

## Article

# Blended Learning in a Higher Education Context: Exploring University Students' Learning Behavior

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**Abstract:** Blended learning is a growing phenomenon in higher education after the COVID-19 pandemic (the educational process moved entirely online), and the way is prepared for blended education mode in universities. Although blended learning research is on the rise, fewer studies regard university students' learning behavior in blended learning environments. This study aims to investigate university students' blended learning behavior perceptions shortly after the pandemic. A 19-item questionnaire was administered to 176 university students in Greece. Students, in general, expressed positive blended learning behavior perceptions. Higher percentages of agreement were associated with the role of audio-visual online resources in facilitating and supporting independent learning and with student motivation in blended education. Students expressed lower percentages of agreement, and some uncertainty, with regard to involvement in small group work with their peers. Implications for students, educators, as well as university policy and practice are discussed.

**Keywords:** blended learning; university; higher education; student learning behavior; student perceptions



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## 1. Introduction and Background

After the COVID-19 pandemic blended modes of education, and online education increasingly spread at universities and higher education institutions [1–3], many university students express their preference towards blended approaches of teaching and learning [3,4]. Blended or hybrid education takes place partially on the Internet; it may be that some students attend the lesson in person while (at the same time) others are online, or some lessons take place face-to-face and some take place online [5]. Blended learning “is not a simple juxtaposition of physical presence and technology mediation, but a well-studied alternation of the two, aiming to make the most of the various components and design effective work contexts for both students and teachers” [6], p. 1. Blended learning approaches in higher education combine the flexibility and convenience of online courses with in-person interactions [7] and are associated with benefits such as flexible learning [8] and improved student self-regulated/directed learning [9,10].

After the pandemic, the application of blended learning mode is growing/increasing, while university students studying different academic subjects learn via blended learning approaches, and they are considered as new practitioners [11]; that is, students began engaging with online and blended learning during the pandemic period, without having any previous experience. Research evidence on pandemic-related blended learning in higher education reported on different issues, such as academics' perspectives [12]; professional development initiatives/opportunities [13]; student self-regulation strategies [14]; students' views of blended learning to develop learner autonomy [15]; influence of blended learning on students' learning responsibility, motivation, and involvement [15]; and different factors (e.g., e-learning environment, materials, technical support, interaction with instructors and peer students) that may affect blended learning effectiveness [16]. Digital technology

(Information and Communication Technologies) is a basic element of blended learning, since the flexibility and ability of learners to access educational resources/activities via the Internet constitutes an advantage. A review [9] suggested that effective online and blended education requires, among other things, students with high self-regulation skills and sufficient digital literacy, as well as a high sense of belonging; the student is considered as a main factor besides the course, the teacher, and the institution. Although there is a growing number of research evidence on blended learning from March 2020 onwards, fewer studies regard university students' learning behavior/perceptions in blended learning environments [15,17,18].

### *1.1. Purpose and Significance of the Study*

This study aims to explore Greek university students' learning behavior perceptions in blended learning environments. The study was implemented shortly after the pandemic. In the post-pandemic era, the blended learning mode has gradually spread and integrated into universities [2]. In this paper, the phrase "students' blended learning behavior perceptions" (synonym to "students' blended learning behavior/perceptions") is used more preferably, because students' perceptions reflect their (actual) learning behavior in a blended learning environment. Understanding students' learning behavior perceptions is significant, because it is likely to shape their attitudes about online education during the post-pandemic years [18]; e.g., positive perceptions are likely to reflect positive attitudes. The outcomes of this study are expected to provide insights for educational policy and practice and be useful for students, university educators, and policy makers (e.g., to influence educational content delivery and, in consequence, students' learning). Stakeholders' and educators' actions may improve the application of blended learning approaches and help university students build positive attitudes towards blended learning.

### *1.2. University Students' Learning Behavior Perceptions*

It is acknowledged that blended learning was used prior to COVID-19; it is not new at the university level [19,20]. For example, a study dating back to 2011 [19] investigated university students' attitudes towards blended learning, and more specifically students' perceptions before and after actual system use; the e-learning system was well accepted. Another study in 2014 [20] investigated student engagement and blended approaches to learning in higher education; it was indicated that collaborative learning applications and a blended approach can be used to design and support assessment activities that increase levels of student engagement. However, the pandemic is considered as a turning point for blended mode in universities; the rise of blended approaches and online education appeared as a consequence of the pandemic [1]. Blended education was a novel mode of education for university students who traditionally study in face-to-face mode; during the COVID-19 pandemic, online/blended education was offered as a response to an emergency.

