

Effects of Integrating Garden-Based Learning and E-learning into Life Education

Mei-Lun Chen¹, Shi-Jer Lou^{2*}, Ru-Chu Shih³

¹Department of Tropical Agriculture and International Cooperation, National Pingtung University of Science and Technology, Pingtung, 912, Taiwan

²Department of Vocational and Technical Education, National Pingtung University of Science and Technology, Pingtung, 912, Taiwan

³Department of Modern Languages, National Pingtung University of Science and Technology, Pingtung, 912, Taiwan
lou@npust.edu.tw

Abstract: This study aims to explore the effects of integrating garden-based learning and e-learning into 3rd graders' life attitudes toward the relationships of self-self, others-self, objects-self, and heaven-self. A 15-week intervention, class-based, self-report questionnaire, and a Likert 5-point scale questionnaire were employed to explore the influence on the students' life attitudes. A total of 31 third-grade students participated in the study from a public elementary school in rural area in southern Taiwan. All collected quantitative data were analyzed through descriptive statistics, paired-sample t-test, ANOVA, and Pearson product-moment correlation. The findings of this study show that the students possess significantly greater improvement in life attitudes. In addition, through analyzing students' works, instructional notes, and activity photographs, we found that the students' life attitude has progressed. Furthermore, the findings of the study suggest that using garden-based learning and e-learning as components of life education can increase the students' life attitudes. As a result, we suggest that school administrators and teachers may implement school gardens and computer facilities to positively influence student life attitudes.

[Mei-Lun Chen, Shi-Jer Lou, Ru-Chu Shih. **Effects of Integrating Garden-Based Learning and E-learning into Life Education.** *Life Sci J* 2013; 10(2): 2048-2057]. (ISSN:1097-8135). <http://www.lifesciencesite.com>. 288

Keywords: cooperative learning, e-learning, garden-based learning, life education

1. Introduction

Life education has been an important education policy in Taiwan for the past decade. The Ministry of Education of Taiwan (2008) promulgated the current Grade 1-9 Curriculum Guidelines to establish some ability indicators relating to "life education" in certain fields or subjects. Life education has four main topics in Grade 3 and 4, including (a) education of one and oneself: understanding oneself, respecting oneself; (b) education of one and others: social relationships, public virtue; (c) education of one and the environment: care for life and love for the environment; and (d) education of one and nature: exploring life and getting close to nature (Huang, 2000). Wu (2009) also asserted that the focus of education should be on life education, to realize the harmonious education of "others-self-all things." Simply put the content of life education is in concern for relationships: between others and the self, with others, the environment, and nature, while at the same time exploring life phenomena and pursuing the values of life.

Garden-based Learning (GBL) can be defined as an instructional strategy with utilizing a garden as a teaching tool. It is based on experiential education, and the garden experience can contribute

to ecological literacy and sustainable development (Desmond, Grieshop, & Subramaniam, 2002). With regard to the application of school gardening in experiential education, in terms of quantitative studies, some scholars have produced positive effects in nutritional knowledge (McAlcese & Rankin, 2007; Parmer, et al., 2009; Somerset & Markwell, K., 2009; Gatto, et al., 2012), academic achievements in natural sciences (Klemmer, et al., 2005a; Klemmer, et al., 2005b; Dirks & Orvies, 2005), self-esteem, and life abilities (Robinson & Zajicek, 2005). In terms of qualitative research, it was found that school-based gardening improved student's learning attitudes toward learning motivation, and enthusiasm in all related subject areas (Faddegon, 2005). In addition, there are also studies that explored how horticultural therapy can enhance well-beings with significant results (Rappe, 2005; Kou, 2009). As for the effect of GBL on life education, in Taiwan there is only one study by Tsai (2009) found and showed positive effects. However, in previous studies on environmental attitudes, nutritional knowledge, academic achievement, self-esteem, life abilities, or well-beings are all part of life education, but past scholarly studies have not integrated them into the concept of life education.

