A comparative study of medical student performance and satisfaction in an in-person vs online chronic pain certificate program

Etude comparative de la performance et de la satisfaction des étudiants en médecine dans un certificat sur la douleur chronique en présentiel versus en ligne

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Abstract

Aim : This study aimed to compare student success rates between the in-person and hybrid learning phases of the chronic Pain Certificate (CPC) at the Faculty of Medicine of Tunis (FMT), and to assess student satisfaction with the hybrid model. Additionally, we evaluated the effects of platform modifications on students' satisfaction.

Method: A retrospective analysis was conducted over five years (2018–2024) involving medical students enrolled in the CPC. Success and failure rates were compared between the in-person phase (2018–2020) and the hybrid phase (2020–2024). Student satisfaction was assessed through surveys.

Results: Among the 301 students included, 115 (38.2%) participated in the in-person phase, and 186 (61.8%) in the hybrid phase. The overall success rate was 81.39%. The success rate in the hybrid phase (84.4%) was higher than in the in-person phase (76.5%), though the difference was not statistically significant (p=0.08). Among 70 students who completed the satisfaction survey, self-rated knowledge on chronic pain increased significantly after the course (p=0.013). Satisfaction with the platform improved post-modification in several aspects, including interest in modules 1, 2, 3, and 5 (p=0.036, p=0.047, p=0.004, p=0.025, respectively), resource usefulness in modules 1, 3, 4, and 5 (p=0.004, p=0.002, p=0.012, p=0.018, respectively), and clarity of Module 3 resources (p=0.05). The estimated average preparation time decreased from 96.2 hours to 87.1 hours post-modification, though this change was not statistically significant (p=0.6).

Conclusion: The integration of an online platform into the CPC at FMT was associated with improved student success rates and satisfaction.

Key words: Chronic Pain, Medical Education, Online Learning, Hybrid Teaching, Student Satisfaction

Résumé

Objectif : Cette étude visait à comparer les taux de réussite des étudiants entre les phases d'apprentissage en présentiel et hybride du Certificat de prise en charge de la douleur chronique (CPC) à la Faculté de médecine de Tunis (FMT), et à évaluer leur satisfaction vis-à-vis du modèle hybride. De plus, nous avons évalué l'impact des modifications apportées à la plateforme sur cette satisfaction.

Méthodes: Une analyse rétrospective a été menée sur cinq ans (2018-2024) auprès d'étudiants en médecine inscrits au CPC. Les taux de réussite et d'échec ont été comparés entre la phase en présentiel (2018-2020) et la phase hybride (2020-2024). La satisfaction des étudiants a été évaluée au moyen de questionnaires.

Résultats: Parmi les 301 étudiants inclus, 115 (38,2 %) ont participé à la phase en présentiel et 186 (61,8 %) à la phase hybride. Le taux de réussite global était de 81,39 %. Le taux de réussite en phase hybride (84,4 %) était supérieur à celui de la phase en présentiel (76,5 %), bien que la différence ne soit pas statistiquement significative (p = 0,08). Parmi les 70 étudiants ayant répondu au questionnaire de satisfaction, l'auto-évaluation des connaissances sur la douleur chronique a augmenté de manière significative après la formation (p = 0,013). La satisfaction à l'égard de la plateforme s'est améliorée après modification sur plusieurs points, notamment l'intérêt porté aux modules 1, 2, 3 et 5 (p = 0,036, p = 0,047, p = 0,004 et p = 0,025, respectivement), l'utilité des ressources dans ces mêmes modules (p = 0,004, p = 0,002, p = 0,012 et p = 0,018, respectivement) et la clarté des ressources du module 3 (p = 0,05). Le temps de préparation moyen estimé a diminué de 96,2 heures à 87,1 heures après modification, mais cette différence n'est pas statistiquement significative (p = 0,6).

Conclusion: L'intégration d'une plateforme en ligne au sein du CPC de FMT a été associée à une amélioration des taux de réussite et de satisfaction des étudiants.

