Article

Self-Regulated and Mobile-Mediated Learning in Blended Tertiary Education Environments: Student Insights from a Pilot Study

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Abstract: Despite the rapid rise in the number of blended education studies after the COVID-19 pandemic, the topics of self-regulated and mobile-mediated learning in blended tertiary education environments is an open research issue. The purpose of this pilot study is to identify tertiary education students' perceived enablers/facilitators and barriers to self-regulated and mobile-mediated learning in blended education environments. Nineteen undergraduate and postgraduate students were interviewed in Greece, and data were analyzed through descriptive analysis. According to the findings, most participants believed that blended learning helps their autonomy and self-regulated learning when they are facilitated by ownership of, ease of use, and familiarity with mobile devices. Major enablers/facilitators, but also barriers to, self-regulated and mobile-mediated learning in blended contexts are the course structure (mainly, the online component of blended education, appropriateness of learning activities, and educational material), and individual (educators' knowledge, skills, confidence, and attitudes, and students' knowledge, skills, and concerns) and technological (infrastructure and internet connectivity) factors. Students' expectations concerning blended education courses are associated with the course organization (e.g., provision of alternative learning possibilities, balance between face-to-face and digital/online learning activities, and access to various teaching material/tools) and the role of students and teachers. Implications for students, educators and university policy and practice are discussed.

Keywords: blended education; blended learning; self-regulated learning; mobile learning; mobile technology; higher education

1. Introduction

Blended (or hybrid) education became an important mode of teaching and learning during and after the COVID-19 pandemic, and this mode/approach has rapidly spread in tertiary education [1–3]. Within the blended and online learning contexts, digital technology has a main role (e.g., online mode or use of digital tools in the classroom), while self-regulated learning [3–5] and mobile learning [6–10] are topics that have received increased attention post-pandemic.

Self-regulated learning (SRL) is as an active-constructive process where learners set goals and attempt to monitor their motivation, cognition, and behavior [11]; SRL can also be a factor predicting learning performance; i.e., learners with higher self-regulation competency improve their engagement in learning activities and consequently their academic performance [12]. Student self-regulated/directed learning is associated with blended learning benefits and effectiveness [13–15]. A recent review [3] confirms the effectiveness of SRL on learners' academic achievement in blended learning environments. With regard to mobile learning (ML), mobile technology-mediated learning was applied by many tertiary education institutions during the pandemic, and it supported online and blended learning [6,7,9,10]. Different attributes of mobile-mediated learning such as flexibility

and personalization are associated with its pedagogical potential for effective academic outcomes [16]. Mobile learning educational practices have the potential to support blended teaching–learning approaches/strategies and strengthen post-pandemic university digitalization [8] through the support of online pedagogies, communication, and universities' technological, organizational and academic management.

The purpose of this pilot study is to identify tertiary education students' perceived enablers/facilitators and barriers of self-regulated and mobile-mediated learning in blended education environments. Such an investigation is significant because with the shift to blended education, SRL is important for effective learning in blended contexts [3,5], as mobile technology can support blended learning [7,9,10] and student-perceived performance is influenced by their blended education beliefs [17]. Although there was a rapid rise in the number of blended education studies in tertiary education after the pandemic, the topics of self-regulated and mobile-mediated learning in blended environments/context constitute an open research field (a field that can be enhanced with new evidence). In this paper, blended (or hybrid) education refers to all students meeting part of the time online and part of the time face-to-face, or some students being in class while others are online [18]. Although blended learning is not new for the tertiary education level, this was a novel and sudden experience for university students who normally attend face-to-face classes; before the pandemic, blended learning was mostly associated with part-time university courses. Most of the studies discussed below are with regard to university students' perceptions during and after the COVID-19 pandemic (a period during which online/blended education was provided as a response to an emergency).

The flexibility and combination of face-to-face and online interactions are reported as benefits of blended learning approaches by students in different counties such as Saudi Arabia [19] and the Maldives [20]; students appreciate the aspect of face-to-face lessons [21]. A study in China [4], with students possessing high levels of learning responsibility and motivation, indicated that most participants consider blended learning as a facilitator for the development of learner autonomy. In Saudi Arabia, undergraduate students' perceptions of their e-learning experiences in virtual and blended English classes revealed SRL as a blended learning benefit [22]. In Indonesia, a review [23] indicated that self-regulatory issues are among the biggest challenges students face when they identify obstacles to the online components of blended learning. Student-perceived challenges of SRL were associated with emotional self-regulation (e.g., irrational feelings) and difficulties with capabilities to set up and control their study independently. In addition, some studies indicate that SRL in online or face-to-face modes positively affects (predicts) SRL intention [24] and student engagement [25] within blended learning contexts.