Electronic learning (e-learning) refers to

the use of electronic devices for learning, including the delivery of content via electronic media such as Internet, audio or video, interactive TV, CD-ROM, blog, and so on (Kaplan-Leiserson, 2000). E-learning in this study refers to using the computer to make PowerPoint slide, and being able to use projector and speaker systems to make presentations. Cooperative learning is a type of learning that divides work for cooperation to jointly achieve a learning objective (Dembo, 1994). Abrami et al. (1996) defined cooperative learning as an instructional strategy, in which students are part of a group that works together, and the teacher carefully manages and plans to promote positive interdependence of members, emphasizing each member's individual accountability, requiring that each member be responsible for contributions to achieve the group's mission. Many previous studies on e-learning or cooperative learning and quite a few of them combined of the two, such as ones on web-based cooperative learning or computer-supported collaborative learning (CSCL) (Sun & Lin, 2007). Kao (2009) applied e-learning and cooperative learning to life education found significantly positive results. However, there was no prior study that applied the instructional strategy of cooperative learning, integrating school gardening and computer-supported courses to life education. Thus, the researcher aims to conduct this study explore the effect on the life attitudes, learning attitudes, and learning effects of third grade students.

2. Materials and Methods

2.1. Design and the students

This study used a quasi-experiment approach with a total of 31 third-grade students (15 males, 16 females) from a rural Hakka village in southern Taiwan in this study. They all enrolled in the class named "Natural and Life Science Fields" taught by one of the researcher. The teaching experiment contained 15-week intervention teachings. During the intervention teaching period, the students were divided into six groups, with 5 to 6 people in each group, using group cooperative learning to conduct all intervention activities. The experiment variables were GBL and e-learning, the dependent variables are life education effects, learning effects, and learning attitudes.

2.2. Gardening and e-learning component

The research project was also supported by the principal at the school where the researcher teaches, giving permission to open a vegetable garden on campus, providing capital to construct the farm. Before constructing the vegetable garden, the researcher first discussed the details of planning the

vegetable garden with farmer and part-time lecturer Mr. L who teaches "Happy Farm" at a community college. As the vegetable garden was being established, the experiment began. In the three weeks of garden construction, Mr. L was invited to demonstrate and explain the procedures for creating the farm to subjects, and the following 12 weeks are taught by the researcher. The vegetable garden is located in the corner of a 75m×50m lawn, which also has a composting area, ecological pond, about 50 trees, a slide, and a gateway over a hundred years of history. The vegetable garden is only 20m from the natural science classroom for the third-grade, and is convenient for students to go to when they have natural science classes. The vegetable garden itself is 10m×3m, with plots and gutters for draining. There are six plots of 300cm×90cm each so that students can work on them in groups.

The researcher took full responsibility for maintaining the vegetable garden, purchasing fertilizer and pesticide materials, and arranging for course progress and activities at the vegetable garden each week as well as to report to the school about usage of the vegetable garden and apply for necessary support. The computer classroom has 35 computers for students and one computer for the teacher, the teacher can monitor the students' computer usage. There is also a full set of projector equipment, amplifier, air-conditioner, and fans. The classroom has good ventilation and lighting, along with curtains. Students have to remove their shoes before entering the classroom to maintain its cleanliness. On the walls of the classroom there are rules for using the computer classroom to regulate student behavior.

2.3. Interventions

Intervention classes were taught 40 minutes each period, three periods a week for 15 weeks from late March to June 2012. The course contents in this study were based on the unit "Planting Vegetables" involving relevant gardening knowledge in the textbook for second semester in the third Grade. From the first to third week, when the vegetable garden was being constructed, each week there were two class periods of garden construction; starting in the fourth week, one period was for classroom lectures based on the textbook, one period was for experiential activities in the school garden. The experiential activities included seedling in the fourth and fifth weeks, direct seeding and complementary seeding in the sixth and seventh weeks, and regular activities for taking care of vegetables in the eighth to eleventh weeks. All students were shared responsibilities for propagation, planting, watering, weeding, pest management, tending, and harvesting

in the garden. Other than class time, including on weekends, students were arranged to water plants in shifts. The last weeks were spent conducting creative activities relating to gardening (Table 1).

In the 15 weeks of intervention, a computer class session was included in each week. Since students do not have a foundation in Chinese input and PowerPoint slide production, the first three weeks they were guided in basic computer operating techniques relating to this study; the fourth and fifth weeks was the PowerPoint slide production for "Three Steps of Garden-Building," the sixth and seventh weeks were the PowerPoint slide production of "Planting Vegetables," the eighth through eleventh weeks were the PowerPoint slide production of "Growth of Vegetables," the twelfth and thirteenth weeks were the PowerPoint slide production of "Creative Gardening Activities." In the last two weeks, each group reports on the PowerPoint slide content for each unit for discussion and sharing.

