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Identifying student profiles based on their attitudes and beliefs towards online education and exploring relations with their experiences and background

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ABSTRACT

This exploratory study aims to identify student profiles based on their attitudes and beliefs towards online education during the COVID-19 pandemic, and then relate these profiles to students' online education experiences and background characteristics. To do this, in 2020, 676 students from a Dutch university were asked to complete a survey about their attitudes and beliefs towards and experiences with online education, and their background characteristics. By using cluster analysis, three main student profiles were identified: (P1) relaxed/positive students, (P2) stressed/negative students, and (P3) somewhat stressed/neutral students. The results showed that student profiles were related to their online education experiences but that profiles did not differ in terms of background characteristics such as age and gender. The results of this study guide educational institutions to better support their targeted students within online education contexts. We discuss these results and provide an agenda for future research and practice.

KEYWORDS

attitudes and beliefs; Covid-19; online education experience; student background characteristics; student profiles

Introduction

After the sharp transition to online education due to the outbreak of Covid-19, a lot of research has been conducted to explore how online education has impacted students' performance and perceptions of learning (United Nations, 2020). Previous studies have revealed a concern in higher education regarding students' perceptions and experiences with online education during the COVID-19 pandemic (Moorhouse & Wong, 2022). Studies found that students' workload and stress in online education during the COVID-19 pandemic were high (e.g. Hakami et al., 2021; Watermeyer et al., 2021) and students reported low motivation and well-being (e.g. loneliness) in online education (e.g. van Puffelen et al., 2022). From an educational administration perspective, this evidence is critical since it can be interpreted as a threat to students' retention and willingness to engage in online education (Suhlmann et al., 2018). From a pedagogical

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perspective, this evidence can indicate that teachers lack knowledge and experience on how to support students with different perceptions of online education. Therefore, it is crucial to know how students with different perceptions respond to online education.

The present study seeks to provide a comprehensive understanding of how students' perceptions of online education including their attitudes and beliefs jointly are related to their online education experiences and background characteristics. To do this, we first aim to identify student profiles based on their different attitudes and beliefs towards online education, and second, we will relate the identified profiles to students' online education experiences and background characteristics. This will help with providing a more person-oriented understanding of students' online education experiences. In addition, this study can add value to online education literature by understanding how students with different attitudes and beliefs towards online education respond to online education. For educational leaders, this means that they can better target students who are at the most risk of dropping out given their negative perceptions of online education and poor online education experiences. For teachers, the findings of this study on student profiles and its relation to students' online experiences could be a starting point for designing adaptive learning environments and trajectories based on students' different profiles.

Theoretical framework

The framework of this study was built on three central variables namely students' attitudes and beliefs towards online education, experiences with online education, and background characteristics. Students' attitudes and beliefs towards online education were defined based on the variables motivation, perceived ability, perceived performance, stress, attitudes towards individual learning, and attitudes towards live interaction. In this study, we defined motivation as the driving force that inspires and encourages students to engage in and persist with their online education (Badali et al., 2022). In other words, in this study, motivation means that students have a strong desire and urge to follow online education. Perceived ability means that students feel able to follow and learn from online courses. Perceived performance refers to students' beliefs about their learning outcomes in online education and whether it gets worse or better. Stress refers to any emotional tension or negative feelings that are caused by online education. Attitudes towards individual learning refer to students' feelings and opinions on studying and learning independently at their own pace in online education and attitudes towards live interaction mean how a student feels about having a live interaction in online education. Students' different responses on the mentioned variables were used to identify student profiles. The second central variable is online education experiences where we looked at two concepts including students' experiences with online education support and exam stress. Students' experiences with online education support refer to the support that students received from the university including IT support, training support, and staff support. Exam stress refers to students' stress experiences during online exams which could be caused by technical issues, time pressures, or other reasons. The third and last cornerstone of the framework is students' background characteristics. This main variable includes students' age, gender, nationality, year of study, and education level (Figure 1).

