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Mobile-Assisted English Learning among Medical Students with Varying English Proficiency

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ABSTRACT

This study examined medical students' usage and acceptance of mobile-assisted English learning (MAEL) in a Chinese context. 184 medical students with varying levels of English proficiency, from beginner to advanced, at a university in China participated in the study. A quantitative method was used in the study. A questionnaire on the acceptance of mobile learning was used to understand students' perceptions of mobile-assisted English studies. Descriptive analysis and one-way ANOVA were employed to examine differences among three groups of medical students with varying levels of English competence. The results suggested that medical students' acceptance of mobile-assisted English learning was positively associated with their English proficiency. Medical students with advanced English proficiency achieved the highest scores. There were significant differences among the three groups of medical students with varying English proficiency in perceived usefulness, perceived easiness, perceived playfulness, perceived facilitating conditions, subjective norm, voluntariness, and image. Students' ages, possession of mobile devices, and perceptions of and obstacles to mobile-assisted English learning were also observed. Although medical students generally accepted mobile-assisted English learning, they reported several challenges. The findings of this study help understand the perceptions and challenges of mobile-assisted English learning among medical students with varying English levels, and promote the use of mobile-assisted English learning for English improvement and professional development.

Keywords: Medical Students; Mobile-Assisted English Learning; Varied English Proficiency; Perception; Acceptance

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1. Introduction

With the rapid development of information and Internet technologies, the use of mobile learning with mobile devices, such as smartphones, tablets, and PDAs, is becoming increasingly popular in academic settings^[1]. Mobile learning addresses key challenges in traditional English teaching in higher education that may limit opportunities for learners' participation and autonomous language practice^[2]. By leveraging the advantages of mobile learning, learners gain enhanced access to learning resources, engage in learning processes more, and participate more collaboratively. Consequently, they boost their academic performance and satisfaction^[3,4]. With mobile learning, instructors can organize various teaching activities. The teaching time and space have greatly expanded, moving from in-class to after-class. On the other hand, college students have access to online learning resources and are able to perform mobile learning anytime and anywhere. Apart from ubiquity and mobility, another distinct feature of mobile learning is the convenience of communication and frequent interaction for learners in the mobile context. Therefore, it has unique edges in higher education.

Mobile learning is suitable for language teaching and learning. It's proven to be effective in improving EFL learners' vocabulary, grammar, reading skills, writing skills, and solving the difficulties learners encounter during foreign language learning^[5,6]. Many previous studies examined factors influencing students' acceptance of mobile learning without focusing on a specific major^[7,8]. Few researchers have conducted studies on mobile learning in medical contexts, with little attention to medical students' acceptance of mobile learning in such environments^[9].

Compared with English studies for general purposes, medical students learn English for medical purposes, and they struggle with insufficient L2 vocabulary, which negatively impacts their listening, speaking, reading and writing skills and the inadequacy of disciplinary terminology associated with academic success^[10]. A majority of medical students are dissatisfied with less time and attention on the current higher education English teaching curriculum, and the lack of medical-related texts in English textbooks. Many of them found the current English language courses did not meet their language learning needs^[11]. It resulted in a lack of communicative competence in interacting with others

effectively and hindered the further development of their academic performance and future careers^[12,13]. Therefore, mobile learning meets medical students' specific needs for English study by providing specialized materials with medical content. Mobile-assisted English learning with medical purposes benefits medical students' language acquisition, improving their language competence and expanding their vocabulary in the medical field.

This study examined medical students' acceptance of mobile-assisted English learning specifically. Medical students with three different English levels—from beginning to advanced—at a medical university in a southern province in China participated in the study. Since mobile-assisted English learning meets medical students' English learning needs and could greatly improve their English outcomes, it is not only essential for their English study, but also plays an important role in their major study and career. The study also sheds light on the challenges of mobile-assisted English learning for medical students and the implementation of mobile learning across diverse disciplines. Besides, it offers a useful pedagogical experience for mobile-assisted language learning (MALL).

2. Literature Review

2.1. Mobile Learning

Mobile learning is closely related to distance education and e-learning and is a current popular trend in new technologies^[14]. It was defined as the intersection of mobile computing and e-learning^[15]. Winters summarized four distinct features of mobile learning, namely techno-centric, relationship to e-learning, augmenting formal education, and learner-centered^[16]. Kukulska-Hulme emphasized mobile learning's feature of learning mobility, which means that learners can engage in educational activities without physical location limits^[17]. With the use of mobile devices and mobile internet services, mobile learning facilitated interactions and collaboration among individual learners^[18].