Table 1. GBL and E-Learning Activities during the 15 Weeks

Weeks	GBL activities	E-learning activities
1-3 Building garden	Building gardens Fertilizing	Instruction on Chinese input and presentation software
4-5 seedling	Observing seeds and vegetables Propagating	Teams produce "Three Steps of Garden-Building" PowerPoint slide
6-7 Planting vegetables	direct seeding and complementary seeding Weeding, watering, measuring and caring for plants every weeks Writing the "vegetable growth chart"	Teams produce "Planting Vegetables" PowerPoint slide
8-11 Growth of vegetables	Observing, writing and graphing for plants Harvesting vegetables Cooking, preparing and consumption vegetables from the garden Writing the "vegetable growth chart"	Teams produce "Growth of Vegetables" PPT Making personal "vegetable growth notebook" PowerPoint slide
12-15 Creative Gardening Activities	Making the paper cover of the "vegetable growth notebook" Making seed bags by recycled paper Making propagating pots by newspaper Introduction of asexual reproduction and reproduction of silver vine and snake plant	Teams produce "Creative Gardening Activities" PowerPoint slide Teams make presentations

2.4. Research tools

Both "the Life Attitudes Questionnaire" and "the Learning Attitude and Effects Scale" were developed using 5-point Likert scale by the

researchers. Data on life attitudes were obtained via a questionnaire completed by the students one week before and one week after the intervention. Learning Attitude and Effects Scale was assessed for post-test only. The questionnaires were comprised of the following sections:

2.4.1. Demographic information

All the students were asked basic demographic information, including grade, sex, and ethnicity. To ascertain the correlation between the students' gardening experience and this study, the questionnaire has some semi-structured questions, about whether "family members one lives with" works in cultivation, whether the students helped with cultivation, and the personal gardening experience of the students.

2.4.2. Life Attitudes Questionnaire

The Life Attitudes Questionnaire contains 15 questions, which was compiled and modified by the researchers based on Huang's (2000) four major parts of life education and the Ministry of Education's Grade 1-9 Curriculum Guidelines (2008). The scale was evaluated by two professionals for the content validity. One has a bachelor's degree in gardening, an elementary school teacher with 20 years of experience; the other is a Catholic nun who has been working in the religious field for nearly 40 years and is currently working on remedial education for children in remote areas. The scale has four dimensions, which are self-self-relationships (4 items), other-self relationships (4 items), object-self relationships (4 items), and nature-self relationships (3 items). Then pilot study was employed to a group of 85 children (valid value=77) of the similar age to determine the appropriateness of the questions of the Life Attitudes Questionnaire for this similar age group and modified accordingly. The questionnaire obtained 0.869 of the Cronbach alpha value, indicating the questionnaire is reliable.

2.4.3. Learning Attitude and Effects Scale

This scale was compiled by the researchers in order to understand preferences, attitudes, and effects after subjects undergo the integrated course with the three types of learning, cooperative learning (CL), garden-based learning (GBL), and e-learning (EL) for life education. The scale containing 15 questions were divided into the three dimensions of GBL, EL and CL. The first question of each dimension is the students' preference for the learning activity; the second question is on the involvement in learning; the third question is the instructional effect of life education; the fourth question covers the direct effects of this learning are planting vegetables,

making PowerPoint slides, and interpersonal interaction; the fifth question is transfer of learning, the benefit on other aspects of learning.

2.4.4. Group PowerPoint slide work

The group PowerPoint slide work consisted of four units. The content of each unit includes the four parts of instructional content, photo collection, problem discussion, and reflections. The first part, “instructional content” needs to review the important learning points in the unit. For the second part, “photo collection,” the teacher provides photos of student activity for the unit, and team members choose from them, then copy and paste to the PowerPoint slides. For the third part, “problem discussion,” team members have to discuss together and answer the teacher’s questions about life education in the unit. For the fourth part, “reflections,” individuals or the groups jointly present their feelings after participating in activities for this unit (Figure 1). Starting in the sixth week, the seedlings were direct seeded in the garden, and every student had to write a “vegetable growth chart” with paper and pencil, and record what they did in the garden, drawing how the vegetables are growing, measuring the height of vegetables, the difficulties they encountered and how they solved them, as well as their reflections about the gardening activities for six weeks. Finally, the students write covers on the six pages of records, making a nice “vegetable growth notebook”, which was their paper-based assignment. The teacher scan all the students’ paper “vegetable growth charts” and students paste the jpg of the charts into PowerPoint slide, creating their personal “Vegetable Growth Notebook” PowerPoint work.



Figure 1. Samples of Group 1 “Three Steps of Garden-Building” PowerPoint Slides

2.4.5. The researcher’s instructional observation records

The researcher’s instructional and observational notes did not have fixed format. The researcher was always recording the learning portfolio of classroom instruction, gardening activities, and students in the computer classroom as well as anecdotes.

