of horticulture. The first researcher was responsible for participant recruitment, the distribution of horticultural materials, administration and undertook the roles of interviewer, observer and recorder. After the end of each group activity, he (she) discussed with the group leader and provided feedback and suggestion. Two researchers trained as horticultural therapists and are licensed.



### Research Design

This study adopted a pretest and posttest design, including the experimental group and the control group. The experiment was conducted Saturday mornings from 8:00 to 12:00 from April to June 2013. This study adopted self-concept, Chinese well-being and horticultural effectiveness scales as measurement tools. The pretest was conducted with the two groups one week before the group activity. After the activity, the posttest was conducted. After each activity, the experimental group completed a unit feedback form. After the last activity, the experimental group also completed a total feedback form. Before and after the group activity, the researcher conducted individual interviews with the experimental group to find the members' motives, feelings and thoughts on participation and changes as the qualitative data.

### Activity

The "Green Giant Growth Group" aims to lead to a sense of achievement by developing creativity through horticultural activities, enhance confidence and adaptation to life and allow the members to relax and enjoy learning. It also encourages participants to engage in physical activity, purify thoughts and recognize horticultural techniques and career options. The design of the activity is shown in Table 1. Activity content and works are shown in Figures 1-12.

**Table 1. Activity design of "Green Giant Growth Group".**

Week	Names of units	Activity content
1	Love of Taiwan	1. Introduction of the group; 2. Our agreement; 3. Bottle of five element energy; 4. Stage of seeds; 5. Sharing and feedback
2	Special Mothers' Day activity	1. Creative plant dye; 2. Potting of mother flowers; 3. Sharing and feedback
3	Potting and flower design	1. Potting design; 2. Flower design; 3. Sharing and feedback
4	Food of plants	1. Washing and eating Jelly Fig; 2. Growing and eating houseleeks; 3. Mushroom planting; 4. Sharing and feedback
5	Call from the green giant	1. Angels and Demons; 2. Green wind bells; 3. Sharing and feedback
6	Let's go out	1. Introduction of plants on campus; 2. Beauty of aluminum steel; 3. Sharing and feedback
7	Memory of herbs	1. I am a little green man; 2. Herbal party; 3. Sharing and feedback



**Figure 1. Bottle of five element energy**



**Figure 2. Stage of seeds**



**Figure 3. Creative plant dye**



**Figure 4. Potting of mother flowers**



**Figure 5. Potting design**



**Figure 6. Flower design**







**Figure 7. Washing and eating Jelly Fig**



**Figure 8. Growing and eating houseleeks**



**Figure 9. Angels and Demons**



**Figure 10. Green wind bells**



**Figure 11. Beauty of aluminum steel**



**Figure 12. I am a little green man**

**Figures 1-12: Activity content and works.**

#### *Instrument*

(1) Scale of self-concept. The "Scale of self-concept" by Yeh (2008) was adopted as the measurement tool of self-concept. The scale includes 17 items, and it is classified into "psychological self" (4 items), "family self" (5 items), "school self" (4 items) and "moral self" (4 items). The researcher adopted a 4-point Likert scale. Regarding reliability, Cronbach's  $\alpha$  of the factors of internal consistency are 0.71, 0.87, 0.87 and 0.66, and the  $\alpha$  of the total scale is 0.87.

(2) Scale of Chinese well-being (simplified version). The researcher adopted the "scale of Chinese well-being (simplified version)" designed by Lu and Shih (1997). The scale includes 9 dimensions: optimism (4 items), social commitment (1 item), positive affect (4 items), sense of control (2 items), physical fitness (1 item), satisfaction with self (3 items), achievement at work (1 item), downward social comparisons (1 item) and peace of mind (3 items). The scoring is based on a 4-point Likert scale. When the scores are higher, well-being is higher.

(3) Scale of horticultural effectiveness. The researcher adopted the "scale of horticultural effectiveness" designed by Yan-yu Lu and Yu-Jen Kuo. There are 7 items in the questionnaire, and the scoring is based on a 5-point Likert scale. When the scores are higher, the effectiveness of the horticultural therapy is higher. The Cronbach's  $\alpha$  of the scale is 0.72 ~ 0.83.

