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The attitude of gifted college students towards self-regulated mobile learning and student satisfaction: The mediation role of teacher's support and moderator role of gender

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Abstract

This study aims to investigate the mediation role of teacher's support and the moderator role of gender in the relation between attitude towards self-regulated mobile learning and student satisfaction. 410 undergraduate students from different universities in the KSA were recruited. Purposive sampling was used to collect the data. Attitudes towards the self-regulated mobile scale, satisfaction with the mobile learning scale and teacher's support were used to collect data. Attitudes towards self-regulated mobile learning positively correlated with the teacher's support. Teachers' support and attitude towards self-regulated mobile learning significantly and positively correlated with the students' satisfaction. These results indicated that teacher's support partially mediated the relationship between attitude towards self-regulated mobile learning and student satisfaction. However, the interaction between teacher's support and gender was not correlated with attitude towards self-regulated mobile learning. Gender could not moderate the relationship between attitude towards self-regulated mobile learning and teacher's support. This study highlights the mediation role of teacher's support and the moderator role of gender in the relation between attitude towards self-regulated mobile learning and student satisfaction. This study contributes to the improvements in the education system in the KSA especially when the increasing value of self-regulated mobile learning is considered.

Keywords: Distance education and online learning, Gender, Human-computer interface, Improving classroom teaching, Teacher's support, Mobile learning, Students satisfaction.

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Contents

Contribution of this paper to the literature

The present study can also contribute to improvements in the education system in Saudi Arabia especially when the increasing value of self-regulated mobile learning is considered. These results contribute to the rapidly developing attitudes towards the self-regulated mobile learning fields.

1. Introduction

Teachers seek to benefit from the rapid development of wireless communication technology and mobile devices and the wide spread of these easy-to-use devices (Chen, Wang, & Wang, 2022; Timotheou et al., 2023). They also look forward to employing this modern digital technology in the educational process in light of the learners' needs based on an educational theory that directs its utilization and achieves its optimal use (Marougkas, Troussas, Krouska, & Sgouropoulou, 2023; Zhao, Li, Wang, & Shi, 2020).

Hence, one of the methods of teaching and learning appeared which is called mobile learning or "M" learning (Fombona, Pascual, & Pérez Ferra, 2020). It is the use of mobile computing devices such as mobile phones and tablets, smartphones, and e-readers for access to learning resources, communication, collaboration, and sharing of learning experiences (Zhang, 2022). They also identify various distinctive characteristics of these mobile devices that make them suitable tools for teaching and learning inside and outside school such as mobility, portability, flexibility and simplicity (Burden & Hopkins, 2016; Chang, Chien, Yu, Lin, & Chen, 2016).

Accordingly, the distinctive characteristics of mobile learning require that the learner be self-directed and motivated for his learning and make his ability to do so a condition for the success of this mobile learning which is called self-regulated learning.

Online education is based primarily on distributed open education, bypassing time and spatial boundaries and physical materials compared to formal education that takes place face-to-face in schools (Rangel-de Lazaro & Duart, 2023; Sprenger & Schwaninger, 2021). This type of education gives the learner autonomy in learning called self-regulated online learning (SRL). SRL is considered to be a process that learners initiate to control their learning (Brenner, 2022; Zimmerman, 2008). Nevertheless, online learners rarely interact with or receive guidance and supervision from teachers (Hollister, Nair, Hill-Lindsay, & Chukoskie, 2022) which is why, they struggle to regulate their learning processes.

Learning environments support the development of self-regulation skills for learning (Duffy & Azevedo, 2015) and mobile learning environments specifically can be used to develop these skills based on digital technology (Zheng, Li, & Chen, 2018). The learner needs to practice self-regulation skills for learning in digital learning environments more than in other learning environments (Moos & Bonde, 2016) because the "context" of learning in these environments makes the cognitive and metacognitive burden on the learner (Koca, Kılıç, & Dadandı, 2024).