For these reasons, all studies in this section regard university students' learning behavior perceptions during or after the COVID-19 pandemic; the focus is on recent studies published in 2021 and 2022. As student motivation is particularly relevant in blended learning environments, a brief definition is provided. Student motivation to learn regards student willingness to attend university lectures/classes and can be intrinsic or extrinsic; intrinsically motivated students participate in the learning process for the pleasure/satisfaction they get from it, while extrinsic motivation regards carrying out an activity out of an obligation [21] (students expect certain gains such as obtaining certificates or better marks [22]).

In China, within the context of a university translation course, blended learning was applied [15]. Quantitative data (through a questionnaire) and qualitative data (via interviews) were collected from 120 students. Different aspects such as students' perceptions of blended learning to develop learner autonomy, teachers' construction of a blended course, and the influence of blended learning on students' learning responsibility, motivation, and involvement were explored. According to the findings, most students perceive blended

learning as an effective way to develop learner autonomy; they are learners of quite high levels of learning involvement, motivation, and responsibility (their learning independence is also moderately high).

Ballouk et al. [17], in Australia, explored the way medical students learn in a program that applies a blended learning strategy. They developed and validated an instrument which revealed learning, motivation, and delivery of content as major groups. Motivation and resources influence students' learning behavior and study habits, while learning was associated with the social context (the role of learning with others/peers). In our study, we used the instrument that had been previously validated by Ballouk et al. [17], and this is discussed in the research instrument section. However, the questionnaire was administered to a different country and culture, to students studying different academic subjects.

In Saudi Arabia, Al-Kahtani et al. [7] implemented a longitudinal study (2018–2021) with 30 health science students, and found increased student satisfaction, engagement, convenience, and enhanced learning during the period following the pandemic lockdowns (adaptation period). The majority of the sample reported that such online and blended education allowed them to understand basic concepts, while students attending the blended-mode group indicated a higher achievement. In the same country, a study at the beginning of the pandemic [23] collected qualitative data from 12 students, in order to explore EFL students' perceived benefits and challenges of blended learning during the spread of COVID-19. EFL (English as a foreign language) students' perceived benefits of blended learning include support of their writing skills and utilizing online resources to search for various topics. In parallel, perceived challenges include technological problems, difficulties with online tests, and the university council's decisions.

Another researcher, in the Maldives [24], administered a questionnaire to 407 university students from different academic disciplines and reported students' positive perceptions about blended learning; most participants were receptive to the use of technology for learning. Increased access to learning and flexibility were perceived as major benefits, while barriers included limited internet infrastructure and technical support. The study reported mixed views regarding enhanced learner engagement (41.4% believe blended learning does not provide them with more learner engagement), while some differences were identified in relation to academic disciplines; e.g., students studying tourism and business subjects were more negative about blended learning in comparison to those studying science and engineering.

With regard to students' perceived benefits of blended education, these are frequently associated with combining the benefits of online and face-to-face education (e.g., socializing with peers during the implementation of in-person approaches and being more autonomous and self-directed in home environments) [2,25]. Another benefit regards the application of practical sessions (e.g., practical/lab work) after the theory [26]. Finlay et al. [26], in the UK, investigated the views and experiences of undergraduate sport and exercise science students with regard to online and blended learning strategies during the pandemic. Blended learning was shown to have a higher overall course satisfaction score (e.g., with regard to learning resources, academic support, feedback, learning opportunities, and assessment); students' clear preference for blended learning reveals that students appreciate the access to in-person classes. Some differences within the same-year group regard assessment and feedback, academic support, and learning community, with higher perception scores reported in the blended learning survey (vs. the online learning survey). Similarly, in another study with student teachers in South Africa [27], the in-person aspect (physical presence) of blended learning eliminated the challenge of a digital divide (existent in fully online teaching), and students exercised self-directed learning skills such as identifying resources and learning goals, being responsible for their learning, critical thinking, and collaboration and problem-solving skills.

