

■ Article ■

A Study on the Effects of Multicultural Teaching Materials Making Activities Based on the Capstone Design Teaching Model

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Abstract

This study examines the applicability of the capstone design teaching model as a teaching model for teacher education. This is done by examining how multicultural teaching materials based on the capstone design teaching model affected pre-service early childhood teachers' multicultural teaching efficacy and learning motive. The subjects of this study were 30 pre-service early childhood teachers in their fourth year at the Department of Early Childhood Education of N University in G City. The experiment was conducted for 15 weeks from September 1 to December 12, 2014. When collected data were analyzed through paired-sample t-test, multicultural teaching materials making activities based on the capstone design teaching model were found to be effective in enhancing pre-service early childhood teachers' multicultural teaching efficacy and learning motive.

■ **Key words** : capstone design, multicultural teaching materials making activities, multicultural teaching efficacy, learning motive

Introduction

Recently universities are showing many changes including the expansion of their roles from cultivating expert knowledge through research to guiding the students to join the field of employment. In response to these trends, universities are promoting the “Leaders in Industry-University Cooperation (LINC)” project aiming at reinforced employability. As a part of the program, they are launching and operating employment-oriented curricula for raising the competent people demanded by companies. In

particular, the capstone design teaching model (CDTM) utilized at engineering departments has been proposed as a new alternative and its application is being tried in various major areas. Capstone design is defined as the final stage of education and the crystallization of skill and experience that concludes the entire university curriculum by producing an outcome through integrating all knowledge acquired within the curriculum (Jeong, 2012; Wagenaar, 1993)

In the case of American universities, capstone design is operated largely in two forms depending on the sameness of theme (Lim, 2006), but Korean universities are operating capstone design courses in the way of selecting different themes and developing and presenting works related to the themes. One of the methods of capstone design course operation is that the professor suggests themes for which he is able to provide guidance. Each team chooses an interesting theme and makes a team approach to the theme under the professor's supervision. In this way, an assignment is executed and completed through a series of processes. Another method is assigning the same theme to all the teams and each team is assessed based on the outcome derived from that theme. As capstone design courses are being applied and operated in various ways, there is not a specific standard method of instruction.

Despite this current situation, capstone design is being used as an alternative teaching model for raising people competent in field works based on theories learned from the major curriculum. This is mainly due to the characteristics of capstone design as follows. First, capstone design is an essential major course offered after the completion of general education courses. Second, it provides activities related to practical themes demanded in the field of employment. Third, it is a project that selects a theme and executes a series of processes. Fourth, it is a team activity through which the members experience practical work of organizations in the field of employment. Fifth, it is an integrated design process comprehending the theoretical knowledge of the major and the knowledge and knowhow of relevant disciplines. Sixth, it is a learning performance assessment tool for testing the achievement of learning (Kim et al., 2012).

Accordingly, capstone design, assuming the learners' active participation out of their inner desire, is based on the participants' learning motivation that promises the maximization of learning (Lim, 2008). Internal motive, which is one of the main factors of learning motivation, means that the learner attaches a value to learning itself or the mastery of learning; the characteristic of capstone design as an integrated design process comprehending the theoretical knowledge of the major and the knowledge and knowhow of its relevant disciplines can be an internal motive. In addition, external motive, which is another main factor of learning motivation, is induced from attaching value to the acquisition of credits and others' recognition and the acquisition of credits for graduation and positive evaluation of outcomes through capstone design work as elements of external motive. The reason that capstone design is emerging as a new alternative teaching model is that the merit of capstone design aiming to motivate students and to raise competent people is nothing but learning motivation, which is an important element of education promoting students' learning (Jeong, 2012).

What is more, capstone design executed as a team project requires creative outcomes, which are possible only through the establishment of cooperative relationships among the team members. All the processes of adjusting conflicting opinions, resolving discordances among the team members, and deriving the best results should be understood as part of capstone design (Kim, et al., 2012). The process of adjusting members' different opinions is inevitable in capstone design; each member should have an open attitude in disclosing himself/herself. That is, individuals are expected to have self-disclosure, the ability to communicate their rights, desires, and opinions with regard to their mind/body and surrounding environment as they are without harming others. Another keen requirement is self-assertion, the ability for individuals to express frankly their thoughts, feelings, and acts upon their mind/body and the surrounding world.