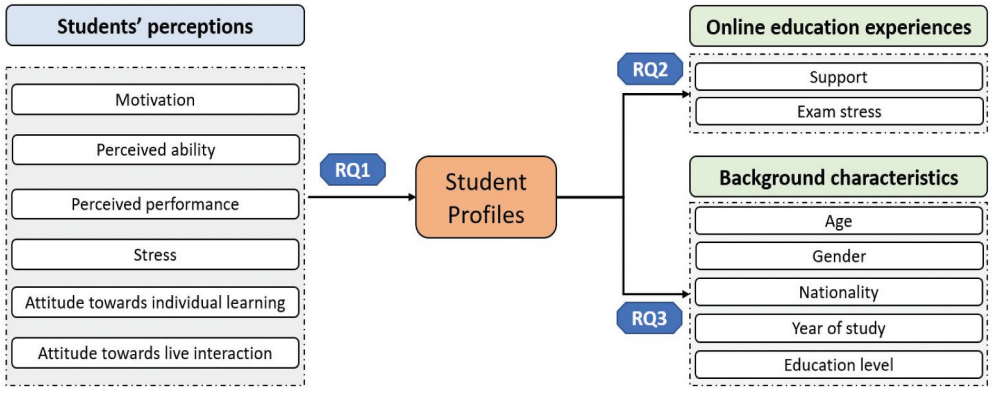

Figure 1. The theoretical framework of the study.

The transition to online education during COVID-19 has affected higher education students' perceptions regarding online education such as their perceptions of performance (e.g. exam scores) (Clark et al., 2021), support (Chandra, 2020), beliefs (e.g. stress, self-efficacy), attitude (Boca, 2021), and motivation (Gustiani, 2020). Students' perceptions of online education have also been influenced by their background characteristics such as age and gender (Hakami et al., 2021).

Previous studies highlight the role of students' perceptions and background characteristics in their online education experiences (e.g. Camacho et al., 2021; Clark et al., 2021). However, these studies also show different patterns among students in terms of their satisfaction, learning, and engagement (Aguilera-Hermida, 2020). While some research has shown improvements in students' learning satisfaction, learning at their own pace, flexibility, and comfortability, others have revealed drawbacks in students' engagement, motivation, and well-being (Gustiani, 2020; Meulenbroeks & van Joolingen, 2022).

These differences in students' experiences with online education can be related to their different beliefs, attitude, motivation, and cognitive responses to online education (Chesser-Smyth & Long, 2013; Hakami et al., 2021). Students can have positive, negative, or neutral feelings (Stevens et al., 2023). That is to say that students' positive, negative, or neutral perceptions regarding online education can result in different online education experiences (e.g. Parpala et al., 2021). For example, students who have positive attitudes towards online education tend to have less stress in online education and positive perceptions of the efficiency of online lectures (Drašler et al., 2021). While students with negative attitudes tend to have high levels of exam stress, low motivation, and less engagement in online education (Göksu et al., 2021). Furthermore, male and female students' beliefs and attitude towards online education can also differently influence their online education experiences (Chandra, 2020). For example, a study found that the fear of academic failure and stress in online education is more common among female students than male students (Chandra, 2020).

These findings suggest that students' different attitudes and beliefs towards online education can result in different online education experiences. This implies the need for the identification of student profiles based on their different attitudes towards online education and linking these profiles to their online education experiences and

background characteristics to provide a more person-oriented understanding of students' online education experiences.

Up until now, only a few empirical studies have been conducted to identify student profiles in the context of online education (Cockburn et al., 2022). For example, Parpala et al. (2021) identified four learning profiles for students during the COVID-19 pandemic: (a) unorganised and unreflective students, (b) unorganised students, (c) reflective students, and (d) high-level organised and reflective students. The key results of this study showed that unorganised students showed a higher level of exhaustion in online education while high-level students showed a decrease in exhaustion in online education. Parpala et al. (2021) study, like other previous relevant studies (Cockburn et al., 2022; Hofer et al., 2023), lacks in providing insights into the connection between students' learning profiles and background characteristics (Parpala et al., 2021), relating student profiles to their online education experiences (Hofer et al., 2023), and perceptions of online education (Cockburn et al., 2022).

Previous studies mostly focused on a single variable and took a variable-oriented approach which does not fill the gap in providing a comprehensive understanding of how students' attitudes towards online education jointly affect their online education experiences. In the current study, we took a more person-oriented approach. Taking a person-oriented approach can give insights into how the relationships between different sets of variables may lead to different online education experiences and also can provide more comprehensive insights into the patterns of and interrelationships between the variables that can lead to more specific guidelines to better support different categories of students within online education contexts.

Therefore, this study seeks to first identify student profiles based on students' attitudes and beliefs (motivation, perceived ability, perceived performance, stress, and attitude towards individual learning and live interaction) regarding online education. Second, this study relates student profiles to their online education experiences (support and exam stress) and background characteristics (age, gender, nationality, year of study, and education level). Accordingly, the following research questions are formulated to guide this study.

