Perceptions of students and instructors towards relevance of physics in Mahidol Dental curriculum: A questionnaire survey

Somkiat Koohawayrojanapakorn¹, Taweepong Arayapisit², Somsak Mitrirattanakul³, Ratchapin L Srisatjaluk⁴, Kawin Sipiyaruk⁵

¹ Education and Academic Office, Faculty of Dentistry, Mahidol University
² Department of Anatomy Faculty of Dentistry, Mahidol University
³ Department of Masticatory Science, Faculty of Dentistry, Mahidol University
⁴ Department of Oral Microbiology, Faculty of Dentistry, Mahidol University
⁵ Dental Hospital, Faculty of Dentistry, Mahidol University

Objective: To explore the relevance of physics in Mahidol undergraduate dental curriculum based on perceptions of both instructors and students.

Materials and methods: The study employed a quantitative research method, using a paper-based questionnaire survey. The questionnaire contained questions regarding demographics, perceptions towards relevance of physics in dentistry, and self-perceived importance of physics in dental curriculum. The data were analyzed using descriptive statistics and Spearman’s rho.

Results: There were 341 (57.1%) dental undergraduates and 74 (52.1%) instructors who responded to the questionnaire. The most three relevant physics topics for dental curriculum rated by students were Introduction (physical quantity and applications of physics), Fluid mechanics, and Dynamics, whilst those rated by instructors were Basic quantum mechanics, Fluid mechanics, and Introduction. Instructors and students considered Prosthodontics and Orthodontics as relevant subjects to physics, whilst only the instructor group valued Oral and maxillofacial radiology and Implantology as relevant subjects. In addition, 76% of the students believed that content of physics learned in high school was sufficient for dental curriculum, however over a half of the instructors disagreed. Respondents from both students and instructors also believed physics should be used as a part of the dental school admission. From students’ view, the credits of physics courses should be deducted to three credits, and some topics should be excluded.

Conclusion: Physics is essential for dental curriculum. However, the current physics courses should be revised; a vertical integration and exclusions of irrelevant topics or topics overlapping with high school physics can be key factors for further curriculum improvements.

Keywords: Basic science, Dental curriculum, Dental education, Physics, School admission


Introduction

Physics is the branch of science that studies laws of nature and explains matter and energy, which is the most fundamental of all other sciences. [1] Due to this concept, physics is considered as one of the most important subjects in education of science programs. It has been generally taught as a compulsory subject in high schools in order to construct essential knowledge, with an expectation for further application in university programs such as engineering, pharmacy, medicine, and dentistry.
There has been evidence that basic sciences including physics are helpful for medical students. The average grades of basic science courses achieved by medical undergraduates in the first year could influence the scores in subsequent years. [2] Knowledge of basic sciences is one of competences that medical students required to understand concepts of clinical practices. [3, 4] Therefore, basic sciences should be taught in a curriculum to comprehensively enhance knowledge and skills of medical students.

A point of physics application in dentistry has been discussed for a long time. In 1941, the role of physics in dentistry was introduced, which physics principles could be applied to better understand masticatory function or tooth restoration, either mechanical or esthetical aspects (color matching). [5] Later on, physics has been globally considered as an important subject in dental curricula. Dental schools generally set a criterion that their applicants have to successfully complete physics courses in high schools, and/or include physics subjects into entrance examinations. [6-10] Furthermore, dental undergraduates are required to study physics courses in pre-clinical years of dental curricula. [11-13] These requirements have also been applied to Thai dental school. [14]

According to the Doctor of Dental Surgery degree of Mahidol University, physics has been considered as an essential subject for all undergraduates. Not only physics has been required for the entrance examination, but also all first-year dental students are required to study three courses of physics. They are arranged in a total of six credits out of the total of 44 credits during the first year of all health science programs. Those three physic courses include one credit of ‘General Physics Laboratory (SCPY110)’, two lecture credits of ‘Basic Physics for Medical Science (SCPY153)’, and three lecture credits of ‘Physics for Medical Science (SCPY154)’. In addition, these three subjects are set as prerequisites for ‘Physical Principles in Life Science and Dentistry (DTBC235)’ course of the second-year dental curriculum.