With regard to university students' perceived enablers/facilitators and barriers to mobile-supported/mediated learning in blended context, there is a small number of studies from the beginning of the pandemic to the present. Undergraduate and postgraduate students in Saudi Arabia perceived the following as main facilitators for mobile-learning usage in blended learning environments: the institutions' facilitating conditions/infrastructure, students' positive attitudes (e.g., flexible leaning), and familiarity with and ownership of mobile devices. In parallel, barriers to using blended mobile learning include tutors' negative attitudes (resistance to change), universities' limited provision of internet services, and distractions [26]. In India, nursing students had a positive attitude and acceptance towards mobile learning in a blended context, due to its ease of use, usefulness, and convenience [27]; hindrances include poor internet access, inadequate technical support, limited student and educator training, and distractions (looking at non-educational contents). In Ghana [28], undergraduate students expressed the following as facilitation conditions for mobile learning: university facilitation for mobile device access, accessing courses/internet via mobiles, and speed of internet; students had positive views about blended learning. University students in Spain indicated the potential of the online and hybrid teaching methodologies, and they believed these complement one another and reinforce learning personalization [29]. Students also stressed normalizing the use of mobile devices (espe-

cially tablets and laptops) to follow up from teaching. Korean students studying English as a foreign language indicated that mobile devices' features (e.g., portability) and the perceived usefulness of and satisfaction with apps, as enablers of mobile-assisted language learning in blended environments, while students' unfamiliarity with conducting group discussions using mobile devices was an obstacle [30].

There are a few relevant studies where the blended education environment/context is not (explicitly) mentioned. Indicatively, a study in the USA [31] reported on undergraduate students' perspectives of mobile technology use facilitators (ease of use, portability, convenience) and obstacles (issues of compatibility, design of mobile devices). In Saudi Arabia, undergraduate and postgraduate students' perspectives revealed that awareness and university management support were factors affecting mobile learning adoption/acceptance [32]. In South Africa, postgraduate students indicated the affordability, the ease of use, and the features of mobile apps as mobile learning facilitators (to facilitate student–student/tutor communication), while social media distractions were reported as inhibitors [33].

In the Greek context, there is a small number of studies on the topic. Immediately after the pandemic, Greek students expressed a preference for both in-person and blended approaches for learning, and their perceived blended learning benefits include adaptability for working students and SRL [34]. Another study [35] revealed students' positive blended learning behavior-perceptions with regard to online audio-visual resources that facilitate/support their independent learning. Postgraduate students also expressed strong beliefs for mobile technology's learning benefits and possibilities (flexibility in learning, collaboration among students, improvement of skills, etc.), while more positive views are associated with course attendance in blended (rather than face-to-face) mode [36]. Finally, undergraduates' perceived benefits of mobile technology include flexibility, familiarization with mobiles, and easy and quick searches, while barriers include connectivity issues, unreliable sources for obtaining information, and distractions [8]. Considering the great rise in blended education studies post-pandemic, and the limited evidence within the Greek context, this study was considered as necessary. The rest of the paper is organized as follows: Section 2 regards materials and methods, Section 3 presents the results, Section 4 is the discussion, and Section 5 is the conclusion.

2. Materials and Methods

2.1. Research Questions

The following research questions were addressed:

RQ1. What are the enablers/facilitators and barriers/hindrances of self-regulated learning in the blended education context, as perceived by students?
RQ2. What are the enablers and barriers of mobile technology use in the blended education context, as perceived by students?
RQ3. What are students' expectations from blended learning courses?

2.2. Sample and Procedure

Before describing the sample, the blended education context in Greece is briefly mentioned. Blended learning has gained popularity since the pandemic, and has been implemented selectively in public universities (there are no private universities, yet). Blended learning approaches are more likely to be adopted by postgraduate rather than undergraduate programs/courses, and these may differ according to the academic subject, the course objectives, the tutor, and the available technology. Although undergraduate university courses are now provided in face-to-face mode, university tutors have the autonomy to apply blended format approaches in their courses/lessons. Postgraduate courses implement blended approaches to a greater extent. The new 2022 draft law provides the possibility for Greek universities to participate in European university partnerships, with the establishment of joint short-term study programs; if implemented effectively, it

can open new perspectives in the adoption of blended education, which will also aid in connecting universities.