- RQ1. Which profiles can be identified for students based on their beliefs and attitude (motivation, perceived ability, perceived performance, stress, attitude towards individual learning, and live interaction) during the COVID-19 pandemic?
- RQ2. How are the identified profiles related to students' online education experiences (support and exam stress) during the COVID-19 pandemic?
- RQ3. Do identified profiles differ in terms of student background characteristics (age, gender, nationality, year of study, and education level)?

Methods

Participants and procedure

This study was conducted during the COVID-19 time in a Dutch university which is specialised in life science. The questionnaire used for this study was developed in collaboration with the educational support department of the university. A panel of

experts (mainly educational researchers, educational technologists, and learning environment scholars) monitored and validated the items of the questionnaire. The purpose of the survey was to monitor and understand students' experiences and to collect information to improve education and student support services. The survey covered a wide range of topics, with a limited number of questions for each topic to not overburden students.

The survey was conducted in October 2020, at the end of the first period of the academic year. All students ($N = 11.763$) received an email from the educational support department to fill out a survey regarding their beliefs and attitude, perceptions of online education, and background characteristics. In total, 676 students filled out the survey (% 5.7). The nationality of the participants was as follows: Dutch nationality ($N = 536$, 81%), other European nationality ($N = 88$, 11%), and non-European nationality ($N = 52$, 8%)". In total, 67% of students were female ($N = 450$) and 30% of students were male ($N = 201$). Students from both education levels (BSc: $N = 355$, 53%, and MSc: $N = 319$, 47%) participated in this study. Students came from different disciplines including Plant Sciences ($N = 68$, 8%), Social Sciences ($N = 98$, 12%), Environmental Sciences ($N = 229$, 28%), Animal Sciences ($N = 70$, 9%), Agrotechnology and Food Sciences ($N = 202$, 25%), Biology ($N = 69$, 8%), and other ($N = 81$, 10%). The age of participants varied from 18 to over 30 (Average = 22; SD = 3.01). To comply with ethical considerations, students were informed and their consent was received. Students were assured that the results would be shared anonymously. In addition, ethical approval was received from the home university.

Measurement

Measurement of students' perceptions of online education

Students' perceptions of online education were measured via six variables. The first variable was related to students' motivation which included three items such as '*I was motivated to follow courses largely online*'. The second variable was related to students' perceived ability which consisted of two items such as '*I feel I managed to follow online education successfully*'. The third variable referred to students' perceived performance which included five items such as '*my learning performance in online education compared to on-campus education was much worse/much better*'. The fourth variable represented students' stress which was measured in five items such as '*I experienced more stress with following courses largely online*'. The fifth variable indicated students' attitudes towards individual learning which consisted of two items such as '*I like courses that allow me to process information or feedback at my own pace*'. Finally, the sixth variable was related to students' attitudes towards live interaction which included two items such as '*I like course activities that involve online live interaction*'.

Measurement of students' online education experiences

Students' online education experiences were measured via two variables. The first variable was about perceived support which was measured with five items such as '*I felt supported by teachers in the challenges that come with online education*'. The second variable represented students' exam stress which consisted of three items such as '*I experienced more stress than usual while making the online proctored exam*'.

Table 1. Reliability of the variables.

	N items	M	SD	Cronbach's alpha
Motivation	3	2.89	1.03	.74
Perceived ability	2	3.33	1.11	.79
Perceived performance	5	2.32	0.65	.77
Stress	5	3.52	0.88	.76
Attitudes towards individual learning	2	3.79	0.84	.67
Attitudes towards live interaction	2	4.07	0.90	.79
Support	5	3.44	0.74	.73
Exam stress	3	3.24	1.01	.62

All items of both measurements were designed based on a five-point Likert scale ranging from '*strongly disagree*' to '*strongly agree*' or '*much less*' to '*much more*'.

Measurement of students' background characteristics

The measurement of students' background characteristics consisted of five items including age, gender, nationality, year of study, and education levels.