Given mobile learning's unique advantages, it is considered effective for improving learners' academic performance and is widely employed in higher education. Various mobile systems were designed and employed to meet the needs of mobile teaching for different subjects. Mobile augmented reality (MAR) applications were developed and used

in the digital electronics course^[19]. An instant messaging app, Telegram, was used in language teaching, and it was found to improve female adult learners' grammar accuracy. As a useful learning aid, it improved the language acquisition of learners^[20].

Researchers have conducted studies on learners' perceptions and the influencing factors of mobile-assisted language learning. It turned out that mobile learning has been widely used in EFL contexts, and EFL learners held a welcoming attitude toward mobile-assisted language learning. Al-Rahmi et al. examined key factors influencing university students' behavioral intention and their use of mobile learning in higher education^[21]. In the Iranian context, EFL students were positive about mobile learning and mobile devices in EFL learning, as they provided opportunities for ubiquitous learning, internet access, multimedia use in the classroom, and portability^[22]. Chen undertook a similar study on the perceived acceptance of mobile learning, not only from the perspective of students, but also from that of EFL university instructors^[23]. The results showed high levels of perception and acceptance of M-learning for EFL from both instructors and students. Perception and acceptance were positively associated with the acceptance of M-learning for EFL. Önal et al. used a mobile game (SOS Table) in "Tenses in English" at a state university in Turkey, and the findings indicated that the mobile learning tools positively influenced students' views of mobile learning^[24]. At the same time, it improved students' motivation and acceptance of English language learning.

2.2. Mobile-Assisted English Learning in China

Mobile-assisted language learning refers to the use of mobile devices to support language learning in formal or informal settings for learners of all ages. MALL creates opportunities for innovative, engaging learning activities and enhances language acquisition and learner engagement^[25]. The researchers in China originally defined mobile learning as a new form of distance learning, an extension of digital learning, and a brand-new learning technology characterized by its mobility and situational characteristics^[26]. Research focus on mobile-assisted English learning in China can be summarized into three main categories: mobile learning design, mobile learning applications and platforms, and mobile learning technology.

Mobile learning design is the first research focus. Only by carefully designing each mobile learning session can an ideal teaching effect be achieved. A "three-stage asynchronous" teaching mode for a blended flipped classroom was constructed using a mobile learning platform, which improved learners' learning engagement, self-efficacy, and performance^[27]. Zhang and Bi proposed a college English mobile learning system based on the Conversation-Activity-Distribution (CAD) model and implemented it for English vocabulary teaching^[28]. The teaching effect was also promoted. Three mobile applications were used to support undergraduate oral English learning, and the results showed that they enhanced students' speaking competence and overall learning experience^[29]. The second research focus is mobile learning, supported by applications and platforms. Researchers used Mosoteach and Rain Classroom to support mobile learning in English and other courses and explored their outcomes^[30,31]. Guo and Wang integrated WeChat into the MALL and explored its effect on students' engagement and learning outcomes in College English^[32]. In addition, Fan and Wang examined the effect of gamified interaction in mobile learning apps on users' learning experiences and performance^[33]. Android and iOS systems were also used to develop a mobile learning environment for English study^[34,35]. A specific mobile learning platform was developed by a university for College English IV, and it significantly improved participants' learning outcomes, cognitive load and satisfaction^[36]. Another research emphasis in mobile learning technologies included augmented technologies and other approaches. Augmented Reality (AR)-supported technology has become a major focus of research in MALL. Zhang et al. introduced three existing AR design frameworks in the mobile learning contexts with a strong theoretical basis and aimed to promote the use of advanced technology in English language education^[37]. The Production-Oriented Approach (POA) was used with mobile learning on EFL learners, and the result indicated that learners enhanced their satisfaction, boosted motivation and significantly improved learning outcomes^[38].

2.3. Medical Students' Acceptance of Mobile-Assisted English Learning

Considering medical students' specific needs in English study and their limited English proficiency, it is necessary to incorporate e-learning and computer-assisted language learn-

ing to improve their job-related language competence and efficiency. Furthermore, it facilitates their use of mobile learning and promotes their English performance and further professional development. Medical students' acceptance of mobile-assisted English learning needs further exploration. Kim applied a free mobile classroom app, Socrative, in a Medical English course and found that students were positive and satisfied with the new mobile technology. Socrative worked effectively as a tool to organize formative assessment and provide formative feedback. Students engaged more actively in English study in class, and their self-efficacy and English performance improved^[39]. Önal et al. used a mobile game, SOS Table, to study tenses. The participants found the mobile learning tool well received^[24]. Their motivation and attitude were shaped during the application process. Medical students' acceptance of mobile learning was analyzed from psychological and behavioral perspectives using the framework of the theory of planned behavior (TPB). It was revealed that attitude and perceived behavioral control significantly influenced students' intention to adopt mobile learning^[9].