With regard to student engagement and motivation (to improve students' academic performance with online/blended classes), this was reported as a challenging issue during the pandemic period [28,29]. Students' perceptions of the factors that influence their interest

and motivation for engagement include teacher and teaching methods [30,31], the academic discipline [30], and online activities [2]. For example, students were demotivated when tutors did not support them (e.g., through providing feedback) during online learning [31]. In parallel, a small number of studies indicated differentiation of student perceptions with regard to demographic characteristics (e.g., gender). For example, a study in Bahrain and Saudi Arabia [16] explored the relationship of eight independent factors: e-learning environment, e-learning facilitation, e-learning materials, e-learning technical support, instructors' personal attention, interaction with instructors, interaction with peer students, and laboratory learning environment, in the provision of effective blended learning in higher education during the pandemic. Undergraduate and postgraduate students' perceptions of blended learning effectiveness in universities differed with regard to gender (female students utilize online teaching and learning to the maximum, while male students get more benefits in face-to-face discussions) and level of the course (younger students are well versed in digital competency) [16].

Our study differs from the above-mentioned studies in that we focused on university students studying various academic subjects using a validated instrument. We also examined the effect of specific demographic variables (gender, year of study, age, faculty) on students' blended learning behavior perceptions. The majority of the aforementioned studies were carried out with students attending a specific course or program (e.g., health sciences, English as a foreign language).

In Greece, there is a small number of studies regarding students' learning behavior perceptions in blended learning contexts. A recent study [32] conducted immediately after students returned back to face-to-face education indicated that they intend to use e-learning platforms to learn in the post-pandemic era. This study used the Unified Theory of Acceptance and Use of Technology (UTAUT2 model extended with the construct 'Learning Value') to determine the factors predicting university students' behavioral intention to use e-learning platforms in the post-pandemic era; students' acceptance of e-learning platforms is critical for the success of online/blended learning. It was found that the variables Performance Expectancy, Social Influence, Hedonic Motivation, Learning Value, and Habit had a significant impact on students' intention to use e-learning platforms to learn, while Facilitating Conditions and Learning Value had a direct impact on actual use. Greek students also expressed preference for both in-person and hybrid approaches for learning in the future, and their positive blended learning perspectives were associated with the combination of benefits offered via in-person and online education [3].

Considering that blended learning studies in higher education are on the rise, and that there is limited evidence within the Greek context, this study was considered necessary. The rest of the paper is organized as follows: Section 2 presents materials and methods, Section 3 is the results, Section 4 includes the discussion and implications, and Section 5 regards the conclusion.

## 2. Materials and Methods

### 2.1. Objectives of the Study

As mentioned earlier, the purpose and aim of this study are to explore Greek university students' learning behavior perceptions in blended learning environments. Specific objectives are (i) to investigate students' blended learning behavior perceptions via a questionnaire and (ii) to explore the impact of students' demographic characteristics on their blended learning behavior perceptions.

### 2.2. Sample and Procedure

176 students participated in this study in Greece; they are attending/studying different academic fields at different public universities across Greece. The characteristics of the sample (gender, year of study, age, and field of study) are presented in Table 1. The female students numbered 108, the male students numbered 68, and most of the students were attending their third year of study or above, while the age range was 18–25+ years old. It is

noted that in Greece, undergraduate degrees are typically four years long for most faculties, while for polytechnics it is five years and for medical schools it is six years; however, not all students complete their degree by the end of the typical period.

**Table 1.** Demographic characteristics of the sample (N = 176).

Category	Category	Frequency	Percentage (%)
Gender	Female	108	61.4
	Male	68	38.6
Year of study	4th+	92	52.27
	3rd	76	43.19
	1st	8	4.54
Age	18–21	112	63.64
	22–25	20	11.36
	25+	44	25
Faculty (Field of study)	Applied Sciences	68	38.63
	Humanities, Social Sciences	60	34.10
	Economics, Computer Sciences	44	25
	Health Sciences	4	2.27

The students were invited to answer an anonymous online questionnaire in December 2022. The questionnaire link was predominantly sent to all students registered in the e-class (platforms) of the courses taught by the authors and two other tutors. The students were also encouraged to forward/distribute the link via social media, so students from other universities/faculties could also respond. All students participated voluntarily, and ethical issues were taken into account in accordance with the General Data Protection Regulation. Informed consent was obtained from all subjects involved in the study. We notified all participants that, should they wish to participate in the research, their responses would be anonymous; it was explained that their privacy is protected and the data will be utilized with confidentiality, only for research purposes.