Analysis

The reliability of the measurements was tested by using Cronbach's alpha (see Table 1). A hierarchical cluster analysis was conducted considering students' motivation, perceived ability, perceived performance, stress, attitude towards individual learning, and attitude towards live interaction to establish student profiles. By using the Ward method and squared Euclidean distance for hierarchical cluster analysis, we identified two optimal sets of profiles, one with four clusters and the other with three clusters. We selected the student profiles with three clusters as the variance within each cluster was less than the other student profiles. This means that the cluster solution of three profiles was to be the most distinctive cluster with a rather equal distribution of cluster size, low variance within clusters, and high variance between clusters. A one-way ANOVA was used to examine the extent to which the differences in mean scores on the variables between the three profiles were significant. An ANOVA test was used to examine differences between student profiles in terms of their online education experiences. A one-way ANOVA test was used to explore if student profiles differed in age. The Chi-square test was used to examine if student profiles differed in terms of gender, nationality, year of study, and education level.

Results

Results for RQ1

The result showed a significant difference among student profiles in terms of their motivation ($F(1,674) = 404.83$, $p < 0.01$), perceived ability ($F(1,674) = 229.53$, $p < 0.01$), perceived performance ($F(1,674) = 247.95$, $p < 0.01$), stress ($F(1,674) = 312.90$, $p < 0.01$), attitude towards individual learning ($F(1,674) = 124.12$, $p < 0.01$), and attitude towards individual learning and live interaction ($F(1,674) = 226.62$, $p < 0.01$). The cluster analysis revealed three main student profiles based on their beliefs and attitude towards online education: (P1) relaxed/positive students, (P2) stressed/negative students, and (P3)

Table 2. Cluster solution with three clusters.

Ward Method		Motivation	Perceived ability	Perceived performance	Stress	Attitude (ind)	Attitude (interact)	Pct %
P1	Mean	4.07	4.38	2.95	2.60	4.41	3.23	22.1
	N	151	151	151	151	151	151	
	SD	0.68	0.58	0.51	0.83	0.53	0.98	
P2	Mean	2.19	2.07	1.86	4.10	3.23	4.44	29.2
	N	198	198	198	198	198	198	
	SD	0.72	0.77	0.46	0.70	0.96	0.76	
P3	Mean	2.76	3.61	2.31	3.61	3.86	4.23	48.7
	N	327	327	327	327	327	327	
	SD	0.86	0.69	0.55	0.62	0.61	0.66	
Total	Mean	2.89	3.33	2.32	3.53	3.80	4.07	100
	N	676	676	676	676	676	676	
	SD	1.03	1.11	0.65	0.88	0.83	0.89	

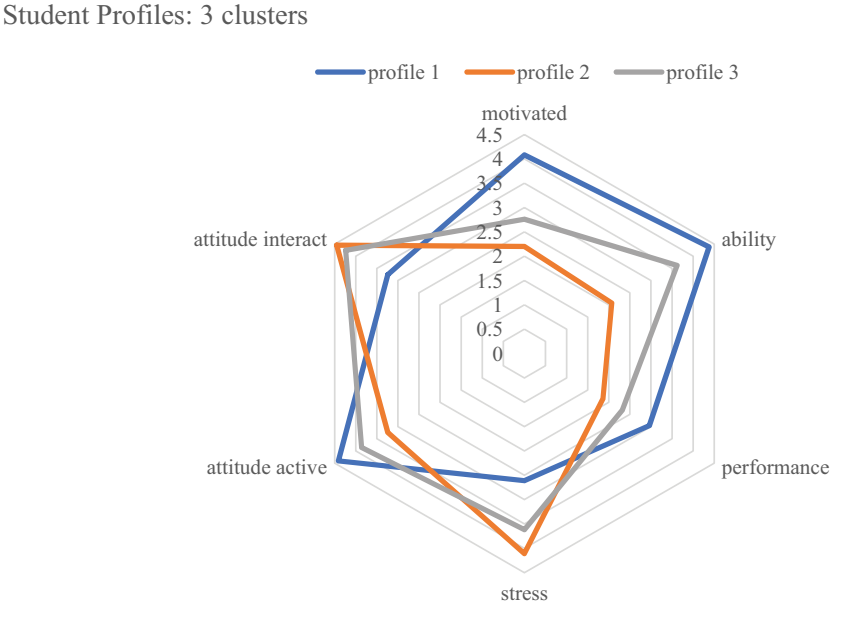

Figure 2. Radar graph of the clusters based on the means of the five cluster variables.

somewhat stressed/neutral students (Table 2). The first profile (22.1%) included students who were relaxed, motivated, felt able to study online, and liked individual learning at their own pace in online education, however, they were neutral on the perceived performance and liking live interaction in online education. The second profile (29.2%) included students with high stress, less motivation, feeling not able to study online, and worse perceived performance in online education. Students in the second profile were neutral on individual learning at their own pace, however, interested in live interaction in online education. The third profile (48.7%), which contained a larger number of students compared to the other two profiles, included students who were neutral on motivation and perceived ability to study online, were perceiving their performance in online education as somewhat worse and felt somewhat high stress, however, they were positive about individual learning and live interaction (Figure 2).