2.5. Data analysis

SPSS 19.0 version was used to analyze all collected data. Content validity of the questionnaire and scales were established by experts in the related fields. Descriptive analysis, t-test, ANOVA, and Pearson product-moment correlation were used to analyze the collected quantitative data. Qualitative data, including activity photos, student PowerPoint slides, the researcher’s instructional observation records, and the various instructional materials were also analyzed. All the data were organized and summarized to search for information related to life education, and to verify quantitative data and explore the research results.

3. Results

The 31 students in the experiment (male=15, female=16) all completed the 15week interventions. The major findings of the study are as follows. First, there is no significant difference in gender distributions between male and female groups ($p=.238>.05$). Next, students’ ethnicities are analyzed (Taiwanese=8, Hakka=20, Aborigine=2, loss value=1), the results of testing the regression coefficient homogeneity show that the F value is not significant ($F=2.186$, $p=.132>.05$), which conforms to the assumption of regression coefficient homogeneity, thus covariance analysis can be conducted. The results show no significant difference among the three groups ($F=.161$, $p=.852>.05$). Third, there is no significant difference in family background distributions between family members one lives with who engage in farming and do not engage in farming (family members engage in farming=23, family members do not engage in farming=8; $p=.799>.05$). Finally, there is no significant difference in the two subgroups of those who have farming and gardening experience and those who do not have farming and gardening experience (have experience in farming and gardening=16, no experience in farming and gardening=15, $p=.871>.05$).

3.1. Life Attitudes Questionnaire

The Life Attitudes Questionnaire was administered before and after intervention. Table 2 shows results of the means of subject scores, standard deviations, and t-test in the four dimensions before and after the interventions. Paired sample t-test shows that the mean differences between posttest and the pretest scores are 0.85, 0.93, 1.13, 0.98, t values are 7.21, 8.13, 8.22, and 6.87 respectively; p values are all $.000<.001$, reaching the .001 level of significance and showing significant improvement. The mean difference between overall posttest and pretest scores is 0.99, t value =11.83, $p=.000<.001$, reaching

the .001 level of significance, indicating that after the course intervention, the students possess significantly better life attitudes than before intervention.

Table 2. Results of changes in students' life attitudes between pre- and post-interventions

Variable	Pre-M	Post- M	Change	t	p
Self-self relationships	2.95	3.80	0.85	7.21	.000***
Other-self relationships	3.09	4.02	0.93	8.13	.000***
Object-self relationships	2.96	4.09	1.13	8.22	.000***
Nature-self relationships	3.02	4.00	0.98	6.87	.000***
Total life attitudes	2.99	3.98	0.99	11.83	.000***

*** $p < .001$

3.2. The Learning Attitude and Effects Scale

The Learning Attitude and Effects Scale was divided into three dimensions, including GBL (5 items), EL (5 items) and CL (5 items) which were only implemented in the posttest. After descriptive statistical analysis, Table 3 shows the means of the three dimensions: GBL 4.26(.51); EL 4.12(.51); CL 4.20(.47). In terms of participant preference for GBL, EL and CL, they most prefer CL ($M=4.32$), followed by GBL ($M=4.29$), and EL ($M=4.03$). In terms of participant involvement in GBL, EL and CL, they are most involved in CL ($M=4.13$), followed by GBL ($M=4.00$), and EL ($M=3.90$). In terms of the effect of three types of learning on life education values, the students believe it can best enhance CL ($M=4.29$), followed by GBL ($M=4.16$), and EL ($M=4.10$). For planting vegetables (GBL), in terms of the PowerPoint (EL) and interpersonal interaction learning effects (CL), the students believed that the highest is GBL ($M=4.48$), followed by EL ($M=4.32$), and CL ($M=4.03$). In terms of the effect of three types of learning on learning transfer, the students believed that the most helpful was GBL ($M=4.35$), followed by EL ($M=4.23$), and CL ($M=4.19$) (Table 3). The results of paired sample t-test show that the students have significant differences in their preference for GBL and EL, as well as EL and CL ($p=.047$ and $p=.045 < .05$ respectively); in addition to learning effects for CL and GBL ($p=.037 > .05$). Otherwise, there is no significant difference (Table 4).