2. Literature Review

2.1. Student Satisfaction

Student satisfaction is among the most important indicators of education quality. It is regarded as the "perceived value" of the education a student receives while attending an educational institution (Jong-Yeon & Sanghoon, 2016). A higher level of satisfaction may be associated with a higher likelihood of success and, accordingly, students may exhibit better levels of academic performance (Jeno, Grytnes, & Vandvik, 2017). Sarrab, Elbasir, and Alnaeli (2016) found causal relationships between learner satisfaction and the overall proposed mobile learning system.

Since 2020, online teaching has gradually become an important form of teaching. Online teaching is conducive to breaking through the limitations of time and space. Students can use mobile terminals to learn anytime and anywhere even in special periods (Stoian, Fărcaşiu, Dragomir, & Gherheş, 2022). Learning will not be interrupted and the requirement of "suspending classes but not learning put forward by the Ministry of Education has been implemented (Weerasinghe & Fernando, 2017). At present, all kinds of schools across the country are actively carrying out online teaching and other online teaching activities, and at the same time, corresponding online teaching and research activities have been carried out, allowing teachers to reasonably adjust teaching content and teaching methods according to the characteristics of online teaching, ensure teaching progress and teaching quality, and ensure that online learning is substantially equivalent to offline classroom teaching quality (Kumar, Saxena, & Baber, 2021).

Factors affecting students' satisfaction levels with the online learning environment have been evaluated from different perspectives (Alqurashi, 2019). According to Arbaugh (2000) these factors are perceived usefulness of learning software, perceived flexibility, and perceived course interactivity. According to Bolliger and Martindale (2004), teacher, technology and interaction factors affect students' satisfaction. According to Wang (2003) the factors that determine the satisfaction levels of students taking courses in the online learning environment are the student interface, learning community, content and personal behaviors (Yu, 2022).

Similarly, Chua and Montalbo (2014) discussed these factors from four different perspectives: student interface, learning community, content and usability. Swan (2001) evaluated learner satisfaction in the online learning environment in three dimensions: clarity of design, interaction with the teacher, and active discussion between students. Sun, Tsai, Finger, Chen, and Yeh (2008) stated that learner, teacher, course, technology, and design were examined in six dimensions, including environmental factors (Dondi, Moretti, & Nascimbeni, 2006). Gülbahar (2012) discusses learner satisfaction with the online learning environment in four different dimensions: transmission and usability, teaching process, interaction with teaching content and evaluation. Geçer and Topal (2015) evaluated the factors affecting students' satisfaction levels in the online environment in five different dimensions: materials and communication tools used, teacher-student interaction, environment design, attitude towards e-courses, course content and the teaching process.

Student satisfaction in the online learning environment is an important factor in determining the success or failure of students, courses and programs (Bolliger & Martindale, 2004). Learner satisfaction with the online learning environment is measured in six different dimensions: student-student interaction, student-teacher

interaction, online courses, technical support, printed materials and face-to-face activities (Rabe-Hemp, Woollen, & Humiston, 2009). Learner satisfaction in the online learning environment is mostly evaluated in the context of the graphical interface, course content and design, materials and communication tools used in the course, teacher, teaching process, interaction, evaluation and technical support dimensions (Aldhahi, Alqahtani, Baattaiah, & Al-Mohammed, 2022; Levy, 2007).

2.2. Teachers' Support

In this context, one of the first issues to be addressed to successfully adapt and implement e-learning should be the availability of teachers who will take part in e-learning processes (Keržič et al., 2021; Puljak et al., 2020). In order to benefit from of e-learning, such as helping to increase the flexibility of the teaching process or facilitating communication and interaction between teachers and students, teachers involved in the e-learning process must have the technical competencies to use Information, Communication and Technology (ICT) tools in e-learning processes, redesign the lessons they teach through traditional teaching and the ability to integrate into the e-learning environment and should be able to produce solutions to technological problems that may be encountered in the process calmly without worrying. In this context, teachers play a key role in the smooth transition from traditional teaching to e-learning in the design of pedagogical strategies to be used in e-learning programs and in achieving success in e-learning processes (Adeshola & Agoyi, 2023; Tomás, Gutiérrez, & Alberola, 2023).

