

Challenges in the most challenging course as perceived by the students of health sciences during the Covid-19 pandemic: What are they and who were struggling the most?

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Abstract

The immediate shift to remote teaching or distance learning, due to COVID-19 management strategies, most notably limited in-person contact, was abruptly implemented in universities worldwide. This process was demanding for both the instructors and the students, notwithstanding. The present study examined the challenges in a course attributed as the most challenging during the Covid-19 pandemic by health sciences students of different socio-demographic backgrounds, life circumstances, educational background and academic achievement ($N=743$). A questionnaire was designed and translated to French employing the forward-backward translation method. The factor structure and reliability were examined by Categorical Principal Component Analysis (CATPCA) and Cronbach's alpha, respectively. Chi-square tests with post-hoc examinations using adjusted standardized residuals and z-tests of independent proportions were performed to investigate the group differences. Participants were bachelor and master students of Medicine, Pharmacy, Biomedicine, Physiotherapy, Public Health, Motor Sciences (Physical Education) and Dentistry from the University of Liege,

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The preliminary findings of the study were presented and appeared as an abstract in the proceedings of the 16th Annual International Technology, Education and Development Conference (INTED) organized from 7 to 9 March, 2022 in Valencia, Spain.

Belgium. Results revealed that the most three reported challenges were difficult learning content, course intensity, feeling of stress and worry. Additionally, online learning implementation due to Covid-19 measures, feeling of failure (not having learnt what was supposed to be learnt) and lack of instructors' interaction and support were mentioned as the prominent challenges encountered. Furthermore, more bachelor, full-time and female students, students who were in early stages of the learning trajectory and low and averaged achievers reported experiencing challenges with difficult learning content, course intensity, stress and online learning. The findings, thus, emphasized the role of faculty-led and instructors' support in the early stages of students' learning trajectory and adequate attention to their well-being if online learning is to be institutionalized.

KEYWORDS

Covid-19 pandemic, health sciences, medical studies, online learning, students' challenges

1 | INTRODUCTION

Like so many other educational institutions, medical faculties and schools around the world have experienced a most critical shift in curricular changes and didactical approaches since March 2020, when the COVID-19 pandemic had significantly caused a constantly increase in hospitalizations, mortalities and exponential infected cases on a daily basis ever since. The need and decisions to limit in-person interactions and classroom teaching and eventually transition to online learning and teaching were self-evident, despite the observation that medical schools were often challenged by self-imposed barriers of excessive traditionalism, faculty resistance, the nature of the discipline and time constraints (Binks et al., 2021).

It is endorsed that online learning does not simply entail the transfer of what used to be taught during classroom contact to the online learning platform. Indeed, this necessitated a re-design of learning activities and reconsidering the role of the instructors on the one hand. On the other hand, online learning is demanding such that students are expected to be autonomous and self-regulated learners next to the possession of appropriate digital devices and skills to participate in online learning activities, both individually and collaboratively (Shea & Bidjerano, 2010). This means that the shift to partly or full online learning and teaching is demanding for both the lecturers and the students.

Furthermore, this shift to remote or online teaching, which under normal circumstances would have required a well thought-out and planned design, had to be carried out almost overnight. Transition to learning solutions offered by digital tools was accelerated and quickly achieved due to the urgency to avoid in-person contact. However, whether the desired learning outcomes were to be achieved remained questionable. In this respect, some authors suggested to use the term emergency remote teaching to capture this abrupt shift to online teaching during the pandemic circumstance, to differentiate with quality online learning usually referred to in the literature (Hodges et al., 2020). In essence, emergency remote teaching is an alternative and temporary mode of delivery, which entails a return to face-to-face teaching once the crisis has come to an end.

Recent studies have collected evidence of curricular adaptations of how the transition to online teaching and learning has taken place (Binks et al., 2021). While most universities had put in place appropriate resources, staff development and online learning platform, the main challenges for the instructors consisted in online learning design, heavy workload and students' engagement. Indeed, while being considered and proved to be effective in disciplines such as social sciences and humanities, whether online learning could equally facilitate students' learning in medical sciences remained unanswered. In addition to the higher-order cognitive competences specific to the medical fields, hands-on experiences and the need to interact with the instructors, peers and patients are the acknowledged factors that hinder the wider adoption of online learning of different formats in medical schools. For example, the students indicated that either the online activities were too simple for higher order thinking or just too complex to proceed (White et al., 2015).

The mandated transition to online learning entailed by Covid-19 management strategies inevitably demanded students' adaptation if the desired educational goals were to be fully achieved. The demand was more evident, particularly for students who had no prior online learning experience. Students may be challenged by unfamiliar software although most of them were assumed to be digital natives (Binks et al., 2021). Furthermore, learning in an online environment, which was mostly without in-person contact in the pandemic, required not only self-regulated learning skills but also online learning skills like effective and efficient online contributions and discussion facilitations. For this transition, it was important that non-experienced or early staged students could receive sufficient support and coaching. Furthermore, pandemic-related anxiety and stress (Rajab et al., 2020) coupled with the different public health interventions to mitigate the viral transmission imposed extra burden, particularly for non-traditional students. For example, the decision to close K-12 schools and childcare at the same time and the obliged teleworking or working-from-home induced greater difficulty to balance school, work and personal life. In other words, students of different socio-economic backgrounds, life circumstances, learning experience and fields of medical sciences might have faced different challenges when it came to remote learning during the Covid-19 pandemic.

Except in institutions that offer distance learning for the whole programme, it is not always the case that medical students had to follow all or most of the courses within a semester or an academic year in an online mode. This explains the fact that studies examining the challenges students from medical sciences had encountered when all learning activities were organized online are scarce. Research on students' challenges during the Covid-19 pandemic involved students from fields such as Psychology, Physical Education and Sports Management (Barrot et al., 2021) or faculty members (Bdair, 2021) with either sample size as a limitation or restricted only to qualitative approaches. Moreover, students' learning stages, academic learning achievement and (online) learning experiences and life circumstances, fields of study have not been extensively investigated when addressing the different challenges and discouraging factors in an online learning modality. Examining these factors in such an authentic online learning environment at a faculty of Medicine will facilitate our committed effort to 'modernize' medical education (Binks et al., 2021).

Against these backgrounds, the imposed online learning organization during the Covid-19 was a unique and valuable opportunity for such investigation on the challenges encountered by students from different fields of health sciences to be conducted. Therefore, the aim of the present study was to examine the challenges experienced by students of different fields of health sciences in a course that they attributed as the most challenging course during the Covid-19 pandemic in the academic year 2020–2021. Differences among students of different socio-demographic backgrounds, life circumstances, educational background and academic achievement were also brought to light.

2 | LITERATURE REVIEW

While mostly intellectually prepared when entering the training of a medical school or faculty, students might not be prepared to meet the rigours and demands of the curriculum (Deepa & Panicker, 2016). Three groups of stressors were identified, namely, academic pressure, social issues and financial problems, of which academic pressure was the most reported and a reoccurring factor in different studies (Vitaliano et al., 1984; Waghachavare

et al., 2013). Academic pressure encompasses several identified stressors such as heavy workload, frequency of tests and examinations, high self-expectations of themselves, authoritative relationship with the professors, insufficient skills in medical practices, difficulty in understanding the learning content, poor achievement, or feeling of lagging behind (Harris et al., 2015; Imran et al., 2016; Mahajan, 2010; Radcliffe & Lester, 2003). The inherent nature of the demanding curricula of different medical science fields lead to high levels of stress, which results in mental distress, low self-esteem, anxiety and depression among students in both developed and developing countries (Chew-Graham et al., 2003; Dyrbye et al., 2006; Saipanish, 2003; Velayudhan et al., 2010).

The challenges students from medical schools experienced were further reinforced by the pandemic. In a study by Rajab et al. (2020), the students indicated that in-person communication, technologies, experience with online learning, pandemic-related stress and anxiety were issues related to online learning during the Covid-19 pandemic. A recent systematic review on the effectiveness of online teaching during the Covid-19 pandemic involving medical students revealed that while online learning effectively enabled teaching continuity, technical challenge, poor student engagement and loss of assessment as well as mental health issues were documented (Wilcha, 2020). A qualitative study using interviews with 10 nursing students and 10 faculty showed that despite the flexibility, opportunities to be more student-centred in the teaching approach and improved academic achievement being reported, certain challenges related to online learning and life situations were quoted (Bdair, 2021). The first challenge was the academic integrity with students and faculty mentioning that online learning was not appropriate for the acquisition of practical competences and hands-on skills due to the lack of instructor-students and student-student interactions. Consequently, the students experienced a lack of motivation and complained of a lack of attention and feedback either from the instructors or from their peers. Second, students' active engagement was a concern that could not be managed during online sessions because of many reasons such as external distractions and Internet connection problems and a lack of teamwork and peer interactions. Third emerged the challenge related to students' life circumstances such as financial burden and familial obligations. Accordingly, a reliable Internet-connected device was not always affordable given that all members in the family should have one to work and study; or a quiet learning environment was not evident for certain households and for students with domestic obligations and kids (Rahiem, 2021).