Table 3: Descriptive Results of the Learning Attitude and Effects Scale

	GBL	EL	CL
Variable	M	M	M
Preference	4.29	4.03	4.32
Involvement	4.00	3.90	4.13
Life education effects	4.16	4.10	4.29
Learning effects	4.48	4.32	4.03
Learning transfer	4.35	4.23	4.19
Total	4.26	4.12	4.20

N=31

Table 4: Results of t-test of any two groups of the Learning Attitude and Effects Scale

	paired GBL,EL		paired EL,CL		paired CL,GBL	
Variable	t	p	t	p	t	p
Preference	2.07	.047*	-2.09	.045*	0.27	.790
Involvement	0.44	.662	-1.30	.202	0.84	.408
Life education effects	0.40	.690	-1.03	.311	0.48	.635
Learning effects	1.31	.202	1.10	.279	-2.19	.037*
Learning transfer	0.81	.423	0.24	.813	-1.15	.258

* $p < .05$

3.3. Correlation analysis of learning attitudes and effects and the posttest of life attitudes

The 15 variables in the Learning Attitude and Effects Scale and the four dimensions of the Life Attitudes Questionnaire posttest were analyzed by Pearson product-moment correlation and the coefficients (Table 5). The results show that there is a significantly positive correlation between participant preference for GBL and the two dimensions of life attitudes in other-self relationships, object-self relationships and overall life attitudes variables ($p=.011$ & $p=.026 < .05$, $p=.007 < .01$), with correlation coefficients at .450, .399 (rounded to .40) and .457 respectively, indicating there is a significant positive correlation between participant involvement in GBL with the self-self relationships dimensions ($p=.039 < .05$), the correlation coefficient is .372. There is a significant positive correlation between participant involvement in EL and the other-self relationships dimension ($p=.047 < .05$), the correlation coefficient is .359. The students who believed that EL can help their life education values also scored

higher in terms of other-self relationships, with significant positive correlation ($p=.046<.05$), the correlation coefficient is .362. The students who believed that they learned good interpersonal interactive techniques in CL actually scored lower in the self-selfrelationships dimension, with a significant negative correlation ($p=.027<.05$), the correlation coefficient is -.397. Other than these 5 variables, the other questions in the Learning Attitude and Effects Scale do not show significant correlation with the overall life attitudes posttest and the four dimensions.

Table 5:Correlation of the Learning Attitude and Effects Scale and the Life Attitudes Questionnaire posttest

Learning attitude & effects		Self-self	Other-self	Object-self	Nature-self	Overall
GBL preference	Persons correlation	.327	.450	.399	.265	.475
	Significance (two-tailed)	.072	.011*	.026*	.150	.007*
GBL Involvement	Persons correlation	.372	.196	.018	-.041	.180
	Significance (two-tailed)	.039*	.291	.924	.827	.333
EL Involve ment	Persons correlation	.069	.359	.339	-.080	.246
	Significance (two-tailed)	.712	.047*	.062	.667	.182
EL life education effects	Persons correlation	.335	.362	.265	.104	.354
	Significance (two-tailed)	.065	.046*	.150	.577	.050
CL learning effects	Persons correlation	-.397	-.231	-.121	-.132	-.284
	Significance (two-tailed)	.027*	.211	.516	.480	.122

* $p<.05$ ** $p<.01$

3.4. Content analysis of life education PowerPoint slide

The following themes were induced from the students' PowerPoint slide works (Table 6).

Table 6:Summary of Students' PowerPoint Slide Works in Life Education

Theme	Content analysis
Self-self relationships	
Self-reflection	Two students mentioned that planting vegetables seemed very easy, other people could do it, but they could not; one student Lin mentioned three times in different works that his behavior was not very good, he was clumsy.

Diligence and responsibility

Many students promised they would take good care of bok choy, and others specifically wrote about watering and weeding, one student even said he would take care of everyone's vegetables every day; one student mentioned that the bok choy had not grown up yet, so they had to work very hard. One student said he would not let other people touch his bok choy.

Other-self relationships

Mutual assistance and cooperation

Some people thought the bugs were disgusting and did not want to touch them, so they had to ask for help from classmates; three students mentioned that they were not good at planting but other students would help them, and they would help do what they can do, such as picking up pebbles; one student stated that classmates would actively water for him; two students said it was fun to have different work and cooperate, even though sometimes he would fight with classmates; Lin said twice that classmates did not give him the watering can, and there were bad classmates who threw sand in his eyes and the team members were mean to him.

Discussions and sharing

One student mentioned his contributions in the discussion, and some said that they did not contribute to discussion, and would certainly contribute next time. One student said that he would tell his grandmother and mother of the good news that he planted a five-leaved bok choy.

