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EFFECTS OF PROBLEM-BASED LEARNING ON DENTAL HYGIENE COURSE STUDENTS' CORE COMPETENCIES

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ABSTRACT

This study applied a one-group pre/post-test design to investigate the effects of a Problem-Based Learning (PBL) method on dental hygiene course student's core abilities. The data was analysed by SPSS ver. 24.0 using the paired samples t-test. Used core competencies were classified according to the following categories: 'Basic core competency' and 'Major core competency'. As a result of comparing both competencies before and after the introduction of PBL education, in both areas, the score after introducing the technique was higher than before the introduction, and both had the same results for all sub-competences as well showing a significant result($p<0.001$). And to conclude, this investigation illustrates that PBL-based education influences learners to develop their core competencies and suggests that it is necessary to build a creative curriculum and employ new teaching methods, for students to have both basic and major core competencies for students.

KEYWORDS: Problem based learning, Core competency, Dental hygiene course student.

INTRODUCTION

Today's society is rapidly changing technologically and socioculturally, and the demand for talented people changes according to the trend of social change. This emphasizes the importance of education that can develop the ability to flexibly and creatively deal with various problems in real rather than simple knowledge and skill acquisition education. The OECD said that competencies in DeSeCo (Definition and Selection of Competencies) project are not only acquisition of knowledge and skills, but also the ability to integrate and utilize knowledge, skills, attitudes and values to meet diverse and complex needs, and they recognize its importance in human life itself, not just for a job.[1] Recently each university is continuously striving to apply the competency-based curriculum, which is necessary for individual's successful life, with the criticism that existing education based on knowledge does not guarantee the successful life. They are also trying to provide a creative curriculum designed to help learners achieve their core competencies.

In the rapidly changing medical industry, there is a change in manpower demand due to survival competition. In addition to this change, dental hygienists are also required to comprehensively equip themselves with professional knowledge, skills, and attitudes as a member of society, as well as to flexibly cope with various problems encountered in the field. Furthermore, education for dental hygienists is necessary for them to develop practical coping skills in various clinical fields, communication skills with patients, work performance skills, and problem-solving skills.[2]

The term 'Competence' in dental hygiene education is defined as behaviour that integrates professional values including integrated and comprehensive problem recognition and problem-solving skills, evidence-based decision making and attitudes, as well as knowledge and skills for performing dental hygienist roles.[3] However, through traditional instructor-led education system, there is a limit to nurturing dental hygienists who can meet the needs of the change of the times. Recently, a variety of teaching methods have been used, such as learner-centred education focusing on problem-solving skills, breaking away from the existing education system. In the field of dental hygiene, various techniques in teaching and learning are being attempted to improve learners' motivation, problem-solving abilities, communication skills, work performance and job satisfaction, through problem-based, team-based, action and project-based learning.[4-6] Therefore, it is needed to improve the present curriculum and introduce different instructional strategies to adapt well to the changing environment and acquire necessary competencies in schools for students.

Among learner-centred methods, Problem-Based Learning (PBL) is a student-cantered pedagogy to improve coping skills and critical thinking skills in the field by acquiring knowledge, skills, and attitudes necessary to find problems and figure out solutions in

specific situations.[7] Previous studies have demonstrated that the PBL method is effective in improving self-directed learning, problem-solving skills, discussion skills, cooperative spirit, communication skills and coping abilities in real situations.[8-9] Thus, it is important to apply various teaching procedures to cultivate skilled people who reflect the changes in education in the social flow and possess the core competencies required in the industrial field, whereas, the things is that such attempts haven't been actively made in the field of dental hygiene.

Therefore, the aim of this study is to figure out the effect of the PBL-based education on dental hygiene course students' core competencies.

METHOD

Target and Period

The study takes form of a one-group pre/post-test design to verify the effects of the PBL education on dental hygiene students' core competencies, from February 27th to June 9th, 2017, targeting on 70 students who took major courses in dental hygiene at 'C' college in 'U' city. After explaining the purpose and method of the research, students who agreed to the questionnaire were asked to fill out the self-filled questionnaire before and after the class using the PBL method. A pre-test was conducted on research variables on the first week after the start of the class, and PBL-based lectures were provided for 3 hours per week for 9 weeks, and after that, a post-test was carried out.

The questionnaire referred to Mr. Kim's previous research and was modified and supplemented to meet our goals.

Tool

Questionnaire for this study were modified and supplemented to fit the competence of dental hygienists after referring to Lee's study[11] and Shin's tool[10] which was made by brining general competency models of interpersonal service into a model based on core and basic competencies of female workers in sales. It consists of 5 questions about general characteristics and 34 questions related to core competencies. The core competencies were divided into basic and major core competencies, and the former consists of 25 questions in 8 sub-categories and the latter consists of 9 questions in 3 sub-categories. A 5-Likert scale was used in the research and the higher the score, the more positive the answer.