2.3. The Moderator Role of Gender

Gender differences moderate human-technology relationships (Lee & Rha, 2017). According to Jung (2012) females regard distance education as important and satisfactory. Additionally, according to Johnson (2011) women have more chances to communicate positively and more socially while in distance education courses. They rated online courses as valuable and they showed satisfaction. Female students show higher satisfaction in online learning environments when compared to their male peers (Alharthi, Yamani, & Elsigini, 2021; González-Gómez, Guardiola, Rodríguez, & Alonso, 2012).

3. Hypotheses

H_1: Attitude towards self-regulated mobile learning would positively predict student satisfaction among college students.

H_2: The teacher's support would play a mediating role between attitude towards self-regulated mobile learning and students' satisfaction.

H_{2a}: Attitude towards self-regulated mobile learning would positively predict teacher's support among college students.

H_{2b}: The teacher's support would positively predict student satisfaction among college students.

H_3: Gender would moderate the relationship between teacher's support and student satisfaction. Specifically, a positive attitude towards self-regulated mobile learning would result in student satisfaction for both sexes of students.

The present study constructed a moderating effect model to examine the mediating role of teacher's support between attitude *towards* self-regulated mobile learning and students' satisfaction among college students. In addition, we tested whether the indirect path between attitude *towards* self-regulated mobile learning and teacher's support would be moderated by gender.

4. Research Methodology

4.1. Participants

Four hundred and twenty self-reported questionnaires were returned and 410 were found to be useful, resulting in a 93.1% response rate. They are undergraduate students from different universities in Saudi Arabia. For comparing the study variables, both male and female students were included within the age range of 18–21 years (M=20.03, SD=2.45). The students were included in the study from different universities in Saudi Arabia where the learning process was physical in normal routine. Students with previous experience of self-regulated mobile learning were included (see Table 1).

Table 1. Descriptive statistics of demographic characteristics (N=410).

Characteristics	Male (%)	Female (%)
Age (In years) M (SD)	20.02 (1.41)	19.16 (1.01)
Gender	190 (46.3)	210(53.7)
Faculty		
College of education	40(33.3)	80(66.7)
College of science	30 (33.3)	60(66.7)
College of arts	60(46)	70(54)
College of commerce	30(42.8)	40(57.2)

4.2. Procedure

Written informed consent was obtained from participants before the data collection.

4.3. Measures

Attitude *towards* self-regulated mobile scale: A five-item, 5-point Likert scale with a range of 1 (strongly disagree) to 5 (strongly agree) was used to score each item.

Satisfaction of Mobile Learning Scale: An eleven-item, 5-point Likert scale with a range of 1 (strongly disagree) to 5 (strongly agree) was used to score each item.

Teacher's Support Scale: An eight-item, 5-point Likert scale with a range of 1 (strongly disagree) to 5 (strongly agree), adapted to the subscale of invested was used to score each item (see Table 2).

Table 2. Descriptions and sources of measures.

Latent constructs	Source	No. of items	Range of scale
Attitude *towards* self-regulated mobile scale	Jiang, Wang, Li, and Li (2022)	5	5-point LS: 1 (Strongly disagree) to 5 (Strongly agree).
Satisfaction of mobile learning scale	Mao (2014)	1	5-point LS: 1 (Strongly disagree) to 5 (Strongly agree).
Teacher's support scale	Jiang et al. (2022)	8	5-point LS: 1 (Strongly disagree) to 5 (Strongly agree).

Cronbach's alpha was assessed for internal consistency and reliability for each individual item in the construct with a lowest accepted value of 0.70 (Goffee & Jones, 1996). Convergent validity was assessed by examining the factor loadings (λ) of each item, composite reliability (CR), and the average variance extracted (AVE). The results of the reliability and convergent validity analysis are presented in Table 3.

Table 3. Reliability and convergent validity.

