GAMIFICATION AS A LEARNING RESOURCE FOR DENTISTRY STUDENTS – EXPERIENCE REPORT

GAMIFICATION AS A LEARNING RESOURCE FOR DENTISTRY STUDENTS - RELATÓRIO DE EXPERIÊNCIA

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ABSTRACT: Introduction: Teaching in higher education is challenging, especially in the undergraduate Dentistry course since the transition between theory and practice is delicate. Gamification is a new learning approach that can be useful in several situations. Objective: To report the perception of Dentistry students regarding a gamified activity developed to address the topic of Bruxism. Methods: This cross-sectional study used a group of students from a Dentistry course. The students were randomly distributed in groups and received a printed crossword puzzle with questions about Bruxism. The groups would compete against each other to answer the questions. After that, the students were invited to answer a questionnaire about their experience perception. The students could indicate the following answers for each sentence: a. Totally agree; B. Agree c. Indifferent; d. Disagree, and e. Totally disagree. In addition, we propose that the students give their opinion on the activity if they wish. The obtained data were organized and statistically analyzed. Results: Ninety-one dentistry students participated in the research, 71 females (78.0%) and 20 males (22.0%). The general positive perception regarding the activity was higher than 82.0% for all sentences. One hundred percent of the students totally agree or agree that the perception that the activity aroused curiosity about the topic and was motivating. Conclusion: The main conclusion of this study was that the
new approach made the bruxism topic more attractive, stimulating, and motivating for students.

**KEYWORDS:** Education, Dentistry, Gamification.

**RESUMO:** Introdução: Ensinar em cursos de nível superior é desafiador, principalmente no curso de graduação em Odontologia que envolve uma delicada transição entre teoria e prática. A gamificação é uma nova abordagem de aprendizagem que pode ser útil em diversas situações. Objetivo: Relatar a percepção de estudantes de Odontologia em relação a uma atividade gamificada desenvolvida para abordar o tema Bruxismo. Métodos: Este estudo transversal foi conduzido com um grupo de estudantes de um curso de Odontologia. Os estudantes foram distribuídos aleatoriamente em grupos e receberam um jogo impresso de palavras cruzadas com perguntas sobre Bruxismo. Os grupos competiram entre si para responder as questões. Em seguida, foram convidados a responder um questionário sobre a percepção da experiência. Os estudantes poderiam indicar as seguintes respostas para cada sentença: a. Concordo totalmente; b. Concordo c. Indiferente; d. Discordo, e e. Discordo totalmente. Além disso, propomos que os alunos opinassem sobre a atividade, se desejarem. Os dados obtidos foram organizados e analisados estaticasticamente. Resultados: Participaram da pesquisa 91 estudantes de Odontologia, sendo 71 do sexo feminino (78,0%) e 20 do sexo masculino (22,0%). A percepção geral positiva em relação à atividade foi superior a 82,0% para todas as sentenças. Cem por cento dos alunos concorda totalmente ou concordam que a atividade despertou curiosidade sobre o tema e foi motivadora. Conclusão: A principal conclusão deste estudo foi que a nova abordagem tornou o tema Bruxismo mais atrativo, estimulante e motivador para os alunos.

**PALAVRAS-CHAVE:** Educação, Odontologia, Gamificação.

1. Introduction

The undergraduate dentistry course is one of the most challenging higher education courses for teachers and students due to the challenges
students face. Such challenges require developing several skills, including clinical and interpersonal skills, which cause a certain amount of stress (Polychronopoulou and Divaris, 2009). From the professors' perspective, a major educational challenge is maintaining students' motivation when the exposure, almost always theoretical, of an essentially clinical study topic must occur. That is, this transition between theory and practice is delicate and, sometimes, difficult for professors highly qualified for clinical practice but inexperienced in terms of methodological innovations in the classroom.