Mots clés: Douleur chronique, Éducation médicale, Apprentissage en ligne, Enseignement hybride, Satisfaction des étudiants

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Introduction

Medical studies have progressed remarkably during recent decades. Indeed, conventional teaching based solely on lectures has shown limitations in addressing current educational needs of the medical community. It has been demonstrated that teaching through lectures may be perceived as monotonous. In addition, during lectures for large groups, teachers may not be able to understand and respond to students' individual questions.

As a result, the development of information and communication technologies has contributed to the establishment of new educational methods that are more attractive and adapted to technological progress. This is how online teaching has emerged and has taken an important place as an educational tool in general, and in the medical field in particular [1,2].

There are two types of online teaching: exclusive online teaching and hybrid teaching. Exclusive online teaching means that the contact between the teacher and the learners remains strictly virtual. Several universities around the world have adopted this mode of teaching and no longer even have classrooms. This is what is applied in the 'Massive Open Online Courses' (MOOCs) [3,4]. However, hybrid teaching combines face-to-face time at the university and online time using virtual resources [5].

To manage this new learning system, various learning management systems have emerged, the most famous of which is undoubtedly the Moodle platform [6]. The latter is used both for managing courses and enrolled students, and for monitoring learners' progress, evaluating them and collecting their questions and comments in the exchange forums [6,7]. According to a recent systematic literature review on the use of learning management systems, Moodle is the most popular open source platform [8]. The number of Moodle users has increased from 78 million in 2015 to more than 294 million in 2021 [6].

The Chronic Pain Certificate (CPC) at the Faculty of Medicine of Tunis has recently switched from exclusive conventional face-to-face teaching to online teaching via the Moodle platform, which has allowed students to easily access scientific resources and be continuously evaluated. The online platform was also a means of communication within the group and a tool for teachers to monitor students.

This study aimed to compare student success rates between the in-person and hybrid learning phases and to assess student satisfaction with the hybrid model. Additionally, the study evaluated the effects of platform modifications implemented in 2023 on students' satisfaction.

Methods

Study design and population

This was a retrospective descriptive study conducted over a five-year period (2018–2024) at the Faculty of Medicine of Tunis (FMT). The aim was to evaluate the transformation of the CPC from a traditional in-person course to an online learning format and assess its impact on student success and satisfaction.

All medical students officially enrolled in the CPC for Chronic Pain between 2018 and 2024 were eligible for inclusion.

Exclusion criteria were incomplete registration records and students who either did not take the final exam or dropped out before completion.

Descriptive Characteristics of the Online Teaching Model

Since 2020, the CPC has been delivered through an online learning platform comprising five structured modules with a total of 40 hours of asynchronous lectures. The modules address:

- Module 1: General aspects of chronic pain
- Module 2: Neuropathic pain
- Module 3: Musculoskeletal pain
- Module 4: Cancer pain and palliative care
- Module 5: Pain in specific populations

Each module includes online multiple-choice assessments as continuous evaluation. Upon completion of the five modules, students are required to complete a practical internship (8 days, 40 hours) in pain management, rheumatology, neurology, or oncology clinics. Final CPC validation requires completion of all modules, successful continuous assessment, completed internship, and a passing score on the final examination.

Data collection

Three types of data were collected:

-Structural data on the online platform's educational content and organization (modules, hours, internship requirements) were gathered from institutional teaching materials and course plans.

-Administrative data on enrollment numbers and success/failure outcomes for each academic year were extracted from institutional records.

-Satisfaction data of the hybrid form were collected through a self-administered online questionnaire distributed to students. The questionnaire was developed using Google Forms and included items rated on a 6-point Likert scale (0 = strongly disagree to 5 = strongly agree). It explored several dimensions of the learning experience, including ease of access to the platform, navigation within course spaces, relevance of module objectives, usefulness and clarity of educational resources, benefit of continuous assessments, communication within students, support provided by teaching staff and perceived usefulness of revision seminars.