Statistical Analysis

Data analysis was carried out by a statistical software IBM SPSS 24.0 using the paired samples t-test and significance levels was tested at 0.05. Frequency and percentages were calculated to determine the general characteristics. A one-group pre/post-test design was used to investigate the effects of PBL technique on survey respondents' core abilities.

RESULTS

General Information of Subjects

Table 1 shows general information of survey respondents. A total of 70 were included, of whom 98.6% were female and 1.4% were male. Average academic achievement last semester was divided into 3 groups: A (90 – 100), B (80 – 89), and C (< 79) and the proportions were 11.4%, 54.3%, and 34.3%, respectively. The major satisfaction was as follows: Satisfaction 45.7%, Average 48.6%, and Dissatisfaction 5.7%.

Table 1. General characteristics of survey respondents. (N = 70)

Variables	Categories	Frequency (N)	Percentage (%)
Gender	Male	1	1.4
	Female	69	98.6
Academic Achievement	A (90 – 100)	8	11.4
	B (80 – 89)	38	54.3
	C (79 or less)	24	34.3
Major Satisfaction	Satisfied	32	45.7
	Average	34	48.6
	Dissatisfied	4	5.7

Table 2. Effects of PBL-based education on basic core competencies

Categories	Pre-test	Post-test	t	p
	M ± SD*	M ± SD*		
Achievement Orientation	2.93 ± 0.53	3.84 ± 0.58	-9.515	< 0.001
Leadership	3.19 ± 0.53	3.84 ± 0.58	-8.845	
Data Management	2.97 ± 0.61	3.90 ± 0.53	-11.574	
Interpersonal Relations	3.40 ± 0.53	3.92 ± 0.55	-6.695	
Organizational Awareness	3.22 ± 0.57	3.91 ± 0.54	-8.593	
Critical Thinking	3.29 ± 0.60	3.98 ± 0.52	-8.035	
Flexibility	3.19 ± 0.56	3.93 ± 0.56	-8.547	
Self Confidence	2.85 ± 0.60	3.80 ± 0.60	-11.050	
Total	3.12 ± 0.43	3.89 ± 0.45	-12.455	

*Mean / Standard Deviation

Table 3. Effects of PBL-based education on major core competencies

Categories	Pre-test	Post-test	t	p
	M ± SD*	M ± SD*		
Patient Care and Education	2.57 ± 0.60	4.00 ± 0.52	-15.606	< 0.001
Basic Dental Hygiene Care	2.71 ± 0.82	3.91 ± 0.54	-10.864	
Ethics	2.67 ± 0.82	3.96 ± 0.56	-10.902	
Total	2.65 ± 0.67	3.96 ± 0.48	-14.038	

*Mean / Standard Deviation

Effects of PBL education on Basic Core Competency

Table 2 indicates the effects of the PBL method on basic core competencies. Total scores before and after PBL-based lecturers were averaged 3.12 and 3.89, respectively ($p<0.001$). The average scores for each subcategory before and after PBL-based classes were as follows ($p<0.001$): 2.93 and 3.84 for 'Achievement Orientation', 3.19 and 3.84 for 'Leadership', 2.97 and 3.90 for 'Data Management'. 3.40 and 3.92 for 'Interpersonal Relations', 3.22 and 3.91 for 'Organizational Awareness', 3.29 and 3.98 for 'Critical Thinking', 3.19 and 3.93 for 'Flexibility', and 2.85 and 3.80 for 'Self Confidence'.

Effects of PBL education on Major Core Competency

Table 3 presents the relationship between PBL-based lectures and students' major core competencies. Total scores before and after PBL-based lecturers were averaged 2.65 and 3.96, respectively ($p<0.001$). The average scores for each subcategory of major core competences before and after the lecture were as follows ($p<0.001$): 2.57 and 4.00 for 'Patient Care and Education', 2.71 and 3.91 for 'Basic Dental Hygiene Care', and 2.67 and 3.96 for 'Ethics'.