In addition, self-efficacy is one of essential requirements for collaborative relationship building. In the capstone design class, the students

experience collaborative project activities. Lee et al. (2012) reported that the collaborative project teaching-learning method had a positive effect on pre-service early childhood teachers' self-efficacy. Moreover, in her study on the relationships among collaborative self-efficacy, team efficacy, and team interaction in university students' team-based project learning, Yoo (2014) reported that self-efficacy was a significant antecedent for the factors related to learning process and outcome. That is, students' high self-efficacy had a positive effect on their learning process or outcome. As the subjects of the present study were pre-service early childhood teachers, we extended self-efficacy to teaching efficacy, which is a similar concept, and examined its effects.

In response to these demands, universities regard the capstone design teaching model as an alternative education method for cultivating various abilities to open students' opinions and assert them in a reasonable way and for reinforcing employability through giving learning motivation and consequently inducing active participation. They adopt it as a program for training and educating experts equipped with creativity, practical skills, teamwork knowhow, and abilities to play leading roles. As an integrated design education program for raising creative technological manpower acceptable to industrial fields, capstone design is not only a teaching model reflecting demands from various areas including industrial enterprises and educational institutions.

The area of education in contemporary society shows commerciality as consumers and producers are mediated by teaching materials that educators utilize for delivering the contents of learning to students. For this reason, educators are required to develop creative teaching materials from an educational viewpoint (Kim, 2006). For such teaching materials, the area of early childhood education is emphasizing the role of teachers as materials developers, suggesting that the immediate use of teaching materials should be presupposed in order to reflect young children's changeable interest in education (Ryu, 2012). Many early childhood teachers perceive that the use of teaching materials is closely linked to teachers' ability and that it is essential to utilize teaching materials for

inducing children's interest (Choi, 2010). Some universities are so interested in teaching materials that they hold exhibitions related to the development of teaching materials before graduation. However, overemphasis on the production of materials may lead to attachment to the external form of materials rather than the effectiveness of the contents and utilities of materials. For this reason, there should be careful approaches to the design and application of teaching materials from the perspective of educational engineering. Thus, it is educationally valuable to apply the CDTM at the department of teacher education for developing and using various teaching materials.

People's interest in capstone design and its active application originated from the project for developing and spreading creative engineering education programs sponsored by the Ministry of Commerce, Industry and Energy in 2002 (Park et al., 2008). Most of relevant previous studies (Ryu, 2008; Park et al., 2008; Kim et al., 2012; Kim, 2012; Jeong, 2012; Lee & Kim, 2014) reported about the development and effects of programs including teaching activity support models and interaction centering on engineering departments. Recently, a few studies were attempted that applied capstone design in the area of design (Yun, 2012; Shin & Kwon, 2014; Jang, 2015) but they simply introduced instruction methods step by step or reported their outcomes. There has not been a case of course operation by applying capstone design to teacher education. In this situation, it is a meaningful attempt for N University in G City to have introduced a capstone design course for pre-service early childhood teachers.

This study attempted to apply capstone design in teacher education, focusing on the class for making educational media with multicultural themes. The recent Korean society now has an increasing number of young children with cultural diversity and problems experienced by children growing in such an environment are becoming new issues of the society (Kim, 2010). In response to the expanding multicultural population and for helping multicultural families solve their problems with young children, it will be a desirable educational alternative to provide adequate systematic education from early childhood and, by doing so,

to remove fixed ideas or prejudices against multiculturalism and to give learners opportunities to have good multicultural experiences.