The participants of this study were obtained using the convenience sampling technique in consideration of the accessibility and willingness of respondents in taking the interview [37]; the research instrument is described in the following sub-section. The inclusion criterion required that, post-pandemic, students attended at least one university course in blended format (the duration of a typical university course is an academic semester of 13 weeks). Consolidated criteria for reporting qualitative research (COREQ) [38] were applied in this pilot study. The students were approached either face-to-face or by email [38], by utilizing the author's professional networks; personal contacts and emails were used to reach out to potential participants to record expression of interest. A number of students were initially contacted, but about 15 students could not participate [38] because they did not meet the inclusion criterion. The sample of the study consisted of 19 postgraduate and undergraduate students who were studying different academic subjects across Greece. Table 1 shows the characteristics of the sample (gender, level of study, age, field of study, frequency of mobile phone use for academic purposes). Most of the participants were female (15 out of 19), about half of the sample (10) were postgraduate students aged 25+, and 11 students were studying education (e.g., preschool level, primary level, Greek language and literature, special needs education, English as a foreign language) and social studies academic subjects; the convenience sampling resulted in a sample in which most participants were studying theoretical subjects (i.e., close to the author's academic field). The frequency of mobile phone use for academic purposes varied from 2 to 4 times/week to more than 10 times/week. It was noted that all university students own a mobile phone with internet access, while the use of mobile devices for academic activities is up to the individual students and educators [8]. The undergraduates had less post-pandemic blended learning experience in comparison to the postgraduates (i.e., they had attended one or a maximum of two courses in blended format, while postgraduates had attended three or more courses). The participants had not attended blended or online courses before the COVID-19 pandemic.

The participation of the students was voluntary and ethical issues were considered in accordance with the General Data Protection Regulation. The author-researcher conducted the interviews, and the reasons for doing the research were explained to the students [38]. All participants were assured that, should they wish to participate in the research, their comments and input would remain anonymous; they were also made aware that interviews would be recorded, while recordings and transcripts would not be disclosed to any third party. The interviews were conducted one-to-one (participant and researcher-author) in home settings, at a time period convenient for the students, and were audio-recorded [38] via Zoom. The duration was about 12–15 min. Participants were encouraged to answer with honesty, recalling and sharing their experiences of blended education. The trustworthiness of the data was established by providing participants with opportunities to clarify meaning [39]. Repeat interviews were not carried out [38]. Transcripts were given to participants [38] and returned without major modifications.

Table 1. Demographic information of participants (N = 19).

Gender	Level of Study (Age)
Female (15) Male (4)	Postgraduate (25+ years old) (10) Undergraduate (21–24 years old) (9)
Field of Study	**Frequency of Mobile Device Use for Academic Purposes**
Education and Social Sciences (11) English language (3) Economics (3) Engineering, Chemistry (2)	Daily (>10 times/week) (6) 5–10 times/week (7) 2–4 times/week (6)

2.3. Research Instrument and Data Analysis

The data were collected via interviews in May and June 2023. The interview questions were guided by information emerging from international research (e.g., from [4]) and were in line with this study's research questions. The qualitative interview has been validated by two colleagues specializing in the field of educational technology. Indicative interview questions were as follows: How does blended learning help/facilitate your self-regulated learning? How does blended learning hinder your self-regulated learning? In what ways can blended learning arouse your interest to learn when mobile technology is integrated into traditional learning tools? What are the main facilitating factors in the use of mobile technology in blended learning? What are the main hindering factors in the use of mobile technology in blended learning? What are your expectations from a blended course?

Content-thematic analysis was used, and the codes for the data analysis were descriptive. The interviews were transcribed, and then units of meaning (phrases/words) were identified. The responses were analyzed using descriptive content analysis; the author coded the data [38]. Through the process of coding, patterns of responses were used to inform themes and categories generated in line with their relevance to the research questions [40]. Students' responses were thematically grouped into those which related to the pre-determined themes [38] of enablers/facilitators and barriers/hindrances of self-regulated and mobile-mediated learning in blended education environments, as well as students' expectations from blended learning courses. Anonymity was confirmed so as to eliminate possible untruthful responses. To ensure anonymity, codes were used for the students.

3. Results

The results are organized by the three research questions guiding the study, which formed the three main themes (as mentioned above, the themes were identified in advance). In Tables 2–4, the first column presents the categories identified, and the second column indicates the codes (the numbers of references are shown in parenthesis). Different responses may derive from the same student. Beside the excerpts, the codes S1–S19 are used for the students (S1: Student 1, S2: Student 2, etc.), followed by 'pg' or 'ug' (for postgraduate or undergraduate student, respectively).