Medical students spend little time studying English, and their English courses did not make full use of mobile learning methods. Currently, few studies have focused on mobile learning for medical students, examining the effects of mobile devices and tools on academic performance, medical undergraduates' attitudes, perceptions, and involvement in mobile learning^[40,41]. Scarce studies have investigated students with varying levels of English proficiency and their perceptions of mobile learning. This study examined medical students' acceptance of mobile-assisted English learning to help them learn English in a continuous and lifelong way. A total of 184 medical students from three groups with varying English levels, ranging from beginner to advanced, participated in the study. Questionnaires on mobile learning acceptance were designed using the main constructs of TAM2 and UTAUT to assess medical students' acceptance of mobile-assisted English learning^[42]. They were sent to the students after one year of English study, with assistance from mobile learning. Comparisons and analyses were conducted among three groups of students to understand differences in perceptions, acceptance, and obstacles. The research questions are as follows.

1) How do medical students with different English proficiency levels (low, intermediate, and high) differ in

their acceptance of and perceptions toward mobile-assisted English learning?

2) How do the three groups of medical students perceive mobile-assisted English learning, and what are their challenges in studying English with the assistance of mobile learning?

3. Methodology

This survey aimed to investigate the holistic impact of mobile-assisted English learning among three groups of medical students with English proficiency levels ranging from beginning to advanced at a medical university in southern China. The acceptance and perceptions of three groups regarding mobile-assisted English learning were examined using questionnaires. Quantitative data were collected and analyzed using SPSS 26.0. Medical students' perceptions and challenges of mobile-assisted English learning were also analyzed.

3.1. Participants

First-year medical college students at a medical university in southern China participated in the study. The students came from different regions in China. They learned the College English course by following instructions using mobile-assisted English learning. Based on their performance in the final English exam of the first semester in the first year, the medical students were divided into three groups with different English levels, from beginner to advanced, in the second semester of the first year. The upper 27% (50) of students were placed in the advanced English proficiency group, the lower 27% (50) in the beginning English proficiency group, and the rest (84) in the intermediate English proficiency group^[43]. Participants were randomly selected and voluntarily took part in the study. They were informed about the study's purpose, voluntary participation, confidentiality protections, and their right to withdraw at any stage without penalty.

3.2. Instrument

3.2.1. English Proficiency Test

This study used a quantitative method to investigate the acceptance of mobile-assisted English learning among medical students with varying English proficiency levels. The

College English Test Band 4 (CET 4), a compulsory, nationwide, and authorized English proficiency test in China, was used to assess the competence of non-English majors. After completing one year of mobile learning in their first-year College English course at university, the medical students took the final English exam following the College English Test-Band 4 (CET-4) pattern, but with a lower level of difficulty.

3.2.2. Questionnaire on Acceptance of Mobile-Assisted English Learning

A questionnaire on acceptance of mobile-assisted English learning was designed with reference to questionnaires on mobile learning used in this study^[44]. The construct of the scale referred to the extended technology acceptance model (TAM 2)^[45] and the Unified Theory of Acceptance and Use of Technology (UTAUT)^[46].

The questionnaire consisted of three parts, with a total of 31 items. The first part investigated the demographic information of medical students, such as age, gender, English proficiency, and mobile device usage. The second part aimed to understand the acceptance of mobile-assisted English learning among medical students with different English levels (25 items): perceived usefulness (3 items; e.g., I think mobile-assisted English learning can improve my English learning efficiency), perceived ease of use (3 items; e.g., When conducting tasks to learn English, operating the mobile learning application is very simple), perceived playfulness (5 items; e.g., Using mobile learning to study English will lead my exploration), perceived facilitating condition (3 items; e.g., I hope there is guidance and assistance within the application when I am learning English), subjective norm (4 items; e.g., People who influence my behavior think that I should use mobile-assisted English learning), voluntariness (3 items; e.g., I voluntarily engage in mobile-assisted English learning) and image (4 items; e.g., People who use mobile-assisted English learning have a higher status in the education system). A five-point Likert scale was used in this part. 1 means “strongly disagree” and 5 means “strongly agree”. The Cronbach’s Alpha of the second part was 0.933, which is much higher than 0.7, indicating that its internal consistency and reliability are very high. Validity was also conducted. The KMO value was 0.897, exceeding 0.8. It showed the high validity of the scale. The third part had two open questions. Medical students expressed their willingness to use mobile learning in English study and the barriers to it,

based on their learning experiences.