Multicultural education is to induce mutual understanding and respect among people of different races, genders, languages, classes, etc., and ultimately to pursue common goals in the world of diverse cultures. An additional purpose is to prepare knowledge, skills, and attitudes for communication with people from other cultures. Therefore, it is necessary to systematize the contents and methods of multicultural education fittingly to the learners' developmental stage in order to provide accurate and correct knowledge and information from early childhood and to promote anti-prejudicial thinking in young children (Lee, 2011). Multicultural teaching efficacy, which is formed through multicultural education, is the confidence and belief that one is able to teach efficiently learners from diverse cultural backgrounds (Guyton & Wesche, 2005). It is closely related to knowledge about the methods and contents of teaching (Tschannen-Moran et al., 1998). Pre-service early childhood teachers' multicultural experience has a direct influence on their multicultural teaching efficacy and personal multicultural experiences are effective for multicultural perception and understanding (Bae & Kwon, 2011). Thus, teacher colleges need to deliberate on teaching-learning methods in order for future teachers to be able to select the contents of multicultural education and teaching-learning methods for conveying such contents systematically. However, compared to in-service teachers, pre-service early childhood teachers have a poor conceptual perception of multicultural education (Kim & Kim, 2008) and there are only a very small number of multicultural courses in teacher training universities (Mo et al., 2010). That is, pre-service early childhood teachers have few experiences in multicultural courses during their college education and most of them leave the school without understanding the concept of multicultural education (Choi & Woo, 2012).

Considering that pre-service early childhood teachers have to teach young children with diverse cultural backgrounds just after graduation and their multicultural experiences in the course of pre-service teacher

education are highly influential to their perception and attitude in the field of education (Koo et al., 2010), we cannot overemphasize the importance of multicultural education during the course of teacher education.

Thus, this study designed a class for enhancing pre-service early childhood teachers' multicultural teaching efficacy and learning motive through activities to make teaching materials related to multicultural education. The course applied the capstone design model to the class in order to see how the model affects pre-service early childhood teachers' multicultural teaching efficacy and learning motive. Through this work, this study ultimately purposed to assess the applicability of the capstone design class model to courses of teacher education and to provide pre-service early childhood teachers with basic information for designing multicultural education classes.

For these purpose, this study attempted to answer research questions as follows.

First, what effect do multicultural teaching materials making activities based on the CDTM have on pre-service early childhood teachers' multicultural teaching efficacy?

Second, what effect do multicultural teaching materials making activities based on the CDTM have on pre-service early childhood teachers' learning motivation?

Methods

Design

This study adopted a one-group pretest-post-test design that tested differences between a test before multicultural teaching materials making activities based on the capstone design teaching model and a test after in order to examine the effects of the activities on pre-service early childhood teachers' multicultural teaching efficacy and learning motivation.

Subjects and data collection

This study was conducted for 15 weeks from September 1 to

December 12, 2014. Its participants were 30 pre-service early childhood teachers who were seniors at the Department of Early Childhood Education of N University in G City. Multiculture was selected as the theme for multicultural teaching materials making activities based on the CDTM. Data used in this study were 30 questionnaires. The researcher explained the purpose of the research to the participants in person, distributed the questionnaires before and after multicultural teaching materials making activities, and recovered the self-administered questionnaires. The 30 recovered questionnaires were used as valid data for analysis. The subjects' socio-demographic characteristics were as in Table 1.

Table 1. Subjects' Socio-demographic Characteristics.

Item	Type	Frequency	Percentage (%)
Age	22-23	20	66.7
	24-25	3	10.0
	Over 26	7	23.3
Gender	Male	1	3.3
	Female	29	96.7
Experience in OJT	No	20	66.7
	Yes	10	33.3
Total		30	100

Research tools

The tools used in this study are 5-point Likert interval scales, ranging from "Not at all" (1) to "No" (2), "So-so" (3), "Yes" (4), and "Absolutely yes" (5). A high score means a high level of multicultural teaching efficacy or learning motivation.

Multicultural teaching efficacy

In order to measure multicultural teaching efficacy, this study used the Multicultural Efficacy Scale (MES) developed by Guyton & Wesche

(2005) and revised and supplemented by Kim (2009). The scale consists of questions about the sub-factors of multicultural teaching efficacy including five questions on general teaching efficacy, five on instruction teaching efficacy, and four on human relationship teaching efficacy. General teaching efficacy is about developing diverse viewpoints and abilities to cope with cultural diversity through daily living with young children. Instruction teaching efficacy is about creating a class environment for multicultural teaching and having functions to select and develop materials and methods of education and to give instruction according to the children's level. Human relationship teaching efficacy is about promoting mutual respect, mutual understanding, and mutual cooperation among diverse groups. The reliability (Cronbach's α) of the Multicultural Efficacy was .84 in this study.