Understanding for oneself and others

Many students mentioned that it was hard work on the garden, but some students affirmed the worth of their hard work. One student said he could understand the labor of farmers.

Thankfulness

Many students thanked the teacher for teaching them how to plant bok choy, and some students thanked the teacher for pan-frying bok choy for them to eat; some students thanked the help from their classmates; one student was soaked by the rain while working in the garden, and thanked heaven

Object-self relationships

People and the environment

for watering for him.

The team members can think together about “why there is acid rain,” “why does the soil need alkaline magnesia lime,” in turn realizing the problems of acid rain and worsening global environment, also understanding the relationships between human survival, the natural environment, and plants. A student’s feedback stated that it was very meaningful to conduct planting work.

Care for life

When bok choy does not sprout, cannot grow, die, get toppled by rain, beaten by muddy water, or bitten by bugs, many students felt pity, sadness, worry, or scared. One student believed he should help cheer on the bok choy. Some people were sad when the bok choy was harvested to be eaten. On the other hand, vegetable planting and growth made the students very happy, one student said, “I think bok choy is cute because it has heart-shaped leaves.” Another student said, “I feel really happy because my bok choy is going to grow up.” Their childish and naive language expressed their concern for the plants they cared for.

Nature-self relationships

Closeness to nature

Many students said that being with sunlight, soil, and plants made them happy; but there are also people who said it was too hot, too cold, or that they didn’t like the sun and rain while working in the garden. Open questions are used to ask students about the greatest thing they learned from this class. 31 participant responses can be generally categorized into the four types from most to least “cultivation of interest and habits relating to the natural environment,” “understanding the mysteries of nature,” “enjoying the planting of flowers, grass, and trees,” and “it is fun to be in natural science class.” This shows that elevating the relationship between people and nature is the greatest

Mysteries of life

significance of this series of courses.

When the seeds do not sprout, the teacher asked team members to think about why the seeds did not sprout, the answers of groups include: the seeds were buried too deep, buried too close, too little water, eaten by bugs or birds, and some groups also discussed issues on the rate of sprouting. This activity inspired some students who want to continue exploring why the seeds did not sprout. There are also students who want to keep planting to explore the secrets of life and death.

3.5. Teaching portfolio analysis

After combining the life education instructional portfolio over 15 weeks with 4 units, including activity photos, student works, instruction and observational records, and various instructional materials, the explanations of the instructional portfolio is summarized as follows (Table 7).

Table 7: Explanations of the Instructional Portfolio

Activity photo	Explanation
	Preparation: during soil preparation, everyone had to pick stones and weed and they tried hard to dig out deeply-buried stones. After soil preparation, sprinkling magnesia lime and base fertilizer, and making the plots over three weeks, the garden was complete.
	Commitment: two weeks after tending the seedlings, the bok choy is transplanted to the field. When planting, two connected seedlings need to be separated, and the children are very careful, worried that they would hurt the bok choy. They



Planting vegetables



Growing vegetables



Creative gardening activities

promised themselves that they would definitely take good care of bok choy.

Growth: over 6 weeks, they worked hard weeding, repelling pests, and grew with the bok choy in the wind, sun, and rain; the children have gained a rich harvest in bok choy, as well as their internal life attitudes.

Achievement: the creative activities include the agamogenesis of silver vine, production of seed bags and environmentally-friendly seedling pots, and coloring the covers of bok choy record notebooks. Showing off their own work, the students are so confident, and have a great sense of achievement!

In the 15-week course, the students used methods such as planting, row planting, or sowing based on plant characteristics to plant vegetables such as bok choy, Chinese spinach, and yam leaves, and repellent plants such as lemongrass and wormwood. In the nourishing stage, the students saw hundreds of bok choy leaves that peeked out of the soil, and experienced success in gardening; later, the students faced challenges, such as dealing with the leaves eaten by snails and other bugs, and thinking about the reason why bok choy cannot grow, etc. In the last stage of intervention, the students harvest and ate the vegetables they planted. The students experienced the life cycle of vegetables and an unusual life process.

4. Discussions

The purpose of life education aims to

enhance the harmony in self-self, other-self, object-self, and nature-self relationships. This kind of harmony for the quality of life and well-beings are critical. The results of the present study show the positive effects of GBL experience on young children. Although school gardening education alone does seem to increase life attitudes in children, adding the e-learning and cooperative component appears to strength the likelihood that children will improve their life attitudes. In this study, in the variables of Life Attitudes Questionnaire, the 12 items reached the $p=.000$ level of significance, which shows that GBL and EL intervention can help enhance life education effects. For "self-self relationships," the students can better appreciate themselves and learn the time management skill. For "other-self relationships," the students can offer help and cooperate with others, and understand the value of themselves and of others in the sharing and interacting process, while learning how to follow group rules and regulations through group activities. For "object-self relationships," they can learn the symbiotic relationships between people and everything in the environment for respecting life and caring for the environment. For "nature-self relationships," it can inspire the students' curiosity for exploring nature and the mysteries of life.