(4) Feedback form for unit activities and total feedback form. The researcher designed a "feedback form of unit activities" (10 items) that was filled in by group participants after finishing each activity. Items included: participants' feelings toward and learning in the activity, evaluation of the group leader and participants, and investigation of participants' satisfaction with the two activities of the week. The "total feedback form" was the total feedback of members toward activities for the last time. The two scales were based on a 4-point Likert scale.

(5) Interview outline of participants. The "interview outline of participants" designed by the researcher included three parts. "Before participation" items aimed to recognize the members' motives and expectation of group participation. "In participation" intends to ascertain the participants' performance, feelings and learning through the participation. "After participation" focuses on participants' changes after participating in the group.



### Data Analysis

Regarding quantitative methods, this study adopted a pretest and posttest experimental design. Using a single-factor analysis of covariance of the independent sample, it tests the significant difference of scores of the experimental group and the control group in pretest and posttest. Covariance is the score of the pretest. Cronbach's  $\alpha$  is set as 0.05 for analysis. This study adopted a simple effect test of two-factor analysis of covariance of the independent sample and analyzed the scores of the two groups in pretest and posttest with respect to the different genders and grades. The unit feedback form was completed by the experimental group after each activity and was treated by descriptive statistics. The total feedback form ascertains which activities were liked and disliked by participants, and it was analyzed by multiple choices. All quantitative data were calculated using SPSS (version 19.0, SPSS Inc., IBM Company, 2010).

Regarding qualitative methods, the 23 participants were encoded as 1~23, the feedback forms were represented as F-1~F-7 to show the 7 times that the group feedback form was completed. F-8 is the content of the total feedback form. It is the content of the interviews. For instance, 1F-3 means the content of the third group feedback form completed by Member 1. 8I is the interview with Participant 8. The observer's record of the 7 group activities is shown by R-1~R-7.

## Results of Research

### Effectiveness Analysis of Horticultural Activities on Self-Concept

Before the analysis of covariance, the researcher conducted an in-group test of the homogeneity of regression coefficient. The F value of "family self" is significant ( $F=8.278, p=0.006<0.05$ ), and it does not match the assumption of regression coefficient homogeneity. Hence, analysis of covariance was not adopted.

According to Table 2, after eliminating the effect of the pretest score, in posttest of "school self" and "moral self", the experimental group is significantly higher than the control group ( $F=4.556, p=0.039$ ;  $F=4.538, p=0.039$ ;  $<0.05$ ). However, in the posttest of total scale of "psychological self" and "self-concept", the two groups are not significantly different ( $F=3.860, p=0.056$ ;  $F=3.699, p=0.061$ ;  $>0.05$ ). Thus, horticultural activities significantly change students' "school self" and "moral self".

**Table 2. Analysis of covariance of the two groups' self-concept.**

Items	Group	Pretest		Posttest		Adjusted mean of posttest	F
		M	SD	M	SD		
Psychological self	Experimental group	3.36	0.50	3.54	0.43	3.51	3.860
	Control group	3.18	0.64	3.27	0.40		
School self	Experimental group	3.23	0.49	3.47	0.45	3.42	4.556*
	Control group	3.02	0.59	3.10	0.53		
Moral self	Experimental group	3.21	0.55	3.48	0.43	3.46	4.538*
	Control group	3.14	0.42	3.23	0.45		
Total scale of self-concept	Experimental group	3.37	0.33	3.48	0.29	3.45	3.699
	Control group	3.18	0.46	3.27	0.35		

*n.s. p>0.05; \*p<0.05*

According to Table 3, for the male group, the results of the experiment on the different groups are significantly different ( $F=5.098, p=0.035<0.05$ ). Males in the experimental group ( $M=3.57$ ) are significantly higher than the control group ( $M=3.17$ ). Regarding females, the experimental group and the control group do not show any significant difference.