Learning motivation

In this study, pre-service early childhood teachers' learning motivation was measured with the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1993) and translated and revised by Lim (2008). MSLQ was developed in order to assess university students' learning motives and strategies. It consists of five factors but this study used only internal motive and external motive among the sub-factors of learning motivation. These sub-factors are defined as follows. Internal motive is the degree at which a learner attaches value to learning itself or the mastery of learning. External motive is the degree at which a learner attaches value to credit acquisition and others' recognition. The reliability (Cronbach's α) of the internal motive scale was .78 and that of the external motive scale was .86.

Multicultural teaching materials making activities based on the capstone design teaching model

Overview of multicultural teaching materials making activities based on the CDTM

The multicultural teaching materials making activities in this study

mainly aimed to suggest a creative idea for the development of teaching materials on the theme of multicultural, which might enhance young children's learning achievements and to carry out team activities for all the processes from design to development such as making and assembly, completion, and assessment. For the multicultural teaching materials making activities, the pre-service early childhood teachers were divided into five teams of six members. Each team selected two early childhood education institutions and carried out its activities in connection with the institutions. In cooperation with the teams, the early childhood education institutions provided education materials and advice through the stages of design to completion so that the activities including data selection, design, and the elements and goals of education were relevant to the theme. The outcomes were assessed through a teaching materials experience exhibition at which young children at early childhood education institutions could experience teaching materials in person. The activities were concluded with the evaluation of the developed teaching materials through expert evaluation by the teachers and directors of the early childhood education institutions who participated in the exhibition and self-evaluation by the pre-service early childhood teachers who participated in the multicultural teaching materials making activities.

Processes and contents of multicultural teaching materials making activities based on the capstone design teaching model

Multiculture was selected as the theme for research on the effects of multicultural teaching materials making activities on pre-service early childhood teachers' multicultural teaching efficacy and learning motivation. The research was conducted based on the teaching model as follows. The two researchers of this study derived a teaching model fit for the purpose of this study from the teaching model "Creative Engineering Technology Education Program based on Capstone Design" built by Jeong (2012) through restructuring "Problem Solving Teaching Strategies" proposed by Choi (2001). Yun (2012) "Capstone Design

Process” was also utilized. 2012 in the design area. The model was finalized through three sessions of discussion among the two researchers, one professor in education, one expert in early childhood education, and one expert in capstone design. Figure 1 shows the processes and activities of multicultural teaching materials making based on the capstone design teaching model for this study.

Process		Contents of Activities	Schedule	Period
Introduction stage	Organize creative teams	<ul style="list-style-type: none"> Organize creative teams of 5-6 members Set team members' roles Make the rules of team operation 	Sept. 1, 2014 ~ Sept. 5, 2014	1 week
	Select sub-themes based on the theme	<ul style="list-style-type: none"> Select new sub-themes related to the theme centering on the presented theme Collect data for selected sub-themes and estimate material cost 	Sept. 8, 2014 ~ Sept. 12, 2014	1 week
	Generate ideas	<ul style="list-style-type: none"> Derive methodology through brainstorming, etc. for solving problems on the selected theme through team activities 	Sept. 15, 2014 ~ Sept. 19, 2014	1 week
Implementation stage	Plan multicultural teaching materials making and make a prototype	<ul style="list-style-type: none"> Make a plan to make and develop teaching materials based on the problem-solving methodology Make a prototype if necessary 	Sept. 22, 2014 ~ Oct. 3, 2014	2 weeks
	Make	<ul style="list-style-type: none"> Make teaching materials based on the teaching materials development plan Consult with connected institutions 	Oct. 6, 2014 ~ Nov. 11, 2014	8 weeks
Assessment stage	Hold a teaching materials experience exhibition and evaluate	<ul style="list-style-type: none"> Exhibit and present developed teaching materials Hold a teaching materials experience exhibition for young children Evaluate through expert evaluation and self-evaluation 	Dec. 1, 2014 ~ Dec. 5, 2014	1 week
	Make and submit a final report	<ul style="list-style-type: none"> Present the results of activities using PowerPoint Submit a result report Give credits 	Dec. 8, 2014 ~ Dec. 12, 2014	1 week

The table below is a specific example of an activity, the execution stage of an actual class activity for making multicultural teaching materials based on the capstone design teaching model.