As can be seen, students of medical sciences shared common academic challenges, which became more severe during a pandemic context. However, it was plausible that these challenges were perceived differently as a function of different factors, which was discussed further in the following section.

2.1 | Age

Given the changing socio-demographics of higher education students, it was expected that students of different backgrounds were observed in the same and/or different cohorts. These background differences included age, marital status with or without child obligations and employment status. Studies showed that graduate students demonstrated certain differences as compared to undergraduate students (Zhao et al., 2022). The former had more heterogenous lifestyles such that they often lived off-campus, either married or single and had a full-time or part-time job. The latter were younger with ages in the range 18–25 years and had a more homogeneous lifestyle, e.g., living more on-campus. The differences in the background characteristics resulted in different coping strategies experienced during a study programme. For example, younger students and those with low perceived family support were found to experience more academic stress (Khan et al., 2013; Pandey et al., 2015). In the present study, following findings from recent study (e.g. Cummins et al., 2019), we differentiated three categories of age, including 18–25 years who were considered as having no gap during their learning trajectories, hence forming a homogeneous group; (2) 26–35 years who were mostly graduate students, thus having experienced higher education beforehand and (3) over 35 years of age who represented prominent characteristics of non-traditional university students or adult learners with a working life and possibly familial obligations.

As age was concerned, there were significantly more students in the younger group, i.e., from 18 to 25 years of age, indicating that the course was most challenging because it addressed difficult learning content ($n=486$, 76.2%, $p=.001$) and the class was intense ($n=460$, 58.5%, $p=.016$) compared to those aged between 26 and 35, but not for those over 35 years of age. Students from the younger group also felt more worried and stressed about the class ($n=375$, 58.8%, $p=.011$).

2.2 | Gender

When it came to academic stress, findings revealed that male and female were different in the level of stress experienced. Female students were found to be more emotional, more engaged to school and study and attach greater importance to academic achievement, especially during the transition to higher education (Salmela-Aro & Tynkkynen, 2012; Velayudhan et al., 2010). These factors might have contributed to their higher levels of stress and school burnout (Tajularipin et al., 2009). On top of that, female and married students were more likely to encounter greater challenges when schools and day-care were closed as a result of COVID-19 preventive measures, which made learning and/or working from home difficult to manage or completely not feasible. Indeed, in the context of Covid-19 pandemic, female students were found to have more academic stress than the others (Guldager et al., 2021).

2.3 | Study cohorts and the learning experience

Research on students' stress levels were inconsistent regarding the findings, which revealed that students experienced higher stress levels either in the first year or in the last year of their study or in both stages of the study (Deasy et al., 2014, 2016). The coping strategies during Covid-19 pandemic differed among undergraduates and graduates (Zhao et al., 2022). The former employed more problem-focused coping styles which were associated with lower level of stress. On the other hand, the latter tended to use more avoidance coping which were usually associated with negative emotions. Therefore, it was plausible to argue that students who were later in the learning trajectory were more likely to experience fewer challenges than early staged students given their experience in stress coping.

According to Melincavage (2011), students may experience stress when it comes to new learning experiences. In the study context, this can be the fact that all or most courses were organized online. In this respect, the number of online courses students had taken was found to be correlated to students' self-efficacy to complete an online course and the self-efficacy to interact with the classmates for academic purposes (Shen et al., 2013). Undergraduate and graduate students also differed in how they could efficiently handle online learning tools. With a higher number of online courses previously taken, the graduate students were on the advantage edge (Shen et al., 2013). Therefore, it is hypothesized that students having prior experience with online learning experience less challenges.

2.4 | Academic achievement

Students following programmes in a medicine school are expected to experience higher stress levels due to the demanding requirements both at university entry and during the study. However, not all students were prone to experience the same stress level. According to a study among perceived stress in medical students, those belonged to the average groups were with a higher level of perceived stress compared to the excellent group. Similarly, in a previous study, Sohail (2013) found that higher levels of stress were more observed among the low achievers. In the context

of medical schools, stressor can be due to life circumstances and/or academic stress caused by a heavy curriculum, frequent examinations and high course workload (Manjareeka & Yadav, 2020). It can be expected that with the health crisis, a number of additional stressors would bring more challenges to medical students, particularly the low achievers who were either more vulnerable to the stressors or lacked coping strategies.

In brief, the challenges encountered by the students of medical sciences during the Covid-19 pandemic were related not only to the academic pressure, but also to the stress triggered either from the cognitive load itself or from the pandemic. The implementation of online learning also posed significant challenges such as technical issues, distractions and limited interactions, which in turn led to demotivation and anxiety. Whereas studies on the challenges of students in medical sciences in general and during the Covid-19 pandemic were available, most of them were with limited sample size and did not cover different fields of study. Consequently, comparisons concerning the challenges encountered by students of different backgrounds, cohorts, academic achievement and learning experience have not been made possible. Therefore, the present study aimed to address the following research questions:

1. What are the greatest challenges experienced by the students during their perceived most challenging course?
2. Are there significant differences in the perceptions of challenges as a function of students' socio-demographic characteristics?
3. Are there significant differences in the perceptions of challenges as a function of students of different cohorts, fields of study and academic achievement?

3 | METHODOLOGY

3.1 | Context

From March 2020 to June 2021, following the measures of the Belgian Federal Government and the guidelines of the Government of the Federation Wallonia-Brussels, classroom teaching in different faculties of the University of Liege (Liege, Belgium) was replaced by online teaching and learning. To ensure an effective transition, a short training course on the use of appropriate digital tools for teaching was provided to interested instructors on a daily basis by the Higher Education Training and Research Institute (IFRES, University of Liege). Furthermore, technical support, e.g., podcast recording, production of optimized online learning content and quizzes, was available to the instructors in the form of short videos and helpdesk service. Students were asked about their possession of appropriate digital devices and internet connection and those who were in difficulties were provided with appropriate solutions (loan of laptop, access to computer rooms, etc.). During this process, the instructors were encouraged to communicate their expectations to the students regarding online participation and their assessment methods and criteria, be responsive to students' questions and attentive to students who had problems with online learning due to this exceptional circumstance. The institutional online learning platform (ecampus) was based on the Blackboard® learning management system, including the Collaborate® module as a specific virtual classroom tool. An additional use of Lifesize®, Zoom® and Webex® for video-conferences was possible, according to the personal preferences of the instructors.

3.2 | Study design

To reach a significant number of students, a cross-sectional design was adopted such that invitations to participate in the present study were sent to all students ($n=3963$) following bachelor and master programmes at the Faculty of Medicine (University of Liege) on 15 June 2021. A reminder was sent after 2 weeks to those who did not respond or complete their answers. Respondents' anonymity was ensured such that no identified information

could be retrieved. The respondents were asked to provide their informed consent before they completed the questionnaire. They were informed about the voluntary nature of the study and that their anonymity was ensured. Also, to encourage the respondents, it was clearly stated that there was no right or wrong answer and that the respondents could withdraw at any time of the study by contacting the principal investigators whose email addresses were indicated in the invitation. A total of 743 responses were obtained, which equalled a response rate of 18.75%. The study protocol was approved by the Ethical Committee of the University of Liege, reference number 2021-067 dated 25 March 2021.

3.3 | Participants

The participants were mostly in the age group of 18–25 years ($n=639$, 88.4%) with a median age of 22.0 [20.00–23.0]. Sixty-five participants (9.0%) were in the age range of 26–35 years and another 2.6% in the 36–50 years of age. Roughly two-thirds of the participants were female and 30.2% ($n=218$) were male students. As for civil status, the majority of the participants was single ($n=678$, 93.8%). To better capture life circumstances of the participants, the family situation was also elicited. Accordingly, 75.5% ($n=546$) of the participants were living with their parents and 7.5% ($n=54$) living alone. Another 13.1% was living with a partner or in couple (legally habituating) without children. Of notice, among the participants with children, there were 17 participants (2.4%, $n=17$) who were living in couple and three participants living alone (0.4%, $n=3$). Full-time students constituted the largest group while working students made up 8% of the sample. Among the latter group, 18 (2.5%) were working fulltime and 40 (5.5%) were part-timers.