Despite the fact that physics is considered necessary, it is the subject that put in dispute on dental curriculum revision. In terms of dental school admission, one study has found no correlation between physics grade in high schools and the examination (physics/GPA) scores of the first year of dental curriculum. [15] Another study conducted in the University of Kentucky College of Dentistry in the USA revealed that dental students perceived physics courses as not relevant to dental curriculum and should not be required for admission in the dental school. [11] One possible problem is that students might not have an insight for the application of physics principles in clinical practice. Nevertheless, they did express that physics was essential for studying in pre-clinic classes. [16] For dental curriculum revision and course development, there is limited information in a relevance of physics in dental curricula. Therefore, this study was conducted to explore the relevance of physics in Mahidol undergraduate dental curriculum based on perceptions of both instructors and students in order to put the information into consideration for appropriate content of physics in the dental curriculum.

Materials and methods

Research design

This study employed quantitative research methods (a cross-sectional survey design), using a self-administered questionnaire as a data collection tool to explore perceptions towards physics amongst instructors and students from the Faculty of Dentistry, Mahidol University.

Setting and population

This research was conducted in the Faculty of Dentistry, Mahidol University. Research
population was 142 instructors from 11 departments and 597 dental undergraduates from the first year to sixth year during academic year of 2017. Due to a nature of a quantitative research approach, a large number of samples was expected to represent the population (Morse, 1991). Therefore, this study aimed to include as many as participants from the sample pool.

**Data collection tool**

The questionnaire was constructed in four parts, derived from relevant literatures, group discussion with educational experts, and physics course syllabi of SCPY153 and SCPY154. Part 1 was relevant to demographics, including sex and age, as well as year of studying and physics grades (from high school and university levels) for dental students, but specialty and work experience for instructors. According to Part 2, there were 27 questions exploring perceptions on relevance of physics topics towards dental curriculum. The questions include the topics arranged in the course syllabi of SCPY153 (13 questions) and SCPY154 (14 questions). The responses were collected using ‘Physics Relevant Score (PRS)’: 5-point scale ranging from strongly irrelevant to strongly relevant. The option ‘Unmeasurable’ was also available for respondents who might not be able to recall the information and could not answer a question. Part 3 consisted of 12 questions exploring relevance of physics towards dental specialties. Similar to Part 2, the information was gathered from respondents using PRS. Part 4 was about self-perceived importance of physics in dental curriculum, in accordance with sufficiency of high school’ physics for studying dentistry, physics as one of the criteria for dental school admission, and suggested credits of physics courses in dental curriculum.

To test reliability and validity, the questionnaire was piloted in 22 instructors, 25 students from the first to third year classes, and 25 students from the fourth to sixth year classes. The quality of the questionnaire was accepted when Cronbach’s Alpha Coefficient was greater than 0.8 for reliability, and index of Item-Objective Congruence of each question was equal to 0.5 point or higher for content validity.

**Data collection procedures**

The paper-based self-administered questionnaire (student version) was indirectly given to dental students by handing to a student representative of each class (first to sixth year). Students were then asked to complete the questionnaire and return it to a designated area in front of their classrooms. The instructor version of the questionnaire was handed to each instructor directly. When they completed the questionnaire, they were asked to return it to the department secretary. The data collection process was performed between October 2017 and February 2018.