Table 2. Capstone Design Task Execution Plan.

Capstone Design Task Execution Plan			
Activity name	Let's travel around the world	Participants' age	5
Life theme	Various countries in the world	Theme	The lives of various peoples in the world
Curriculum-related elements	<ul style="list-style-type: none"> • Communication-listening: listening in a right attitude • Communication-speaking: sharing feelings, thoughts, and, experiences • Taking interest in social relations-society: taking interest in the world and different cultures 		
Planned teaching materials	National flag, building and food cards, capsules, and vending machines of various countries in the world		
Goals of education	<ul style="list-style-type: none"> • Know the names, national flags, buildings, and food of various countries in the world. • Take interest in various cultures. • Link national flags, buildings, and food to their corresponding countries. 		
Materials making item	Glue, foam board, scissors, thread, needle, fomex, felt, Korean paper, capsule, glue gun, OHP film, 6 cylinders		
Making methods	<ol style="list-style-type: none"> 1. Wrap fomex with felt. 2. Assemble the fomex wrapped with felt in the form of a box. 3. Wrap cylinders with felt. 4. Make a hole in three of the six cylinders so that capsules can slip out, and for the other three, cut the bottom, put into the fomex, and fix with foam board. 5. Attach a lever in the form of an airplane to the holed cylinders. 6. Attach red and blue color tape to the capsules. 7. Decorate the assembled fomex with felt. 8. Make a pocket for holding a book on the back. 		

First, Make teaching materials based on the teaching materials development plan.

Second, Collect advisory opinions based on the contents below from connected institutions.

Table 3. Capstone Design Field Advisor’s Opinion.

Capstone Design Field Advisor’s Opinion			
Requester’s name	Kim, O O	Date of request	Nov. 3, 2014
Advisory opinion			
<p>1. Key viewpoints and directions for the theme of advice</p> <p>1) Derived goals of education, and the results of medium making</p> <ul style="list-style-type: none"> • How much do the materials meet the purposes of education? • Are the materials adequate for the subjects of application? • Are there issues (solidity, practicality, flexibility, risk, etc.) in the educational application of the materials made? • Have the materials been planned and made adequately for the intended goals of education? <p>2) Lesson plans</p> <ul style="list-style-type: none"> • Have the lesson plans been made consistently with the selection and organization of contents, goal setting, and planned contents of teaching based on the goals of education? • Have the contents of education been selected fittingly for the goals of medium making? • Are the stated goals of learning adequate for the learners’ level? • Are the lessons assigned to adequate class hours? • Are the contents of class and motivation attractive? • Is the class planned in a way of facilitating the learners’ participation? <p>2. Strategies for improvement or development</p> <p>This activity is performed by putting cards showing the national flags, food, and buildings of various countries in the world in capsules, putting the capsules in vending machines of different countries in the world, and drawing a capsule and finding the country together with young children. Because this activity is not specific, however, it is necessary to add supplementary teaching tools.</p> <p>3. Conclusion</p> <p>Because this activity of putting cards showing the national flags, food, and buildings of various countries in the world in capsules, putting the capsules in vending machines of different countries in the world, and drawing a capsule and finding the country together with young children is not specific enough, it is considered necessary to add supplementary teaching tools.</p> <p>I submit an advisory opinion as stated above. November 10, 2014 Submitter: Lee, o o (Signature or seal)</p>			

Third, make a revised plan as below by reflecting on advisory opinions and then revise and add teaching materials.