3.3. Data Collection and Analysis

An online questionnaire was generated and sent to the participants via Wenjuanxing, a widely used and popular online questionnaire platform in China. Students scanned the QR code and completed the questionnaire within 20 min, reflecting their authentic classroom situations at the end of the second semester of the first year, with clarified instructions. The questionnaire was completed anonymously, and it wouldn’t affect students’ final English assessment. After the questionnaires were returned, researchers with expertise checked the answers carefully and deleted invalid or blank questionnaires. There were 184 valid questionnaires in total. Moreover, the effective response rate was 93.88%.

The Statistical Package for the Social Sciences (SPSS) 26.0 was used to analyze the data of this study. Descriptive analysis was used to show medical students’ demographic information, such as gender, age, English proficiency, and mobile device usage. To answer the first research question, a one-way ANOVA was conducted to examine whether there were differences among three groups of medical students with varied English levels in their acceptance of mobile learning in English study. The assumption test was run and the result showed that the homogeneity requirement of one-way ANOVA was met. Post-hoc analyses were conducted to confirm the significant differences identified by ANOVA. Then, word clouds were generated to visualize the frequency of words appearing in the open-ended responses. To improve the reliability of the qualitative data analysis, the analysis function and the word cloud map of Wenjunxing were used.

4. Results

4.1. Demographic Information of Three Groups of Medical College Students

The demographic information of participants was displayed in **Table 1**. A total of 184 valid questionnaires were analyzed in the study. About two-thirds of the students were female in all three groups. The students’ ages ranged from 17 to over 20 years old. It’s noteworthy that students with a beginning English level started college later than their coun-

terparts. 72% of them were 19 years old or above. As for medical students with intermediate English proficiency, the percentage of those who were older than 19 years dropped to 36.9%. And only 16% of students with an advanced level of English were older than 19.

Regarding mobile devices owned by medical students, almost all students possessed smartphones. Compared with

students at the beginning and intermediate levels, medical college students with advanced English proficiency were adept at using diverse mobile devices and used them frequently for mobile-assisted English learning. 82.00% had personal computers, and 40.00% had laptops. In addition, their possession of e-books (24.00%), and e-dictionaries (22.00%) was higher than the other two groups.

Table 1. Demographic information of three groups of medical students.

	Beginning (n = 50)	Intermediate (n = 84)	Advanced (n = 50)
Gender			
Male	20 (40.00%)	28 (32.90%)	16 (32.00%)
Female	30 (60.00%)	56 (67.10%)	34 (68.00%)
Age			
17 years	2 (4.00%)	2 (2.38%)	4 (8.00%)
18 years	12 (24.00%)	51 (60.71%)	38 (76.00%)
19 years	21 (42.00%)	26 (30.95%)	5 (10.00%)
≥20 years	15 (30.00%)	5 (5.95%)	3 (6.00%)
Mobile Devices Usage (Multiple Choices Allowed)			
PC	10 (20.00%)	64 (76.19%)	41 (82.00%)
Laptop	7 (14.00%)	9 (10.71%)	20 (40.00%)
Smartphone	48 (96.00%)	84 (100.00%)	50 (100.00%)
e-book	4 (8.00%)	7 (8.33%)	12 (24.00%)
e-dictionary	7 (14.00%)	13 (15.48%)	11 (22.00%)

4.2. Three Groups of Medical Students' Acceptance of Mobile-Assisted English Learning

According to the questionnaire, the average scores of the three groups of medical students generally increased with improvements in their English proficiency. The mean scores of the three groups of medical students were all greater than 3, except for the image item, indicating that students gener-

ally recognized the positive effect of mobile-assisted English learning on improving the efficiency and performance of English study. Medical students at an advanced level achieved the highest score on voluntariness, followed by perceived facilitating condition and perceived ease of use. The students with a beginning English level scored the lowest on image, perceived playfulness, and subjective norm (see **Table 2**).

Table 2. Descriptive analysis of acceptance of mobile-assisted English learning among three groups of medical students.

