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Original Article

The impact of integrating oral health education into a human physiology curriculum for students of early childhood education



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KEYWORDS

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Abstract *Background/purpose:* The good oral health plays a pivotal role in improving the general health of the body. The purpose of this study was to evaluate an innovative design incorporating oral health education into a human physiology curriculum for students of early childhood education by evaluating the students' perspectives on the oral health curriculum.

Materials and methods: Forty-two first-year students who took the compulsory course entitled "Introduction to Human Physiology" in National Taiwan Normal University in 2022 were invited to fill out the questionnaire for a presurvey regarding their familiarity with basic oral health concepts, and a postsurvey in which the students answered the same presurvey questions after finishing the class.

Results: Of the 42 students, 41 (97.62%) participated in both the presurvey and postsurvey. The results showed that the learning unit of oral health education helped students in raising their

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concepts on oral health. To the questions asking that I understand the structure and function of the oral cavity and I understand common oral diseases (dental caries and periodontal diseases), the numbers of students who agreed increased from 12 (29.27%) to 39 (95.12%) and 11 (26.83%) to 36 (87.80%), respectively. Moreover, the mean scores increased from 3.24 to 4.20 ($P < 0.001$) and from 3.12 to 4.29 ($P < 0.001$) for the two corresponding questions, respectively.

Conclusion: In this study, the learning unit of oral health education in the human physiology curriculum for students of early childhood education helped the students to increase their awareness and understanding of oral health.

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Introduction

Since the first dental college (Baltimore College of Dental Surgery) was established in the United States in 1840, dentistry went the way of an independent profession from medicine.¹ Not only that, dentistry seems to be independent of other professions, and dental education has become the patent of dental schools or dental colleges. Dental education outside the dental schools or dental colleges seems to be less valued. In fact, the separation of dental education from medical education or other professions has an adverse effect on the delivery of dental care.² Despite a large number of the primary medical staff (including primary care physicians, nurse practitioners, primary care providers, and pharmacists) and the opportunity to provide preventive oral care such as oral hygiene instruction to patients in their workplace, the primary medical staff are still unable to play an active role in the field of preventive oral care, because they have very little knowledge on the basic structure and function of the oral cavity and oral diseases as well as how to maintain and improve oral health.^{3–5} For the same reason, there are also a large number of kindergarten teachers, primary school teachers, and high school teachers who often have the opportunity to provide their students with correct oral health knowledge and oral care concepts in their education fields. In particular, the kindergarten teachers often have the opportunity to play an active role in the preventive oral care of early childhood at the deciduous teeth stage. Unfortunately, in the process of the development for kindergarten teacher profession, there is almost no learning on the basic structure and function of the oral cavity and oral diseases as well as how to teach the children to maintain and improve their oral health, and this makes it impossible for them to play an active role in promoting oral health of the children.

Previous studies have repeatedly proven that dental students have better oral health concepts than students in other majors.^{6–8} In addition, the integration of oral health education into medical students' courses does have the effect of improving medical students' oral health concepts. However, such curriculum design had already been used in the medical education in Taiwan in the past but finally it was removed from the medical education, because the medical students had too many credits to learn in their

studying period of six years.^{9,10} Therefore, it's the real occasion to incorporate oral health education into relevant curricula designed for those students who will become teachers in the future.

In this study, we designed a learning unit of oral health in a general human physiology course for students of early childhood education in National Taiwan Normal University. The goal of this curriculum design was to hopefully prepare students to become teachers with a more comprehensive understanding of oral health in the future. Therefore, the main purpose of this study was to evaluate our innovative design and students' learning outcomes by assessing the students' perspectives on the oral health curriculum.

Materials and methods

Participants

A total of 42 students who took the compulsory course entitled "Introduction to Human Physiology" in the National Taiwan Normal University in 2022 were included in this study.

Teaching process

The course was a specific subject for students in the second semester of the first academic year of the Undergraduate Program of Early Childhood Development and Education of the Department of Human Development and Family Studies, which was a 3-credit subject and was taught in the form of lectures. This course was mainly taught by the teachers of the School of Life Science who specialized in the field of Zoology, and students from different fields were also welcome to take this course.

Physiology is a course to introduce the basic knowledge about the body composition and function. This course was designed based on the function of different body systems to teach students about the principle of physiology systematically, the mechanisms and regulation in organ operation as well as the integration of these body systems to maintain homeostasis. In this study, this course was designed to add the content of oral health education to the unit of the digestive system, which introduced the structure and physiological function of the oral cavity, and how common

oral diseases (dental caries and periodontal diseases) caused the impairment of oral function, hoping to enhance the students' concepts of oral health.