Table 4. Revised Plan of Capstone Design Task

Revised Plan of Capstone Design Task			
Activity name	Let's travel around the world	Participants' age	5
Life theme	Various countries in the world	Theme	The lives of various peoples in the world
Curriculum-related elements	<ul style="list-style-type: none"> • Communication-listening: listening in a right attitude • Communication-speaking: sharing feelings, thoughts, and, experiences • Taking interest in social relations-society: taking interest in the world and different cultures 		
Planned teaching materials	National flag, buildings, food cards, capsules, and vending machines of various countries in the world, felt characters in the costumes of various countries in the world, felt book of various countries in the world		
Goals of education	<ul style="list-style-type: none"> • Know the names, national flags, buildings, and food of various countries in the world. • Take interest in various cultures. • Link national flags, buildings, and food to their corresponding countries. 		
Materials making item	Color paper, scissors, Velcro, thread, needle, felt, coating sheet, glue gun, ring, punch		
Making methods	<ol style="list-style-type: none"> 1. Make the cards of national flags, food, and buildings of five countries (Korea, China, France, Mexico, and India). Make card holders for the cards with felt. 2. Make felt characters in the traditional costumes of the five countries. 3. Make a book with pieces of felt and sew using buttonhole stitches. 4. Attach descriptions of the felt character, building and food of each country. In addition, make the border of the part where the card is to be attached. 5. Make holes through the book using a punch, and bind the book using snap rings. 		
Materials making	Cards, felt characters, and felt book for teaching the culture of various countries in the world.		

As presented in Figure 1 and Tables 2-4, the multicultural teaching materials making activities in this study organized small groups of five or six members. Each team selected new sub-themes related to the theme, set the goals of education, and collected various types of relevant information through the introduction stage. Then, through the implementation stage, it drafted a teaching materials development plan and completed a teaching tool according to the plan. In the assessment stage, the study was concluded with expert evaluation and self-evaluation through a teaching materials experience exhibition. All of the stages of

the multicultural teaching materials making activities in this study were conducted in connection with early childhood education institutions so that data and methods used in developing specific teaching materials might be relevant to the educational goals of such institutions and reflect the viewpoints and needs of teachers working the field of early childhood education. Such a connection to the field is one of the characteristics of the CDTM. This is to reflect the position of educational engineering based on the viewpoint on teaching materials of Reiser (1994) who argued that the use of materials should be included in teaching strategies by introducing materials that induce the effect of teaching methods melted in the materials rather than inducing the effect of the materials themselves. Also important is the opinion of Park and Yeom (2007) who argued that teaching strategies are not separated from the use of teaching materials but it is necessary to design teaching systematically and to select or make adequate teaching materials based on the goals of teaching demanded in the field and the analysis of teaching contents and learners' needs.

Data analysis

In order to examine the effects of multicultural teaching materials making activities based on the CDTM on pre-service early childhood teachers' multicultural teaching efficacy and learning motivation, this study collected data through a pretest and a post-test and analyzed the data using SPSS 18.0 for Windows through frequency analysis and paired-sample t-test.

Results

The results from the analysis of the effects of multicultural teaching materials making activities based on the CDTM on pre-service early childhood teachers' multicultural teaching efficacy and learning motivation are as follows.

The effects of multicultural teaching materials making activities based on the CDTM on pre-service early childhood teachers' multicultural teaching efficacy

In order to examine the effects of multicultural teaching materials making activities based on the CDTM on pre-service early childhood teachers' multicultural teaching efficacy, this study conducted paired-sample t-test using the mean scores of multicultural teaching efficacy obtained from the tests before and after participation in multicultural teaching materials making activities. The results are shown in Table 5.

Table 5. Differences in Multicultural Teaching Efficacy.

Factor	Variable	M	SD	Paired difference		df	Paired t
				m	sd		
General teaching efficacy	Pretest	19.03	2.32	-.266	1.33	29	-1.09
	Post-test	19.30	2.36				
Instruction teaching efficacy	Pretest	14.73	2.57	-4.33	1.21	29	-19.56***
	Post-test	19.06	2.62				
Human relationship teaching efficacy	Pretest	12.93	2.04	-3.36	1.06	29	-17.29***
	Post-test	16.30	2.19				
Total of multicultural teaching efficacy	Pretest	46.70	5.82	-7.96	2.34	29	-18.63***
	Post-test	54.66	6.67				

*** $p < .001$

As presented in Table 5, according to the results of paired-sample t-test on the scores of multicultural teaching efficacy obtained from the tests before and after multicultural teaching materials making activities based on the capstone design teaching model participation, $t = -18.63$ ($p < .001$) for multicultural teaching efficacy, $t = -1.09$ ($p > .05$) for sub-factor General teaching efficacy, $t = -19.56$ ($p < .001$) for sub-factor instruction teaching efficacy, and $t = -17.29$ ($p < .001$) for sub-factor human relationship teaching efficacy. This shows that there were statistically significant differences in the factors. This means that multicultural teaching materials

making activities based on the CDTM have a positive effect on pre-service early childhood teachers' multicultural teaching efficacy.