Regarding their background, 62.8% ($n=454$) obtained a secondary diploma, 33.5% ($n=242$) a previous bachelor degree and 3.7% ($n=27$) a previous master degree. As for the current registered programme, bachelor students ($n=450$, 62.8%) outnumbered master students ($n=273$, 37.8%). For their field of study, the largest group was students of Medicine ($n=248$, 34.3%), followed by students in Pharmacy ($n=141$, 19.5%), Biomedicine ($n=115$, 15.9%), Physiotherapy and Rehabilitation ($n=109$, 15.1%), Public Health ($n=49$, 6.8%), Motor Sciences (Physical Education, $n=36$, 5.0%) and Dentistry ($n=25$, 3.5%).

As to academic achievement, students who had received a grade point average (GPA) from 12 to lower than 14 ($n=242$, 33.5%) were the largest group. Students with a GPA from 14 and lower than 16 ($n=170$, 23.5%) made up the second largest group. 6% of the participants were high achievers, i.e., those with a GPA from 16 to lower than 18 ($n=43$, 5.9%) and from 18 to 20 ($n=1$, 0.1%) whereas 3.6% ($n=26$) was with a GPA lower than the failing grade of 10. At the time being, 102 participants (14.1%) did not have their GPA available. The result is presented in [Table 1](#).

3.4 | Instrument

3.4.1 | Design

The questionnaire in the present study consisted of two sections. The first section addressed questions related to the students' socio-demographics (age, gender, family situations, working status and learning experience including their highest diploma, current registered programme and field of study, current study year and the GPA obtained from the most recent semester). Following Salmela-Aro and Read (2017), we differentiated four study stages. Accordingly, stage 1 indicated that students who were in their first year, stage 2 those who were in their second and third year, stage 3 fourth and fifth year and stage 4 sixth year and higher.

The second section involved items related to students' opinions about the course that they perceived as the most challenging course during the academic year 2020–2021. The instrument was adopted from Micari and

TABLE 1 The socio-demographics, educational background and online learning experience of the participants (N = 723).

Variables	Percentage (%)
Age	Median = 22.00 [20.00–23.00]
<i>Age group</i>	
18–25 years	639 (88.4)
26–35 years	65 (9.0)
>35–50 years	19 (2.6)
Years in higher education	Median = 3.00 [2.00–5.00]
<i>Gender</i>	
Female	504 (69.7)
Male	218 (30.2)
Non-binary	1 (0.1)
<i>Civil status</i>	
Single	678 (93.8)
Legally cohabitating	14 (1.9)
Divorced	3 (0.4)
Married	15 (2.1)
Widow/widower	1 (0.1)
Other	12 (1.7)
<i>Family situation</i>	
Living alone/with parents	600 (83.0)
Living with a partner/in couple—no children	95 (13.1)
Living as couples and having children	17 (2.4)
Living alone and having children	3 (0.4)
Other	8 (1.1)
<i>Employment status</i>	
Full-time student ^a	658 (91)
Full-time working	18 (2.5)
Part-time working	40 (5.5)
Job-seeking/Other	7 (1.0)
<i>Highest diploma</i>	
Secondary	454 (62.8)
Bachelor	242 (33.5)
Master	27 (3.7)
<i>Current programme</i>	
Bachelor	450 (62.2)
Master	273 (37.8)
<i>Field of study</i>	
Medicine	248 (34.3)
Dentistry	25 (3.5)
Pharmacy	141 (19.5)

TABLE 1 (Continued)

Variables	Percentage (%)
Biomedicine	115 (15.9)
Motor Sciences (Physical Education)	36 (5.0)
Physiotherapy and Rehabilitation	109 (15.1)
Public Health	49 (6.8)
<i>GPA obtained from the last semester</i>	
≤10	26 (3.6)
10 ≤ 12	139 (19.2)
12 ≤ 14	242 (33.5)
14 ≤ 16	170 (23.5)
16 ≤ 18	43 (5.9)
18–20	1 (0.1)
Not applicable	102 (14.1)
<i>Prior online learning experience</i>	
No	611 (84.5)
Yes	112 (15.5)

^aFull-time students were those who did not work, be it full time or part time.

Pazos (2012), which encompassed three themes identified through a content analysis from the comments of the students, i.e., positive learning experience (2 items), difficult content (3 items) and discouragement (4 items). Two new items were added to reflect the new teaching and learning circumstance triggered by the Covid-19 pandemic. These were 'The course was organized purely online' and the other was 'The course did not fit my way of learning.' The two items referred to the new organization of learning which was possibly not optimal to students' learning styles and preference. Therefore, they were initially subsumed under the discouragement theme, which was subject to a factor analysis to confirm their relevance. In addition, an open-ended question provided an opportunity for the students to indicate further reasons not covered.

3.4.2 | Validation of content, reliability and structural validity

The instrument was translated from English to French using the forward-backward translation method. The content validity was verified by a group of experts ($n=6$). Accordingly, the expert panel evaluated the equivalence of the translated version in terms of content, semantics and cultural appropriacy. In so doing, they helped to identify the inadequate translated items, discrepancies and suggested alternatives from both conceptual and educational perspectives. After content and language validation, the questionnaire was piloted to a group of 33 students who were representatives of their respective field of study. The students rated if the meaning of each item was either clear or not clear to them. All items received 80% of rating as clear, hence they were all retained. However, students suggested some minor remarks as to questionnaire structure and punctuations, which were also modified accordingly.

The final version of the questionnaire was administered to the target group and subject to structural validation and reliability analyses. Accordingly, Categorical Principal Component Analysis (CATPCA) with the rotation method as Varimax with Kaiser Normalization and Cronbach's alpha were performed, respectively. Factor loadings above .400 and Cronbach's α above .700 were considered acceptable. The results were presented in Section 4.1.

3.5 | Data analysis methods

First, categorical principal component analysis was performed to validate the factor structure of the challenges dimensions, followed by Cronbach's alpha to examine the internal consistency of the items within one identified factor. Second, descriptive analysis with frequencies and percentages was performed to examine which challenges were most reported by the students. Third, chi-square test of independence was conducted to explore if there were significant differences among groups of students regarding the challenges encountered. Once the omnibus chi-square was significant, post-hoc chi-square using adjusted standardized residuals and z-tests of independent proportions were used to find out which cells were accountable for the associations. Results were considered significant at $\alpha=.05$ and the data were analysed using SPSS v.28.

4 | RESULTS

4.1 | Instrument validation

Using Categorical Principal Component Analysis (CATPCA), an implementation of optimal scaling approach, with the rotation method as Varimax with Kaiser Normalization, the result revealed that the 11 items yielded a three-factor solution. However, item 8 'The class presented a more advanced way of thinking' displayed a loading of 0.396, which was just at a marginally acceptable criterion. However, as per meaning, the item entailed that students were required to effectuate high-order thinking including analysis and synthesis rather than observations of factor or theory memorization. The item was relevant and applicable as far as the content of the course was concerned and therefore it was retained. Accordingly, the first factor labelled difficult learning content consisted of 4 items which reflected the difficult and intense content, elaborated higher order thinking and the stress induced. The second factor, assigned as discouragement, concerned the discouraging perception and negative feeling of the students. The factor was made up of 5 items. The third factor captured the new and/or positive learning experience and consisted of 2 items, including the rewarding learning content and online learning organization. Altogether, the factors accounted for an explained variance of 42.4% with the whole scale Cronbach's $\alpha=.864$. The factor structure and loadings can be found in [Table 2](#).

4.2 | Challenges most experienced by the students during their perceived most challenging course

When asked to indicate the reason why attributing the course in question as most challenging during the academic year 2020–2021 where remote teaching was largely implemented, difficult content was the dimension that received more indications than the other two dimensions. Particularly, the students quoted the difficult learning content ($n=534$, 73.8%) and intensiveness ($n=508$, 70.2%) as the most prominent reasons. The next reason related to the emotion such that more than half of the students stated that they felt worried and stressed about the course ($n=411$, 56.8%). For discouragement, having a negative motivation ($n=350$, 48.3%), i.e., being discouraged in the course, feeling disappointed that he/she did not learn well what he/she learned ($n=181$, 25%) and that the professor was not caring ($n=162$, 22.4%) were cited as the next reasons that made the course the most challenging. As for the new/positive learning experience, the fact that the course was purely online was a challenge facing the student ($n=387$, 53.5%) and another 22.9% ($n=166$) cited learning something rewarding. The responses were detailed in [Table 3](#).