		Mean	N	Min	Max	Mean	SD
Perceived usefulness	Beginning English proficiency		50	2.00	4.33	3.22	0.45
	Intermediate English proficiency		84	2.00	5.00	3.32	0.52
	Advanced English proficiency		50	1.33	5.00	3.58	0.71
Perceived ease of use	Beginning English proficiency		50	1.67	4.67	3.32	0.59
	Intermediate English proficiency		84	3.00	5.00	3.59	0.53
	Advanced English proficiency		50	2.67	5.00	3.69	0.63
Perceived playfulness	Beginning English proficiency		50	1.00	4.00	3.12	0.48
	Intermediate English proficiency		84	2.20	5.00	3.15	0.46
	Advanced English proficiency		50	2.00	5.00	3.38	0.69
Perceived facilitating condition	Beginning English proficiency		50	2.00	4.33	3.44	0.49
	Intermediate English proficiency		84	2.00	5.00	3.62	0.55
	Advanced English proficiency		50	2.00	5.00	3.70	0.68
Subjective norm	Beginning English proficiency		50	1.50	4.25	3.17	0.60
	Intermediate English proficiency		84	1.50	5.00	3.32	0.59
	Advanced English proficiency		50	1.00	5.00	3.51	0.76
Voluntariness	Beginning English proficiency		50	2.33	4.00	3.31	0.41
	Intermediate English proficiency		84	1.00	5.00	3.39	0.60
	Advanced English proficiency		50	3.00	5.00	3.75	0.61
Image	Beginning English proficiency		50	1.00	4.00	2.89	0.58
	Intermediate English proficiency		84	1.67	5.00	2.84	0.59
	Advanced English proficiency		50	1.00	5.00	2.93	0.93

The first research question aimed to explore differences among three groups of medical students regarding their acceptance of mobile-assisted English learning. As presented in **Table 3**, very significant differences were found for perceived usefulness ($F = 6.35, p = 0.002$), perceived ease of

use ($F = 6.09, p = 0.003$), and voluntariness ($F = 6.90, p = 0.001$). Perceived playfulness ($F = 3.95, p = 0.021$). Perceived facilitating condition ($F = 3.07, p = 0.049$), subjective norm ($F = 3.84, p = 0.023$), and image ($F = 4.11, p = 0.018$) also reached statistical significance.

Table 3. One-way ANOVA of mobile-assisted English learning among three groups of medical students.

Dependent Variables	Type III Sum of Squares	DF	Mean Square	F-Value	Sig.
Perceived usefulness	4.19	2	2.09	6.35	0.002**
Perceived ease of use	4.08	2	2.04	6.09	0.003**
Perceived playfulness	2.37	2	1.18	3.95	0.021*
Perceived facilitating condition	2.09	2	1.05	3.07	0.049*
Subjective norm	3.28	2	1.64	3.84	0.023*
Voluntariness	3.19	2	1.59	6.90	0.001**
Image	2.59	2	1.29	4.11	0.018*

Note: * $p < 0.05$, ** $p < 0.01$.

Post-hoc comparisons using the Least Significant Difference (LSD) test were conducted to identify specific group differences (see **Table 4**). The results revealed that the advanced English proficiency group consistently scored higher than the low-proficiency group across all seven dimensions. Notably, the most pronounced differences between the low and advanced groups were found in perceived usefulness

($p = 0.002$), perceived ease of use ($p = 0.002$), and voluntariness ($p = 0.001$). The advanced group also significantly outperformed the intermediate group in perceived usefulness ($p = 0.027$). However, no statistically significant differences were found between the low and intermediate groups for most constructs, except for perceived ease of use ($p = 0.027$), where the intermediate group reported higher scores.

Table 4. Post-hoc analysis for the ANOVA.

Dependent Variables	Comparisons	Mean Differences	Standard Error	Sig.
Perceived usefulness	Beginning–Intermediate	0.113	0.105	0.532
	Beginning–Advanced	0.373	0.109	0.002**
	Intermediate–Advanced	0.260	1.000	0.027*
Perceived ease of use	Beginning–Intermediate	0.276	0.106	0.027*
	Beginning–Advanced	0.375	0.110	0.002**
	Intermediate–Advanced	0.099	0.100	0.584
Perceived playfulness	Beginning–Intermediate	0.037	0.100	0.926
	Beginning–Advanced	0.261	0.104	0.035*
	Intermediate–Advanced	0.224	0.095	0.051
Perceived facilitating condition	Beginning–Intermediate	0.188	0.107	0.189
	Beginning–Advanced	0.272	0.111	0.041*
	Intermediate–Advanced	0.084	0.101	0.686
Subjective norm	Beginning–Intermediate	0.152	0.120	0.416
	Beginning–Advanced	0.342	0.125	0.018*
	Intermediate–Advanced	0.190	0.113	0.216
Voluntariness	Beginning–Intermediate	0.142	0.088	0.244
	Beginning–Advanced	0.336	0.092	0.001**
	Intermediate–Advanced	0.194	0.083	0.054
Image	Beginning–Intermediate	0.170	0.103	0.228
	Beginning–Advanced	0.307	0.107	0.013*
	Intermediate–Advanced	0.137	0.097	0.339

Note: * $p < 0.05$, ** $p < 0.01$.