The idea of gamification in education has been introduced previously. In fact, this strategy has been widely used in educational activities and processes (Gentry et al., 2019; Kim and Castelli, 2021). This approach uses games or playful activities that replace the pure and straightforward exposition of a specific topic of study. The central idea is to create a safe and controlled environment in which there is competition between students, motivating them and promoting cognitive development to achieve long-term learning goals.

In dentistry, a highly prevalent condition that has been attracting attention due to dental impairment and its association with various environmental factors, such as the presence of stressful or anxiogenic situations, sleep disorders, and other clinical conditions, is Bruxism (Manfredini et al., 2017; Lobbezoo et al., 2018; Scarpini et al., 2023). Bruxism is characterized by repetitive or sustained tooth contact and involuntary masticatory muscle activity during sleep or wakefulness. Bruxism is not a disorder in healthy individuals but a risk or protective factor for some clinical conditions. It should be carefully studied during the individual's evaluation as they may be symptoms of underlying health problems with severe consequences (Lobbezoo et al., 2018).

Despite being a current and fascinating topic for students, Bruxism is challenging to transmit and assess. Obviously, there are countless ways to
approach Bruxism during a class for undergraduate students. In this article, the main objective is to report the perception of Dentistry students at the University of Curitiba regarding a gamified activity developed to address the topic of Bruxism.

2. Methods

This cross-sectional study used a group of students from the fifth period of the Dentistry course. The students received information regarding the objective and protocol of the activity and were randomly distributed in groups with 5 or 6 components. Each group received a printed crossword puzzle whose study theme was Bruxism. The crossword puzzle was produced on the website https://www.educolorir.com (Figure 1).

Figure 1. Study themes and concepts regarding bruxism were launched on https://www.educolorir.com and generated a puzzle with vertical and horizontal words. The questions were: 1. Masticatory muscle activity with repetitive or sustained tooth contact and/or static or dynamic muscle contraction without tooth contact; 2. A common parafunctional habit of multifactorial etiology that occurs during sleep and/or while awake; 3. Diagnosis of bruxism based on electromyography exam with or without patient self-report; 4. Rhythmic and non-rhythmic masticatory muscle activity; 5. Diagnosis of bruxism based only on positive self-report; 6. Diagnosis of bruxism based on positive clinical evaluation with or without positive self-report.

Source: the authors.
Next, the questions were projected onto the multimedia equipment available in the classroom. The time stipulated to complete the activity was 15 minutes, or the activity would be completed when the first team delivered the correctly completed crossword puzzle. In case of an error in the activity, the next team that submitted the activity would be evaluated, thus, until there was a winning team.

Students could consult any source of information: the internet, apps, and the University virtual library, among others. They were also instructed to interact and think about the concepts covered. In order to increase the spirit of competition, the winning team received coupons for free coffee in the university cafeteria. When the winning team was known, a space was opened for discussion regarding the game's issues. In this case, the students revisited and discussed each question with the professor's mediator.

After the activity, the students were invited to respond to a Google Forms (https://docs.google.com/forms) questionnaire about their experience perception. The students should express their opinion regarding the following statements: i. The activity carried out aroused your curiosity about the subject of the class; ii. The activity was carried out motivating; iii. The activity carried out contributed to the understanding of the bruxism topic. For each question, the students could indicate the following answers: a. Totally agree; B. Agree c. Indifferent; d. Disagree, and e. Totally disagree. In addition, we propose that the students give their opinion on the activity if they wish. The obtained data were organized and statistically analyzed.

3. Results

Ninety-one dentistry students participated in the research, 71 females (78.0%) and 20 males (22.0%). The general positive perception regarding the activity was considerably high: 86.8%, 89.0%, and 82.4% of students
totally agree with statements 1, 2, and 3, respectively. Regarding the perception of the activity developed considering distribution by sex, male students demonstrated greater satisfaction with the development of the activity. However, no statistical difference was observed for any statements (p > 0.05). Table 1 shows the distribution of responses among participating individuals.