The effects of multicultural teaching materials making activities based on the CDTM on pre-service early childhood teachers' learning motivation

In order to examine the effects of multicultural teaching materials making activities based on CDTM on pre-service early childhood teachers' learning motivation, this study conducted paired-sample t-test using the mean scores of learning motivation obtained from the tests before and after participation in multicultural teaching materials making activities. The results are presented in Table 6.

Table 6. Differences in Learning Motivation.

Sub-factor	Variable	M	SD	Paired difference		df	Paired t
				m	sd		
Internal motive	Pretest	4.06	.65	-.323	1.045	29	-2.19*
	Post-test	4.24	.55				
External motive	Pretest	3.70	.54	-.447	.742	29	-4.10***
	Post-test	4.06	.60				
Total of learning motivation	Pretest	7.76	.37	-.566	1.257	29	-5.39**
	Posttest	8.30	.34				

* p<.05, ** p<.01, *** p<.001

As presented in Table 6 according to the results of paired-sample t-test on the scores of learning motivation obtained from the tests before and after multicultural teaching materials making activities based on the capstone design teaching model participation, t=-5.39 (p<.01) for learning motivation, t=-2.19 (p<.05) for sub-factor internal motive, and t=-4.10 (p<.001) for sub-factor external motive This shows that there were statistically significant differences. This means that multicultural teaching mate-

rials making activities based on the CDTM have a positive effect in enhancing pre-service early childhood teachers' learning motivation.

Discussion and Conclusions

This study purposed to examine the effects of multicultural teaching materials making activities based on the capstone design teaching model on pre-service early childhood teachers' multicultural teaching efficacy and learning motivation. The results of this study for each research question are summarized as follows.

First, multicultural teaching materials making activities based on the CDTM were found to have a positive effect in enhancing pre-service early childhood teachers' multicultural teaching efficacy. That is, pre-service early childhood teachers' scores of multicultural teaching efficacy were significantly higher in the post-test than in the pretest and this suggests that multicultural teaching materials making activities based on the CDTM have a positive effect on pre-service early childhood teachers' multicultural teaching efficacy.

When examining by sub-factor, instruction teaching efficacy and human relationship teaching efficacy were significantly higher in the post-test than in the pre-test, showing that the educational materials making activity based on the Capstone Design class model had a positive effect on pre-service early childhood teachers' instruction teaching efficacy and human relationship teaching efficacy.

Among the sub-factors of multicultural teaching efficacy, instruction teaching efficacy is about creating a class environment for multicultural teaching and having functions to select and develop materials and methods of education and to give instruction according to the children's level. The enhancement of such instruction teaching efficacy may be explained by the fact that pre-service early childhood teachers had brainstorming meetings to select multicultural contents for developing materials of multicultural education and to teach the contents effectively, and in the

course, they had direct experiences in approaches to multicultural education and teaching-learning methods. That is, these activities are believed to have had a positive effect on their instruction teaching efficacy. This finding supports the previous report that multicultural teaching efficacy was influenced more by direct multicultural experiences than by indirect ones (Bae & Kwon, 2011). Additionally, due to their developmental characteristics, multicultural classes for young children require direct activities using materials. Therefore, the development of materials for multicultural classes is an important variable for enhancing the teachers' confidence in multicultural teaching. Among the sub-factors of multicultural teaching efficacy, human relationship teaching efficacy is about promoting mutual respect, mutual understanding, and mutual cooperation among diverse groups. In this study, pre-service early childhood teachers included contents for cultural understanding in the materials of multicultural education so that young children from multicultural backgrounds and ordinary ones might come to know each other through natural interactions. It is believed that, in the course of making such media, their multicultural perception or understanding might also be improved.

It is known that teachers feel fear when they are faced with a difficult situation in the classroom when they do not have knowledge and skills to handle the situation. Accordingly, in order to enhance pre-service early childhood teachers' multicultural teaching efficacy, we need to strengthen their confidence in teaching multicultural young not only through theoretical education but also practices for having direct experiences during their training course.