Among the 55 answers referring to the challenges other than those mentioned, the majority of the responses was related to the workload ($n=24$) and online learning ($n=20$) including learning material quality, organization and timing, course organization, lack of interaction or interaction difficulties with peers and professor. For example,

TABLE 2 Factor structure and loadings of the challenging reasons.

Items	Difficult content	Discouragement	New/positive learning experience
r_2 The class was very hard/intense	0.719		
r_1 It addressed difficult learning content	0.704		
r_3 I felt worried/stressed about the class	0.448		
r_8 The class presented a more advanced way of thinking	0.396		
r4_1 I felt discouraged in this class		0.645	
r_5 The professor did not care about the students		0.641	
r_6 I disliked the class		0.563	
r_11 The course did not fit my way of learning		0.543	
r_7 I did not learn well what I learned		0.508	
r_9 I learned something rewarding			0.744
r_10 The course was purely online			0.643

TABLE 3 Proportion of the challenges reported by the students (N = 723).

Challenges	Percentage (%)
<i>Difficult content</i>	
The class was very hard/intense	508 (70.2)
It addressed difficult learning content	534 (73.8)
I felt worried/stressed about the class	411 (56.8)
The class presented a more advanced way of thinking	68 (9.4)
<i>Discouragement</i>	
I felt discouraged in this class	350 (48.3)
The professor did not care about the students	162 (22.4)
I disliked the class	133 (18.4)
The course did not fit my way of learning	159 (22.0)
I did not learn well what I learned	181 (25.0)
<i>New/positive learning experience</i>	
I learned something rewarding	166 (22.9)
The course was purely online	387 (53.5)
<i>Others</i>	55 (7.6)

one student stated that he/she had 'huge workload in research, reading, synthesis and presentation for the exam (based on presentations)' and another reported that he/she 'had a workload that did not allow me to present the work on time and then the teacher was very demanding.' Sometimes, the increased workload was not adequately justified as reported by one student, 'The professor added the subjects of baccalaureate 2 and 3 in the course of bac 1, under the pretext that we had more time.' Regarding online learning, challenges related to technical problem was revealed: 'there was no recording of lessons, so no way to listen to complicated or lost passages due to my internet connection', said one student. Further came the poor course organization and quality of learning material which caused frustration for the students. They found it hard to follow because 'the course very badly organized online; I did not know which chapter we were at for example', stated one student. Some students raised

problems with the availability of the podcasts and were not satisfied with how they were delivered. For example, podcasts were not available according to the schedule or half of them were given in the last 2 weeks of the semester or quickly disappeared. The lack of interactions or difficulty to interact with the professor and peers was also pronounced. One student summarized it succinctly, 'The course included a huge amount of material that would have been much easier to assimilate in a healthier work environment rather than at home. Real-life emulation and interactions, which can be found in a lecture hall, induce better learning and put us in a better state of mind than alone in front of a screen.' Also, one student mentioned that with 'a huge group of 14 people so very difficult to manage meetings remotely' in the context of teamwork for problem-based learning sessions.

In addition to challenges related workload and online learning, other reasons reported by students included difficulty to follow face-to-face sessions while working ($n=1$), demanding/picky/tricky exam ($n=5$), motivation ($n=2$) and course requirements ($n=3$). Detailed responses and the corresponding grouping were presented in the Supplementary [File 1](#).

4.3 | Differences in the perceptions of the most challenging course

4.3.1 | Difficult learning content

Socio-demographics

No gender differences were found regarding the perception of content nature and course intensity such that 74.4% ($n=375$) female and 72.5% ($n=158$) male participants indicated that the course was most challenging because of the difficult content. 72.8% ($n=362$) female and 66.5% ($n=145$) male students indicated course intensity as a reason. However, there were significantly more females feeling worried or stressed ($n=323$, 64.1%, $p<.001$) than male students. Also, more females thought that the course presented a more advanced way of thinking ($n=57$, 11.3%) than males ($n=11$, 5.0%).

As age was concerned, there were significantly students in the younger group, i.e., from 18 to 25 years of age, indicated that the course was most challenging because it addressed difficult learning content ($n=486$, 76.2%, $p=.001$) and the class was intense ($n=460$, 58.5%, $p=.016$) compared to those aged between 26 and 35, but not for those over 35 years of age. Students from the younger group also felt more worried and stressed about the class ($n=375$, 58.8%, $p=.011$).

Regarding working status, a significantly higher number of full-time students found that the difficult learning content ($n=501$, 76.1%, $p<.001$) and course intensity ($n=477$, 72.5%, $p<.001$) were those that make the course most challenging as compared to working students (fulltime or part-time) or job seekers.

With regards to family situations, interestingly, there were significantly more students who lived with parents feeling more stressed about the course than expected ($n=329$, 60.3%, $p=.008$).

Educational background and experiences

Students who had just finished secondary diploma and enrolled in bachelor students found difficult learning content and course intensity were the critical factors making a course challenging. Particularly, 77.8% ($n=353$) secondary degree holders found difficult learning content was most challenging compared to 67.4% bachelor degree holders ($n=163$) and 66.7% ($n=18$) master degree holders, $p=.009$. It followed that students in a bachelor programme were more challenged by the difficult learning content ($n=351$, 78%, $p<.001$) and course intensity ($n=329$, 73.1%, $p=.031$) in comparison with that 67.0% ($n=183$) and 65.6% ($n=179$) of master students.

As for fields of study, a significantly higher number of students in Medicine ($n=185$, 74.6%), Pharmacy ($n=107$, 77.3%), Motor Sciences ($n=30$, 83.3%), Physiotherapy and Rehabilitation ($n=85$, 78.0%) were challenged by the difficult learning content than students in Public Health ($n=24$, 49%), $p=.003$. On the other hand, more students in Medicine ($n=187$, 75.4%) and Pharmacy ($n=113$, 80.1%) were challenged by the course intensity than students in Public Health ($n=25$, 51%). However, in terms of stress, more students in Pharmacy ($n=100$, 70.9%) mentioned stressed feeling as reasons associated with the challenging nature of the course than students in Medicine

($n = 131$, 52.8%) and Public Health ($n = 22$, 44.9%), $p = .005$. Also, more students in Pharmacy ($n = 20$, 14.2%) than expected reported that the class presented a more advanced way of thinking.

When study stage was considered, it was found that a larger proportion of students in the second ($n = 200$, 76%) and third stage ($n = 168$, 78.5%) mentioned difficult content as reason for the most challenging course compared those in stage 4 ($n = 72$, 62.6%), $p = .012$. More students who were in their first year ($n = 22$, 16.8%) mentioned that the class presented a more advanced way of thinking than their own compared to students in stage 4 ($n = 11$, 9.6%), $p = .009$.

Concerning academic achievement measured by GPA obtained from the most recent semester, no significant differences were found among the different levels of achievement, except when it came to stress. Accordingly, a significantly higher number of students with GPA from 12 to lower than 14 ($n = 152$, 62.8%) felt more stressed than those with a GPA above 16 ($n = 16$, 36.4%). Interestingly, the difficult learning content was found to be perceived by a greater number of students who had prior online learning experience ($n = 95$, 84.8%) than those without such an experience ($n = 439$, 71.8%).

4.3.2 | Discouragement

Socio-demographics

When it came to discouraging factors, no significant difference was observed between groups of students based on their socio-demographic characteristics, except one variable. Accordingly, a significantly higher number of female students ($n = 258$, 51.2%, $p = .008$) reported that they felt discouraged in the course perceived as most challenging than male students ($n = 91$, 41.7%, $p = .020$).

Educational background and experiences

As far as education attainment was concerned, more students with only a secondary diploma ($n = 239$, 52.6%) felt discouraged in the challenging course than bachelor's degree holders ($n = 99$, 40.9%), $p = .009$, which was also reflected in the registered programme. Accordingly, more bachelor students ($n = 242$, 53.8%) felt discouraged in the challenging course than master students ($n = 107$, 39.2%), $p < .001$.

More students in Pharmacy ($n = 91$, 64.5%) felt more discouraged than students in Medicine ($n = 97$, 39.1%) and Dentistry ($n = 4$, 16.0%) whereas students in Motor Sciences ($n = 21$, 58.3%) and Physiotherapy and Rehabilitation ($n = 58$, 53.2%) were more discouraged than peers in the Dentistry ($n = 4$, 16.0%), $p < .001$. A significantly higher proportion of students in Pharmacy ($n = 44$, 31.2%) stated that the course was most challenging because the professor did not care about the students compared to 16.1% ($n = 40$) of students in Medicine, $p = .003$. Additionally, more students in Physiotherapy and Rehabilitation ($n = 37$, 33.9%) reported that they disliked this challenging course as opposed to 12.9% ($n = 32$) of students in Medicine and Dentistry ($n = 0$, 0.0%).