### 2.3. Research Instrument

An online questionnaire (consisting of two sections) was designed using Google Forms, and it was used for data collection. The students completing the survey were given a definition of blended learning (this definition is presented in the introduction [5]). The first section aimed to collect information on students' demographic characteristics (see Table 1). The second section included 19 statements/items which were taken and adapted from the study of Ballouk et al. [17]. They developed and validated a questionnaire in order to investigate how medical students learn in a blended learning environment in Australia. This questionnaire was selected because it was a valid and reliable instrument (overall Cronbach- $\alpha = 0.75$ ), and it was recently (within the pandemic context) developed and administered to an undergraduate university population. We translated and adapted the statements for Greek students, irrespective of academic field. The questionnaire was comprised of four groups as follows: group 1 (Resources: Accessibility and Guidance) involved four items (S13, S16, S5, S15); group 2 (Resources: Delivery of Content) involved six items (S18, S19, S14, S1, S6, S4); group 3 (Learning: Social and Contextual) involved five items (S3, S2, S9, S10, S11); and group 4 (Motivation: Intrinsic and Extrinsic) involved four items (S8, S7, S12, S17). In order to pilot the instrument, 11 students (not being participants in the main survey) answered the questionnaire, in order to check that ambiguities/difficulties do not exist in interpreting the statements; no ambiguities appeared, so there was no need to adjust the items. The 19 items were presented in mixed order, to avoid bias, and the students had to respond on a five-point Likert-type scale (1 = strongly disagree to 5 = strongly agree).

## 2.4. Data Analysis

With regard to data analysis, the statistical software SPSS version 21.0 was used for managing the data and conducting the statistical analyses (descriptive statistics, factor analysis, correlation analysis). One-way ANOVA analyses including pairwise *t*-test with Bonferroni correction were performed.

## 3. Results

### 3.1. Descriptive Measures for Students' Learning Behavior Perceptions

A descriptive analysis was applied in order to investigate students' learning behavior perceptions in a blended learning environment. Table 2 shows students' response percentage frequencies on the 19 items of the questionnaire (N = 176 students). The last column of the table has added together the percentages of those who "agree" and "strongly agree". The majority of the students expressed strong learning behavior perceptions. More specifically, over 77% of the sample "agree and strongly agree" with items S4, S17, S15, S7, S14, S16, S1, S19, and S6. The items with the highest percentages of agreement were S4 (agreement 97.7%) and S17 (agreement 88.7%); these items regard the importance and efficiency of audio-visual online resources in learning, characteristics that can motivate students' learning. Examples of items with lower percentages of agreement (and higher percentages of uncertainty) were S10, for which 50% of the students agree that their study habits are affected by their peers/social interaction (25% undecided/uncertain); and S3, for which 54% express the view they are able to consolidate their learning following a small group activity (38% undecided/uncertain). Such perceptions are related to student motivation and learning in blended environments and have implications for student training.

**Table 2.** Students' response percentage frequencies on the 19 items (N = 176 students).

	SD	D	U	A	SA	A & SA
S4. I find external audio-visual online resources very important to my learning	0.0	0.0	2.3	54.5	43.2	97.7
S17. Some online resources are efficient because they are well summarized	0.0	0.0	11.3	52.3	36.4	88.7
S15. Access to online material off-campus enables me to structure my independent learning	0.0	4.5	9.1	50.0	36.4	86.4
S7. My use of study resources differs leading up to exams	2.3	2.3	9.1	29.5	56.8	86.3
S14. I learn more efficiently when I'm able to access online resources using different devices	0.0	4.5	11.4	45.5	38.6	84.1
S16. I use Faculty lecture material as a guide for what to learn	0.0	4.5	11.4	43.2	40.9	84.1
S1. I actively seek online resources to prepare my learning materials before a learning activity (tutorial/lecture/ward presentation)	0.0	4.5	11.4	50.0	34.1	84.1
S19. I often integrate a variety of Faculty and external online resources to support my learning	0.0	0.0	18.2	47.7	34.1	81.8
S6. Flexibility to use a variety of online material motivates my independent learning	0.0	4.5	18.2	47.8	29.5	77.3
S11. I set up study goals that organise/structure my learning	0.0	9.1	25.0	43.2	22.7	65.9
S13. Accessibility to Faculty lectures online enhances my independent learning	0.0	9.1	25.0	43.2	22.7	65.9
S2. I find small group work enhances my understanding about a particular concept	2.3	4.5	31.8	38.7	22.7	61.4
S18. Specific external online resources are vital to my independent learning	0.0	4.5	36.4	31.8	27.3	59.1
S9. My study is stimulated by group discussions	4.5	4.5	36.4	43.2	11.4	54.6
S5. I find the audio-visual online resources provided by the Faculty crucial for my learning	0.0	9.1	36.4	34.0	20.5	54.5
S3. I am able to consolidate my learning following a small group activity	2.3	4.5	38.7	38.6	15.9	54.5
S8. My motivation to study increases leading up to exams	4.5	11.4	31.8	25.0	27.3	52.3
S10. My study habits are influenced by my peers/social interaction	4.5	20.5	25.0	40.9	9.1	50.0
S12. My study is influenced by the fact that I need to maintain my image (among peers/supervisors)	6.8	27.3	27.3	25.0	13.6	38.6

(SD = Strongly Disagree, D = Disagree, U = Undecided/not sure, A = Agree, SA = Strongly Agree).