Students were also asked to self-rate their knowledge of chronic pain before and after the course (on a scale of 0 to 10), and to estimate the number of hours spent preparing for the CPC

In 2023, several modifications were implemented on the platform: the removal of one course and the addition of a new one in Module 3, the splitting of a previously lengthy course in Module 5, and the addition of a discussion forum. These changes were assessed by comparing student satisfaction before and after their implementation.

Statistical Analysis

Data entry and analysis were conducted using Statistical Package for the Social Sciences (SPSS), version 23. Qualitative variables were described using absolute frequencies and percentages. Comparisons between groups were performed using Pearson's Chi-square test for categorical variables. Continuous variables were summarized as means ± standard deviations and compared using Student's t-test or Mann-Whitney U test, depending on normality. A p-value < 0.05 was considered statistically significant.

Results

Comparison of success rates between the in-person learning and the online Platform

Among the 301 students included in the five-year study, 115 (38.2%) participated in the in-person phase (2018–2020), and 186 (61.8%) in the hybrid phase (2020–2023). The overall success rate was 81.39% with a failure rate of 18.6%. The success rate in the hybrid phase (84.4%) was higher than in the in-person phase (76.5%), though the difference was not statistically significant (p=0.08) (table 1).

Table 1. Comparison of Student Success Rates by Teaching Format (2018–2024)

Teaching Format	Number of Students (n)	Success Rate (%)	Failure Rate (%)	p-value
Face-to-face (2018–2020)	115	76.5%	23.5%	0.08
Hybrid/Online (2020–2024)	186	84.4%	15.6%	
Total	301	81.4%	18.6%	

*Statistically significant difference between formats (p < 0.05)

Student Satisfaction and Knowledge Gains

Among the 301 students included, 70 completed the satisfaction questionnaire. Students self-rated their knowledge on chronic pain at an average of 3.94/10 before the course and 7.71/10 after completing the certificate (p = 0.013), indicating a significant perceived improvement. Platform access and navigation was positively rated (4.33/5 and 4.36/5; respectively).

Satisfaction with the platform improved post-modification in several aspects, including interest in modules 1, 2, 3, and 5 (p=0.036, p=0.047, p=0.004, p=0.025, respectively), resource usefulness in modules 1, 3, 4, and 5 (p=0.004, p=0.002, p=0.012, p=0.018, respectively), and clarity of Module 3 resources (p=0.05). The estimated average preparation time decreased from 96.2 hours to 87.1 hours post-modification, though this change was not statistically significant (p=0.6). These results could reflect improved learning efficiency and platform optimizations such as content updates, clearer course structuring, and the introduction of a discussion forum. Other items did not show statistically significant differences (Table 2).

Table 2. Detailed evolution of Student Satisfaction in learning via an Online Platform before and after modifications (2023)

Question	Mean	Before 2023	After 2023	p-value
Was access to the platform easy?	4.33	4.43	4.15	0.506
Was navigation in the platform easy?	4.36	4.39	4.31	0.995
Did the objectives of Module 1 spark your interest?	4.22	4.02	4.42	**0.036**
Did the objectives of Module 2 spark your interest?	4.04	3.82	4.27	**0.047**
Did the objectives of Module 3 spark your interest?	4.13	3.8	4.46	**0.004**
Did the objectives of Module 4 spark your interest?	4.14	4	4.27	0.218
Did the objectives of Module 5 spark your interest?	4.27	4.07	4.46	**0.025**
Did Module 1 resources were useful?	3.93	3.52	4.35	**0.004**
Did Module 2 resources were useful?	3.7	3.45	3.96	0.058
Did Module 3 resources were useful?	4	3.59	4.42	**0.002**
Did Module 4 resources were useful?	4	3.7	4.31	**0.012**
Did Module 5 resources were useful?	4.03	3.7	4.35	**0.018**
Did Module 1 resources clarify chronic pain better?	4.22	4.09	4.35	0.387
Did Module 2 resources clarify chronic pain better?	4.02	3.91	4.12	0.467
Did Module 3 resources clarify chronic pain better?	4.14	3.86	4.42	**0.05**
Did Module 4 resources clarify chronic pain better?	4.19	4	4.38	0.154
Did Module 5 resources clarify chronic pain better?	4.15	4	4.31	0.348
What did you think of the continuous assessment of Module 1?	4.2	4.14	4.27	0.203
What did you think of the continuous assessment of Module 2?	4.1	4.07	4.12	0.716
What did you think of the continuous assessment of Module 3?	4.22	4.16	4.27	0.396
What did you think of the continuous assessment of Module 4?	4.2	4.25	4.15	0.984
What did you think of the continuous assessment of Module 5?	4.27	4.23	4.31	0.464
How was the group communication?	4.11	3.98	4.23	0.413
Were the revision seminars beneficial?	4.36	4.25	4.46	0.211
How much time (in hours) did you spend preparing for the CPC?	91.74	96.28	87.19	0.603