**Data analysis**

Descriptive statistical analysis was employed to present demographics and opinions of respondents, as well as data regarding relevance of physics towards dentistry (dental curriculum and dental specialties), with mean PRS interpretations classified as follows:

- 1.0 ≤ PRS < 1.5 refers to strongly irrelevant
- 1.5 ≤ PRS < 2.5 refers to slightly irrelevant
- 2.5 ≤ PRS < 3.5 refers to neither relevant or irrelevant
- 3.5 ≤ PRS < 4.5 refers to slightly relevant
- 4.5 ≤ PRS < 5.0 refers to strongly relevant

In addition, Spearman’s rank order correlation (Spearman’s rho) was used to analyze the correlation between the PRS level and the physics grades as well as preference towards physics to PRS level; this non-parametric test was required, as the data distributions of physics grades were not normal.
Ethical approval

Ethical approval for this research was granted by the Faculty of Dentistry and the Faculty of Pharmacy, Mahidol University, Institutional Review Board (MU-DT/PY-IRB), reference number: MU-DT/PY-IRB 2017/054.1610.

Results

Reliability and validity of the questionnaire

Following the reliability and validity tests, Cronbach’s Alpha Coefficient of each construct was higher than 0.8 for internal consistency reliability, and index of Item-Objective Congruence of each item was between 0.8 and 1 for content validity. Therefore, the questionnaire was considered reliable and valid.

Demographic data

There were 341 dental undergraduates (respond rate 57.1%) and 74 instructors (respond rate 52.1%) who responded to the questionnaire. The numbers of students from each class and instructors from each department were listed in Table 1 and Table 2, respectively. A majority of them were female, 220 (64.5%) students and 43 (58.1%) instructors. The average ages were 21.2 years for students, and 42.3 years for instructors with 15.9 years of work experience. According to the physics grades of the students, the findings clearly showed that the average grade was higher in high schools, compared to grade achieved during the first year of dental school. These data were presented in Table 3.

<table>
<thead>
<tr>
<th>Specialty</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral and Maxillofacial Surgery</td>
<td>17</td>
</tr>
<tr>
<td>Endodontics</td>
<td>12</td>
</tr>
<tr>
<td>Pediatric Dentistry</td>
<td>12</td>
</tr>
<tr>
<td>Prosthodontics</td>
<td>12</td>
</tr>
<tr>
<td>Orthodontics</td>
<td>11</td>
</tr>
<tr>
<td>Operative dentistry</td>
<td>10</td>
</tr>
<tr>
<td>Oral Medicine</td>
<td>9</td>
</tr>
<tr>
<td>Periodontology</td>
<td>9</td>
</tr>
<tr>
<td>Masticatory Science</td>
<td>7</td>
</tr>
<tr>
<td>Oral and Maxillofacial Radiology</td>
<td>8</td>
</tr>
<tr>
<td>Pre-clinic</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>142</strong></td>
</tr>
</tbody>
</table>
Perceptions of Students and Instructors towards Relevance of Physics in Mahidol Dental Curriculum: A questionnaire survey

Table 2  Number of students in each year

<table>
<thead>
<tr>
<th>Year</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>80</td>
</tr>
<tr>
<td>2nd year</td>
<td>84</td>
</tr>
<tr>
<td>3rd year</td>
<td>103</td>
</tr>
<tr>
<td>4th year</td>
<td>111</td>
</tr>
<tr>
<td>5th year</td>
<td>109</td>
</tr>
<tr>
<td>6th year</td>
<td>110</td>
</tr>
<tr>
<td>Total</td>
<td>597</td>
</tr>
</tbody>
</table>

Table 3  Demographic data of respondents

<table>
<thead>
<tr>
<th>Sex (n)</th>
<th>Age (year)</th>
<th>Physics grades</th>
<th>Work experience (year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High school</td>
<td>First year</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1st year</td>
<td>19.0</td>
<td>3.28</td>
</tr>
<tr>
<td>Female</td>
<td>2nd year</td>
<td>19.7</td>
<td>3.36</td>
</tr>
<tr>
<td>Male</td>
<td>3rd year</td>
<td>20.6</td>
<td>3.60</td>
</tr>
<tr>
<td>Female</td>
<td>4th year</td>
<td>21.8</td>
<td>3.68</td>
</tr>
<tr>
<td>Male</td>
<td>5th year</td>
<td>22.6</td>
<td>3.57</td>
</tr>
<tr>
<td>Female</td>
<td>6th year</td>
<td>23.7</td>
<td>3.52</td>
</tr>
<tr>
<td>Male</td>
<td>Total students</td>
<td>21.2</td>
<td>3.50</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Instructors</td>
<td>42.3</td>
<td>-</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Relevance of physics topics towards dental curriculum