In the preference and involvement for the three types of learning of GBL, EL and CL, the students gave the highest score to CL. In addition, there is a statistical difference between CL and EL (both $p<.05$). Since CL is incorporated into the whole intervention of GBL and EL, indicating that the students prefer to learn in groups with peers and can best engage them in learning actively. In terms of effect of GBL, EL and CL learning content, the students believe that they are best at gardening, followed by PowerPoint making, and finally is the interpersonal skills, indicating that interpersonal skills are not easy to learn. The results of correlation analysis of the Learning Attitude and Effects questionnaire and the Life Attitudes Scale posttest show that when the students possess positive learning attitudes toward GBL, their positively life attitudes will be increased, demonstrating that using school gardening activities to promote life education is an effective teaching approach for life education. Also, EL provided team members to discuss life education issues together to enable the students involved more and improved their other-self relationships. Furthermore, the intervention of EL is beneficial to the establishment of other-self relationships in the content of life education. In CL, those who believed that they have better interpersonal technique learning effects actually have worse self-self relationships in life education, showing that

when collaborative learning is incorporated in teaching, the students would simultaneously emphasize on their personal traits such as self-appreciation, diligence and responsibility, problem-solving, and time management.

In terms of qualitative analysis, the content of the students' works and feedback can be summarized into the four dimensions of self-self, other-self, object-self, and nature-self. In terms of self-self, the students expressed self-reflection and told themselves to exercise diligence and responsibility in taking good care of bok choy. In terms of other-self, they demonstrate the spirit of mutual assistance and cooperation, sense their contributions in group discussion, and share their happiness with family members; they can understand the hard work of farmers in the process of their own labor, and think about the price of their own hard work. All students feel thankful for the people around them. In terms of object-self, the students are able to think about issues of humans and the environment, care for earth, and care for life. In terms of nature-self relationships, the students believe that their greatest gain from this series of courses is a greater liking for being close to nature; some are more willing to continue exploring the mysteries of life. The instructional portfolio of the four units can demonstrate how the research design affects the life attitudes of students in the following four domains: preparation, commitment, development, and accomplishment. A fertile garden is a place for plants to grow, and it is necessary to get rid of obstacles, fertilize, and make plots so that plants have good space to grow. Also, commitment is the source of motivation; one can only plan for the next step with an objective and ideals. As time passes by, plants grow, and the students grow with them physically and psychologically. All students also learned the principle of reaping what one sows. In the last four weeks of the activity, the students learned knowledge and techniques relating to asexual reproduction in plants, unlike the seeded plants' sexual reproduction. Finally, the students learned the relevant gardening activities for showing creativity and their self-confidence is enhanced.

5. Conclusion and Suggestions

The results of this study suggest that life education through gardening and e-learning to assist instruction in school settings with young children can enhance a range of self-self, other-self, object-self, and nature-self relationships. Also, the results show that integrating cooperative learning and e-learning into life education course can improve its instructional effects. The above-mentioned findings support the inclusion of garden-based learning as a useful

component of experiential learning strategies of life education, which are in accordance with the findings of Sun & Lin, 2007 and Kao, 2009. Meanwhile, the instructional portfolio of the four units demonstrates how the research design has affected the life attitudes of students, including preparation, commitment, development, and accomplishment. In other words, with preparation there is success, and without preparation there is failure. Finally, the intervention of EL is beneficial to the establishment of other-self relationships in the content of life education. However, this study encountered some limitations. Ideal research design is random distribution with comparisons between the experiment group and control group, with continuous evaluation for long-term results. However, due to the insufficient classes and students, experimental time, and curriculum content, the results of this study may not be able to generalize to other populations and subjects. Therefore, a need for future research is warranted. Since some schools do not have appropriate resources for the establishment of food gardens or computer facilities, assessment of other settings conducive to experiential learning about life education are also suggested for the future study.

*Corresponding author:

Shi-Jer Lou,

Full Professor, Department of Vocational and Technical Education, National Pingtung University of Science and Technology, Pingtung, 912 Taiwan.