### 3.2. Factorial Structure of the Questionnaire

For the exploration of the factorial validity of the questionnaire, an exploratory factor analysis was performed using the Principal Axis Factoring method accompanied by the Oblimin Factor rotation method. The items S5, S7, and S13 were eliminated due to cross loading, while the item S10 was taken out due to low loading (<0.4). For the remaining 15 items, the Kaiser–Meyer–Olkin (KMO) test for sampling adequacy and Bartlett's test

for sphericity were used; KMO was used because it is the standard measure to support sampling adequacy, indicating that the items meet the conditions for factor analysis [33]. The KMO measure (KMO = 0.619) indicates adequacy with a value greater than the cutoff for adequacy (0.5). Bartlett's test indicated a very good sphericity ( $v^2 = 1199.937$ ,  $df = 105$ ,  $p < 0.001$ ). The Scree Plot supports a three-factor solution which we retain for interpretation. Factor number one (F1), named "Resources", was linked to seven statements: S15, S14, S4, S18, S6, S19, S1. Factor number two (F2), named "Learning", was linked to three statements: S2, S3, and S9. Factor number three (F3), named "Motivation", was linked to five statements: S11, S12, S8, S16, and S17. Factor loadings were above 0.4 and no items were candidates for elimination [34]. Table 3 displays the loadings and Cronbach's alpha coefficient for internal consistency for each factor (F1 to F3), as well as the mean and standard deviation per statement. All factors show an acceptable internal consistency: the range for Cronbach's alpha coefficient is from 0.713 to 0.795 (Cronbach's alpha based on standardized items is 0.800).

**Table 3.** Factor loadings, mean, and standard deviation per item (15 items).

Statements	F1	F2	F3	Mean	SD
S15.	0.874			4.18	0.78
S14.	0.783			4.18	0.81
S4.	0.744			4.41	0.54
S18.	0.710			3.82	0.89
S6.	0.610			4.02	0.82
S19.	0.418			4.16	0.71
S1.	0.413			4.14	0.79
S2.		0.822		3.75	0.94
S3.		0.797		3.61	0.89
S9.		0.766		3.52	0.92
S11.			0.814	3.78	0.89
S12.			0.692	3.11	1.15
S8.			0.617	3.59	1.16
S16.			0.578	4.21	0.82
S17.			0.505	4.25	0.65
Cronbach's alpha	0.795	0.761	0.713		

All responses ranged from 1 (strongly disagree) to 5 (strongly agree). Factor 1 (F1): "Resources", Factor 2 (F2): "Learning", Factor 3 (F3): "Motivation". Extraction method: Principal Axis Factoring [35,36]. Rotation method: Oblimin Factor [36].

Mediocre–moderately positive correlations were identified among the factors (Table 4); ("moderate degree" [37]). The "Resources" factor (F1) was significantly correlated to "Motivation" (F3) ( $r = 0.354$ ,  $p < 0.01$ ). Table 5 indicates the mean score and Cronbach-a values for the four original subscales and this study's subscales (i.e., the new version of the subscales, the three factors); Cronbach-a values are higher for this study's subscales.

**Table 4.** Pearson correlations among factors.

	Resources (F1)	Learning (F2)
Learning (F2)	0.061	-
Motivation (F3)	0.354 **	-0.112

\*\* Correlation is significant at the 0.01 level (2-tailed).

**Table 5.** Mean score and Cronbach-a values for the original subscales and this study's subscales (applied in our sample, N = 176).

4 Original Subscales *	Mean	Cronbach's Alpha	This Study's Subscales (3 Factors)	Mean	Cronbach's Alpha
S5, S13, S15, S16	3.96	0.674	F1 (S15, S14, S4, S18, S6, S19, S1)	4.82	0.795
S1, S4, S6, S14, S18, S19	4.12	0.715	F2 (S2, S3, S9)	3.63	0.761
S2, S3, S9, S10, S11	3.60	0.538	F3 (S11, S12, S8, S16, S17)	4.74	0.713
S7, S8, S12, S17	3.83	0.305			

(\*) after Ballouk et al. [17].