Table 4. Effects of PBL-based education on core competencies by academic achievement

Categories		Pre-test	Post-test	t	p
		M ± SD*	M ± SD*		
A (90 – 100)	Basic Core Competency	3.07 ± 0.43	3.90 ± 0.33	-8.056	< 0.001
	Major Core Competency	2.44 ± 0.78	3.88 ± 0.23	-6.425	
B (80 – 89)	Basic Core Competency	3.18 ± 0.46	3.85 ± 0.49	-7.574	
	Major Core Competency	2.73 ± 0.67	3.92 ± 0.51	-9.528	
C (< 79)	Basic Core Competency	3.03 ± 0.37	3.95 ± 0.43	-8.749	
	Major Core Competency	2.60 ± 0.66	4.05 ± 0.48	-8.508	

*Mean / Standard Deviation

Effects of PBL education on Core Competencies by Academic Achievement

The influence of the PBL education on core competencies by academic achievement is presented in Table 4. Academic achievement was divided into largely 3 groups: A, B and C. In the group A (90-100), the average basic core competency before and after employing PBL method was 3.07 and 3.90, respectively, and major core competency was 2.44 and 3.88($p<0.001$). In the group B (80-89), the scores of each core competency before and after the PBL education were 3.18 and 3.85 for basic competency, and 2.73 and 3.92 for major competency($p<0.001$). The group C showed each score as follows: 3.03 and 3.95 for basic, and 2.60 and 4.05 for major($p<0.001$).

DISCUSSION

A variety of higher education methods should be provided to develop abilities needed in an era of rapid change and innovation. It is necessary to cultivate people capable of meeting rapidly changing social demands by adopting learning methods that students can lead their classes by themselves, rather than passively acquiring knowledge. Therefore, this study was carried out to propose effective teaching methods for dental hygiene students by introducing a Problem Based Learning (PLB) system to improve learners' core competencies and verifying its effectiveness.

The research investigated core competencies by classifying them into the basic and major, and the results are as follows. The effect of utilizing the PBL on basic core competencies showed higher scores with a significant difference after than before the class in all 8 subcategories of basic core competencies, which are 'Achievement Orientation', 'Leadership', 'Data Management', 'Interpersonal Relations', 'Organizational awareness', 'Critical Thinking', 'Flexibility', and 'Self Confidence'. Among them, there was the biggest difference in 'Data management' and 'Self-confidence' and followed by 'Achievement orientation'. The effects on major core competencies also showed higher scores after the class than before in all sub areas 'Patient care and Education', 'Basic Dental Care' and 'Ethics'. As a result of examining the effect of PBL method on the improvement of core competencies according to academic achievement, it was found that the basic and major core competencies were improved in all groups A, B, and C. Kim et al[12] have suggested that PBL-based education influences self-confidence, self-control, co-operative skills and self-directed learning such as contemplating about the education's contents, exploring or expanding a scope of data collection. Several other research papers have also reported that nursing students improved their active and participative learning ability, problem-solving and critical thinking skill[13], and physical therapy students' effective knowledge acquisition, independent learning skills, resolving skills and practical clinical experience were enhanced thanks to introducing the PBL system[14]. Also, by adopting the PBL system, it has been reported that students were able to have self-confidence for learning, communication skills between leaners, understanding of diversity and consideration for others[15], and the system contributes to increasing the interest of learners and learning effect[16]. In this respect, although the results of previous studies are difficult to directly compare with those of the current study, it can support our results in the way that they proved the basic core competency and major core competency required in the field were enhanced. The introduction of PBL-based education can not only increase academic achievement, but also, through a team-based problem-solving process, develop various capabilities of learners by the process of communicating, seeking new alternatives, and presenting solutions. Additionally, PBL-based pedagogy will give students the confidence to smoothly solve many of the challenges they will face in clinical practice in the future and will enable them to develop various coping skills by having opportunities to make appropriate judgements and decision for themselves. In view of this, it is important to improve the existing dental hygiene education that focuses mainly on its major education through the development of curriculum and the application of various techniques in teaching and learning so that students can have both basic and major core competencies. The improvements should be for the ability to apply knowledge to real situations, not just for the simple acquisition of knowledge and skills, and it should help students have the competence to adapt and live well in society as a member of society.

A drawback of this investigation, however, is that it is difficult to generalize since it was solely targeted at students in dental hygiene department at some universities. Also, there have been several previous studies on the effect of PBL method, but lack of previous research on core competencies so it was difficult to compare directly with this study. However, it is meaningful in that it reflects the changing trend of university education and deals with core competencies and learner-centred teaching and learning methods as research subjects. Further studies should be carried out to verify more clear effects of utilizing PBL-based education by subdividing the core competencies and applying them to a new variety of teaching methods.

CONCLUSION

This study was conducted to examine the changes in core competencies of dental hygiene students before and after the introduction of Problem-Based Learning education in form of a one group pre/post-test design. Core competencies were divided into basic core competency and major core competency. As a result of comparing the basic and major core competencies before and after employing PBL-based education, the scores of every area were higher after than before the PBL-based class. As well as, all subcategories of the basic and major core competencies showed higher scores after than before the PBL-based lectures showing significant results($p<0.001$).

In conclusion, it was found that the PBL-based education influences improving the core competency of dental hygiene students, and it is necessary to develop curriculum and apply various teaching methods for students to be equipped with basic and major core competency comprehensively.

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