Considering academic achievement, a significantly higher number of students with GPA from 10 to lower than 12 ($n = 37$, 26.6%) reported that they disliked the class than students from 12 to lower than 14 ($n = 35$, 14.5%).

4.3.3 | Positive and new learning experience

Socio-demographics

More students belonging to the age group from 18 to 25 ($n = 330$, 56.2%) stated that the fact that the course was purely online made it the most challenging compared to those aged from 26 to 35 ($n = 22$, 36.1%) and over 35 years of age ($n = 4$, 22.2%) $p = .001$.

Interestingly, more full-time students ($n = 334$, 55.1%) experienced challenges when the course was purely online than expected. Furthermore, there were fewer students who lived alone reported purely online learning as a challenge ($n = 20$, 37.0%) than expected.

TABLE 4 Group differences regarding perceived challenges—socio-demographic factors.

Categories	Difficult learning content			Discouragement			Positive experience				
	It addressed difficult learning content	The class was very hard/intense	I felt worried/stressed about the class	The class presented a more advanced way of thinking	I felt discouraged in this class	The professor did not care about the students	I did not learn well what I learned	The course did not fit my way of learning	I learned something rewarding	The course was purely online	
Gender											
Female (n = 504, 69.7%)	375 (74.4)	362 (72.8)	323 (64.1) ^a	57 (11.3)	258 (51.2)	108 (21.4)	94 (18.7)	123 (24.4)	114 (22.6)	113 (22.4)	259 (55.2)
Male (n = 218, 30.2%)	158 (72.5)	145 (66.5)	88 (40.4) ^b	11 (5.0)	91 (41.7)	54 (24.8)	39 (17.9)	58 (26.6)	45 (20.6)	53 (24.3)	97 (49.2)
Chi-square test	p = .589	0.152	<0.001	0.008	0.02	0.323	0.809	0.531	0.556	0.579	0.158
Age											
Age group 1 (638, 88.2%)	486 (76.2) ^b	460 (72.1)	375 (58.8) ^a	61 (9.6)	314 (49.2)	139 (21.8)	118 (18.5)	163 (25.5)	139 (21.8)	151 (23.7)	330 (56.2) ^a
Aged 26–35 (65, 9.0%)	35 (53.8) ^b	(38, 58.5)	28 (43.1) ^b	6 (9.2)	26 (40.0)	18 (27.7)	11 (16.9)	14 (21.5)	16 (24.6)	12 (18.5)	22 (36.1) ^b
Aged >35 (19, 2.6%)	13 (68.4)	10 (52.6)	7 (36.8)	1 (5.3)	8 (42.1)	5 (26.3)	4 (21.1)	3 (15.8)	4 (21.1)	3 (15.8)	4 (22.2) ^b
Fisher's exact test	0.001	0.016	0.011	1.000	0.33	0.439	0.881	0.554	0.849	0.567	0.001
Working status											
Full-time students (658, 91%)	501 (76.1) ^a	477 (72.5) ^a	384 (58.4)	64 (9.7)	326 (49.5)	145 (22.0)	126 (19.1)	168 (25.5)	146 (22.2)	155 (23.6)	334 (55.1) ^a
Full-time working (18, 2.5%)	9 (50.0)	8 (44.4)	7 (38.9)	0 (0.0)	5 (27.8)	4 (22.2)	2 (11.1)	4 (22.2)	3 (16.7)	3 (16.7)	2 (14.3) ^b
Part-time students (40, 5.5%)	20 (50.0) ^b	22 (55.0)	17 (42.5)	4 (10.0)	15 (37.5)	11 (27.5)	5 (12.5)	8 (20.0)	9 (22.5)	6 (15.0)	15 (38.5)
Job-seekers (7, 1%)	7 (57.1)	1 (14.3) ^b	3 (42.9)	0 (0.0)	3 (42.9)	2 (28.6)	0 (0.0)	1 (14.3)	1 (14.3)	2 (28.6)	5 (71.4)
Fisher's exact test	<0.001	<0.001	0.068	0.631	0.139	0.77	0.479	0.865	0.976	0.571	0.003

TABLE 4 (Continued)

Categories	Difficult learning content			Discouragement			Positive experience			
	It addressed difficult learning content	The class was very hard/intense	I felt worried/stressed about the class	The class presented a more advanced way of thinking	I felt discouraged in this class	The professor did not care about the students	I did not learn well what I learned	The course did not fit my way of learning	I learned something rewarding	The course was purely online
<i>Family situation</i>										
Living alone (54, 7.5%)	35 (64.8)	38 (70.4)	25 (46.3)	5 (9.3)	23 (42.6)	11 (20.4)	6 (11.1)	8 (14.8)	8 (14.8)	20 (37.0) ^b
Living with a partner/in couple - no children (95, 13.1%)	72 (75.8)	70 (73.7)	46 (48.4)	5 (5.3)	49 (51.6)	20 (21.1)	18 (18.9)	26 (27.4)	20 (21.1)	52 (58.4)
Living with parents (546, 75.5%)	409 (74.9)	384 (70.3)	329 (60.3) ^b	55 (10.1)	265 (48.5)	121 (22.2)	104 (19.0)	141 (25.8)	124 (22.7)	296 (54.2)
Living as couples and having children (17, 2.4%)	10 (58.8)	8 (47.1)	6 (35.3)	2 (11.8)	6 (35.3)	5 (29.4)	4 (23.5)	2 (11.8)	3 (17.6)	6 (35.3)
Living alone and having children (3, 0.4%)	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	2 (66.7)	2 (66.7)	0 (0.0)	1 (33.3)	0 (0.0)	2 (100.0)
Other (8, 1.1%)	6 (75.0)	7 (87.5)	5 (62.5)	1 (12.5)	4 (50.0)	3 (37.5)	1 (12.5)	3 (37.5)	1 (12.5)	5 (62.5)
Fisher's exact test	0.355	0.163	0.008	0.619	0.757	0.355	0.720	0.253	0.988	0.018

Note: Z-test of independent proportions was conducted to compare column proportion. Cells with different subscript were significant different at $p < .05$, using Bonferroni correction.

TABLE 5 Group differences regarding perceived challenges – educational background and experiences.

Categories	Difficult content			Discouragement			Positive learning				
	It addressed difficult learning content	The class was very hard/intense	I felt worried/stressed about the class	The class presented a more advanced way of thinking	I felt discouraged in this class	The professor did not care about the students	I did not learn well what I learned	The course did not fit my way of learning	I learned something rewarding	The course was purely online	
<i>Highest diploma obtained</i>											
Secondary (454, 62.8)	353 (77.8) ^a	331 (72.9)	268 (59.0)	47 (10.4)	239 (52.6) ^a	103 (22.7)	89 (19.6)	123 (27.1)	105 (23.1)	107 (23.6)	251 (60.5) ^a
Bachelor (242, 33.5)	163 (67.4) ^b	158 (65.3)	132 (54.5)	18 (7.4)	99 (40.9) ^b	56 (23.1)	40 (16.5)	52 (21.5)	50 (20.7)	51 (21.1)	94 (42.0) ^b
Master (27, 3.7)	18 (66.7)	19 (70.4)	11 (40.7)	3 (11.1)	11 (40.7)	3 (11.1)	4 (14.8)	5 (22.2)	4 (14.8)	8 (29.6)	11 (40.7)
Chi-square	0.009	0.114	0.119	0.416	0.009	0.362	0.546	0.26	0.501	0.526	<0.001
<i>Current programme</i>											
Bachelor (450, 62.2)	351 (78.0) ^a	329 (73.1) ^a	261 (48.0)	48 (10.7)	242 (53.8)	103 (22.9)	87 (19.3)	118 (26.2)	103 (22.9)	109 (24.2)	255 (61.2)
Master (273, 37.8)	183 (67.0) ^b	179 (65.6) ^b	150 (54.9)	20 (7.3)	107 (39.2)	59 (21.6)	46 (16.8)	63 (23.1)	56 (20.5)	57 (20.9)	101 (40.6)
Chi-square	<0.001	0.031	0.439	0.136	<0.001	0.69	0.403	0.344	0.455	0.3	<0.001
<i>Field of study</i>											
Médecine (248, 34.3%)	185 (74.6) ^a	187 (75.4) ^a	131 (52.8) ^a	15 (6.0)	97 (39.1) ^{a,b}	40 (16.1) ^a	32 (12.9) ^a	61 (24.6)	52 (21.0)	68 (27.4)	125 (53.6)
Dentistry (25, 3.5%)	18 (72.0)	14 (56.0)	15 (60.0)	2 (8.0)	4 (16.0) ^b	3 (12.0)	0 (0.0) ^a	6 (24.0)	8 (32.0)	8 (32.0)	8 (42.1)
Pharmacy (141, 19.5%)	109 (77.3) ^a	113 (80.1) ^a	100 (70.9) ^b	20 (14.2)	91 (64.5) ^c	44 (31.2) ^b	28 (19.9)	45 (31.9)	36 (25.5)	25 (17.7)	70 (53.8)
Biomedicine (115, 15.9%)	83 (72.2)	73 (63.5)	69 (60.0)	16 (13.9)	56 (48.7)	21 (18.3)	21 (18.3)	27 (23.5)	22 (19.1)	28 (24.3)	51 (49.5)
Motor Sciences (36, 5%)	30 (83.3) ^a	24 (66.7)	17 (47.2)	3 (8.3)	21 (58.3) ^{a,c}	13 (36.1)	9 (25.0)	7 (19.4)	7 (19.4)	6 (16.7)	22 (64.7)
Kinésithérapie et Réadaptation (109, 15.1%)	85 (78.0) ^a	72 (66.1)	57 (52.3)	5 (4.6)	58 (53.2) ^{a,c}	28 (25.7)	37 (33.9) ^b	27 (24.8)	25 (22.9)	24 (22.0)	62 (61.4)
Public Health (49, 6.8%)	24 (49.0) ^b	25 (51.0) ^b	22 (44.9) ^a	7 (14.3)	22 (44.9)	13 (26.5)	6 (12.2)	8 (16.3)	9 (18.4)	7 (14.3)	18 (39.1)
Chi-square	0.003	<0.001	0.005	0.027	<0.001	0.003	<0.001	0.387	0.137	0.163	0.093