Regarding to SCPY153 (Table 4), the findings demonstrated that ‘Introduction (physical quantity and applications of physics)’ was rated by students as the most relevant topic (PRS=3.5), followed by ‘Fluid Mechanics’ (PRS=3.2) and ‘Dynamics’ (PRS=3.0), and these three topics were also considered as relevant by instructors although ‘Fluid mechanics’ and ‘Basic quantum mechanics’ achieved the highest score (PRS=4.1). On the other hand, the most irrelevant topics rated by both students and instructors seemed to be ‘Kinetics’, ‘Work and energy’, ‘Wave and sound’, ‘Electronics’, ‘Magnetism’, and ‘Nuclear physics’. Overall, perceived relevance of each topic was rated higher in the instructor group, compared to the student group. In addition, amongst the students, the final year undergraduates tended to consider most topics as more relevant.

According to results from SCPY154 (Table 5), students rated all topics irrelevant to dental curriculum, which the three most irrelevant topics were ‘Special relativity theory’, ‘Wave function’, and ‘Schrödinger equation’ (PRS=1.6). Although these topics were rated higher in the instructor group, they were considered as the three less relevant topics (PRS=2.4-2.5). Similar to SCPY153, the student group perceived all topics less relevant to dental curriculum, compared with the instructor group. In addition, PRS of SCPY154 rated by both students and instructors appeared to be lower than one of SCPY153.
Overall, the most five relevant topics rated by students were ‘Introduction’ (PRS=3.5), ‘Fluid mechanics’ (PRS=3.2), ‘Dynamics’ (PRS=3.0), ‘Thermal physics’ (PRS=2.9), and ‘Fluid dynamics’ (PRS=2.8), whilst ones valued by instructors were ‘Basic quantum mechanics’ (PRS=4.1), ‘Fluid mechanics’ (PRS=4.1), ‘Introduction’ (PRS=4.0), ‘Fluid dynamics’ (PRS=3.8), and ‘Dynamics’ (PRS=3.8). None of the SCPY154 topics achieved these top five rankings. These findings were presented in Table 6.
Relevance of physics towards dental specialties

When considering relevance of physics towards 12 dental specialties (Table 7), both instructors and students considered that physics was relevant to ‘Prosthodontics’ and ‘Orthodontics’ (3.5 ≤ PRS < 4.5), whilst only the instructor group valued ‘Oral and maxillofacial radiology’ and ‘Implantology’ as relevant (3.5 ≤ PRS < 4.5). The findings also presented that ‘Community dentistry’ and ‘Oral medicine’ were rated irrelevant by both instructors and students (1.5 ≤ PRS < 2.5); only the student group considered ‘Pedodontics’ as irrelevant (1.5 ≤ PRS < 2.5). The rest were rated by both groups as neither relevant nor irrelevant.

