Oral health educational needs and perceptions based on capstone design

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Objectives: The purpose of this study is to investigate dental hygiene college students' perception and educational need for a capstone-design-based oral health education program.

Methods: The study subjects were 130 students. A questionnaire consisting of four items on general characteristics, nine items on perception, and nine items on educational needs was used. A t-test, ANOVA, and correlation analysis were performed.

Results: In the perception, the degree of the students' understanding was only high, and the degree of interest, necessity, influence, and willingness to participate were moderate. The degree of need was moderate. Among them, communication ability and problem-solving ability were high. However, home visiting education and team-based learning were low. Lastly, the more the perception increased, the more the needs increased.

Conclusions: For dental hygiene students, it is necessary to apply an oral health education based on capstone design for creativity and convergence. In addition, these results can be used as basic data to apply the capstone design to various curricula.

Keywords Dental hygiene, Educational activities, Oral health, Teaching method, Training technic

Ⅰ. Introduction

In the 4th industrial revolution, the issue is how to educate people in disappearing occupations and turn them into new ones. Governments and societies must prepare for such changes and build systems [1]. Response to these changes, the government suggested the direction of curriculum reform as educating convergent human resources [2]. Convergence talent refers to people who are capable of producing original products in new ways [3].

As a result, many universities have recently attempted to enhance a creativity and a convergence by introducing a Capstone Design course, which integrates a major knowledge and solves a problem. Capstone design courses have been introduced into non-engineering fields since 2012 as part of Leaders in INdustry-university Cooperation(LINK) [4].

Capstone is derived from a capstone that is finished in architecture with ornaments and symbols on top of walls and structures. This is the climax or the impression through finishing in buildings [5]. Capstone design in the curriculum, unlike the traditional education design, means integrating the knowledge to produce a result and finishing the learning [6]. The way of presenting the result is learning outcomes such as a research paper and a graduation work, and the curriculum is composed of designing and producing what is applicable in the industrial field based on their major knowledge. Students can develop practical skills and teamwork [7]. Currently, it is now expanding to various academic fields, and it is turning into a comprehensive design education which solves problems by forming teams for student creativity [8].

Capstone designs can also be applied to dental hygiene education. Traditional teaching methods induced students to learn passively, and they were difficult to learn by themselves and to motivate [9]. Dental hygiene education should be equipped with the knowledge, skills Therefore, the researcher will investigate the educational needs to apply the oral health education practice as a capstone design, and also examine the students' perception nad attitudes of the major to respond appropriately to various clinical situations. In particular, the ability to conduct an oral health education is a main core competency among dental hygienists [10].

Recent studies have shown that capstone design education is effective in improving students' creative problem solving ability, learning interest, academic achievement and learning satisfaction [6-7, 11-13, 17]. However, there is insufficient research to apply the capstone design in the dental hygiene curriculum, and research on need and perception of student.

In order to apply an oral health education practice as a capstone design, a series of processes of selecting subjects, surveying educational needs, setting educational goals, selecting contents and experiences, selecting educational methods and media, and evaluating methods are required. Therefore, the purpose of this study is to investigate the educational needs of applying capstone design to oral health education practice and to investigate the perceptions of student.

Ⅱ. Materials and Methods

1. Subjects

The subjects were 149 students from the dental hygiene department in Suncheon. Explained the purpose and method of the study, they were completed the questionnaire only if they agreed. This study was approved by Institutional Review Board (CA17-200312-HR-001-01). The investigation period was 5 days from April 06 to 10, 2020, and collected by the researcher.

The minimum number of samples was calculated as 128 using the G Power 3.1 program [14-15] by the correlation analysis with the significance level of 0.05, test power 80%, and 0.51 effect size. Assuming the rate of elimination as 10%, 149 subjects were suitable for analysis. The size effect was referenced in the question about the results by level of communication skills in the study of Tae etc. [16].

2. Methods

The questionnaire consisted of 22 items including 4 character-istics of the study subjects, 9 questions about perceptions of capstone design, and 9 questions about educational needs. Based on the research of Tae et al. [16], the items were modified

and adapted according to the purpose of the study.

3. Analysis method

The independent t-test and ANOVA were used to compare the differences between the perceptions and need of capstone design. In addition, their correlation was analyzed.

The data were analyzed using SPSS(ver. 18.0, Chicago, Illinois, USA). Cronbach's alpha was calculated for internal reliability of the question. The reliability of perceptions was 0.865, and that of needs was 0.952.