Constructs	Items	Mean	SD	λ	A	CR	AVE
Att	Att1	4.332	0.704	0.915	0.883	0.926	0.816
	Att2	4.422	0.622	0.912			
	Att3	4.400	0.714	0.849			
	Att4	4.403	0.734	0.877			
	Att5	4.401	0.688	0.867			
Satisf	Satisf1	4.411	0.723	0.811	0.866	0.901	0.813
	Satisf2	4.421	0.627	0.823			
	Satisf3	4.413	0.719	0.854			
	Satisf4	4.413	0.739	0.821			
	Satisf5	4.433	0.680	0.870			
	Satisf6	4.421	0.708	0.862			
	Satisf7	4.453	0.620	0.841			
	Satisf8	4.411	0.718	0.855			
	Satisf9	4.423	0.730	0.862			
	Satisf10	4.441	0.687	0.833			
	Satisf11	4.423	0.711	0.828			
TS	TS1	4.365	0.708	0.871	0.876	0.900	0.811
	TS2	4.404	0.620	0.862			
	TS3	4.420	0.718	0.844			
	TS4	4.403	0.730	0.851			
	TS5	4.411	0.687	0.870			
	TS6	4.414	0.708	0.863			
	TS7	4.400	0.620	0.841			
	TS8	4.408	0.718	0.852			

4.4. Statistical Analysis

Statistical Package for the Social Sciences (SPSS) version 23.0 (Hayes, 2017) was used to test the mediating effect of teachers' support. Model 7 of the PROCESS macro (version 3.4) was used to test the moderating role of gender on the mediation effect.

5. Results

5.1. Descriptive and Correlational Analyses

According to Table 4, positive correlations were found between attitude towards self-regulated mobile learning, students' satisfaction and teachers' support. The correlation between gender and all other variables are not significant.

Table 4. Pearson's correlations among relevant study variables.

Variables	1	2	3	4
1.Gender	-			0.05
2. Att.	0.04	-	0.24***	
3. Satisf.	0.03		-	0.17**
4. TS		0.26***	0.19**	-

Note: ** $p < 0.01$; *** $p < 0.001$.
Att: Attitude towards self-regulated mobile learning.
Satisf: Students' satisfaction.
TS: Teacher's support.

In the absence of the mediator, attitude towards self-regulated mobile learning was positively associated with student satisfaction after controlling for age. According to Table 5, attitude towards self-regulated mobile learning significantly positively correlated with teacher's support. Both attitude towards self-regulated mobile learning and teacher's support significantly and positively correlated with student satisfaction. These results indicated that teachers' support partially mediated the relationship between attitude towards self-regulated mobile learning, and student satisfaction which was consistent with hypotheses 1 and 2.

Table 5. Testing the mediation model of teachers' support.

Teacher's support				
BOOSTRAP 5000 TIMES 95% CI				
	β	**S.E.**	**LLCI**	**ULCI**
Constant	−3.22	1.6	−5.49	0.87
Att	0.09***	0.01	0.06	0.08
TS	0.08***	0.01	0.05	0.07
Age	0.34	0.10	0.09	0.45
R2 =0.32				
F = 87.48***				

Note: ***p < 0.001. Variables have been normalized. 95% CI estimated using the bootstrap method. Bootstrap sample size = 5,000.

Figures 1 and 2 show the total effect and mediation. The results indicated that the three simple path coefficients (paths a, b, and c) were statistically significant. The results from 5,000 bootstrapping samples showed that all indirect effects were statistically significant with the bootstrapping 95% CI excluding zero. The total effect of attitude towards self-regulated mobile learning on students' satisfaction was 0.08 ($p < 0.001$). The indirect effect of teachers' support was 0.05, 95% CI (0.04, 0.05) accounting for 24.03% of the total effect.

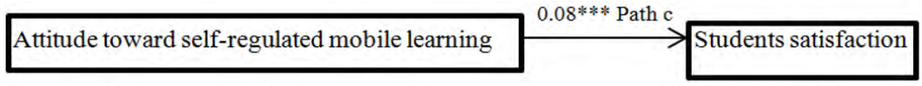

Figure 1. (Hypothesis 1) total effect models: Effect of attitude towards self-regulated mobile learning on students' satisfaction.
Note: ***p< 0.001.