Discussion

Our study suggests that transitioning from a traditional in-person format to a hybrid online model may enhance student satisfaction and facilitate learning outcomes.

The higher success rate observed during the hybrid

phase, although not statistically significant, could be partly explained by easier access to educational materials, enhanced peer interactions, and continuous instructor guidance through the Moodle platform.

Our results are consistent with previous research indicating that well-structured online learning modalities can enhance student performance. Cipriano et al. aimed to determine the impact of the integration of an online curriculum for dermatology learners. They evaluated their knowledge acquisition using a 50-item, multiple-choice pretest and posttest, and found that all 51 participants significantly improved in their dermatology knowledge ($p<0.001$) [9].

Also, the study by Enyoojo et al. found that 63.1% of medical students agreed that the online learning platform was effective for delivering medical course content with a mean user learning experience score of 4.15 [10]. These findings support the continued use and development of online learning technologies, particularly in medical education.

Student satisfaction showed notable improvement between 2020 and 2024, particularly regarding module objectives, clarity of resources, and the usefulness of continuous assessments. In the study by Vavasseur et al. [11], user satisfaction in online learning was strongly influenced by ease of use and the availability of technical support. The authors reported that there was a clear value in new educational technologies with a blended learning format combining e-learning and a face-to-face classical course. This approach led to improved student performance and greater engagement with the learning process.

In our study, The estimated average preparation time decreased from 96.2 hours to 87.1 hours post-modification, though this change was not statistically significant ($p=0.6$). Possible contributing factors could include a clearer course structure, updated content, and the introduction of features such as discussion forums.

A cross-sectional, web-based study, including 3286 medical students from 12 different countries, found that most students felt comfortable using the software solutions (80%). Online learning provided greater flexibility (84%) and led to an unchanged or even higher attendance of courses (70%) [12].

While our results highlighted the benefits of hybrid learning, it is important to consider potential drawbacks of exclusively online learning. A study conducted in China during the COVID-19 pandemic has shown that fully online learning can contribute to feelings of loneliness, which may lead to burnout. In contrast, the hybrid model used in our program may have mitigated these risks by maintaining in-person interactions through clinical internships and fostering communication via discussion forums, so offering a more socially supportive learning environment [13].

This study has several methodological limitations. First, the satisfaction questionnaire used was not formally validated, which may limit the reliability and comparability of the responses. Second, no multivariate analysis was conducted to control for potential confounding factors such as prior academic performance, learning habits, or motivation level. Third, participation in the satisfaction survey was voluntary, which may have introduced a self-selection bias, as more motivated or engaged students could have been more likely to respond. This bias is further suggested by the relatively low response rate. Finally, the retrospective design of the study limits causal inference, and the observed associations should therefore be interpreted with caution.

Additionally, it is important to consider the potential influence of the COVID-19 pandemic on academic outcomes and student satisfaction. The shift to online and hybrid learning coincided with the pandemic period, which may have affected students' study habits, stress levels, and engagement. As such, the observed differences between the in-person and hybrid phases could be partly influenced by these external factors, rather than solely by the format of the course.

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