TABLE 5 (Continued)

Categories	Difficult content				Discouragement			Positive learning			
	It addressed difficult learning content	The class was very hard/intense	I felt worried/stressed about the class	The class presented a more advanced way of thinking	I felt discouraged in this class	The professor did not care about the students	I disliked the class	I did not learn well what I learned	The course did not fit my way of learning	I learned something rewarding	The course was purely online
<i>Study stage</i>											
Stage 1 (131, 18.1%)	94 (71.8)	87 (66.4)	74 (56.5)	22 (16.8) ^a	69 (52.7) ^{a,b}	24 (18.3)	29 (22.1)	36 (27.5)	34 (26.0)	28 (21.4)	58 (47.5) ^a
Stage 2 (263, 36.4%)	200 (76.0) ^b	190 (72.2)	148 (56.3)	22 (8.4)	150 (57.0) ^b	68 (25.9)	51 (19.4)	63 (24.0)	55 (20.9)	64 (24.3)	154 (63.6) ^b
Stage 3 (214, 29.6%)	168 (78.5) ^b	160 (74.8)	128 (59.8)	13 (6.1)	90 (42.1) ^{a,c}	49 (22.9)	35 (16.4)	62 (29.0)	49 (22.9)	49 (22.9)	98 (49.7) ^a
Stage 4 (115, 15.9%)	72 (62.6) ^a	71 (61.7)	61 (53.0)	11 (9.6) ^b	40 (34.8) ^c	21 (18.3)	18 (15.7)	20 (17.4)	21 (18.3)	25 (21.7)	46 (43.8) ^a
Chi-square	0.012	0.058	0.685	0.009	<0.001	0.238	0.464	0.115	0.491	0.904	0.001
<i>GPA last semester</i>											
<10 (26, 3.6%)	22 (84.6)	20 (76.9)	14 (53.8)	4 (15.4)	14 (53.8)	3 (11.5)	3 (11.5)	9 (34.6)	4 (15.4)	5 (19.2)	10 (40.0)
<12 (139, 19.2%)	103 (74.1)	103 (74.1)	81 (58.3)	17 (12.2)	78 (56.1)	38 (27.3)	37 (26.6) ^b	40 (28.8)	32 (23.0)	13 (16.5)	71 (56.3)
<14 (242, 33.5%)	176 (72.7)	177 (73.1)	152 (62.8) ^b	18 (7.4)	119 (49.2)	55 (22.7)	35 (14.5) ^a	61 (25.2)	45 (18.6)	61 (25.2)	133 (59.6)
<16 (170, 23.5%)	128 (75.3)	111 (65.3)	91 (53.5)	10 (5.9)	72 (42.4)	42 (24.7)	30 (17.6)	36 (21.2)	47 (27.6)	44 (25.9)	82 (52.2)
<18 (44, 6.1%)	35 (79.5)	29 (65.9)	16 (36.4) ^a	1 (2.3)	16 (36.4)	6 (13.6)	6 (13.6)	9 (20.5)	10 (22.7)	11 (25.0)	15 (40.5)
Chi-square	0.652	0.303	0.017	0.079	0.069	0.212	0.034	0.385	0.24	0.287	0.095
<i>Prior online learning experience</i>											
No (611, 84.5%)	439 (71.8)	433 (70.9)	350 (57.3)	57 (9.3)	300 (49.1)	143 (23.4)	117 (19.1)	148 (24.2)	132 (21.6)	135 (22.1)	337 (55.2)
Yes (112, 15.5%)	95 (84.8)	75 (67.0)	61 (54.5)	11 (9.8)	49 (43.8)	19 (17.0)	16 (14.3)	33 (29.5)	27 (24.1)	31 (27.7)	49 (43.8)
Chi-square	0.005	0.472	0.652	1.000	0.348	0.168	0.276	0.289	0.643	0.242	0.033

Note: Z-test of independent proportions was conducted to compare column proportion. Cells with different subscript were significant different at $p < .05$, using Bonferroni correction.

Educational background and experiences

Secondary degree holders ($n=251, 60.5\%$) and bachelor students ($n=255, 61.2\%$) indicated that a purely online course was challenging compared to 42.0% ($n=94$) of bachelor's degree holders and 40.6% ($n=101$) of master students, respectively.

A higher proportion of students in stage 2 ($n=154, 63.6\%$) mentioned the fact that the course was purely online was a challenge compared to 47.5% ($n=58$) of staged-1 students, 49.7% ($n=98$) of staged-3 students and 43.8% ($n=46$) of staged 4 students. As expected, a higher proportion of students without a prior learning experience reported the purely online learning course as a challenge ($n=337, 55.2\%$).

The results can be found in [Tables 4 and 5](#) and graphically presented with [Figures 1 and 2](#).

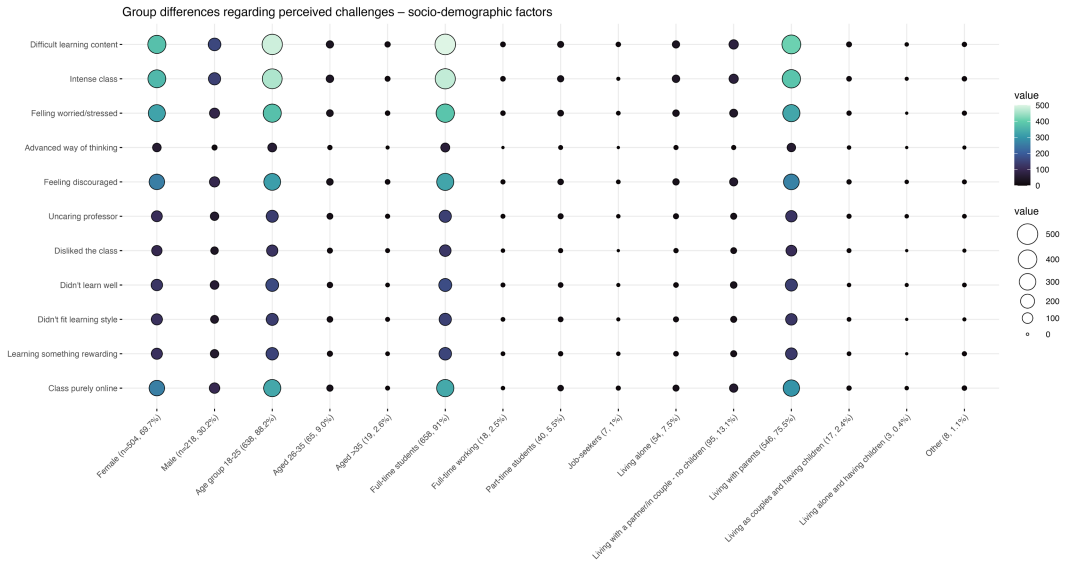


FIGURE 1 Group differences regarding perceived challenges—socio-demographic factors.