3.1. Self-Regulated Learning in the Blended Education Context—Student-Perceived Enablers and Barriers

Table 2 indicates the categories and codes of the first theme (enablers and barriers of SRL in the blended education context). The ways SRL is enabled in blended education environments are grouped under the categories learner autonomy and hybrid course organization/structure. Initially, the majority of participants reported that blended learning helps autonomy, and self-management (e.g., management of time and location) (14 replies). Within the category hybrid course organization/structure, the perceptions with more responses were that the asynchronous mode enables studying at own pace (nine replies), and the online mode is convenient for reasons such as bus strikes or illness (eight replies). Around one-fourth of the sample believed that well-organized hybrid courses and the combination of face-to-face (f2f) with online activities constitute enablers of SRL. The ways that SRL is hindered in blended education contexts are grouped under the categories hybrid course organization, technological barriers, and individual barriers. In the category hybrid course organization, inappropriate course structure (e.g., tools that hinder self-activity, insufficient course management) was reported as an obstacle to SRL (eight replies), followed by the hindrance of interactions/engagement in the online mode of blended education (six replies). Other obstacles were technological (limited technology infrastructure, technical problems) and individual (limited student skills to perform online/digital activities, student difficulties in adapting to blended learning) ones.

Table 2. Categories and codes of the first theme (enablers and barriers of SRL in blended education context).

Categories	Sample Codes
Enablers of SRL in the blended education context	
Learner autonomy	Helps autonomy, self-management (e.g., of time, location) (14)
Hybrid course organization/structure	Asynchronous mode enables study at own pace (9) Online mode convenient (e.g., for work, strikes, illness) (8) Helpful when the hybrid course is well organized (5) Combination of f2f and online activities is an incentive (5) Facilitates interest, participation research work (4) Combination of autonomous learning with teacher support (3)
Barriers to SRL in the blended education context	
Hybrid course organization/structure	Inappropriate course structure (e.g., tools that hinder self-activity, insufficient course management) (8) Online aspect hinders interactions, engagement (6)
Technological barriers	Limited technology infrastructure (3) Technical problems (3)
Individual barriers	Limited student skills to perform online/digital activities (3) Student difficulties to adapt to blended learning (2)
No obstacle at all (5)	

Examples of excerpts on how blended learning enables/helps SRL were:

"In my opinion blended learning enhances SRL, autonomy, and self-management. The student has the ability to manage the time and pace of her study and adjust them based on her needs, and become more efficient. This becomes particularly clear when it is possible to, asynchronously, watch presentations or record the lesson (for later usage)." (S1, pg)

"It enables me to gain more autonomy and responsibility for my learning process as I can choose which topics I want to explore more. . . it gives me more control, freedom and helps me progress at my own pace." (S19, ug)

"It helps me to better manage my time." (S6, pg)

"The combination of face-to-face learning activities with online activities (e.g., educational materials with audio, image, video, simulations) offers incentives for further personal engagement and can improve SRL, autonomous research and learning." (S14, pg)

Another student noted that:

"When the lesson is recorded I have audio-visual material, it makes it easy to watch whenever I want." (S13, ug)

With regard to how blended learning hinders self-regulated learning indicative excerpts were:

"When it (the course) is not properly structured it may not be a motivation for continuing your training." (S8, pg)

"I personally lose interest when the course is done remotely. My (physical) presence in the classroom helps me to be more engaged, even if the speaker is online. Participating in the course is a physical experience, which includes the interaction of the students with the professors and the students with each other, which requires a physical presence, otherwise it does not have the same results." (S17, pg)

"I am worried by the fact that I do not know many things, yet, in the management of the electronic environment." (S3, pg)

Another participant shared:

"Hybrid learning can hinder the student's autonomy in case of his/her inability to adapt to the different way of teaching. The one-sided attachment to strictly traditional teaching methods, the absence of modern technological infrastructure and the difficulty of adopting new technologies use, can hinder autonomous learning." (S2, pg)