Table 6. The five most relevant physics topics rated by students and instructors

<table>
<thead>
<tr>
<th>Rank</th>
<th>Students</th>
<th></th>
<th>Instructors</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic</td>
<td>PSR</td>
<td></td>
<td>Topic</td>
<td>PSR</td>
</tr>
<tr>
<td>Introduction</td>
<td>3.5</td>
<td></td>
<td>Basic quantum mechanics</td>
<td>4.1</td>
</tr>
<tr>
<td>Fluid mechanics</td>
<td>3.2</td>
<td></td>
<td>Fluid mechanics</td>
<td>4.1</td>
</tr>
<tr>
<td>Dynamics</td>
<td>3.0</td>
<td></td>
<td>Introduction</td>
<td>4.0</td>
</tr>
<tr>
<td>Thermal physics</td>
<td>2.9</td>
<td></td>
<td>Fluid Dynamics</td>
<td>3.8</td>
</tr>
<tr>
<td>Fluid dynamics</td>
<td>2.8</td>
<td></td>
<td>Dynamics</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Table 7. Relevance of physics towards dental specialties (PRS)

<table>
<thead>
<tr>
<th></th>
<th>Oral &amp; maxillofacial surgery</th>
<th>Periodontology</th>
<th>Pedodontics</th>
<th>Prosthodontics</th>
<th>Community dentistry</th>
<th>Masticatory Science</th>
<th>Oral medicine</th>
<th>Oral &amp; maxillofacial radiology</th>
<th>Endodontics</th>
<th>Orthodontics</th>
<th>Operative dentistry</th>
<th>Implantology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>3.2</td>
<td>3.0</td>
<td>2.9</td>
<td>3.4</td>
<td>2.8</td>
<td>3.4</td>
<td>3.0</td>
<td>3.4</td>
<td>3.3</td>
<td>3.6</td>
<td>3.1</td>
<td>3.2</td>
</tr>
<tr>
<td>2nd year</td>
<td>2.6</td>
<td>2.2</td>
<td>2.3</td>
<td>3.0</td>
<td>2.0</td>
<td>2.8</td>
<td>2.2</td>
<td>3.1</td>
<td>2.5</td>
<td>3.2</td>
<td>2.7</td>
<td>2.5</td>
</tr>
<tr>
<td>3rd year</td>
<td>2.8</td>
<td>2.3</td>
<td>2.0</td>
<td>3.5</td>
<td>1.6</td>
<td>2.9</td>
<td>1.9</td>
<td>2.9</td>
<td>2.3</td>
<td>3.7</td>
<td>2.4</td>
<td>2.7</td>
</tr>
<tr>
<td>4th year</td>
<td>3.7</td>
<td>2.5</td>
<td>1.9</td>
<td>3.8</td>
<td>1.5</td>
<td>3.1</td>
<td>1.7</td>
<td>3.5</td>
<td>2.6</td>
<td>4.1</td>
<td>2.8</td>
<td>3.6</td>
</tr>
<tr>
<td>5th year</td>
<td>3.6</td>
<td>2.5</td>
<td>2.1</td>
<td>3.7</td>
<td>1.5</td>
<td>3.0</td>
<td>1.8</td>
<td>3.5</td>
<td>2.5</td>
<td>3.8</td>
<td>2.6</td>
<td>3.3</td>
</tr>
<tr>
<td>6th year</td>
<td>3.6</td>
<td>2.7</td>
<td>2.2</td>
<td>3.9</td>
<td>2.0</td>
<td>3.2</td>
<td>2.0</td>
<td>3.7</td>
<td>2.8</td>
<td>4.2</td>
<td>2.9</td>
<td>3.8</td>
</tr>
<tr>
<td>Total students</td>
<td>3.4</td>
<td>2.6</td>
<td>2.2</td>
<td>3.6</td>
<td>1.9</td>
<td>3.1</td>
<td>2.0</td>
<td>3.4</td>
<td>2.7</td>
<td>3.8</td>
<td>2.8</td>
<td>3.3</td>
</tr>
<tr>
<td>Instructors</td>
<td>3.3</td>
<td>2.9</td>
<td>2.6</td>
<td>4.1</td>
<td>2.1</td>
<td>3.4</td>
<td>2.3</td>
<td>4.2</td>
<td>3.2</td>
<td>4.0</td>
<td>3.3</td>
<td>3.8</td>
</tr>
</tbody>
</table>
Self-perceived importance of physics in dental curriculum

When considering sufficiency of physics content learned during high school for dental education, a majority of the students (76%) believed that it was sufficient, however marginally more than half of the instructors (52.7%) disagreed. Both students and instructors were asked whether physics should be used as a part of the dental school admission. Only 13.5% of the students and 4.1% of the instructors did not agree with keeping physics as a subject for the dental school admission. In addition, most of the respondents believed physics to be used as an admission subject, with the suggested proportion of 40% of total basic science admission score (Table 8).