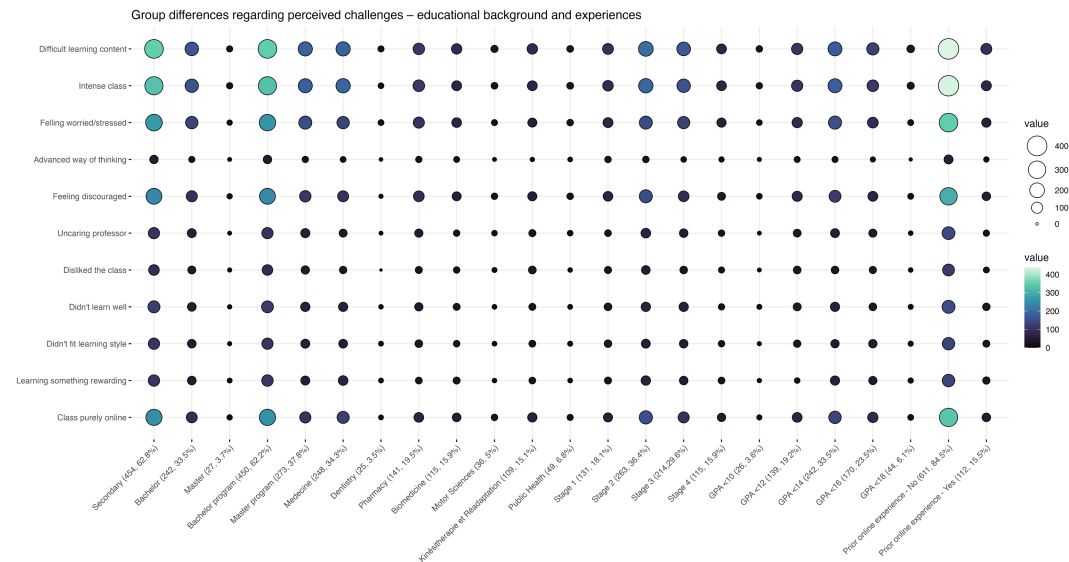


FIGURE 2 Group differences regarding perceived challenges—educational background and experiences.

5 | DISCUSSION

The present study investigated the challenges encountered by university students from different fields of health sciences in a course attributed as the most challenging during the Covid-19 pandemic. This pandemic period marked the curricular shift from classroom teaching to partly or fully online learning in almost all courses at the researched institution. The findings regarding the most challenges encountered and differences in the perceptions of the students are discussed hereafter.

First, factor analysis showed that the challenges could be differentiated as three groups of factors including difficult content, discouragement and new/positive learning experience. To the best of our knowledge, the present study was among the first to validate the factor structure of the challenges encountered by students of health sciences. The factor structure was, therefore, investigated using an exploratory rather than confirmatory approach. However, considering recent literature on the challenges experienced by students in health sciences in both pre- and during the Covid-19 pandemic (Binks et al., 2021; Rajab et al., 2020), the factor structure seemed to sufficiently capture key challenges encountered by the students. The first factor was the difficult learning content which reflected the academic pressure entailed by the course intensity and higher order and advanced way of thinking or working. The second factor addressed the discouraging factor such as feeling of being discouraged, lagging behind or the perception that the students had to make greater effort because the course did not fit their learning style or that their professor did not care about their progress. The third factor referred to new learning experience. In this context, rewarding learning content and online learning experience were the indicators. The findings, therefore, confirmed that the lack of support and supervision as a result of remote teaching during the pandemic added further obstacles to the existing heavy academic workload of students of health sciences, which was in accordance with findings from Chand et al. (2021) and Chandrasiri and Weerakoon (2022). To expand the instrument, it is recommended that the factor indicators could be extended or modified according to the context. For instance, the new experience could be one about the virtual learning environment implemented to teach teamwork skills.

The descriptive result of the whole sample revealed that, within each dimension, there were indicators receiving more rating than the others. The intensity and difficult learning addressed in the course accounted for more than 70% of the rating, which indicated that cognitive challenge was perceived as the most important stressor for the students. This, in turn, resulted in more than half of the students feeling worried and stressed during the course. Indeed, research among medical students showed the burden of information and demanding curriculum had affected or even deprived the wellbeing of the students (Lee & Graham, 2001). To make it even worse, those experiencing stress from the beginning of their study were more likely to endure more stress later (Niemi & Vainiomäki, 2006). In the dimension of discouragement, once again roughly half of the students felt discouraged in the class and a quarter of them reported that they failed to learn or retain what they learnt. This is in accordance with the findings from Steiner-Hofbauer and Holzinger's study (2020). Accordingly, the most common stressors among health students were performance pressure overload and high expectations of themselves with 52.4% students reaching critical scores in the depression screening. Next to these perceptions of cognitive challenges and perceived stress, the professor or student-faculty relationship emerged as a critical factor with more than 20% of the students stating that they felt challenged when the professor did not care about the students. Indeed, in a highly challenging course, the student-faculty relationship was one that was characterized by concern over grades, confusion, intimidation related to asking for help from the professor (Micari & Pazos, 2012) and authoritative non-encouraging professor. Finally, as expected, more than half of the students indicated that learning in a purely online course was a challenge for them. However, it was found that as to the technical aspect of online learning, the students had cited almost no difficulties, which was positive and differed findings from Chandrasiri and Weerakoon's study (2022). Instead, the students mentioned more issues related to how (badly) online learning was organized and the lack of instructor's support and interactions with other students as the challenges regarding the course under question. These aspects of online learning were related to the two critical components of

online learning design, namely teaching presence and social presence, the lack of which may result in demotivation and affect the quality of the teaching and learning process (Arbaugh et al., 2008).

Group differences regarding the perceptions of the challenges in the most challenging course concerning the socio-demographic characteristics of the students were found. Accordingly, there was a significantly higher number of female students feeling more worried, stressed and discouraged than male students and struggling with the advanced way of thinking of the course. This difference could be explained by the gender difference concerning academic self-efficacy. According to a meta-analysis by Huang (2013), males had a higher average academic self-efficacy than females. This lower level of self-efficacy was likely to be associated with higher levels of stress in females (Khoshhal et al., 2017; Roddenberry & Renk, 2010). Additionally, more younger students, i.e., those aged between 18 and 25 years and students with parents perceived difficult learning content as the challenge facing them and felt more stressed about the class, respectively. A significantly higher proportion of students aged 18–25 years stated that online learning was a challenge for them. On the contrary, there were significantly fewer students of older age (from 26 years) or students who were working full-time or living alone mentioning online learning was a challenge for them. As revealed from the open-ended responses, online learning with the flexibility of access combined with teleworking seemed to better cater for the circumstance of working students. This prompts a positive direction towards the upcoming curriculum change in medical education such that the advantages of online learning, namely flexibility, interactivity and self-pacing (Chand et al., 2021) were appreciated by a proportion of students who were occupied with other familial and professional obligations.

As far as students' educational background and study stage were concerned, it was found that more students who were with a secondary degree, following a bachelor programme or in early stages of the learning trajectory mentioned difficult learning content, course intensity, feeling discouraged and online learning as the experienced challenges compared to those with a master degree or in the final stages. The findings confirmed results from Deepa and Panicker's study (2016) such that the first year in the medical school was most difficult for the students. They had to adapt to the new learning environment and learning approaches and cope with a much heavier workload than that in high schools, sometimes with the lack of guidance and support. As students progressed to later stages, they might have developed coping strategies, enabling them to handle the challenges encountered (Deepa & Panicker, 2016). For example, sixth-year students were found to experience less stress than their juniors in second year (Steiner-Hofbauer & Holzinger, 2020).