Ⅲ. Results

1. The general characters of study subjects

The general characters of study subjects were shown in <Table 1>. The final subjects were 130, excluding 19 who responded incompletely. Most of them were female (99.2%), in the freshman with 34.6%, sophomore with 32.3%, junior with 33.1%. 65.4% of them took the theory of oral health education and 33.1% practiced training.

2. Perception of capstone design education

It was shown <Table 2> that was the perception of capstone design education. The understanding was high (4.74 points), but the level of interest (3.02 points), necessity (3.30 points),

<Table 1> The general characters of study subjects (n=130)

Variable		N	%
Gender	Male	1	0.8
	Female	129	99.2
Grade	Freshman	45	34.6
	Sophomore	42	32.3
	Junior	43	33.1
Theory lecture[*]	Taken	85	65.4
	Untrained	45	34.6
Practice train	Trained	43	33.1
	Unexperienced	87	66.9

[*]Oral health education lecture

<Table 2> Perception of capstone design education

Variable	Mean	SD
Understanding	4.74	0.80
Interesting	3.02	0.87
Need	3.30	0.87
Influence	3.42	0.86
Participation intention	3.27	0.85
Total	3.55	0.69

<Table 3> Perception of capstone design according to grade

Variable		N	Mean	SD	p-value
Understanding	Freshman	45	4.58	1.03	0.252
	Sophomore	42	4.83	0.79	
	Junior	43	4.81	0.45	
Interesting	Freshman	45	2.93	0.94	0.611
	Sophomore	42	3.12	0.89	
	Junior	43	3.02	0.77	
Need	Freshman	45	3.33	0.85	0.914
	Sophomore	42	3.31	0.87	
	Junior	43	3.26	0.90	
Influence	Freshman	45	3.51	0.76	0.671
	Sophomore	42	3.40	0.94	
	Junior	43	3.35	0.90	
Participation intention	Freshman	45	3.31	0.82	0.739
	Sophomore	42	3.31	0.90	
	Junior	43	3.19	0.85	
Total	Freshman	45	3.53	0.70	0.878
	Sophomore	42	3.60	0.75	
	Junior	43	3.53	0.62	

<Table 4> Perception of capstone design according to experience of the practice train

Variable		N	Mean	SD	p-value
Understanding	Trained	43	4.81	0.45	0.453
	Unexperienced	87	4.70	0.93	
Interesting	Trained	43	3.02	0.77	0.999
	Unexperienced	87	3.02	0.91	
Need	Trained	43	3.26	0.90	0.685
	Unexperienced	87	3.32	0.86	
Influence	Trained	43	3.35	0.90	0.492
	Unexperienced	87	3.46	0.85	
Participation intention	Trained	43	3.19	0.85	0.436
	Unexperienced	87	3.31	0.85	
Total	Trained	43	3.53	0.62	0.770
	Unexperienced	87	3.56	0.72	

<Table 5> Perception of capstone design according to experience of the theory lecture

Variable		N	Mean	SD	p-value
Understanding	Taken	85	4.82	0.64	0.151
	Untrained	45	4.58	1.03	
Interesting	Taken	85	3.07	0.83	0.392
	Untrained	45	2.93	0.94	
Need	Taken	85	3.28	0.88	0.752
	Untrained	45	3.33	0.85	
Influence	Taken	85	3.38	0.91	0.399
	Untrained	45	3.51	0.76	
Participation intention	Taken	85	3.25	0.87	0.685
	Untrained	45	3.31	0.82	
Total	Taken	85	3.56	0.68	0.834
	Untrained	45	3.53	0.70	

influence (3.42 points), and willingness to participate (3.27 points) were moderate.

There was no statistically significant difference in understanding, interesting, need, influence, participation intention according to grade <Table 3>. In addition, there was no difference according to the experience of theory lecture and practice train <Table 4><Table 5>.

3. Educational needs of capstone design

The educational needs are the same as <Table 6>. The needs were moderate (3.52 points), and the communication (3.68 points) and dealing with problem (3.58 points) were high, and the home visit education (3.33 points) and team-based learning (3.45 points) were low.

There were no statistically significant differences in knowledge of oral health education, critically thinking, integration, social need, team-based learning, visiting education, problem replacement ability, communication ability, and achievement according to grade and to experience of the practice train <Table 7><Table 8>. However, the needs for team-based education was higher in the group who took the theory lecture (p<0.05) <Table 9>.