Regarding to the suggested number of physics credits in dental curriculum, responses were varied. Whilst over two-thirds of respondents suggested physics credits to be reduced, approximately 20% of students and instructors believed that the amount of six credits was appropriate. Among those who agreed with the credit reduction, a majority of the students (27%) and the instructors (24.3%) suggested that the physics credits should be deducted to only three credits. Most of them (61.9% of students and 75.7% of instructors) further suggested that some topics of the physics should be excluded.

Correlations amongst PRSs and physics grades

The analysis found that PRS of SCPY153 significantly correlated with PRS of SCPY154 ($p<0.01$). In addition, there was a significant correlation between the high school physics grade and the first-year physics grade in dental school ($p<0.01$). PRSs of both subjects also significantly correlated with the first-year physics grade ($p<0.01$). However, no significant correlations between the two PRSs and the high school physics grade were found. These results are presented in Table 9.

<table>
<thead>
<tr>
<th>Table 8</th>
<th>Physics as a criterion for the dental school admission (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not used as a criterion</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1st year</td>
<td>17.4</td>
</tr>
<tr>
<td>2nd year</td>
<td>13.3</td>
</tr>
<tr>
<td>3rd year</td>
<td>9.6</td>
</tr>
<tr>
<td>4th year</td>
<td>14.3</td>
</tr>
<tr>
<td>5th year</td>
<td>8.9</td>
</tr>
<tr>
<td>6th year</td>
<td>16.1</td>
</tr>
<tr>
<td>Total students</td>
<td>13.5</td>
</tr>
<tr>
<td>Instructors</td>
<td>4.1</td>
</tr>
</tbody>
</table>
Relevance of physics in dentistry

The findings of this study demonstrated that not all of the physics topics in SCPY153 and SCPY154 were relevant to dental curriculum. The topics rated most relevant by both students and instructors appeared to be ‘Introduction’ and ‘Fluid mechanics’. Interestingly, as the ‘Introduction’ topic provided information on how physics could be applied for other fields including medicine and dentistry, respondents clearly considered it as relevant. According to the ‘Fluid mechanics’ topic, Pascal’s law (fluid pressure), Archimedes’ principle, and surface tension were introduced; these could be used to describe physiology of cardiovascular system and dental biomaterial properties, [17-19] thus respondents rated this topic as relevant.

Surprisingly, ‘Basic quantum mechanics’ achieved the highest PRS amongst instructors but lower in the student group. This topic provided knowledge regarding atomic physics, x-ray imaging, and computed tomography system. Dental radiography was commonly used as diagnostic aids, e.g. proximal carious detection. However, dental undergraduates might lack of clinical experience, and therefore they consider this topic less relevant than instructors. This was consistent to the findings that instructors rated physics as more relevant to ‘Oral and maxillofacial radiology’, compared to the students. Other physics topics were considered by respondents as less relevant, because they seemed beyond the use in dental curriculum, such as ‘Magnetism’ and ‘Wave function’ as well as all topics contained in SCPY154.

In terms of dental specialties, in addition to ‘Oral and maxillofacial radiology’ discussed above, ‘Prosthodontics’ and ‘Orthodontics’ were rated as most relevant to physics in both groups of respondents, whilst the relevance of ‘Implantology’ was agreed by only among instructors. Adding to this, the six-year dental students showed the higher PRS in ‘Oral and maxillofacial radiology’ and ‘Implantology’ than other years and comparable to the instructors. These four specialties required knowledge and understanding in the principle of forces, [20-25] which was introduced in the ‘Kinetics’ topic. However, it was not considered as the most relevant, as this topic in SCPY153 might contain other knowledge that was beyond the application in dentistry.