4.3. Students' Perceptions and Challenges of Mobile-Assisted English Learning

Although medical students were willing to use mobile-assisted English learning, they also had some concerns.

Among medical students with a beginning English level, 58% reported that using mobile devices or apps would distract their attention during English learning, and 18% admitted that they lacked experience with mobile devices. 16% of them found it inconvenient to use mobile devices for learn-

ing English compared with traditional learning. For students with an intermediate level of English, about half perceived that mobile devices and applications might compromise their study efficiency, citing inconvenience as a main concern. 12.33% of them indicated unfamiliarity with using mobile devices in English studies. Although 40.98% of students with advanced English proficiency agreed that mobile devices and applications could cause distraction and that they were not very convenient, the group was willing to explore mobile-assisted English learning and demonstrated greater experience with it (see **Figure 1**).

Despite the concerns, students across all proficiency levels admitted the positive effects of mobile-assisted English learning. Students at the beginning level conceived

mobile learning as useful for English study, as it provided various English learning resources that enabled them to learn independently after class. Students with an intermediate English proficiency held a similar view, reporting that mobile-assisted English learning made it easy to study English anytime, anywhere, without time or space limits. Students at an advanced level of English reported the highest acceptance of mobile-assisted English learning. They were able to make full use of their time after class by using mobile devices and learning applications. Moreover, they could complete in-class assignments and tailor their after-class English learning through mobile tools. The approach facilitated their online communication with peers and enabled them to receive timely feedback from the teacher (see **Figure 2**).



Figure 1. Students' challenges in mobile-assisted English learning.

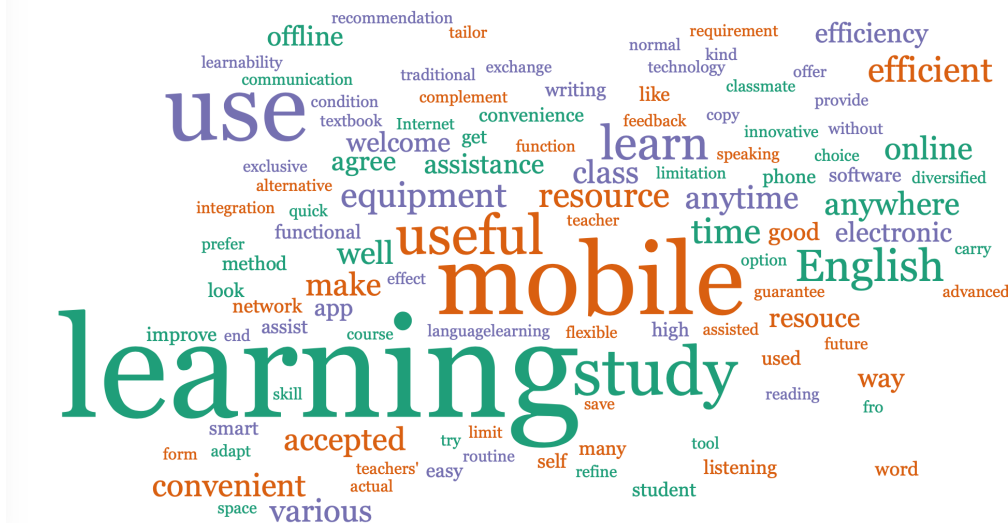


Figure 2. Students' perception of mobile-assisted English learning.

In summary, the primary obstacles identified across the three groups were distraction and inconvenience associated with certain mobile devices in the English study. Some students found reading and writing on small screens cumbersome, with frequent interface switching posing further difficulties. Nevertheless, as English proficiency improved, students tended to gain more experience with mobile devices. Overall, a majority of students maintained a welcoming attitude toward mobile-assisted English learning, balancing awareness of its limitations with recognition of its pedagogical benefits.

5. Discussion

This study examined the acceptance of mobile-assisted English learning among three groups of medical students using a quantitative method. It aimed to get a holistic understanding of medical students' use of mobile-assisted English learning. The results showed that medical students' acceptance of mobile-assisted English learning increased as their English proficiency improved. There were significant differences in the acceptance of mobile-assisted English learning in all measured constructs. Despite some challenges, medical students generally welcomed the use of mobile-assisted English learning under guidance.

5.1. The Differences among the Three Groups of Medical Students

Students with an advanced English level entered university earlier than medical students with beginning or intermediate English levels. With better English proficiency, they were more motivated to use various mobile devices for mobile-assisted English learning. The study highlighted the importance of age and English proficiency in learners' acceptance of and perceptions of mobile-assisted English learning in the Chinese context. It's supported by Qashou's finding that age, gender and educational level were key determinants of users' intentions toward mobile learning in a foreign context^[47].