### 3.3. Impact of Characteristics on Blended Learning Behavior Perception Factors

To identify the possible impact of students' characteristics (gender, year of study, age, and faculty) on their blended learning behavior perceptions, one-way ANOVA analyses were performed. A significance of  $p = 0.05$  was accepted as a conventional level. Regarding gender, there was a statistically significant difference for all three factors (F1: Resources, F2: Learning, F3: Motivation); male students expressed more positive perceptions for F1 ( $F(1, 174) = 9.63, p = 0.002$ ) and F2 ( $F(1, 174) = 9.45, p = 0.002$ ), while female students did so for F3 ( $F(1, 174) = 9.21, p = 0.003$ ) (see Table 6). Similarly, regarding year of study, a statistically significant difference occurred for all three factors (see Table 7); first-year students expressed more positive perceptions for F2 ( $F(2, 173) = 7.66, p = 0.000$ ), third-year students had more positive perceptions for F3 ( $F(2, 173) = 4.01, p = 0.000$ ), while fourth-year students and above expressed more positive perceptions for F1 ( $F(2, 173) = 3.62, p = 0.025$ ). Pairwise mean comparisons using the Bonferroni test [38] did not reveal significant differences between year of study and Resources (F1). For F2, students in their third year of study expressed more positive perspectives in comparison to the other years. Regarding F3, those in their third year of study or above had more positive perceptions in comparison to first year students.

Regarding age group, no statistically significant difference occurred (see Table 8). Regarding faculty, a statistically significant difference occurred for all three factors (Table 9); health sciences students expressed more positive beliefs for F1 ( $F(3, 172) = 3.62, p = 0.014$ ) and F3 ( $F(3, 172) = 13.35, p = 0.000$ ), while applied sciences students expressed more positive beliefs for F2 ( $F(3, 172) = 3.05, p = 0.000$ ). Pairwise mean comparisons using the Bonferroni test revealed differences for all three factors (see Table 9). Students studying economics or computer science expressed more positive perceptions in comparison to those studying applied science (for F1) and in comparison to all other faculties for F3. For F2, those studying applied sciences expressed higher perceptions in comparison to those studying humanities or social sciences.

**Table 6.** Perception factor scores by gender (N = 176).

Factors	Male		Female		p
	Mean	SD	Mean	SD	
F1	4.28	0.49	4.04	0.51	0.002
F2	3.84	0.57	3.49	0.82	0.002
F3	3.61	0.81	3.90	0.46	0.003

F1: Resources, F2: Learning, F3: Motivation.

**Table 7.** Perception factor scores by year of study (N = 176).

Factors	1st Year		3rd Year		4th Year and Above		p
	Mean	SD	Mean	SD	Mean	SD	
F1	3.79	0.76	4.07	0.57	4.21	0.47	0.029
F2	4.50	0.53	3.33	0.84	3.79	0.57	0.000
F3	3.50	0.11	3.94	0.57	3.70	0.69	0.025

F1: Resources, F2: Learning, F3: Motivation.

**Table 8.** Perception factor scores by age group (N = 176).

Factors	18–21		22–25		25+		p
	Mean	SD	Mean	SD	Mean	SD	
F1	4.15	0.50	3.88	0.52	4.18	0.52	0.073
F2	3.68	0.68	3.73	0.50	3.45	0.97	0.198
F3	3.73	0.65	3.92	0.38	3.79	0.64	0.225

F1: Resources, F2: Learning, F3: Motivation.



**Table 9.** Perception factor scores by faculty (N = 176).

Factors	Applied Sciences		Humanities Social Sciences		Economics Computer Sc.		Health Sciences		<i>p</i>
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
F1	4.02	0.49	4.11	0.59	4.29	0.41	4.57	0.25	0.014
F2	3.82	0.77	3.40	0.86	3.61	0.49	3.33	0.37	0.030
F3	3.61	0.73	4.13	0.45	3.55	0.49	4.40	0.29	0.000

F1: Resources, F2: Learning, F3: Motivation.