Email: lou@npust.edu.tw.

Reference

- [1] Abrami, P. C., Chambers, B., Poulsen, C., De Simone, C., d'Apollonia, S. & Howden, J. Classroom Connections: Understanding and Using Cooperative Learning. Harcourt Brace. New York, NY. 1996.
- [2] Dembo, M. H. Applying Educational Psychology (5th ed.). Allyn & Bacon. Boston, MA. 1994.
- [3] Desmond, D., Grieshop, J. & Subramaniam, A. Revisiting Garden-based Learning in basic education. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy. 2002: 20. Retrieved Feb 2, 2013, from <http://www.fao.org/sd/erp/revisiting.pdf>.
- [4] Dirks, A. E. & Orvis, K. An evaluation of the junior master gardener program in third grade classrooms. HortTechnology 2005; 15:443–447.
- [5] Faddegon, P. A. The Kids Growing Food School Gardening Program: Agricultural Literacy and other Educational Outcomes. Doctoral dissertation. Cornell University. Ithaca, NY. 2005.

- [6] Gatto, N. M., Ventura, E. E., Cook, L. T., Gyllenhammer, L. E. & Davis, J. N. LA Sprouts: A garden-based nutrition intervention pilot program influences motivation and preferences for fruits and vegetables in Latino youth. *Journal of Academy of Nutrition and Dietetics* 2012; 122 (6): 913-920.
- [7] Haung, D. X. Live education in elementary school: implication and practice. In: Lin, S. L. ed. *Theory and Practice of Life Education*. Cosmos. Taipei, Taiwan. 2000; 241-253.
- [8] Kao, M. C. A Study on Life Teaching assisted with Blogs in Elementary School. Master's thesis. National Pingtung University of Science Technology, Pingtung, Taiwan, 2009: 125-126.
- [9] Kaplan-Leiserson, E. e-Learning glossary. 2000. Retrieved April 2008, from <http://www.learningcircuits.org/glossary.html>.
- [10] Klemmer, C. D., Waliczek, T. M., & Zajicek, J. M. Development of a science achievement evaluation instrument for a school garden program. *HortTechnology* 2005a; 15:433-438.
- [11] Klemmer, C. D., Waliczek, T. M., & Zajicek, J. M. The effect of a school gardening program on the science achievement of elementary students. *HortTechnology* 2005b; 15:448-552.
- [12] Kou, Y. J. Elevating student knowledge and behavior through gardening programs. *Journal of Agricultural Association Taiwan* 2011; 12(1): 18-26.
- [13] McAleese, J. D., & Rankin, L. L. Garden based nutrition education affects fruit and vegetable consumption in sixth grade adolescents. *American Dietetic Association* 2007; 107: 662-665.
- [14] Ministry of Education. Grade 1-9 Curriculum Guidelines. 2008. Retrieved Feb 2, 2013, from http://teach.eje.edu.tw/9CC2/9cc_97.php.
- [15] Parmer, S. M., 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. *Journal of Nutrition Education and Behavior* 2009; 41(3):212-217.
- [16] Rappe, E. The influence of a green environment and horticultural activities on the subjective well-being of the elderly living in long-term care. Academic Dissertation. University of Helsinki, Finland. 2005; 36-38. Retrieved Feb 2, 2013, from https://helda.helsinki.fi/handle/10138/17738/search?query=Erja+Rappe&scope=&rpp=10&sort_by=0&order=DESC.
- [17] Robinson, C. W., & Zajicek, J. M. Growing minds: The effects of a one-year school garden program on six constructs of life skills of elementary school children. *HortTechnology* 2005; 15:453-457.
- [18] Somerset, S. & Markwell, K. Impact of a school-based food garden on attitudes and identification skills regarding vegetables and fruit: a 12-month intervention trial. *Public Health Nutrition* 2009; 12(2): 214-221.
- [19] Sun, C. Z. & Lin, S. R. Web-Based Cooperative Learning. Psychology. Taipei, Taiwan. 2007; 22-24.
- [20] Tsai, M. H. The influence of life education on the affective attitude and life adaptation of the elementary school students and integrating the life curriculum. Master's thesis. National Taipei University of Education, Taipei, Taiwan. 2009; 115-116.
- [21] Wang, M. F. Third Grade Science and Technology Text book of Second Semester. Kang-Hsuan. Taipei, Taiwan. 2012; 4-23.
- [22] Wu, C. J. (2009). Life education: the most important lesson in life. *Commonwealth-Special Edition of Education* 2009; 11: 54-56.

6/6/2013