Significant differences were found among the dimensions of perceived usefulness, perceived ease of use, perceived playfulness, perceived facilitated condition, subjective norm and voluntariness. Among them, very significant differences were found in perceived usefulness, perceived ease of use, and voluntariness. It's noteworthy that

as students' English level rose, they became more adept at using mobile-assisted English learning in playful ways. Thus, they used mobile-assisted English learning with ease and improved their English performance. Students with an advanced level of English were more willing to engage in mobile learning. They were satisfied with mobile-assisted English learning and agreed that it improved English performance. This was in line with Wenji et al., who found that EFL students who learned in a mobile-assisted environment outperformed their counterparts in academic performance^[48]. Mergany et al. demonstrated the effect of a mobile educational intervention on knowledge acquisition in a medical context among dental students^[49].

Medical students with higher English proficiency achieved higher scores on perceived ease of use than those with lower English proficiency. It could be assumed that students with high English proficiency were more confident in mobile-assisted English learning and thus more goal-oriented in learning English. Compared with those with low English proficiency, they were active in exploring various learning applications for English study. Since they are more proficient in using mobile-assisted English learning, they can skillfully use a variety of mobile learning tools to further improve their English learning. It is in line with the findings of Balaskas et al. that advanced users regard mobile-assisted English learning as easy to use, and have a stronger intention to use it in their studies^[50].

Interestingly, students with advanced English proficiency significantly outperformed those with beginning English proficiency on social factors. It replicated Salhab and Daher's study that social influence played a crucial role in students' mobile learning, and students were likely to be engaged socially, cognitively, and behaviorally^[8]. With encouragement from instructors and family members, learners were more likely to use mobile-assisted English learning. Their peers could also inspire them. In the current era of teamwork, it is difficult to achieve good performance in mobile learning by relying solely on one individual. Therefore, teachers should encourage students to form study groups for English studies with the assistance of mobile learning. A group leader could lead the group with better English competence and strong self-discipline. Group members communicate with each other face-to-face or on mobile learning platforms to complete English-learning tasks, solving each other's prob-

lems in their English studies. Generating a vicious study group after class facilitated and monitored group members' English learning, urging them to make joint progress as well.

The medical students with advanced English proficiency differed significantly from those with beginning English proficiency on perceptions of the facilitated condition. Students with high English proficiency were willing to accept guidance and instructions from instructors, technicians, and the applications. In the current era of rapid development of information technology, English courses should be widely combined with mobile learning approaches. Guidelines should be provided to assist students in avoiding distractions and using mobile learning appropriately^[22]. Given all the problems encountered by medical students in mobile-assisted English learning, whether it is the network, mobile devices, or mobile learning platform, the technical team of the school should offer timely manual assistance. It is suggested that medical schools establish a dedicated technical team and assist staff in the English department in developing an English mobile learning platform tailored to the needs and realities of medical students at the school. The university could offer facilitated conditions and technical support that promote learners' English learning in this specific pandemic situation^[7]. At the same time, policies on mobile learning need to be implemented to support mobile-assisted English learning.

As medical students born in the millennium, students from all groups perceive the use of mobile devices as a symbol of social status and stressed the importance of freedom in using mobile learning. Most of them would like to perform mobile-assisted English learning for their own sake. They want to use mobile learning in English on their own, without the pressure of instructors. Therefore, instructors should consider the features of the generation, create a learner-autonomy mobile learning environment, and encourage learners to make full use of mobile learning on their own. In this way, instructors should design mobile learning tasks that arouse students' interest in learning English. Instructional supports in the mobile learning environment improve learners' motivation and self-regulated learning (SRL) performance^[51].

5.2. Perception of Mobile-Assisted English Learning

Regarding mobile-assisted English learning, medical students of different proficiency levels generally held a

welcoming attitude. Most participants agreed that mobile-assisted English learning improves English academic performance and learning efficiency, although a few expressed opposing views and adhered to traditional learning methods.

Medical students with a beginning English level demonstrated a relatively superficial understanding of mobile-assisted English learning. Some students were unclear about the concept itself and remained committed to traditional offline learning. Others used mobile learning merely as a convenient tool for looking up word meanings, without exploring its more powerful functions or integrating it into a comprehensive learning strategy. In contrast, students at the intermediate level of English exhibited a better understanding of mobile learning. They recognized that mobile learning offers diverse resources and regarded it as a more effective approach to learn English. The use of mobile devices and online resources enabled them to allocate their time effectively, allowing them to learn English anywhere, at their proficiency level, with high efficiency. Students with an advanced level of English not only used the applications recommended by their teachers but also independently tried various English-learning applications after class to tailor their English study. They were accustomed to mobile-assisted English learning and could efficiently use online resources, mobile devices, and applications to practice their language skills^[52]. Overall, across all three proficiency levels, acceptance of mobile-assisted English learning increased with English competence, with advanced learners demonstrating the most strategic and self-directed use of mobile technologies.