#### 4. Discussion and Implications

In this study, university students' learning behavior perceptions in blended learning environments were explored. It was found that, in general, students expressed strongly positive blended learning behavior perceptions. Students' positive views may influence their decisions about blended learning acceptance and usage. Higher percentages of agreement (over 77%) were associated with items regarding resources and student motivation. Students expressed positive learning behavior perceptions about the role of audio-visual online resources and their combination with faculty resources/material in facilitating and supporting their independent learning in blended education. Such perspectives are in line with research studies in different countries (e.g., study [17] in Australia, study [23] in Saudi Arabia, and study [27] in South Africa); these studies report on students' perceived importance of resources. Student motivation in blended learning environments was also reported by earlier research [15,17]. Different online and faculty learning resources (audio-visual online resources, presentations, etc.) have the potential to support students within the blended learning environment/context.

The results are partially in line with a study indicating mixed views about learner engagement in blended environments [24], and it may be due to limited experience with blended learning (students are more familiar with in-person learning environments). Student engagement with learning activities in the online/blended environment affects their performance [39]. Student motivation and engagement with online resources and educational activities could be encouraged by their tutors; e.g., tutors could foster a student-centered learning environment to actively seek appropriate educational material/resources and suggest ways of using the online platforms. Utilizing an online platform (e.g., Google classroom) was found to affect students' learning behavior and attitude [40]. We suggest improvement of students' skills in searching for online resources/materials. This is a necessity because of the size and variety of resources/materials and their implied knowledge level, the unorganized nature of the Web, and understanding and managing search engines (which employ Boolean logic in their operation).

University students are adults, and in blended learning environments, they are more responsible for their learning (e.g., autonomous, self-directed learners). Autonomous learners act independently, show responsibility, understand the purpose of their learning, set realistic goals, and monitor their learning process [41]. Student mobile learning technology practices can be implemented within the context of blended-mode university classes; these have the potential to foster student autonomy and strengthen university digitalization [42] and culture [43]. Taking into account the move for many universities worldwide to continue implementing modes of blended and online learning, there is a need to stimulate student interest and motivation; in this direction, lifelong learning may also be facilitated.

In this study, students expressed lower percentages of agreement (and some uncertainty) with regard to involvement in small group work with their peers. Indicatively, about half of the sample agree they are able to bring together their learning performing an educational activity in small groups. It may be because student-student interactions become reduced when the communication is carried out via the Internet (due to physical distance). Such findings align with recent research which indicated limited communication and interaction with peers [18,44]; pandemic-related evidence documented difficulties in online

interactions and group work [18,44]. As collaboration is an effective way to facilitate students' engagement in blended learning contexts [45], it is suggested to empower/encourage collaborative group work and discussions when designing and implementing blended learning courses, for example, to encourage application of collaborative activities among students with the aim to produce a group result, or to upload topics for group discussions on the online platform. With technology tools, students can control their learning through choosing their own tempo when participating in discussions online or in person or when watching videos [46].

With regard to factor analysis, three factors were revealed in this study: "Resources" (F1), "Learning" (F2), and "Motivation" (F3); in comparison, four groups/subscales were included in the original questionnaire [17]. A possible explanation for this may lie in the context; i.e., the redistribution of the items may be attributed to the different perceived meaning of the same item or question among student populations, due to the difference in cultural background and context. Factor 1 appears to have greater similarity with the original questionnaire and, in particular, with its second group regarding resources. We suggest for the factors F2 and F3 to be enhanced with additional items (this may also improve the Cronbach- $\alpha$  value).

With regard to the impact of demographic characteristics on blended learning perceptions, isolated significant differences occurred for gender, year of study, and faculty. Male students expressed more positive perceptions for Resources and Learning (F1 and F2), and female students had more positive perceptions for Motivation (F3). More positive perceptions were expressed by first year students for Learning, third year students for Motivation, and fourth year students and above for Resources; this may be interpreted that fourth year students and above are more experienced in searching for resources/material. Differences regarding faculty (e.g., for Resources, students studying economics or computer science had more positive perceptions in comparison to those studying applied science) may be attributed to the different curriculum/skills among various academic fields. With regard to gender, one study indicated differences in student blended learning perceptions [16] while another did not identify differences [47], and with regard to academic disciplines, a study revealed that students studying science and engineering expressed more positive perceptions [24]. However, the findings are inconclusive, and possible differentiation of student blended learning behavior perspectives with regard to characteristics (e.g., gender, field of study) is worth exploration in the future.

This study has implications for students, educators, as well as university policy and practice. Students could be encouraged to develop their self-organization strategies, while it is worth exploring student self-efficacy in blended learning environments. The improvement of students' academic self-efficacy facilitates the enhancement of their intrinsic motivation and, consequently, their intention to adopt blended learning [11]. Student training is suggested to strengthen their skills for searching and evaluating online educational material/resources, as well as communication and collaboration skills. Research [31] indicated that collaboration with peers in an online environment is important and affects satisfaction and student performance. Student training could be facilitated via seminars or workshops that focus on the development of appropriate skills. In parallel, university tutors and policy makers need to be aware of student blended learning perceptions and behavior; lack of knowledge about how students perceive blended learning across disciplines can make it difficult for educators to provide consistent learning experiences to students [24].