**Table 3. Simple main effect analysis of gender and group in self-concept post-test.**

Source of variance	SS	df	MS	F	Significance	Post hoc Comparison
<b>Group</b>						
Males	0.316	1	0.316	5.098*	0.035	experimental group > control group
Females	0.006	1	0.006	0.120	0.733	--

*n.s. p>0.05; \*p<0.05*

According to Table 4, in the experimental group, learning results for the different grades are significantly different ( $F=4.180$ ,  $p=0.031 < 0.05$ ). The learning result of grade 4 ( $M=3.63$ ) is significantly higher than grade 3 ( $M=3.31$ ) and grade 5 ( $M=3.37$ ); in the control group, the different grades do not show any significant difference.

**Table 4. Simple main effect analysis in gender and group of self-concept post-test.**

Source of variance	SS	Df	MS	F	Significance	Post hoc Comparison
<b>Grade</b>						
Experimental group	0.485	2	0.242	4.180*	0.031	Grade 4>Grade 3 Grade 4>Grade 5
Control group	0.028	2	0.014	0.363	0.700	--

*n.s. p>0.05; \*p<0.05*

#### *Analysis of Effectiveness of Horticultural Activities on Well-Being*

Before analysis of covariance, the researcher conducted an in-group test of the homogeneity of regression coefficient. The F values of the total scale of "social commitment", "downward social comparisons" and "well-being" are significant ( $F=6.474$ ,  $p=0.015$ ;  $F=4.315$ ,  $p=0.044$ ;  $F=4.703$ ,  $p=0.036$ ;  $<0.05$ ). The results do not match the assumption of regression coefficient homogeneity. Analysis of covariance was not conducted.

According to Table 5, after eliminating the effect of the pretest score, in "sense of control" and "satisfaction with self" posttest, the experimental group is significantly higher than the control group ( $F=4.939$ ,  $p=0.032$ ;  $F=6.233$ ,  $p=0.016$ ;  $<0.05$ ). However, in posttest of "optimism", "positive affect", "physical fitness", "learning achievement" and "peace of mind", the two groups do not show any significant difference ( $F=2.406$ ,  $p=0.128$ ;  $F=3.525$ ,  $p=0.067$ ;  $F=0.039$ ,  $p=0.844$ ;  $F=0.002$ ,  $p=0.967$ ;  $F=0.456$ ,  $p=0.503$ ;  $>0.05$ ). Thus, horticultural activities significantly change students' "sense of control" and "satisfaction with self".

**Table 5. Analysis of covariance of two groups in well-being.**

Items	Groups	Pretest		Posttest		Adjusted mean of posttest	F
		M	SD	M	SD		
Optimism	Experimental group	3.32	0.71	3.40	0.62	3.33	2.406
	Control group	2.89	0.66	2.96	0.68	3.03	
Positive affect	Experimental group	3.25	0.56	3.38	0.47	3.27	3.528
	Control group	2.64	0.56	2.86	0.58	2.96	
Sense of control	Experimental group	3.11	0.71	3.22	0.70	3.09	4.939*
	Control group	2.48	0.73	2.57	0.51	2.70	
Physical fitness	Experimental group	3.26	0.86	3.04	0.71	2.93	.039
	Control group	2.77	0.75	2.78	0.67	2.89	



Items	Groups	Pretest		Posttest		Adjusted mean of posttest	F
		M	SD	M	SD		
Satisfaction with self	Experimental group	2.86	0.53	3.23	0.64	3.14	6.233*
	Control group	2.45	0.80	2.62	0.61		
Learning achievement	Experimental group	3.09	0.79	3.09	0.79	3.05	.002
	Control group	2.65	1.15	3.04	0.77		
Peace of mind	Experimental group	3.35	0.60	3.35	0.58	3.17	.456
	Control group	2.70	0.48	2.87	0.58		

*n.s. p>0.05; \*p<0.05*

According to Table 6, in the experimental group, the experimental effectiveness on males and females is significantly different ( $F=6.596$ ,  $p=0.018<0.05$ ). The learning result of males ( $M=3.48$ ) is significantly higher than females ( $M=3.05$ ); in the control group, gender does not show significant difference. For males, the effectiveness of horticultural activities is significantly different ( $F=7.815$ ,  $p=0.011<0.05$ ). In the experimental group, male ( $M=3.37$ ) participants are significantly higher than the control group ( $M=2.76$ ). Regarding females, the experimental group and the control group do not show significant difference.