3.2. Mobile Learning in the Blended Education Context—Students' Perspectives on Facilitating and Hindering Factors

Table 3 shows the categories and codes of the second theme (enablers and barriers of mobile technology-learning in blended education context). The facilitating factors are grouped under the categories mobile technology benefits, hybrid course organization, individual enablers, and technological enablers. When the category mobile technology benefits was examined, ownership of, and access to mobile devices was most frequently mentioned (16 responses), followed by ease of use, and familiarity with mobile devices (nine replies). Students who commented on hybrid course organization mentioned as enablers appropriate course organization, appropriate educational material/apps, and the mediating role of mobile technology. Educators' knowledge, confidence, and attitudes, as well as devices' updated operating system were reported as individual and technological enablers, respectively. The hindering factors are grouped under the categories individual barriers and technological barriers. In the category individual barriers, most of the students mentioned the limited (or lack of) educators' knowledge and skills (14 responses), whilst fewer stated the limited students' knowledge, skills, or concerns. Within the category technological barriers, the perceptions reported were limited (or lack of) infrastructure (12 replies), unstable internet connectivity, and technical problems. It is noteworthy to mention that most students (15 out of 19) consider that the interactive educational material and the flexibility of time and location increase their interest to learn when mobile technology is used in blended contexts; this view was most frequently mentioned in the category benefits of mobile technology.

Table 3. Categories and codes of the second theme (enablers and barriers of mobile technology learning in blended education context).

Categories	Sample Codes
Enablers of mobile technology learning in the blended education context	
Benefits of mobile technology/learning	Ownership of, and access to mobile devices (anytime, anywhere) (16) Ease of use, familiarity with mobile devices (9)
Hybrid course organization	Appropriate course organization (to integrate mobile devices) (7) Appropriate mobile apps, educational material (8) Mediating role of mobile technology (5)
Individual enablers	Educators' knowledge, confidence, and attitudes (9)
Technological enablers	Updated operating system, new mobile devices (4)
Barriers to mobile technology learning in the blended education context	
Individual barriers	Limited (or lack of) educators' knowledge and skills (14) Limited students' knowledge and skills (7) Student concerns about privacy and data safety (3)
Technological barriers	Limited (or lack of) infrastructure (12) Unstable internet connectivity (or lack of it) (8) Technical problems (in both online and f2f modes) (6)
Ways that blended learning arouse student interest when mobile technology is integrated	
Benefits of mobile technology/learning	Interactive material and flexibility (of time and location) increase interest (15) Practical, convenient way of learning (5)
	Renewal of educational material, various mobile apps (4)

Statements of perceived facilitating factors were:

"A major factor is the ownership of mobile devices, as well as the unhindered access to them. Also, the ease of use of personal mobile devices and the greater familiarity of the participants with these (in comparison to the older generation of mobile/desktop devices)." (S14, pg)

"When there is no ignorance and insecurity on the part of teachers." (S8, pg)

"The teacher has organized the flow of the lesson in such a way that the integration of mobile devices complements/reinforces traditional teaching." (S5, ug)

"The existence of educational materials and interactive resources on the internet (online tools, platforms, etc.)" (S9, ug)

One participant shared:

"In terms of my master's degree, mobile technology greatly aids hybrid learning for the following reasons: First, I can log-in from my mobile wherever I am, to take the course, thus offering me flexibility and convenience. In addition, I can multitask at the same time, such as answering business e-mails and attending class. Finally, I can quickly navigate the internet in order to find information on an educational topic." (S15, pg)

Multiple students highlighted as perceived hindering factors the limited educators' knowledge/skills and the limited infrastructure; examples of relevant excerpts were:

"One of the main factors is the lack of necessary know-how or even appropriate technology to integrate mobile devices in blended education." (S1, pg)

"The teachers themselves are not properly trained and qualified. The trainings have more of a theoretical background rather than a practical one. So the teachers themselves feel insecure about the medium, but also about its correct pedagogical use." (S18, pg)

"The teacher does not have the necessary technological skills for mobile technology integration in the teaching process. . . There is not enough equipment, infrastructure to fully cover the department's needs." (S5, ug)

Another excerpt with regard to students' knowledge/skills, is:

"We are not so familiar with their (mobile technology) use and furthermore we do not know the platforms." (S7, ug)

3.3. Student Expectations from Blended Education Courses

Table 4 presents the categories and codes of the third theme (student expectations of blended learning courses). These are grouped under the categories hybrid course organization, and role of students and teachers. On the category hybrid course organization, the views most frequently mentioned were regarding provision of alternative learning possibilities (11 references), balance between face-to-face and digital/online learning activities (nine references), and access to various teaching material and tools (e.g., video, interactive exercises). A smaller number of participants expected complementary in-person and online meetings, and well-organized blended courses. With regard to the role of students and teachers, views on a more active role for students, teacher–student communication and feedback, as well as educators' professional development, were expressed.

Table 4. Categories and codes of the third theme (student expectations of blended learning courses).