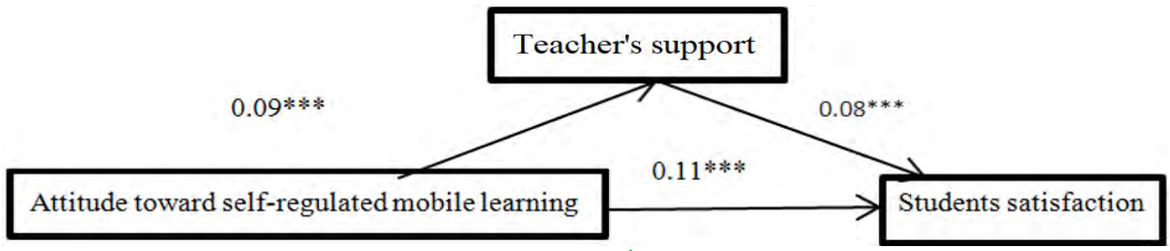

Figure 2. (Hypothesis 2) mediation models: Effect of attitude towards self-regulated mobile learning on students' satisfaction with the mediation of teacher's support.
Note: ***p< 0.001.

5.2. Moderated Mediation Effect Analysis

The relations between variables are illustrated in Figure 3. According to Table 6, attitude towards self-regulated mobile learning positively correlated with the teacher's support. The teacher's support and attitude towards self-regulated mobile learning significantly positively correlated with student satisfaction. These results indicated that teacher's support partially mediated the relationship between attitudes towards self-regulated mobile learning and students' satisfaction. However, the interaction between teacher's support and gender was not correlated with attitude towards self-regulated mobile learning. These results indicated that gender could not moderate the relationship between attitude towards self-regulated mobile learning and teacher's support which is inconsistent with hypothesis 3 in this study.

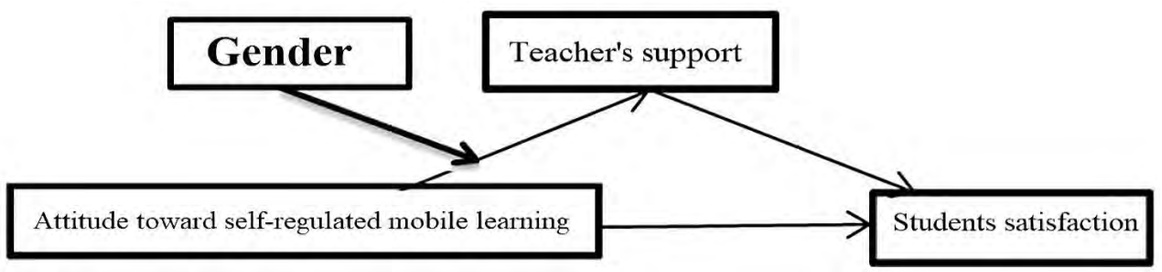

Figure 3. (Hypothesis 3) moderated mediation model: Effect of attitude towards self-regulated mobile learning on students' satisfaction with teacher's support as a mediator and gender as a moderator.

Table 6. Testing the moderated mediation effect of attitude towards self-regulated mobile learning on students' satisfaction.

Teacher's support				
BOOSTRAP 5000 times 95% CI				
	β	**S.E.**	**LLCI**	**ULCI**
Constant	−0.054	1.60	−3.77	3.14
Att	0.091***	0.02	0.05	0.14
TS	0.08***	0.04	0.06	0.08
Gender	-0.34	0.06	0.05	0.8
Att × Gender	−0.01	0.01	−0.04	0.01
R2 =0.51				
F = 42.38***				
Direct effect of att. on satisf.				
Satisfy			BOOSTRAP 5000 times 95% CI	
	B	S.E.	LLCI	ULCI
	0.08***	0.01	0.06	0.11

Note: ***p < 0.001.

6. Discussion

This study proposed a moderated mediation model to examine the role of teachers' support and gender in this process. The results indicate that attitudes towards self-regulated mobile learning could significantly predict students' satisfaction. Moreover, teachers' support played a mediating role in the relationship between attitude towards self-regulated mobile learning and students' satisfaction but the mediating role was not moderated by gender among college students.