**Table 6. Simple main effect analysis of gender and gender in well-being post-test.**

Source of variance	SS	Df	MS	F	Significance	Post hoc Comparison
<b>Gender</b>						
Experimental group	1.072	1	1.072	6.596*	0.018	Males >females
Control group	0.010	1	0.010	0.101	0.754	--
<b>Group</b>						
Males	1.277	1	1.277	7.815*	0.011	Experimental group >control group
Females	0.054	1	0.054	0.465	0.503	--

• *n.s. p>0.05; \*p<0.05*

#### *Effectiveness Analysis of Horticultural Activities*

Before analysis of covariance, the researcher conducted an in-group test of homogeneity of regression coefficient. The F value of "physical exercise" is significant ( $F=7.594$ ,  $p=0.009<0.05$ ). It does not match the assumption of regression coefficient homogeneity. Hence, analysis of covariance was not conducted.

According to Table 7, after eliminating the effect of the pretest score, in posttest of total scale of "sense of achievement", "social skills", "horticultural technique" and "horticultural effectiveness", the experimental group is significantly higher than the control group ( $F=4.445$ ,  $p=0.041$ ;  $F=4.218$ ,  $p=0.046$ ;  $F=10.742$ ,  $p=0.002$ ;  $F=4.600$ ,  $p=0.038$ ;  $<0.05$ ). However, the two groups do not show any significant difference in posttest of "interest and hobby", "relaxing emotion" and "clear consciousness" ( $F=3.352$ ,  $p=0.074$ ;  $F=1.115$ ,  $p=0.297$ ;  $F=1.471$ ,  $p=0.232$ ;  $>0.05$ ). Thus, horticultural activities significantly change students' "sense of achievement", "social skills", "horticultural technique" and "total effectiveness".





**Table 7. Analysis of covariance of two groups in horticultural effectiveness.**

Items	Group	Pretest		Posttest		Adjusted mean of posttest	F
		M	SD	M	SD		
Interest and hobby	Experimental group	4.35	0.83	4.52	0.59	4.47	3.352
	Control group	3.96	1.07	3.87	1.29	3.93	
Relaxing emotion	Experimental group	4.17	0.78	4.30	0.93	4.20	1.115
	Control group	3.74	1.05	3.83	0.94	3.93	
Sense of achievement	Experimental group	3.91	0.79	4.22	0.85	4.20	4.445*
	Control group	3.78	1.09	3.70	0.77	3.71	
Clear consciousness	Experimental group	3.74	0.92	4.00	1.09	3.88	1.471
	Control group	3.30	0.77	3.43	0.84	3.56	
Social skills	Experimental group	3.52	0.99	4.04	0.93	4.01	4.218*
	Control group	3.35	0.83	3.48	0.85	3.52	
Horticultural technique	Experimental group	3.91	1.24	4.35	0.83	4.27	10.742**
	Control group	2.87	1.01	3.22	1.00	3.30	
Total scale of well-being effectiveness	Experimental group	3.92	0.49	4.25	0.60	4.11	4.600*
	Control group	3.49	0.56	3.60	0.68	3.74	

*n.s. p>0.05; \*p<0.05; \*\*p<0.01*

According to Table 8, in the experimental group, the learning results of the different grades are significantly different ( $F=4.235$ ,  $p=0.030<0.05$ ). Grade 4 ( $M=4.57$ ) is significantly higher than grade 3 ( $M=3.92$ ) and grade 5 ( $M=3.99$ ); in the control group, the different grades do not show any significant difference. In grade 4, the experimental process is significantly different ( $F=6.160$ ,  $p<0.05$ ). The experimental group ( $M=4.38$ ) is significantly higher than the control group ( $M=3.72$ ). For grade 3 and grade 5, the experimental group and the control group do not show any significant difference.