Categories	Sample Codes
Hybrid course organization	Provision of alternative learning possibilities (11) Balance between f2f and digital/online learning activities (9) Access to various teaching materials, tools (e.g., video, interactive exercises) (8) Complementary f2f and online meetings (6) Well-organized blended course (e.g., process and evaluation) (5) Improvement of institutional infrastructure (4)
Role of students and teachers	More active role for students (5) Teacher–student communication and feedback (6) Educators' professional development (4)

Many participants pointed out the provision of alternative learning possibilities and the balance between face-to-face and digital/online learning activities; indicative excerpts were:

"To offer alternative ways of learning and more options for understanding and consolidating the material." (S8, pg)

"A hybrid course should feature a balance between traditional instruction and digital activities, in order to provide the students extra motivation to attend effectively. Also, a well-organized course with a clear organization, monitoring and evaluation system is required." (S6, ug)

"To offer me something more than the traditional lecture. . .e.g., access to knowledge that we would not normally have without the use of technology." (S10, pg)

Some excerpts describing access to various teaching material/tools and teacher–student communication were:

"To have access to a variety of teaching materials such as videos, exercises and other tools that can improve my understanding of the course" (S19, ug)

"To have enough communication with my teacher, who should be available for questions and to provide feedback" (S9, ug)

4. Discussion

This study explored university students' perceived enablers and barriers of self-regulated and mobile-mediated learning in blended education environments. The findings add value to the increasing body of evidence on post-pandemic blended higher education.

With regard to the first theme (enablers and barriers of SRL in the blended education context), student-perceived SRL enablers/facilitators are grouped under the categories learner autonomy and hybrid course organization/structure, while SRL barriers/obstacles are grouped under the categories hybrid course organization, technological barriers, and individual barriers. Most participants believe that blended learning helps their autonomy and self-management of time and/or location; this view is shared by Chinese students who report on blended learning as a facilitator for learner autonomy [4]. Hybrid course organization/structure is perceived both as an enabler and barrier of SRL in blended format environments; i.e., an enabler when the course is well organized, and an obstacle when it is inappropriately/insufficiently structured. One example is the online component of the blended course, which is considered as convenient for some circumstances such as work purposes, while it is also perceived as a barrier for interactions and student engagement in academic studies (see Table 2). There is some agreement with student perceptions in Saudi Arabia [19] and the Maldives [20], where the flexibility of the online blended learning mode is considered as a benefit. One-fourth of this study's sample noted that the combination of face-to-face and online activities is an incentive, which aligns with views expressed by students in the above-mentioned studies [19,20]. The perceived technological barriers

are with regard to limited technology infrastructure and technical problems, while the individual barriers are associated with limited student skills or difficulties in adapting to blended learning. The categories identified as enablers and/or barriers have implications for educators and university practice and are discussed later on. In the SRL process, learners set goals, make plans, use strategies, monitor/control their learning, and engage in evaluation/reflection of learning [11]. In order for students to actively self-regulate their learning, barriers should be eliminated. For example, tutors may use the affordances of blended learning to enhance students' SRL skills; such skills are important in online learning (to help students coordinate themselves). In parallel, digital technology and web-based tools may facilitate the improvement of SRL skills (strategic planning, etc.) and allow interaction with diverse forms of learning material (e.g., knowledge visualization tools).

With regard to the second theme (enablers and barriers of mobile technology learning in the blended education context), student-perceived enablers/facilitators are grouped under the categories benefits of mobile technology, hybrid course organization, individual enablers and technological enablers, while barriers/obstacles are grouped under the categories individual barriers and technological barriers. Major factors that facilitate mobile technology use in blended learning contexts, as perceived by students, are ownership of and access to mobile devices, followed by ease of use and familiarity with mobile devices. Ownership of, familiarity with, and ease of use of mobile devices are student-perceived mobile learning facilitators documented in recent studies [8,26,27,31,33]. Personalization is highlighted as a central pedagogical feature of mobile learning [41] and it is associated with ownership of mobile devices and autonomous learning. Ownership of and familiarization with mobile devices can facilitate learners' autonomy and SRL; the sense of ownership together with the autonomy to set goals may, in turn, enhance student motivation. In this study, appropriate hybrid course organization (e.g., integration of appropriate educational material/apps) is also perceived as an enabler/facilitator; it is noteworthy that most participants noted that interactive educational material (together with mobile learning flexibility) increase their interest in blended contexts (Table 3). It is suggested that autonomous learning should be supported by suitable online resources. The increased adoption of affordable mobile devices (e.g., smartphones) needs to be further investigated for access to quality educational apps/materials. During the pandemic, some learning materials were well organized and useful for the learners [6]; thus, attention should be paid to the design of suitable educational apps for different subjects. According to this study's participants, individual enablers and/or barriers include educators' knowledge, confidence, and attitudes, as well as students' knowledge and skills. For example, educators' knowledge, skills, confidence, and attitudes can facilitate or hinder mobile technology use in blended contexts, according to whether these are sufficient or limited/insufficient (see Table 3); this perceived individual enabler/barrier is also documented in studies in Saudi Arabia and India [26,27]. The role of educators in tertiary education blended context is essential; it is linked with blended course organization and has implications for educators. Limited student knowledge or skills were also reported in the study [27]. Technological obstacles such as limited infrastructure and unstable internet connectivity were also identified; such barriers align with recent studies [26,28]. The identification of barriers has implications for university policy and student training and is discussed later on.