Survey tool

Before the class of oral health education, all students who took this course were invited to fill out the questionnaire for a presurvey. Furthermore, the same students were invited again to fill out the questionnaire for a postsurvey after finishing the class. The questions in both the presurvey and postsurvey were the same for analyzing the changes of students' concepts of oral health before and after the class. All students were invited to join in these surveys at their free will to fill out the questionnaires without the pressure from the investigators.

A structured questionnaire through paper was used as the survey tool. The investigated questions included the self-assessment of students' cognition for the concepts of oral health. In the investigated questions, the answer was designed to let the participants to raise a score ranging from 1 to 5. If the intensity or response for each question was extremely agreed, the score was 5. If the intensity or response for each question was neutral, the score was 3. In contrast, if the intensity or response for each question was extremely disagreed, the score was 1. If the mean score was 3 or more, it meant that on average answers agreed the investigated questions, and the higher the score, the higher the degree of their agreement. In addition, a score equal to 4 or more demonstrated that the participants agreed with the investigated questions. The participants were suggested to fill the score in fresh memory.

Statistical analysis

All data obtained from the questionnaires were stored in excel files and used for statistical analysis. The differences in the mean scores (the degree of agreement) of various investigated items, which represented the changes of students' concepts of oral health before and after the class, were compared by paired sample *t*-test. The result was significant if the *P*-value was less than 0.05.

Results

Demographic data

A total of 42 students who took the compulsory course entitled "Introduction to Human Physiology" in the National Taiwan Normal University in 2022 were included in this study. They were from different departments including 39 students from the Department of Human Development and Family Studies and 3 students from other departments. Of these 42 students, 3 were males and 39 were females. Moreover, 36 were first-year students and 6 were second-year students with an average age of 19 years. Only two of them have no career plan to become a teacher in the future (Table 1). Among them, 41 valid questionnaires were recovered. The response rate was 97.62%.

Table 1 Distribution of students (N = 42) who took the compulsory course entitled "Introduction to Human Physiology" in National Taiwan Normal University in 2022.

Category	Number of students	
Department	Department of Human Development and Family Studies	Other departments
	39	3
Grade	First-year	Second-year
	36	6
Gender	Male	Female
	3	39
Career plan to become a teacher	Yes	No
	40	2

The investigated items

There were seven items being investigated in the surveys by the self-assessment of students' cognition for concepts of oral health before and after the class (Table 2). These investigated items all were required for multiple choice. There were question 1: I understand the structure and function of the oral cavity; question 2: I understand common oral diseases (dental caries and periodontal diseases); question 3: I understand how to properly clean (brush) my teeth and how important it is; question 4: In

Table 2 Question content and question type used in the surveys by the self-assessment of students' cognition for the concepts of oral health before and after the class.

Question content	Question type
1. I understand the structure and function of the oral cavity.	For knowledge, multiple choice
2. I understand common oral diseases (dental caries and periodontal diseases).	For knowledge, multiple choice
3. I understand how to properly clean (brush) my teeth and how important it is.	For behavior, multiple choice
4. In order to maintain oral health, I will consider carrying a cleaning (brushing) tool with me, so that I can clean (brush) my teeth at any time after eating.	For behavior, multiple choice
5. I think that it is important to have regular oral health checks.	For attitude, multiple choice
6. I think that oral health is important for overall health.	For attitude, multiple choice
7. After becoming a teacher, I will explain the importance of oral health to my students in the class.	For attitude, multiple choice

order to maintain oral health, I will consider carrying a cleaning (brushing) tool with me, so that I can clean (brush) my teeth at any time after eating; question 5: I think that it is important to have regular oral health checks; question 6: I think that oral health is important for overall health; and question 7: After becoming a teacher, I will explain the importance of oral health to my students in the class (Table 2).

The changes of students’ concepts of oral health before and after the class

There were seven investigated items for analyzing students’ cognition for the concepts of oral health related to knowledge, behavior, and attitude before and after the class (Table 2). Based on the postsurvey results, all respondents found the learning unit of oral health to be helpful in raising their concepts of oral health. The degree of agreement for each item was high, and all the mean scores for each item were 3.68–4.78 in the postsurvey. Moreover, all 41 (100%) respondents agreed that it is important to have regular oral health checks and oral health is important for overall health. Regarding carrying a cleaning (brushing) tool for cleaning (brushing) my teeth at any time after eating, only 25 (60.98%) of the 41 respondents agreed. On the contrary, other concepts of oral health were all well agreed. The data for questions on the concepts of oral health in the presurvey and postsurvey are shown in Table 3.