Second, multicultural teaching materials making activities based on the CDTM were found to have a positive effect in enhancing pre-service early childhood teachers' learning motivation. That is, pre-service early childhood teachers' scores for learning motivation were significantly higher in the post-test than in the pre-test. This suggests that multicultural teaching materials making activities based on the CDTM have a positive effect in changing pre-service early childhood teachers' learning motivation.

This result supports previous studies (Park, 2009; Lee et al., 2011b; Back & Park, 2012) reporting that capstone design, due to its application of team-based learning, had a significant effect on the learners' motivation. The goals and themes of team-based learning are generally easily understandable basic concepts and technologies. The problem solving process involves interactions among the team members (Michaelsen et al., 2002). Therefore, each learner can play a role suitable for his/her abilities and specialties and the team members can enjoy a synergy effect of learning by utilizing one another as resources of learning. According to Lee & Lee's study (2013), teachers should design assignments with forms and themes that the learners cannot plagiarize easily in order to induce the learners to produce differentiated outputs containing their own thoughts and opinions. Furthermore, because learners are motivated to do assignments if the difficulty and quantity of the assignments are adjusted to the learners' level, these factors have been reported to influence university students' performance of assignments. Thus, it is believed that these factors worked on the entire process of multicultural teaching materials making activities including sub-theme selection and idea generation performed by the teachers participating in capstone design as well as improving their learning motivation.

The activities based on capstone design also had a statistically significant effect on internal and external motives, the sub-factors of learning motivation. The positive effect was particularly higher for external motive probably because the activities were applied as a course and the students were stimulated more by external motive, which attaches value to credit acquisition and others' recognition. In addition, as teaching materials were being made and completed, the learners felt interested in the activities themselves and this induced their internal motive, which attaches value to learning itself or the mastery of learning. From these results it is inferred that the application of knowledge, skills, etc. acquired from major education programs in the past, focusing on educational viewpoints, played a pivotal role in drawing out the inner strength of the pre-service early childhood teachers.

However, Lee, Lee, & Lee (2012) pointed out that pre-service early childhood teachers might have been considered to have sufficient theoretical knowledge about teaching materials adequate for the developmental stage of young children but what is experienced in the field may be different from this expectation and this may cause a perplexing situation. In the multicultural teaching materials making activities of this study as well, many of the pre-service early childhood teachers tried problem solving approaches by applying knowledge of various areas in order to understand the nature and contents of their tasks of learning and to resolve ambiguities. Such attempts are believed to be expanded as cognitive attempts to associate the goals of their present learning with future possibilities and, as a result, to work as an internal motive for learning by demonstrating the value of learning.

As to the result of this study that the enhancement of external motive was more significant than that of internal motive, Min-joo Kim's study (2012) found that it takes a certain length of time for deriving the affective effect of team-based learning but the 15 weeks' period of this study was not sufficient for proving the effect because internal motive was part of the affective area. Thus, a program for making teaching materials based on the capstone design teaching model in connection to field institutions needs to be designed to provide a sufficiently long period, at least longer than a semester.

This study applied the capstone design teaching model, which has hardly been used in teacher education, and proved that teaching materials making activities based on the model had a positive effect on pre-service early childhood teachers' multicultural teaching efficacy and learning motivation. The findings of this study are meaningful in that it proved the applicability of capstone design as a multicultural teaching model in teacher education. This may be useful as basic information for producing competent people demanded in the field of education.

In addition to these discussions and conclusions, the limitations of this study and suggestions for future research are as follows. First, the subjects of this study were limited to pre-service early childhood teachers

who were seniors at the Department of Early Childhood Education of N University in G City, so the results have a limitation in being generalized. Future research needs to expand the scope to students of different majors and various themes. Second, this study obtained the results from a one-group pretest-post-test experiment, but future research needs to use various research and analysis methods. Third, this study tested the applicability of the capstone design teaching model in teacher education through variables such as pre-service early childhood teachers' multicultural teaching efficacy and learning motivation, but future research needs to test the effects of various teaching materials developed using the capstone design teaching model.

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