Table 1. Descriptive analysis of the opinions expressed by students who participated in this study categorized by gender

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Overall¹</th>
<th>Gender¹,²</th>
<th>Value p²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female (N=71)</td>
<td>Male (N=20)</td>
<td></td>
</tr>
<tr>
<td>Sentence 1 - The activity carried out aroused your curiosity about the subject of the class.</td>
<td></td>
<td></td>
<td>0.722</td>
</tr>
<tr>
<td>Totally agree</td>
<td>79 (86.8%)</td>
<td>62</td>
<td>17 (85.0%)</td>
</tr>
<tr>
<td>Agree</td>
<td>12 (13.2%)</td>
<td>(87.3%)</td>
<td>3 (15.0%)</td>
</tr>
<tr>
<td>Indifferent</td>
<td>0 (0.0%)</td>
<td>9 (12.7%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Totally disagree</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Sentence 2 - The activity undertaken was motivating.</td>
<td></td>
<td></td>
<td>1.000</td>
</tr>
<tr>
<td>Totally agree</td>
<td>81 (89.0%)</td>
<td>63</td>
<td>18 (90.0%)</td>
</tr>
<tr>
<td>Agree</td>
<td>10 (11.0%)</td>
<td>(88.7%)</td>
<td>2 (10.0%)</td>
</tr>
<tr>
<td>Indifferent</td>
<td>0 (0.0%)</td>
<td>8 (11.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Totally disagree</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Sentence 3 - The activity carried out contributed to the understanding of the bruxism topic.</td>
<td></td>
<td></td>
<td>0.756</td>
</tr>
<tr>
<td>Totally agree</td>
<td>75 (82.4%)</td>
<td>59</td>
<td>6 (85.0%)</td>
</tr>
<tr>
<td>Agree</td>
<td>13 (14.3%)</td>
<td>(83.1%)</td>
<td>3 (10.0%)</td>
</tr>
<tr>
<td>Indifferent</td>
<td>3 (3.3%)</td>
<td>10</td>
<td>1 (5.0%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>0 (0.0%)</td>
<td>(14.1%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Totally disagree</td>
<td>0 (0.0%)</td>
<td>2 (2.8%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

¹n (%); ²Fisher's exact test.

Source: the authors.
The perception that the activity aroused curiosity about the topic, was motivating, and contributed to understanding bruxism is evident when the percentage of totally agree and agree responses are added: 100.0% of the students marked these options in statements 1 (S1) and 2 (S2). In fact, only 3 (3.3%) students (two females and one male) considered that the contribution of the activity was indifferent to understanding bruxism (figure 2).

Figure 2. Distribution of opinions expressed by students regarding sentences 1 (S1), 2 (S2) and 3 (S3).

Note: The numbers in each column indicate the number of participants who expressed their opinions regarding each sentence.
Source: the authors.

Table 2. Opinions were collected from students after the activity realization. All opinions were spontaneous, and no score was assigned to collect these opinions.

<table>
<thead>
<tr>
<th>Student Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student 1</strong></td>
</tr>
<tr>
<td>&quot;I'm super competitive, so I love activities like this, which make us think and research&quot;. &quot;... the group that won is rarely in the room or on their cell phones, so it ends up motivating everyone to win&quot;. &quot;As it wakes us up, it ends up that at the time of the explanation, we are super awake, and we make a link with what we saw on Google. I loved it&quot;.</td>
</tr>
<tr>
<td><strong>Student 2</strong></td>
</tr>
<tr>
<td>Group activities, with competition, always have good participation in our class.</td>
</tr>
<tr>
<td><strong>Student 3</strong></td>
</tr>
<tr>
<td>&quot;Very cool activity, but I feel anxious in this type of activity where there is a kind of competition&quot;.</td>
</tr>
<tr>
<td><strong>Student 4</strong></td>
</tr>
<tr>
<td>&quot;I found this way of learning very interesting, because in addition to learning from mistakes, it was an interesting way to bring together all the students&quot;.</td>
</tr>
<tr>
<td><strong>Student 5</strong></td>
</tr>
<tr>
<td>&quot;The activity was quite productive. The research and discussion we had regarding the concepts helped a lot&quot;.</td>
</tr>
</tbody>
</table>