Table 3. Student profiles differences in terms of support and exam stress.

Variables	Profile	Mean	SD	pairwise comparisons	Difference between profiles
Support	1	3.88	0.59	1 > 2**	F (2, 670) = 7.85, $p < .01$**, η2 = .17
	2	3.02	.76	1 > 3**	
	3	3.47	.65	3 > 2**	
	Total	3.43	.74		
Exam stress	1	2.74	1.05	1 < 2**	F (2, 586) = 28.17, $p < .01$**, η2 = .08
	2	3.55	.95	1 < 3**	
	3	3.31	.92	3 < 2*	
	Total	3.24	1.00		

($P < 0.01$)**, ($P < 0.05$)*.

Table 4. Chi-square test of independence for gender, national, first-year, and education level.

Variables		Profile 1	Profile 2	Profile 3	Result
Gender	Male	35	57	100	X^2 (2, $N = 626$) = 3.67, $p = 0.16$
	Female	109	123	202	
Nationality	Dutch	119	144	254	X^2 (4, $N = 631$) = 2.21, $p = 0.69$
	Non-Dutch/European	14	25	30	
	Non-Dutch/other	11	12	22	
Year of study	First-year	35	54	94	X^2 (2, $N = 415$) = 4.42, $p = 0.11$
	Not first year	65	61	106	
Education level	BSc	85	96	147	X^2 (2, $N = 649$) = 3.73, $p = 0.15$
	MSc	64	94	163	

($P < 0.01$)**, ($P < 0.05$)*.

Results for RQ2

Student profiles differed in terms of perceptions of support and exam stress. The first profile showed a higher level of positiveness in terms of the received support from the university (IT services, study advisers, staff, and teachers) in online education compared to the second and third profiles. The second profile was neutral and the third profile was somewhat positive about the support they received from the university in online education during the COVID-19 pandemic. In terms of exam stress, students in the first profile showed less exam stress than the other two profiles. Students in the second profile experienced more exam stress than the third profile in online education during the COVID-19 situation (Table 3).

Results for RQ3

The result showed no significant differences between student profiles in terms of their age (F(2,537)=.84, $p = .43$). The results of Chi-square showed no statistically significant differences between student profiles in terms of gender (X2 (2, $N = 626$) = 3.67, $p = 0.16$), nationality (X2 (4, $N = 631$) = 2.21, $p = 0.69$), year of study (first year or not) (X2 (2, $N = 415$) = 4.42, $p = 0.11$), and education level (X2 (2, $N = 649$) = 3.73, $p = 0.15$) (Table 4).

Discussions

Profiles (RQ1)

Three profiles were identified including relaxed/positive, stressed/negative, and somewhat stressed/neutral students. The identified profiles are in line with literature that

clustered perceptions into positive, negative, and neutral (e.g. Parpala et al., 2021; Stevens et al., 2023). This finding is also supported by previous research (e.g. Parpala et al., 2021). For example, in Hofer et al. (2023) study, students with positive and negative motivations were identified in online education. In Parpala et al. (2021) study, four different learning profiles for students were found in which 'unorganised and unreflective students' can be an indication of negative students as this profile showed a high correlation with students' boredom in online education. While in contrast, 'reflective students' received lower mean scores for boredom which can be an indication of a positive attitude.

Students in the first profile showed high motivation and perceived ability to study online, positive attitudes towards individual learning, and low stress in online education. This suggests that when students have positive perceptions towards online education, they usually do not feel high stress in online education (Chandra, 2020). This is supported by previous studies that report a negative relationship between stress and motivation, self-confidence, and positive attitudes towards online education (Camacho et al., 2021). A plausible explanation for this is that motivation drives students to engage in and persist with online education. Students who are motivated to learn are more likely to actively participate in online learning activities, such as online discussions, interactive quizzes, and group projects (Ferrer et al., 2022). This increased engagement helps students to retain information and deepen their understanding of the subject matter. In addition, students who are motivated to learn are more likely to persist in their online studies, even when faced with challenges. This perseverance is key to success in online education, as students can work independently and overcome difficulties. Such success in online education can result in positive attitudes towards online education. Furthermore, when students are motivated to learn, they are more likely to feel a sense of purpose and fulfilment in their online studies. This can lead to reduced stress, as students feel confident and capable in their abilities to succeed (Jung, 2013).