For the concepts of oral health related to knowledge, before the class, only 12 (29.27%) students agreed that I understand the structure and function of the oral cavity and the agreed students increased to 39 (95.12%) after finishing the class. The mean score increased from 3.24 ± 0.70 to 4.20 ± 0.60 (P < 0.001). Also, before the class, only 11 (26.83%) students agreed that I understand common oral diseases (dental caries and periodontal diseases), and the agreed students increased to 36 (87.80%) after the class. The mean score increased from 3.12 ± 0.64 to 4.29 ± 0.70 (P < 0.001) after finishing the class (Table 3).

For the concepts of oral health related to behavior, before the class, 37 (90.24%) students agreed that I understand how to properly clean (brush) my teeth and how important it is, and the agreed students increased to 38 (92.68%) after finishing the class. The mean score increased from 4.10 ± 0.62 to 4.46 ± 0.64 (P < 0.01). Also, before the class, only 8 (19.51%) students agreed that in order to maintain oral health, I will consider carrying a cleaning (brushing) tool with me, so that I can clean (brush) my teeth at any time after eating, and the agreed students increased to 25 (60.98%) after the finishing class. The mean score increased from 2.83 ± 0.89 to 3.68 ± 0.76 (P < 0.001) (Table 3).

For the concepts of oral health related to attitude, before the class, 35 (85.37%) students agreed that I think it is important to have regular oral health checks, and 36 (87.80%) students agreed that I think oral health is important for overall health. Moreover, the numbers of agreed students both increased to 41 (100%) after finishing the class. The mean scores increased from 4.24 ± 0.92 and 4.37 ± 0.70 to 4.78 ± 0.42 and 4.71 ± 0.46 (both P-values < 0.001), respectively. Also, before the class, 33 (80.49%) students agreed that after becoming a teacher, I will explain the importance of oral health to my students in class, and the agreed students increased to 38 (92.68%) after finishing the class. The mean score increased from 4.00 ± 0.67 to 4.39 ± 0.63 (P < 0.001). Furthermore, for overall concepts of oral health, the mean score increased from 3.70 ± 0.44 before the class to 4.36 ± 0.37 after finishing the class (P < 0.001) (Table 3).

Discussion

Since dentistry has moved towards professionalism, dental education has become more and more exclusive to dental schools. However, we need to clearly define dental education. In a narrow sense, dental education just refers to a kind of education for cultivating or training dentists. However, all educational activities improving students’ concepts of oral health are dental education in a broad sense or we can also call it oral health education. Unfortunately,

Table 3 Presurvey and postsurvey results of repeated questions for students’ cognition for concepts of oral health before and after the class (N = 41).

Questions	Presurvey		Postsurvey		Significance t-value
	Mean score ± SD	Number (rate) of respondents who answered as agree	Mean score ± SD	Number (rate) of respondents who answered as agree	
Question 1	3.24 ± 0.70	12 (29.27%)	4.20 ± 0.60	39 (95.12%)	-7.57***
Question 2	3.12 ± 0.64	11 (26.83%)	4.29 ± 0.70	36 (87.80%)	-10.65***
Question 3	4.10 ± 0.62	37 (90.24%)	4.46 ± 0.64	38 (92.68%)	-3.06**
Question 4	2.83 ± 0.89	8 (19.51%)	3.68 ± 0.76	25 (60.98%)	-6.90***
Question 5	4.24 ± 0.92	35 (85.37%)	4.78 ± 0.42	41 (100%)	-4.42***
Question 6	4.37 ± 0.70	36 (87.80%)	4.71 ± 0.46	41 (100%)	-4.13***
Question 7	4.00 ± 0.67	33 (80.49%)	4.39 ± 0.63	38 (92.68%)	-5.06***
Overall	3.70 ± 0.44	—	4.36 ± 0.37	—	-12.16***

P < 0.01; *P < 0.001.

dental schools seem to focus solely on developing dental education for dentists, while oral health education is often underappreciated and considered to be a general education that can be easily practiced in a variety of schools and settings. This may obviously cause an adverse effect on the delivery of oral or dental care.