With regard to the third theme (student expectations concerning blended learning courses), expectations are grouped under the categories hybrid course organization, and role of students and teachers. Within the category hybrid course organization, expectations concerning blended education courses include provision of alternative learning possibilities, balance between face-to-face and digital/online learning activities, access to various teaching material and tools, complementary in-person and online meetings, and well-organized blended courses (e.g., in terms of process and evaluation). Students expect a balance between in-person and online activities and meetings, indicating that they appreciate the physical presence in classrooms; this finding is in accordance with recent studies [8,21]. The in-person and online components/aspects of blended education have

their own strengths, and when used in combination can complement one another. It is suggested that online activities/tasks should be complementary and be applied in balance with face-to-face traditional activities. Even better, the online component of blended format could be utilized so as to improve the whole teaching–learning process; for example, by encouraging student motivation and SRL strategies, or via creation of digital content and interactive activities. With regard to student and teacher roles, student expectations include a more active role for students, and teacher–student communication and feedback. The combination of in-person and online interactions has been reported as a blended learning benefit in recent studies [19,20]. Education policymakers need to be aware of student expectations to make suitable decisions.

The findings of this study have implications for students, educators, and university policy makers. The provision of student support (pedagogical and institutional support) to increase students' level of SRL in order, for example, to set/achieve learning goals, adjust learning strategies, interact with digital learning environments, manage time, or reflect on their learning, is very essential. The use of mobile devices facilitates university students' self-regulation process and, in turn, their learning performance [42]. The mobility and autonomy of SRL can enhance students' interest and engagement with their studies. Student training is recommended to assist students in regulating their learning strategies to adapt to the different blended learning modes (mixture of face-to-face with online activities) and be confident with digital mobile technology. Training may help them apply strategies (such as e-book note-taking) that affect their SRL in the blended context [43]. One finding with regard to student expectations is for a more active role; it is recommended for students to also be involved in resource/material development (here signifying resource creation as a means for supporting SRL in the blended context). The organization/structure of blended format courses was perceived by this study's participants as an enabler and barrier; thus, training and support for those involved (mainly educators) is a challenge. Educators need to be aware of student perceptions, manage student expectations for hybrid learning, and organize appropriate blended format courses. Understanding student perspectives on SRL may influence, for example, the organization, management, and implementation of effective blended learning courses; e.g., use of strategies/approaches that facilitate self-paced learning, pedagogical support, and immediate feedback. Organization of appropriate and efficient blended courses is recommended for both undergraduate and postgraduate levels. For example, blended courses that include a combination of appropriate face-to-face and online learning activities, integrate mobile technology (to assist both in-person and online modes), and utilize the online component to improve the educational process (e.g., online tools that enable SRL and assist interactions). Pedagogical practices need to encourage students to have an active role and be engaged in the learning process. Educators' digital technology skills may assist in creating teaching materials (e.g., educational videos), utilizing asynchronous and synchronous tools for teaching, adapting, and monitoring online activities/material, as well as organizing the online learning environment. Teachers could use the affordances/benefits of blended learning (e.g., flexibility) to facilitate the exercise of SRL skills in students; e.g., designing tasks in which students have opportunities for autonomy, decision making, and collaboration [44], or adopting appropriate systems to support SRL in blended learning practices [45]. Professional development can facilitate teachers in acquiring knowledge of and skills in developing students' SRL skills [46]. Sustainable digital pedagogies (including mobile technology-supported pedagogies) and innovative blended practices are recommended.