**Table 8. Simple main effect analysis of grade and gender in horticultural effectiveness post-test.**

Source of variance	SS	df	MS	F	Significance	Post hoc Comparison
<b>Grade</b>						
Experimental group	2.192	2	1.096	4.235	0.030	Grade 4>Grade 3 Grade 4>Grade 5
Control group	0.417	2	0.209	0.914	0.418	--
<b>Group</b>						
Grade 3	0.750	1	0.750	3.437	0.097	--
Grade 4	1.748	1	1.748	6.160	0.023	Experimental group > control group
Grade 5	0.062	1	0.062	0.245	0.632	--

*n.s. p>.05; \*p<.05*



*Result Analysis of Interviews with Participants, Feedback Forms of Unit Activities and Total Feedback Forms*

(1) Participants' motives and expectations of group participation. Participants' **motives** for participating can be generalized as the following: 1. curiosity; 2. interest; 3. knowledge learning; 4. making friends; 5. return of materials. Participants' **expectations** were the following: 1. to learn knowledge or skills related to horticulture; 2. to understand the interesting things related plants; 3. to beautify the house; 4. to change emotion; 5. to participate in team work. The researcher asked, "Will horticultural therapy improve your shortage? Why?" The participants answered, "Yes". Their expected therapeutic effectiveness was the following: 1. to enhance concentration; 2. emotional control; 3. cultivation of responsibility.

(2) Participants' performance, feelings and learning of group participation. Participants' satisfaction with their **performance** in the group was as follows: 1. good work; 2. I performed well in class; 3. I could grow plants. Regarding dissatisfaction with performance: 1. I am talkative; 2. I do not follow the rules; 3. I do not concentrate in class; 4. I do not finish the work properly; 5. I cannot hear clearly. As to **feelings** of participation, participants' responses were the following: 1. enjoy; 2. warm; 3. happy. One student even said: "Too happy to describe it in words." No participants had negative feelings. The **learning** by participating in the group was the following: 1. learn horticultural knowledge and skills; 2. I learned artistic skill (potting, cloth dye, flower arrangement.....); 3. I made new friends; 4. My emotion was positive; 5. I learned team work; 6. My mathematics skills improved.

(3) Participants' changes after participating in the group. According to the participants, their changes after participating in the group can be generalized into interpersonal relationship, behavior and emotion. Regarding changes in interpersonal relationship: 1. I made more friends; 2. I shared with others; 3. I learned to control my emotions; 4. I learned to change ideas. Regarding behavioral change: 1. I treat plants properly; 2. I became willing to be helpful; 3. I become more responsible; 4. My behavior matches the norms. Regarding changes in emotion: 1. I am happier; 2. I have become tender and peaceful; 3. I have become more persistent and patient; 4. I have become more active and flexible; 5. My stress was reduced.

(4) Analysis of participants' satisfaction with horticultural activities. Reasons for students' enjoyment were the following: 1. It is fun and interesting; 2. I learn a lot. One student said: "A lot of reasons: It brings good luck, I can practice cloth dye, have beautiful flower arrangements, produce different forms and eat the food I have made." Reasons why they disliked the activities included: 1. It is boring and uninteresting; 2. It is difficult. Based on the above, participants enjoyed creative activities and did not prefer difficult activities that require knowledge because they are difficult and boring.

**Discussion***Discussion of the Effectiveness of Horticultural Activities on Self-Concept*

The present study suggests that horticultural activities significantly change students' "school self" and "moral self" dimensions of self-concept. Indicators of "school self" are the following: I get along well with classmates, I have good interpersonal relationships, I make friends with classmates and I have many good friends. According to interviews, in horticultural activities, the participants not only made friends but also shared horticulture with their classmates. They could also control and change emotions to improve interpersonal relationships. Apparently, in comparison to the control group, experimental group was more likely to enhance the "school self". Helping others in need is one of the indicators of the "moral self". According to the participants, after participating in horticultural therapy, they actively helped classmates and even showed green plants to their families to release anger. Thus, horticultural activities made participants actively help others and enhance the "moral self". The results support the content of interview.

Although the experimental group felt interested, enjoyed horticultural activities and experienced self-satisfaction, the control group was able to have similar feelings from other channels. Thus, the "psychological self" does not show any significant difference.

For males, the experimental group was significantly superior to control group. Thus, males in this study significantly reinforced "self-concept" by participating in horticultural activities. Grade 4 of the experimental group is significantly superior to grade 3 and grade 5. Based on observations, grade 4 actively participated in the activities, and their performance is higher than the other grades. The self-report questionnaire matches the observation results.