To the best of our knowledge, our study is the first one focusing on oral health education for non-medical professional students in Taiwan. This may be the first study of oral health education outside a dental school or a medical school. The presurvey and postsurvey results showed that the learning unit of oral health education in the human physiology curriculum could result in an increase in students' cognition for the concepts of oral health related to knowledge, behavior, and attitude. It was also observed that students expressed interest in understanding the importance of oral health. This new initiative let the first-year students of early childhood education obtain the knowledge of oral health, because oral health is related to the structure and physiological function of the oral cavity and certain common oral diseases such as dental caries and periodontal diseases do cause the impairment of oral function.

In medical schools, oral health education is an important step to support interprofessional education in the health care professions and to promote a collaborative learning environment.² By similar reasoning, the interprofessional oral health learning helped the first-year students of early childhood education to acquire some basic knowledge of oral health. To the questions asking that I understand the structure and function of the oral cavity and I understand common oral diseases (dental caries and periodontal diseases), 39 (95.12%) and 36 (87.80%) of the 41 students responded positively after the class, compared to 12 (29.27%) and 11 (26.83%) of the 41 students having the corresponding knowledge before the class, respectively. Considering the reported effectiveness of the interprofessional learning for improving students' basic knowledge of oral health, this model shows a good outcome for further use in other institutions. Furthermore, to the question asking that after becoming a teacher, I will explain the importance of oral health to my students in class, 38 (92.68%) of the 41 students responded positively after the class, compared to 33 (80.49%) of the 41 students showing the same attitude before the class (Table 3). Considering the reported effectiveness that will have spillover benefits in the future, this model shows a more valuable promise for further use in other institutions of the teacher education.

The World Health Organization (WHO) established the goal for creating nationwide oral health care in 1979 with the theme of "Health for All". The plan is to set a year 2010 oral health goal that 90% of children aged 5–6 years are free of dental caries.¹¹ A 2011 survey of oral cavity status of children under the age of 6 years in Taiwan found that the prevalence of dental caries is 31.40% for 2-3-year-old children, 61.55% for 3-4-year-old children, 78.05% for 4-5-year-old children, and 79.32% for 5-6-year-old children.¹² This finding indicates that the prevalence of dental caries among children in Taiwan increases with age, and it is much higher than the target set by the WHO. Furthermore, a

previous study found that the dental use rate for dental caries is only 16.84% for 0-4-year-old children and 55.69% for 5-9-year-old children in Taiwan in 2021. This result indicates that there may be still many children with dental caries that do not receive proper treatment in Taiwan.¹³ Therefore, some related persons, especially caregivers or teachers, need to pay more attention to the oral health of young children.

The oral health of infants and early children is very important. For infants and early children, oral health care should start from their birth. Oral health problems caused by dental caries of deciduous teeth will not only affect chewing, pronunciation and esthetics, but also affect the development of future permanent teeth and the growth of the body.^{14–16} It is the real occasion that early childhood teachers can play an important role for oral health care of their students. The integration of oral health education into the general human physiology curriculum has the advantage of enhancing students' oral health concepts, improving students' oral health behavior, and therefore increasing their oral health. In addition, the students in this study are likely to become teachers of early childhood education in the future. They can play an active role in the workplace in the future, including implementing oral health education for children, assisting children in oral health care, identifying children's oral health problems, and promoting children's dental treatment, thereby reducing future oral disease problems, promoting the overall health, and reducing future dental expenses and overall medical expenses. Therefore, it is of great benefit to promote the integration of oral health education into the general human physiology curriculum or related courses in the long run.

Although teachers of early childhood education can play an active role in children's oral health care, either directly give children oral care or indirectly teach children and their parents correct oral health knowledge and oral care methods, it is a pity that early childhood teacher qualification system or teacher education system in Taiwan does not provide or has only very little oral health education for students. Therefore, our early childhood teachers usually cannot play such an active role, resulting in a serious fault in manpower for the oral health care and education of early childhood.

This study does not try to develop an independent oral health education course in the normal university, but merely to add the learning unit of oral health education to the relevant existing basic courses, which is considered to be an innovative beginning. The results of this study will be used as a reference for the development of future courses or educational activities for oral health education. Furthermore, in this study, the learning unit of oral health education in the general human physiology curriculum for students of early childhood education helped them to increase awareness and understanding of oral health. As early childhood education involves multidisciplinary and inter-professional environments with a wide array of early childhood education providers, curricular directions for students of early childhood education should explore an education model that incorporates oral health education into their related curricula.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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