<Table 6> Educational needs of capstone design

Variable	Mean	SD
Knowledge of oral health education.	3.45	0.82
Critically think	3.50	0.81
Integration	3.53	0.81
Social need	3.57	0.80
Team-based learning	3.45	0.92
Visiting education	3.33	0.88
Problem replacement ability	3.58	0.80
Communication ability	3.68	0.82
Achievement	3.58	0.81
Total	3.52	0.71

<Table 7> Differences in educational needs according to grade

Variable		N	Mean	SD	p-value
Knowledge of oral health education	Freshman	45	3.36	0.74	0.505
	Sophomore	42	3.43	0.94	
	Junior	43	3.56	0.77	
Critically think	Freshman	45	3.56	0.66	0.851
	Sophomore	42	3.48	0.94	
	Junior	43	3.47	0.83	
Integration	Freshman	45	3.51	0.69	0.598
	Sophomore	42	3.45	0.94	
	Junior	43	3.63	0.79	
Social need	Freshman	45	3.60	0.58	0.930
	Sophomore	42	3.57	1.02	
	Junior	43	3.53	0.77	
Team-based learning	Freshman	45	3.22	0.97	0.070
	Sophomore	42	3.48	0.97	
	Junior	43	3.67	0.78	
Visiting education	Freshman	45	3.33	0.83	0.361
	Sophomore	42	3.19	0.99	
	Junior	43	3.47	0.83	
Problem replacement ability	Freshman	45	3.53	0.66	0.816
	Sophomore	42	3.64	0.98	
	Junior	43	3.58	0.73	
Communication ability	Freshman	45	3.73	0.65	0.850
	Sophomore	42	3.64	0.98	
	Junior	43	3.65	0.81	
Achievement	Freshman	45	3.62	0.72	0.839
	Sophomore	42	3.52	0.94	
	Junior	43	3.60	0.79	
Total	Freshman	45	3.50	0.51	0.931
	Sophomore	42	3.49	0.88	
	Junior	43	3.57	0.71	

<Table 8> Differences in educational needs according to experience of the practice train

Variable		N	Mean	SD	p-value
Knowledge of oral health education.	Trained	43	3.56	0.77	0.152
	Unexperienced	87	3.39	0.84	
Critically think	Trained	43	3.47	0.83	0.151
	Unexperienced	87	3.52	0.80	
Integration	Trained	43	3.63	0.79	0.151
	Unexperienced	87	3.48	0.82	
Social need	Trained	43	3.53	0.77	0.149
	Unexperienced	87	3.59	0.81	
Team-based learning	Trained	43	3.67	0.78	0.171
	Unexperienced	87	3.34	0.97	
Visiting education	Trained	43	3.47	0.83	0.164
	Unexperienced	87	3.26	0.91	
Problem replacement ability	Trained	43	3.58	0.73	0.149
	Unexperienced	87	3.59	0.83	
Communication ability	Trained	43	3.65	0.81	0.153
	Unexperienced	87	3.69	0.83	
Achievement	Trained	43	3.60	0.79	0.152
	Unexperienced	87	3.57	0.83	
Total	Trained	43	3.57	0.71	0.132
	Unexperienced	87	3.49	0.71	

<Table 9> Differences in educational needs according to experience of the theory lecture

Variable		N	Mean	SD	p-value
Knowledge of oral health education.	Taken	85	3.49	0.85	0.360
	Untrained	45	3.36	0.74	
Critically think	Taken	85	3.47	0.88	0.571
	Untrained	45	3.56	0.66	
Integration	Taken	85	3.54	0.87	0.841
	Untrained	45	3.51	0.69	
Social need	Taken	85	3.55	0.89	0.718
	Untrained	45	3.60	0.58	
Team-based learning	Taken	85	3.58	0.88	0.037*
	Untrained	45	3.22	0.97	
Visiting education	Taken	85	3.33	0.92	0.981
	Untrained	45	3.33	0.83	
Problem replacement ability	Taken	85	3.61	0.86	0.595
	Untrained	45	3.53	0.66	
Communication ability	Taken	85	3.65	0.90	0.570
	Untrained	45	3.73	0.65	
Achievement	Taken	85	3.56	0.87	0.703
	Untrained	45	3.62	0.72	
Total	Taken	85	3.53	0.80	0.783
	Untrained	45	3.50	0.51	

* $p < 0.05$

<Table 10> Correlation between perception and educational needs

	Perception	Needs
Perception	1	
Needs	0.678*	1

* p<0.01 by Pearson's correlation analysis

4. Correlation between perception and educational needs

It was shown in <Table 10> that was the correlation between the perception and the needs. As the perception increased, the needs increased (α =0.678, p<0.01).