*Discussion of the Effectiveness of Horticultural Activities on Well-Being*

The present study demonstrates that horticultural activities significantly change students' "sense of control" and "satisfaction with self" dimensions of well-being. The indicators of "sense of control" are the following: it has a positive effect on my life, and I can finish my work in the planned time. According to the interviews, participants suggested that they were able to "construct the home for plants", they "grew plants properly" and, furthermore, helped others. They realize that their capacity in life is reinforced. By taking care of plants, they developed responsibility, they lower the amount of time they watch TV, completed assignments appropriately and arranged time properly. Therefore, in comparison to the control group, the experimental group experienced enhanced "sense of control". The indicators of "satisfaction with self" are the following. I am satisfied with things in life, I like myself and I find myself attractive. Based on the interviews, the researcher realized that, after joining in horticultural activities, participants became happier, tender and peaceful. With these changes, they were more satisfied with their current lives and with themselves. Regarding interpersonal relationships, they got along well with classmates, made more friends and their self-evaluation changed. They think that they are attractive.

Based on the research results, the dimensions of "optimism", "positive affect", "physical fitness", "learning achievement" and "peace of mind" are insignificant. The indicators of "optimism", "positive affect" and "peace of mind" are abstract and broad. They are not as concrete as sense of control and satisfaction with self. Although many participants in the experimental group indicated that horticultural activities reinforced their positive emotions, the control group might obtain different degrees of positive emotions in other situations because of their characteristics. They did not have any significant difference due to the experimental manipulation. "Physical fitness" and "learning achievement" are influenced by individual physical condition and intelligence, and they are not significantly different due to the horticultural activities.

The learning results of males in the experimental group are significantly higher than females. Regarding males, the experimental group is significantly superior to the control group. Based on observations of activity, males learn actively. This might be due to sampling error. However, this observation demonstrates that males' total "well-being" is significantly enhanced after joining in horticultural activities.

*Discussion of the Effectiveness of Horticultural Activities*

The present study demonstrates that horticultural activities significantly change students' "sense of achievement", "social skills", "horticultural technique" and total "horticultural effectiveness" dimensions. Regarding "sense of achievement", in the interview, students suggested that they learned horticulture knowledge and skills in the group; they created horticultural works, made more friends and cooperated with others. Regarding the unit feedback forms and total feedback form, most participants suggested that they performed well, and this supports the quantitative results. Regarding "social skills", some members intended to make new friends. By horticultural activities, they learned to share, control their emotions and change ideas. Horticultural activities thus improve their social skills and interpersonal relationships. Regarding "horticultural technique", participants obtained horticultural knowledge and skills related to plants. They grew plants well and were moved by the experience.

According to the research findings, the "interest and hobby", "relaxing emotion" and "clear consciousness" dimensions are insignificant. The reason why might be that the control group has other channels of interest and relaxation. Although the theory of green plants is fresh, in the questionnaires and interviews, "clear consciousness" is not positive.

The learning result of grade 4 in the experimental group is significantly higher than grade 3 and grade 5; in grade 4, the experimental group is significantly higher than control group. According to our observations, grade 4, in comparison to grade 3 and grade 5, was more involved in the activity. The participants in grade 4 had strong learning motives. Hence, in comparison to the other grades or the control group, they were significantly different.

**Conclusions**

In the present study, curriculum planning regarding horticultural activity includes knowledge, skill and affection. Based on the data analysis, this study proposes the following conclusions. First of all, after being engaged in horticultural activities, elementary school students' self-concept, sense of control, self-satisfaction, sense of



achievement, social skills and horticultural skills were enhanced. Next, after participating in horticultural activities, elementary school students' enhanced self-concept demonstrated that green plants helped them control their emotions. Green plants could be also the means by which the students shared their friendship with or helped friends, and thus the students made more friends. In other words, their interpersonal relationships were improved and they could get along well with classmates. Because the students were happy and peaceful with green plants and they had more friends, they were satisfied with themselves and their current lives. In addition, through the process of taking care of the plants, the students cultivated their sense of responsibility, altruistic capacity and time management ability. These gains strongly presented horticultural activities as useful components in the learning strategies of experiential education to improve students' self-concept and well-beings.

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