Another reason why students in the first profile had high motivation and low stress can be related to their perceptions of their ability. Studies have shown that the more students feel competent regarding their abilities, the less stress and high motivation they feel in education (Chesser-Smyth & Long, 2013). This is because of the role of students' confidence in their ability regarding handling challenges that might occur in following online courses (Meisha & Al-Dabbagh, 2021). Another reason could be related to the positive attitudes of the students in the first profile (Drašler et al., 2021; Unger & Meiran, 2020). When students have positive attitudes towards online education, they are more likely to follow instructions and participate, thereby achieving learning goals (Nja et al., 2022). Such active participation and successful achievement of learning goals can make students feel more confident and less stressed (Holcomb et al., 2004).

We found that students who are negative about online education have a preference for interactive learning, while students who are more positive about online education have a preference for individual learning. A plausible reason to explain this finding is that stressed/negative students did not feel confident about their ability to study online, therefore, they felt a need for support from teachers or students and interacting with them. While students with relaxed/positive profiles felt confident that they can individually and independently follow online courses (Drašler et al., 2021).

Students in the second profile were found to be stressed about online education with negative attitudes and beliefs towards online education. This finding is supported by

previous studies that highlight the correlation between negative perceptions of online education and high stress in online education (Unger & Meiran, 2020). If students lack motivation, they may struggle to stay engaged and focused on their coursework. This can lead to feelings of frustration and stress, as students may feel overwhelmed and unsure of their abilities to succeed (Stark, 2019). In addition, students who lack motivation may not persist in their online studies, especially when faced with challenges or obstacles. This can result in decreased learning and increased stress. Therefore, low motivation can lead students to doubt their ability in following online courses successfully which can cause fear of failure and stress (Lee, 2017).

The third profile represented students who were in between the other two profiles with somewhat stressed and neutral perceptions. This finding implies that if students express neutral perceptions regarding online education, their level of stress also tends to be in between. This finding is likewise supported by previous research where a correlation between perceptions of online education and stress is reported (Unger & Meiran, 2020). It was also found that this profile entailed the largest number of students (48.7%). This means that a large number of students had neutral attitudes and beliefs towards online education. One reason to explain this finding can be related to students' lack of knowledge and experience with such an abrupt transition to online education during the COVID-19 pandemic. This means that the whole situation was experienced as sudden for most students and they might feel confused about how to respond to the new situation.

Perceptions of education (RQ2)

We found that students in different profiles had different online education experiences. Students in the first profile were more positive regarding university support during the COVID-19 pandemic. This finding is supported by previous studies confirming a positive relationship between students' perceptions of online education and university support (Aguilera-Hermida, 2020; Camacho et al., 2021). A plausible reason for our finding is that when students are positive about online education, they tend to actively engage in the online education process and benefit from the provided support and services by the university for better learning outcomes and success in online education (Camacho et al., 2021). In line with this, for example, Aguilera-Hermida (2020) found a relationship between students' learning performance and the level of the use of online tools provided by the university, and the support for solving technical issues. In contrast, students who showed negative attitudes towards online education and low motivation were less in favour of using technical support for technical issues. This could be explained by previous research where it was found that negative perceptions and low motivations can discourage students from actively engaging in online education (Ferrer et al., 2022). That means when students are reluctant to engage, they usually do not ask for support.

In addition, relaxed/positive students showed less exam stress than stressed/negative and neutral students. This indicates that the more students are motivated in online education, the more they feel confident to study online and express a positive attitude towards online education, and the less they are expected to reveal high exam stress (Chesser-Smyth & Long, 2013; Unger & Meiran, 2020). This finding is supported by literature (Chesser-Smyth & Long, 2013; Drašler et al.,

2021). A plausible reason to explain this finding is that when students show a positive attitude towards online education with high motivation, this positively affects their engagement and learning performance (Tsai et al., 2017). In contrast when students show a negative attitude and perceive their learning performance not successful, this can cause stress and fear of academic failure, especially in final exams (Lee, 2017).