The attitudes of learners towards self-regulated mobile learning are mentioned among the most important factors in being successful and continuing education (Koca et al., 2024; Yenilmez, Balbağ, & Turgut, 2017). Attitude is the tendency for behavioral, emotional and cognitive reactions that an individual creates within himself as a result of his experiences and motivations towards his environment on any subject. Students' attitudes towards course materials taught electronically should be known by the student and the teachers with distance education. These situations should be addressed. Accordingly, the preparation of course contents and designs are important issues for learning in the virtual environment (Mishra & Panda, 2007).

In this study, the attitudes towards self-regulated mobile learning and students' satisfaction appear to be related to each other. This result goes in the same line with that of Sever and Çatı (2021) who found that there was a positive relationship between attitudes towards distance education and satisfaction with distance education. One can say that if one has positive attitudes towards self-regulated mobile learning, then his/her intention to use it and motivation in the process increase (Çevik & Bakioğlu, 2022).

Results indicated that teachers' support partially mediated the relationship between attitude towards self-regulated mobile learning and students' satisfaction. This result goes in the same line with other studies (e.g., (Ajzen, 1991; Taylor & Todd, 1995). Therefore, teachers' persuasion, encouragement and recommendations arouse students' interest in, and build their attitude towards, self-regulated learning, which in turn enables them to engage more deeply in the learning process and learning behavior. This goes in the same line with the findings obtained by Naseer and Rafique (2021) who revealed that teachers' academic support moderated the relationship between students' satisfaction with online learning and academic motivation.

Yu (2021) talked about the educational dimensions of mobile learning and stated that mobile technologies can be individually or socially supported which can support all kinds of pedagogical options. Mobiles are portable and enable social interaction. They offer the opportunity to collect real-time data according to location, time and environment. They create many educational opportunities in terms of connecting with other mobile devices or networks and allowing individualization (Jeno et al., 2017).

Findings concerning the mediation role of gender are inconsistent. For instance, females could achieve higher learning outcomes than males because they were more persistent and committed than males (Harvey, Parahoo, & Santally, 2017; Richardson & Woodley, 2003). Females had stronger self-regulation than males which also led to significantly more positive online learning outcomes than males (Alghamdi, Karpinski, Lepp, & Barkley, 2020; Nistor, 2013). Previous studies show that students with positive attitudes towards distance education have higher online learning readiness (Herguner, Son, Herguner Son, & Donmez, 2020).

7. Theoretical and Practical Implications

Theoretically, this study investigated the effects of attitudes towards self-regulated mobile learning on student satisfaction and explored the mediating effect of teacher's support between attitude towards self-regulated mobile learning and students' satisfaction. Dhaqane and Afrah's (2016) results confirmed that there is a strong relationship between students' satisfaction and academic performance.

Practically, if negative attitudes are not altered, a student is unlikely to continue his education beyond what is required. Discovering students' attitude will help both teacher and student in the teaching-learning process (İnal, Evin Gencel, & Saracaloğlu, 2005). The results should prompt policymakers and even researchers to put more emphasis on the role of the mediation role of teacher's support and the moderator role of gender to enhance the relationship between attitude towards self-regulated mobile learning and students' satisfaction to improve students' learning intention and overall levels of academic achievement.

8. Conclusion

This study highlights the mediation role of teacher's support and moderator role of gender in the relationship between attitude towards self-regulated mobile learning and students' satisfaction. The results of the study helped us to understand the mediation role of teacher's support and moderator role of gender in the relation between attitude towards self-regulated mobile learning and students' satisfaction. As the hypotheses of the present study were formulated based on the previous literature, all of the hypotheses were successfully tested empirically and found to be supported. The study applied Model 4 of the PROCESS macro (version 3.4) of the Statistical Package for the Social Sciences (SPSS) version 23.0 (Hayes, 2017) to test the mediating effect of teachers' support to get meaningful results. Model 7 of the PROCESS macro (version 3.4) was used to test the moderating role of gender on the mediation effect. Overall, the study provides new understanding in relation to the topic and an empirical evaluation of the study model.

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