Implementation of appropriate pedagogical strategies and approaches is likely to maintain and enhance students' intrinsic motivation to learn in blended learning environments. University tutors need to adopt appropriate pedagogical approaches in order to regulate students' learning (e.g., to encourage students to actively participate and interact with each other) in the blended learning context [48]. Educational material delivery affects the learners' environment, and different learning resources/content can be integrated in university course delivery in order to support students in accomplishing learning goals. Educators' professional development (training) could allow them to design and implement

blended learning environments which, for example, encourage interactions, motivation, learners' autonomy, and self-regulation; it is related to educators' academic autonomy to adjust the courses in blended education context. Educators must continue developing their skills in understanding online engagement and designing engaging learning activities beyond what was learnt during the pandemic [49]. When designing/supporting assessment activities, blended strategies could be utilized, because such strategies are likely to enhance student engagement with course concepts, their peers, faculty, and external experts, resulting in better student performance [20].

In the pandemic context, research suggested more resilient universities (i.e., able to adapt to current trends) with better infrastructure [50]. For example, investment in mobile technology might lead to a more flexible and resilient educational system; during the pandemic, students and teachers could access online learning resources via mobile devices. Effective blended learning was reported to depend upon technological, organizational, and academic management [51]. Blended mode is especially useful in times of crisis and disruption, and it is worth being explored in the post-pandemic era. University policies could plan for blended modes of education (a combination of online and offline approaches) and become more favorable towards the utilization of mobile technology for educational purposes (because mobile technology may facilitate student autonomy and control of their learning). Changes to and re-design of courses could incorporate the concept of blended education as part of the university's developmental strategy. Implementation of flexible blended learning is an institutional endeavor that must be applied in accordance with the institution's plans; flexible hybrid learning is an innovative pedagogy that might affect educational policies today [52]. Finally, convenient and flexible digital platforms could also support universities [2,53]; usage of appropriate e-learning/online platforms could enhance blended learning adoption.

A limitation of the study is the sample size and the use of only a questionnaire. The sample cannot be considered as representative due to the academic subjects included in Table 1. The questionnaire could be enhanced with additional statements (e.g., relevant to negative student experiences) to strengthen its reliability and factorial structure. Future research is suggested to include larger samples and to investigate student experiences via mixed methods; a combination of quantitative and qualitative methods could better display students' learning behavior perceptions in blended learning environments. We recommend that the questionnaire be administered to other student populations (e.g., different academic fields and countries) so as to identify possible similarities and differences.

## 5. Conclusions

This study explored university students' learning behavior perceptions in blended learning environments. In general, students expressed strongly positive blended learning behavior perceptions; higher percentages of agreement were associated with the role of audio-visual online resources in facilitating and supporting independent learning and with student motivation in blended education. Lower percentages of agreement (and some uncertainty) were revealed with regard to involvement in small group work with their peers. The strength of this study is that students' behavior perceptions were revealed shortly after the pandemic (a period with the forced application of online education); it is a timely enquiry grounded in recent literature. This study could serve as a pilot for more in-depth studies of institutional and pedagogical developments in the future. This study's outcomes can add to the growing body of evidence on blended education within the higher education context. There are implications for students, educators, as well as university policy and practice. In the post-pandemic era, higher education educational policies are likely to be enriched via understanding students' learning behavior in hybrid environments.

Blended learning emerges as a 'new' post-pandemic trend in higher education, and blended approaches are likely to become even more popular [2,6]; this 'new' norm is appropriate for university students who are adults and more independent learners [2]. As blended learning environments are challenging and under-researched [54], future

research is suggested to explore issues related to the design of blended courses [55] and their potential and effectiveness in the teaching and learning process. For example, since intrinsic and extrinsic motivation are related to students' learning behavior, future research could apply widely accepted models (such as the UTAUT) to explore the factors predicting blended learning adoption and use. Students' perceptions and expectations of university support when blended learning is implemented are suggested to be explored. Since blended learning is increasingly applied in the higher education context, and more students are becoming acquainted with this mode of education, university students' blended learning behavior, perspectives, and experiences constitute ongoing research issues.

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