5.3. Challenges for the Three Groups of Medical Students to Use Mobile-Assisted English Learning

Although the majority of the students were receptive to mobile-assisted English learning and could independently conduct it after class, some medical students mentioned that using mobile devices or applications for English learning distracted their attention during their studies, which supported Zhang et al.'s finding that medical students became easily distracted by mobile learning in the medical environment in Hong Kong, China. They will become easily distracted by pop-up ads if they lack self-discipline^[53]. Besides, they are more likely to use mobile devices for entertainment rather than for academic purposes. Some students think they are inexperienced in using

mobile devices and thus have to spend extra time and effort to learn how to use the new apps. Some of the apps are not free, so it is an additional expense compared with traditional learning. Considering it was somewhat time-consuming and expensive, a small number of students were reluctant to try new learning methods in English learning.

In response to challenges for students in mobile-assisted English learning, teachers should carefully design mobile learning in English teaching. English mobile learning platforms that are easy to operate need to be selected in the initial stages of English learning at university. Furthermore, teachers should explain the operation steps and provide specific links to students when performing mobile teaching activities to ensure that students understand the requirements of mobile learning activities. In the process of implementing mobile learning activities, students' engagement should be monitored from time to time by apps and platforms. Students were encouraged to communicate with each other and learn from each other with the assistance of mobile learning methods. In this way, their communicative competence and English proficiency were improved, and their learning effect was satisfactory.

6. Conclusions

The study examined the acceptance of mobile-assisted English learning among medical college students with three different English levels, ranging from beginning to advanced. A questionnaire on students' acceptance of mobile-assisted English learning was designed and sent to three groups of medical students with various English levels. The acceptance and perceptions of mobile-assisted English learning among the three groups differed significantly across all perspectives. It was found that medical students with advanced English proficiency differed significantly from those with beginning English proficiency for all dimensions. The advanced-English-proficiency group and the intermediate-English-proficiency group differ significantly in perceived usefulness. As for perceived ease of use, the intermediate-English-proficiency group differed significantly from the beginning-English-proficiency group. Students' age, possession of mobile devices, and perceptions of and obstacles to mobile-assisted English learning were also collected. Al-

though medical students generally accepted mobile-assisted English learning, they admitted that distractions, the extra time required to learn to use new mobile applications, and the additional cost of mobile applications posed significant challenges.

The study shed some light on implementing mobile-assisted English learning in similar medical contexts. It offered valuable experience in the post-Covid-19 era in delivering online courses across various subjects. However, it also has some limitations. First, three groups of medical students at a single university participated in the study. Future studies could invite more medical students from various majors from different regions to get a more comprehensive understanding of medical students' differences in acceptance of mobile-assisted English learning. Questionnaires were used to understand medical students' perceptions of mobile-assisted English learning. There might be biases due to the small sample group. Furthermore, a quantitative method was used in the study by sending a questionnaire on the acceptance of mobile-assisted English learning. A mixed-method study was recommended to investigate students' English proficiency development with the help of mobile learning. Furthermore, researchers could examine students' acceptance of mobile learning in specific English performance, such as listening, reading, writing, or translating. In addition, students' acceptance of certain mobile learning applications or platforms could be investigated.

Author Contributions

Conceptualization, M.L.; methodology, M.L.; software, M.L.; validation, M.L. and W.W.; formal analysis, M.L.; investigation, M.L.; resources, M.L.; data curation, M.L.; writing—original draft preparation, M.L.; writing—review and editing, W.W.; visualization, M.L.; supervision, W.W.; project administration, M.L.; funding acquisition, M.L. Both authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

All procedures were performed in accordance with the Declaration of Helsinki. This study was approved by the ethics committee of the Department of Foreign Languages at Hainan Medical University. No ethical approval code was issued because the university assigns protocol codes only to natural science studies, not to social science studies.

Informed Consent Statement

Informed consent was obtained from all participants before they filled out the questionnaires.

Data Availability Statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Conflicts of Interest

The authors declare no conflict of interest.

AI Use Statement

The authors declare that no artificial intelligence (AI) tools were used in the preparation of this manuscript.

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