Source: the authors.
4. Discussion

This cross-sectional study aimed to report the perception of dentistry students regarding a gamified activity developed within a discipline of the Dentistry course about a fundamental topic in dentistry: Bruxism. The main results showed that the activity developed aroused curiosity regarding the topic studied, was motivating, and contributed to understanding the bruxism topic, allowing some reflections on how the teaching-learning process within the Dentistry course can be improved.

Gamification could be interpreted as the use of game design to increase learning attitudes, behaviors, and learning outcomes in the students. Besides that, it offers many advantages to the students, including motivation (Johnson et al., 2016, Kim and Castelli, 2021). Contrary to what one might think, gamifying an activity does not mean using expensive technologies that depend on applications, cell phones, or electronic devices. Games can be created using simple tools. In this research, we used a website that allows the creation of crosswords that can be printed or made available on media for student access. The main advantage of gamification is creating a playful environment that considers students' prior knowledge regarding the topic of study (Alsamawi and Kurnaz, 2021). As the levels of knowledge between students are invariably different, interaction allows an exchange of experiences, which, associated with the spirit of competition, favors the mobilization and internalization of concepts regarding the topic studied, bringing the educational process closer to the student. The classroom becomes a space for sharing knowledge and interaction. In order to improve the motivation of the students, we use a simple rewards system: coupons for free coffee in the cafeteria instead of adding grades, i.e., no score was assigned to this activity. This extrinsic incentive substantially increased student interaction (Ryan and Deci, 2000). After the class, the students...
were asked about their perceptions regarding the activity. All of them totally agree or agree that the activity carried out aroused your curiosity about the subject. Curiosity increase is an advantage of the gamification and is due to an intrinsic motivation provided gamification features, which can be integrated within a virtual context to enhance motivation with potential for application towards online learning settings (Xu et al., 2021). In fact, motivation is the keyword in the gamification method. The combination of intrinsic and extrinsic motivation combined with active participation from students could positively impact behavior (Hill and Nassrallah, 2018).

We think this experience's strength was the collaborative network between the students. In Dentistry, due to the nature of the profession, the student converges into an environment of isolation and forgets that social interaction is fundamental for the profession's development. Interestingly, this vision of collaborative work needs to be explored in dentistry courses despite being explicitly described in the dentistry course curricular guidelines that the trained professional must be able to work in a team (DCN, 2021).

Another fundamental point that requires reflection is the role of the teacher in the teaching and learning process: clearly, in an activity like this, the professor is no longer the holder of knowledge. It becomes a facilitator of learning. In this sense, professors are not always prepared for this challenge. Without any discredit to purely expository classes, it is easier for a professor to work on topics he has mastered using the expository class resource. It requires less preparation time on the part of the professor, however, teaching is completely centered on it. It is also important to mention that our research group comprises dental surgeons who are university professors who constantly discuss new teaching approaches based on educational theories.

Finally, the main challenge of using gamification is the professors' resistance, as some are reluctant to replace traditional teaching methods with something supposedly innovative. We respect the opinion of teachers.
who opt for classic lectures, but we also think that new approaches should be explored, given the speed of changes in the teaching and learning process. Our research group, supported by our university, actively participates in pedagogical training activities, which we consider essential for thinking about new methodologies. Furthermore, our universities support and support the constant development of teachers.

5. Conclusion

The main conclusion of this study was that the new approach made the bruxism topic more attractive, stimulating, and motivating for students, allowing the development of skills, including team cooperation.

Acknowledgement

We are dedicated to the students who are the real motivation to explore new teaching methodologies.
References