The challenges were perceived differently when breaking down to fields of study. It was found that more students in Medicine, Pharmacy, Motor Sciences, Physiotherapy and Rehabilitation were challenged by the difficult learning content and/or course intensity than students in Public Health. The latter group, however, represented typical traits of adult learners or non-traditional students who were older [median age = 29, IQR: 25.50–36.50], mostly married with children and occupied with a job while studying. However, only in the field of Pharmacy, there were a significantly higher number of students experiencing stress and discouraged feeling compared to students in Medicine, Public Health and Dentistry. Also, more students in Pharmacy mentioned the fact that the professor was not caring was the challenge in their most challenging course. On the contrary, there were fewer students in Medicine and Dentistry who disliked or felt discouraged in this challenging course than students in Motor Science and Physiotherapy and Rehabilitation. There was no significant difference among the different fields of study when online learning was concerned. While evidence concerning challenges experienced by students of different fields was limited, the findings in the present study could help to obtain preliminary insights into the profiles of students who faced more challenges than others. Accordingly, next to the academic stressor like content and intensity, more students of Pharmacy seemed to struggle with stress and discouragement than students in Medicine, Dentistry and Public Health. The difference can be attributed to different factors such as better coping and learning strategies employed, e.g., taking initiatives to interact with peers and the faculty (Gade et al., 2014; Lee & Graham, 2001). Note that in Belgium, Medicine and Dentistry students are required to pass an entrance exam to gain access to the studies, but not Pharmacy students, nor Motor Science and Physiotherapy students. This could partially explain why the former were more able to cope with the stress and the risk of discouragement

potentially generated by autonomous study than the latter. The more frequent involvement in the professional life and family obligations of Public Health students might explain the differences concerning the perceived stress and challenges. These hypotheses are subject to further investigations so that more adequate support could be provided to the students in need.

Considering academic achievement, it was found that more low and average achievers, i.e., those with GPA from 10 to lower than 12 and from 12 to lower than 14, experienced stress and feeling of being discouraged than high achievers (GPA above 16). The finding was supported by Talib and Zia-ur-Rehman (2012) who found a moderate negative relationship between perceived stress and academic performance among university students. According to the findings from Dendle et al. (2018), feeling of stress among medical students was rather related to academic pressure and fear of performance failure than external factors. Therefore, effort on mitigating these stressors could help low achievers to become more encouraged and better cope with the academic challenges they were facing. Finally, having a prior online learning experience was an advantage such that students without such an experience struggled more with the newly implemented online course. The results suggested that preparing students so that they were ready for online learning in different aspects such as self-regulation skills, online interaction etiquettes and collaboration skills would be helpful (Joosten & Cusatis, 2020). In so doing, students' online learning self-efficacy would be enhanced and challenges with this modality of learning would be significantly lessened.

6 | IMPLICATIONS

The present study brought into light the challenges most encountered by students of health sciences in a course perceived as the most challenging. The most reported challenges were difficult learning content, course intensity, feeling of stress and worry, online learning and feeling of failure (not having learnt what was supposed to be learnt). While factors related to academic pressure and workload were sometimes beyond instructional decisions at course level, the instructor support and responsiveness have proved to be important. The instructors could help students better prepare for the exam, e.g., making course materials available according to schedule, offering flexibilities in terms of exam schedule and the possibility to have a mock exam before the actual one and embracing principles of constructive alignment (Meredith et al., 2021). In so doing, the students would have better opportunities to achieve the learning objectives and feel less stress regarding performance evaluation. Furthermore, it is recommended that faculty support to improve students' psychological health and well-being should be available, which is not always the case. One of the approaches that could be taken is the autonomy support provided by the instructor or teaching assistant of the course, e.g., providing opportunities for the students to select learning options most suitable for them given the timing, timely support with learning comprehension and offering rooms for students to raise their questions and recommendations regarding the learning process. Students who perceived more autonomy support reported to be highly engaged in the learning, satisfied with campus life and displayed low levels of depressive symptoms (Jiang & Tanaka, 2022).

The finding highlighted that online learning design had to be improved or instructional support to first year students should be available so that an online learning and/or blended learning, i.e., thoughtful combination of face-to-face and online learning, would be that of students' preference rather than a factor of challenge. According to the students, this entails better course organization, high-quality learning materials provided on schedule, instructors' support including interactions with the students and facilitating the interactions among the students when face-to-face contact would be once again restricted. Finally, group differences regarding challenges with difficult learning content, course intensity, perceived stress, worries and discouragement prompt more attention from the instructors and medical faculty to female students, bachelor and full-time students who were in early stages of the learning trajectory and low and average achievers. These students were the most likely to experience academic pressure and stress, which could be attributed to either their specific gender roles or experience with coping and learning strategies. The findings, therefore, emphasized

the role of faculty-led and instructors' effort in supporting students' learning at their early stages and enhancing their well-being during the whole learning process. In addition to the suggested solutions, instructors and course designers could consider providing adaptive support such as accommodating students with a structured course schedule and suggested learning time for respective course chapters and assignments (Teich et al., 2024). In so doing, course expectations are more coherent and students can better set more specific learning goals, monitor their learning process and ask for support before they are ready to move to the next learning milestone.

7 | LIMITATIONS

The cross-sectional design of the study and that sample was from the faculty of Medicine of the University of Liege have limited the generalizability of the findings. In particular, the attributed most challenging course due to non-caring professors could be the responsibility of only a low minority of instructors who were possibly overwhelmed by the increased clinical and research activities entailed by the epidemiological context. Future research could employ a more rigorous sampling method such as stratified sampling technique and recruit participants from different faculties or schools to understand the challenges facing students of health sciences and associated explanatory variables such as socio-demographic characteristics and educational background. In so doing, a thorough understanding of students' challenges could be obtained which in turn serve as a basis to develop institutional support strategies for the struggling students. This was of particular importance if online learning is to be implemented in a greater scale in health education. The use of self-reported measures meant that social desirability could not be completely controlled for. However, the nature of the questions and the anonymization of the participant identity helped to limit the bias to a greater extent. Finally, the low distribution of some categories in the socio-demographic variables resulted in the merging of some categories together. This might have limited our insight into the role of certain factors related to the life situations of the students. Given the changing student demographics, i.e., more non-traditional students and adult students attending higher education and increased diversity, future studies should strive to obtain a more representative sample of the different students' profiles so as to enrich our understanding of the challenges of nowadays students, hence providing better support for student learning.

8 | CONCLUSIONS

The present study investigated the challenges students from health sciences addressed in their most challenging course during an exceptional period of their learning trajectory when most courses were organized partly or fully online with highly restricted in-person interactions with the instructors and classmates. This was a unique opportunity to understand the potential of large-scale implementation of online learning in medical education. The findings revealed that next to academic pressure like difficult learning content and course intensity, feeling of worry, stress and failure together with perception of limited support from the course instructor were the most reported challenges. On top of that, online learning implementation without effective organization and instructors' facilitation was an important issue that might affect students' learning motivation or lead to feeling of overwhelming and frustration. Profiles of students who were struggling more than others were presented, which could inform institutional decision-making regarding the support made available to the target groups of students. In so doing, schools of medicine could better respond to the needs of the students during the transition to online learning. It is acknowledged that groups of factors identified in the present study are not all-inclusive and could not capture all learning contexts and instructional approaches applied such as virtual reality or simulations in medical sciences. Future research could explore further the factor structure of the identified challenges to yield more practical implications for effort to support students' online

learning. Furthermore, a comparative study to examine the challenges among students in online medical/health sciences programmes and those in traditional face-to-face programmes might be interesting to point out commonalities yet what is unique to online learning. The next agenda could be centred around how to develop an online learning curriculum at large in medical sciences and evaluate the effectiveness of these programmes in terms of students' learning outcomes and psychological well-being. For this purpose, findings from the present study prompt insightful input for both course design and instructional and institutional support, particularly for specific groups of students with high levels of perceived challenges.

AUTHOR CONTRIBUTIONS

AND, PH, GP and A-FD conceptualized the study design and research objectives. AND, GP and LC took part in instrument development and validation as well as data collection. AND and GP drafted the manuscript. All authors have thoroughly reviewed, revised and approved the submitted manuscript.

ACKNOWLEDGEMENTS

The authors would like to thank all the students from the Faculty of Medicine, who have participated in the study despite the challenges encountered during the crisis. We are grateful to the Panel committee who had worked through many sessions and discussion to realize the valid translation of the questionnaire from English to the French language. More specifically, we thank prof. Pascal Detroz, prof. Laurent Leduc, prof. Benoît Pétré, prof. Sylvie Strel and Dr. Valérie Dory for their expertise and availability during the translation process.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no competing interests.

DATA AVAILABILITY STATEMENT

The datasets are available from the corresponding author on reasonable request, which is subject to an approval from the ethical committee.

INFORMED CONSENT

Written informed consent obtained from all the participants.

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How to cite this article: Diep, A. N., Philippe, G., Counasse, L., Hubert, P., & Donneau, A.-F. (2024). Challenges in the most challenging course as perceived by the students of health sciences during the Covid-19 pandemic: What are they and who were struggling the most? *European Journal of Education, 00*, e12698. <https://doi.org/10.1111/ejed.12698>