Physics as a criterion for dental school admission

This study revealed that most respondents agreed with a physics subject as a part of dental school admission. In other words, respondents in our research believed that basic knowledge learned in high schools could affect learning performance in dental curriculum. This argument was supported by the evidence that a significant correlation between the high school physics grade and the first-year physics grade was found. However, our findings were not consistent with the results from a research in University of Kentucky College of Dentistry, which dental students

<table>
<thead>
<tr>
<th>Table 9</th>
<th>Correlations amongst PRSs and physics grades</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High school physics grade</td>
</tr>
<tr>
<td>High school physics grade</td>
<td>0.25**</td>
</tr>
<tr>
<td>First-year physics grade</td>
<td>0.16**</td>
</tr>
<tr>
<td>PRS in SCPY153</td>
<td>0.67**</td>
</tr>
<tr>
<td>PRS in SCPY154</td>
<td>** Significant at p&lt;0.01</td>
</tr>
</tbody>
</table>
perceived that physics should not be required for
the dental school admission. [11] In addition,
another research found that the physics grade in
high schools did not correlate with the natural
science performance arranged after the first year
in the dental school, [15] which could be argued
that the natural science course did not contain
only physics but also chemistry and biology.

Potential changes of physic in dental curriculum

Most of the respondents suggested physics
credits to be deducted, ranging from six to three
credits. They also suggested that some physics
topics should be excluded. Together with the fact
that several physics topics were considered as not
relevant to dentistry, some of them might be
removed from the physics courses, especially in
SCPY154.

Should not only the irreverent topics be
concerned, but also the content that has already
been studied should be revised. Following the
curriculum changes of Chinese dental schools in
the 1990s, where the proportion of basic science
was reduced from 20% to 18%, by deleting the
content that was already taught in high schools. [26]
Based on our findings, most students agreed that
physics studied in high school is sufficient for
studying in dental schools although 52.7% of
teachers disagreed with that. Although students
and instructors had opposing opinions towards
sufficiency of high school physics for studying
in dental curriculum, there seemed to be the
content in dental curriculum that requiring revision,
as some had already been taught in high schools.
In this case, the proportion and the scores of
physics in dental admission should be considered.

In addition to the content removal, physics
can be modified as an applied course to enhance
its application in real situations. It should be
illustrated how physics could be applied for
the use in biological systems and medical
instruments. This will improve understanding of
fundamental physics concepts through
biomedicine. [27] In addition, there were some
relevant topics students rated as irrelevant,
possibly due to the lack of dental experience.
This suggests that certain physics courses should
be incorporated in the later years of dental
curriculum, rather than only during the first or
second year. This vertical integration will support
students to recognize relevance of physics in
dentistry, as they have more experience from
other subjects in the curriculum.

Limitations

This research employed a quantitative
research method, using a paper-based
questionnaire as a survey tool; one strength of this
technique was an ability to collect information from
a large number of respondents in a short period.
However, there was limitation in exploring in-depth
information from research participants. Further
studies should be conducted using a qualitative
research approach to enhance understanding in
order to fulfil this gap. In addition, this research
was conducted in only Mahidol dental school;
multi-site research in other dental schools should
be performed, as there may be any other factors
that can affect physics education in dental
curricula.

Conclusions

Based on the perceptions from both instructors
and students, physics was important for dental
curriculum although certain topics of the physics
courses in Mahidol University were considered
irrelevant by both students and instructors. Due to
time constraints of the dental curriculum, irrelevant
topics or topics overlapping with high school
physics may be excluded for the deduction of the
physics credits. In addition, a vertical integration
can also be considered for further curriculum
improvements.
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References