The study's findings can inform tertiary education policy and practice by providing insights into student perspectives. Mobile learning is likely to play an increasingly important role in university teaching and in hybrid courses; mobile technology-supported learning is a pragmatic and sustainable approach. Since digital transformation involves adjustment, educational policies could be reconsidered to adopt/reinforce hybrid modes of education (these can be supported by mobile practices) and enhance organizational, technological, and academic management. Flexible and resilient educational policies should be favorable

towards adoption and use of mobile devices for academic purposes. Appropriate infrastructure and digital learning resources/material, support, cooperation, and a shared vision may assist in the sustainability of blended approaches. It is recommended to strengthen digital (mobile) technology infrastructure, ensuring stable internet to eliminate technological obstacles; for example, infrastructure for classrooms and laboratories for application of blended lessons, where some students are physically present while others are online (thus, enabling interactions). In addition, the creation of interactive digital educational material/resources is suggested; this can take place within the context of university research projects as a result of cooperation between university specialists from different academic fields. Communication and cooperation among stakeholders (policy makers, educators, administrators, etc.) is suggested, as well as possible partnerships to advance competence building for blended approaches in tertiary education. For example, policy initiatives have an important role in student and education training, and in facilitating and planning for blended strategies adoption within the universities.

The limitations of this pilot study include the sample size, the method of sample recruitment, and the use of only a descriptive analysis. Initially, the sample size was small and was therefore convenient; this and the other above-listed limitations could have affected the reliability of the research. The participant undergraduates had less post-pandemic blended learning experience in comparison to the postgraduates, and this is another limitation. Also, the participants' perceptions reflect their personal experiences, and most participants were female students studying theoretical subjects. The analysis included little detail on coding levels or cross-checking, and this may have affected the data. The identification of students' perceived enablers and barriers of self-regulated and mobile-mediated learning in blended education environments post-pandemic is planned to be used for the construction of a questionnaire (in order to be administered to a large and more diverse sample). Possible differences between academic levels (undergraduate and postgraduate) or among academic fields (theoretical and practical subjects) are suggested to be explored in future investigations. For example, the inclusion of participants from a wider range of academic fields can provide a more comprehensive understanding of the topics under exploration.

5. Conclusions

Hybrid teaching is a mode that can become a leading higher education feature if it supplements face-to-face [29]. The scope of this pilot study was to identify tertiary education students' perceived enablers and barriers of self-regulated and mobile-mediated learning in blended education environments. A major limitation of this study is the sample size with the low level of representativeness; however, these findings add evidence for future research studies to build upon them. The findings indicated that most participants believe that blended learning helps their autonomy and self-regulated learning, while it is facilitated by ownership of, and ease of use and familiarity with, mobile devices. The main enablers/facilitators, but also barriers, of self-regulated and mobile-mediated learning in blended contexts are the course structure (the online component of blended education, appropriateness of educational activities, and educational material), and individual (educators' knowledge, skills, confidence, attitudes, and students' knowledge, skills, concerns) and technological (infrastructure, internet connectivity) factors. Student expectations concerning blended education courses are associated with course organization (e.g., provision of alternative learning possibilities, a balance between face-to-face and digital/online learning activities, and access to various teaching material/tools) and the role of students and teachers. Considering the rapid rise in the number of studies, the findings of this study can add to the growing body of evidence associated with the topics of self-regulated and mobile-mediated learning in blended tertiary education environments/contexts. The implications for students, educators, and university policy are discussed.

SRL in higher education is increasingly more important, because success in blended learning context/environments requires students to be more independent, autonomous,

and active when they engage in the learning process. SRL skills become increasingly important as online/blended technology-rich learning environments become more autonomous [25]. In the digital environment, student SRL skills are recognized as a basic competence [47], while technology facilitates such skills [48]. Mobile technology-mediated learning is suggested to support students, while future studies could explore pedagogies associated with the concept of SRL in blended education contexts. The pandemic has accelerated the adoption of blended (and online) education in tertiary education and there has been a rise in the popularity and in the number of blended education studies [2,5,49]. The blended format requires a level of discipline, self-motivation, and responsibility for managing one's own learning. Blended learning can be considered as a 'new' sustainable approach in tertiary education, and it is particularly suitable for postgraduate students who have families and employment responsibilities. Sustainability relates to the degree to which blended learning implementation can be maintained (or not) over time; e.g., to ensure that after the pandemic it endures within different contexts such as educational or cultural contexts. As blended learning environments are under-researched [50], we suggest investigating the topics of SRL and mobile technology-mediated learning in blended environments. These topics are associated with digitization of the educational reality; post-pandemic, the debate on digitization and digital transformation in higher education is more active [8]. Mobile technology-supported pedagogies are part of sustainable digital pedagogies. Future studies which adopt sustainable models/frameworks for mobile learning in tertiary education [51] are suggested in order to also explore the dimension of blended mode of education. Future research is suggested in order to explore different topics related to the sustainability of blended teaching and learning.

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