Background characteristics (RQ3)

The findings revealed no significant differences between the three profiles in terms of students' background characteristics. This finding is in contrast with previous studies where a relation is reported between gender (Cockburn et al., 2022), and year of study (Hakami et al., 2021) with online education experiences. Despite the literature evidence, our findings imply that regardless of what students' background characteristics were, these did not differ between students with different attitude/belief profiles. A plausible reason could be related to the period that data were being collected. For this study, the data were collected from September to November 2020 in which all students regardless of their background characteristics might be impacted by the initial panic caused by the COVID-19 pandemic which has begun in early 2020. This explanation is supported by some previous studies (Hakami et al., 2021).

Limitations, future research, and practical implications

Several limitations in this study should be acknowledged. First, although a large number of students with different background characteristics participated in this study, data were collected from a single higher education institution. This can impede the scalability of the findings. It is suggested to interpret these findings cautiously. Future studies should focus on a larger number of students from different universities to test the generalisability of the results.

Second, other variables may also influence students' perceptions of online education such as self-efficacy (Zimmerman & Kulikowich, 2016), self-esteem (Pellas, 2014), and life capital (Consoli, 2022). For example, self-efficacy which refers to one's beliefs in their capacity and abilities to do certain behaviours has shown a strong relationship with students' online education experiences (Pellas, 2014; Zimmerman & Kulikowich, 2016). Another potentially relevant variable is life capital, which can be described as

> a wealth which every person possesses, a wealth which can be understood through the richness of one's life experiences. Life capital thus entails memories, desires, emotions, attitude, opinions and these can be relatively positive or negative and explicit or concealed depending on how the individual manages, shares and employs their life capital

(Consoli, 2021, p. 122). Future research can focus on exploring how students with different perceptions of self-efficacy, self-esteem, and life capital respond to online education (Consoli, 2022).

Third, since our study took place in a higher education setting, therefore, the findings may not be generalisable to all levels of education such as secondary and vocational education. For future studies, it is suggested to follow the same study design at other

education levels to provide a broader understanding of the effect of students' beliefs and attitudes on their online education experiences.

Fourth, the findings of this study were built on quantitative data which can impede a deep understanding of students' perceptions of online education. Conducting a qualitative study using focus group discussions or interviews with selected students from different profiles can provide deep and supplementary information in this regard.

In addition, thanks to the vaccination programmes, since 2022 everything has gradually gone back to a new balance of face-to-face and online learning. It is expected that online education will stay an integral part of post-Covid-19 education even though face-to-face education will be the starting point again (Lockee, 2021). This new situation requires higher education institutions to formulate more concretely their vision of post-Covid-19 education as it is expected to be more in favour of a blended format (S. K. Banihashem et al., 2023). For future studies, we suggest taking steps forward and examining how students' different beliefs and attitude towards post- COVID-19 education in the blended format may influence their perceptions of education experiences, especially considering the role of emerging technologies such as ChatGPT and learning analytics (K. Banihashem & Macfadyen, 2021; S. K. Banihashem et al., 2022; Farrokhnia et al., 2023; Noroozi et al., 2019).

The findings of this study offer practical implications for higher education institutions. In general, this study can help teachers to better target their students for effective educational support. For example, we found students with negative perceptions of online education needed more support than students with positive perceptions as they expressed a low level of motivation, high stress, and lack of confidence to study online. Teachers should help stressed/negative students in online education by emotionally supporting them, creating a very friendly, supportive, and collaborative learning environment, providing extra learning materials to them, or grouping them with highly motivated and low-stressed students for group assignments.

Conclusion

This study was a response to a research gap in the literature regarding students' online education experiences related to their different attitudes and beliefs towards online education. The findings of this study confirm that students with positive, negative, and neutral perceptions of online education responded differently to online education. These findings are important from both theoretical and practical perspectives. From a theoretical perspective, this study extends our knowledge about how students' perceptions of online education are related to different online education experiences. From a practical point of view, the findings are important for future online education practice as they provide insight into areas of attention for teachers to provide effective support for students. For example, while relaxed/positive students need more support in terms of live interaction as they feel confident to study independently with no need to interact with others, stressed/negative students need support in terms of individual learning and in dealing with exam stress as they do not feel motivated and confident enough to study and pass online courses individually.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Data availability statement

Data will be available upon request.

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