Ⅳ. Discussion

The researcher analyzed the perceptions and the educational needs to apply the oral health education practice as a capstone design.

Although the understanding of capstone design was high (4.74 points), interest (3.02 points), need (3.30 points), influence (3.42 points), and willingness to participate (3.27 points) were moderate. In addition, there was no significant difference in the perception according to the general characteristics of the subjects.

In study of Tae et al. [16], the perception is low, and there is no significant difference between gender and college majors (p>0.05), but that is higher in high grades than in low grades (p<0.01). In the study of Chung et al. [17], the level of perception is moderate and the level of understanding is low, but the perception of seniors is high (p<0.01). It is low because the detailed explanation and publicity of the capstone design is insufficient. Similar to previous papers [16-17], the perception was not high. However, the degree of understanding in this study was high. This is because of the promotion and observations of other departments. However, it needs additional promotion and strategy to increase interest, necessity, influence, and participation. It is necessary to support the basic capstone design program as an irregular course or liberal arts for the lower grades, and apply it to the major education for the higher grades.

The education needs was moderate (3.52 points), and there was no significant difference according to the general characteristics of this study except for team-based learning according to learning experience (p<0.05). It was high (than 4.0 points) in research of Tae et al. [16], there are statistically significant differences according to gender and college majors. The needs of male students are high (p<0.01) and those of non-engineering majors are high (p<0.01). It was moderate (3.35 points) in research of Chung et al.[17]. In addition, higher grades (p<0.01), students with high major satisfaction (p<0.01), students with educational experience (p<0.01), and students with poor interpersonal relationships (p<0.01) have higher the needs. In this study, only the demand for team-based education was higher in the group who took the theoretical lecture. This is because, unlike theoretical lectures, practice is thought to be necessary as a team.

Since the needs are different according to the general characteristics of student, capstone design education should be applied according to gender, grade, and major. The lower grades need to educate for creative thinking and problem-solving skills, and the higher grades need to educate for social and career development. This is because senior students will have a lot of interest in employment and careers.

The higher the perception of capstone design, the higher the need for education (α =0.678, p<0.01). In previous studie [17], the higher the perception, the higher the need (α =0.809, p<0.01).

Society will change and develop faster in the future. The required abilities will continue to change accordingly. To adapt to such changes, we need to have the ability to use, be creative, and learn rather than knowledge itself.

It is expected that it will not be easy to apply the capstone design to many courses at present. However, it is recommended that be taught as a regular or non- regular course according to basic learning ability, grade, and needs of student. The motives for participating in non-regular courses are various experiences, professional improvement, and competency evaluation [18]. It could be expanded by promoting the capstone design education to students and developing a curriculum according to the needs.

In the future, dental hygienists must solve problems and

improve self-directed learning skills [19]. In addition, they need practical skills as well as creative planning and communicating in a variety of clinical situations. However, at present, the education in college is focused on the license exam, be too subdivided, and be focused on theory-based expertise. There is a lack of educational opportunities to develop the role of dental hygienists [20].

Dental hygiene education based on capstone design is not applied in various subjects. As a future oral health educator, it is necessary to apply capstone design to the curriculum in order to enhance students' ability to solve problems and communicate as well as majors.

This study surveyed some subjects and has the limitation that the survey method is a questionnaire. Also, it has limitations in which achievement, effectiveness, and satisfaction after education can not be investigated. However, in order to cultivate creative and convergent human resources required by the future society, we analyzed the perception and need of oral health education based on capstone design. These results can be used as basic data for applying capstone design to various subjects.

V. Conclusion

The results of perception and need of capstone design for dental hygiene student are as follows.

1. In the perception, the degree of understanding (4.74 points) was high, but the interest (3.02 points), need (3.30 points), influence (3.30 points), and participate intention (3.27 points) were moderate. In addition, there was no statistically significant difference according to the general characteristics of the study subjects.

2. The need for communication ability (3.68 points) and problem replacement ability (3.58 points) was relatively high, but the need for visiting education (3.33 points) and team-based learning (3.45 points) was relatively low. In addition, there was no significant difference according to the general characteristics except for team-based learning according to learning experience ($p < 0.05$)

3. The higher the perception of capstone design, the higher the need for education ($\alpha = 0.678$, $p < 0.01$).

For students, we will need to apply the oral health education based on the Capstone Design for a creative and a convergence. If we promote the necessity for students and develop a curriculum according to the needs, you will be able to expand and apply it.

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