Online learning vs blended learning in developing students' self-regulation at Umm Al-Qura University

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ABSTRACT

The purpose of this research is to examine the impact of online learning and blended learning on developing students' self-regulation at Umm Al-Qura University, using gender and specialization variables. The research sample consisted of 376 students at Umm Al-Qura University in the academic year 2021–2022. According to the instructional type, the research sample was divided into the following main branches: Blended learning: 233 students dealt with blended courses, and online learning: 143 students dealt with online courses. A self-regulation questionnaire was developed to collect the required data from the study sample. The validity and reliability of the questionnaire were ensured. The findings of the study revealed that blended learning is more effective in developing students' self-regulation than online learning. Blended learning is more effective in developing male students' self-regulation compared to online learning. The effectiveness of blended and online learning on female students' self-regulation is equal. Blended learning is more effective in developing practical major students' self-regulation compared with online learning. It was observed that the effect of blended and online learning on theoretical major students' self-regulation is equal. The study findings enrich the understanding of the effect of both blended learning and online learning in developing learning outcomes. In addition, these findings may help decision-makers and stakeholders at higher education institutions to provide all available means for embedding blended courses in instructional systems.

1. Introduction

In the 90s, the beginning of widespread Internet usage caused a revolution in the development of distance education. With the rapid development in improving computers, developing the Internet, increasing its speed in line with the spread of tablets and smart devices, and the development of many communication systems, many universities and instructional institutions worldwide have started using e-learning technologies as a successful method in distance education.

The e-learning application in educational institutions is predominantly carried out their instructional courses through the Internet (online learning), or through an integrated way (blended learning), in which online learning and face-to-face learning are integrated. This depends on the goals to be achieved and the characteristics and preferences of the students (Occhipinti, 2017).

Online learning has several advantages, such as solving the problem of crowded lecture halls and classrooms, providing an interactive learning environment, allowing the learner to study from anywhere and at any time, and providing an opportunity for each learner to proceed in the study according to his/her abilities and capabilities, allowing a private learning atmosphere, spreading the information and communication technology culture among learners (Wagner et al., 2008; Basak et al., 2018; Al Rawashdeh et al., 2021). Also, major obstacles appear through using online learning, including the weakness of human interaction that leads to boredom from the use of technology, weakening the role of the educational institution as a social system that plays an important role in socialization, and weakness in self-discipline and

time management (Basak et al., 2018; Al Rawashdeh et al., 2021).

Several studies referred that blended learning might be a solution to overcome online learning obstacles (Bonk and Graham, 2012).

Blended learning enables learners to have the opportunity to interact with their teachers and colleagues face-to-face through electronic and traditional interaction, which helps to strengthen human and social relations and attitudes of learners during education, achieve a high level of satisfaction with the educational system, and achieve greater credibility in the evaluating process (Mirriahi et al., 2015; Suleiman, 2016; Smith and Hill, 2019).

Blended learning also has several difficulties. Setting up a schedule that matches everyone's needs, and some students may need to take time off from work to attend their classes. Also, students outside the campus will not be able to attend class easily. Students suffer from increased cognitive load and teachers have difficulties using a successful blended learning model (Chen and Lu, 2013).

Many studies confirmed the effectiveness of online learning (Alawamleh et al., 2020; Francisco and Barcelona, 2020; Hussain et al., 2020; Darius et al., 2021) and blended learning (Suleiman, 2016; Utami, 2018; Cole, 2020) in developing students' knowledge, skills, and attitudes in various fields.

Some studies are concerned with the comparison between the effectiveness of online learning and blended learning. A study by Lim et al. (2007) showed no significant differences existed in learning outcomes between two groups of learners: The first group was exposed to online learning, and the second group was exposed to blended learning. A study by Yam and Rossini (2011) reported that blended learning is more effective than online learning, where the students have the advantages of both face-to-face learning and the online environment. Occhipinti (2017) claimed that graduate students were generally satisfied with both online and blended courses, but the blended model was preferred and was statistically significant compared to the fully online model.

A study by McCutcheon et al. (2018) reported that participants who received clinical supervisee skills training through a blended learning approach scored higher in terms of motivation and attitudes than participants who received the same skills training through a fully online approach.

Therefore, it would be safe to say that there is a discrepancy in the results of the studies. Lim et al. (2007) reported no significant differences between online learning and blended learning in developing learning outcomes, while other studies confirmed the existence of a difference in favor of blended learning. In addition, no study (to the best of the authors' knowledge) attempted to explore the difference between online learning and blended learning in developing self-regulation. Self-regulation is one of the important factors that affect the educational process and the academic achievement of learners (Rich and Dahlheimer, 1989).

The self-organized individual has good knowledge of his/her goals, weaknesses, and strengths, and in the light of his/her goals, he/she determines his/her behavior and proceeds with high motivation to achieve these goals. When he/she succeeds or fails in achieving his/her goals, he/she evaluates his/her performance and organizes his/her behavior toward achieving the next goal (Zebardast et al., 2011).

Moreover, some studies showed that students have difficulty with self-regulated learning when using online learning environments (Lee et al., 2008; Tsai, 2010). Wandler and Imbriale (2017) mentioned that students would not become better self-regulated learners simply from increased exposure to online courses.

Other studies reported that blended learning environments could support self-regulation (Laer and Elen, 2017; Setyaningrum, 2019). Tucker (2021) claimed that students in each online learning and blended environment have more independence in their learning and take an active role in thinking about their goals, managing their time, monitoring their progress, and reflecting on their learning.

Also, there is a discrepancy among studies' results that dealt with the relationship between the level of self-regulation and gender and specialization variables. For example, Bembenutty (2007) claimed that there are no statistically significant differences in the level of self-regulation due to the gender variable. However, Al-Jarrah (2010) reported that males are better than females due to components of self-regulation. Also, some studies found differences in the level of academic self-regulation by gender, in favor of females (Babakhani, 2014; Milad et al., 2018). In academic specialization, Milad et al. (2018) reported differences in the level of academic self-regulation in favor of major theoretical students. However, Al-Husseinan (2010) found a positive correlation between developing the strategies of self-regulation and practical disciplines compared to theoretical disciplines.

Consequently, the main objective of this research is to examine the impact of online learning and the impact of blended learning on developing students' self-regulation at Umm Al-Qura University, using some variables, such as gender and specialization.

The study answers the following questions:

1. Does the level of self-regulation differ by the instructional type (blended learning vs. online learning) among students at Umm Al-Qura University?
2. Does the level of self-regulation differ by the instructional type (blended learning vs. online learning) among male students at Umm Al-Qura University?
3. Does the level of self-regulation differ by the instructional type (blended learning vs. online learning) among female students at Umm Al-Qura University?

4. Does the level of self-regulation differ by the instructional type (blended learning vs. online learning) among practical major students at Umm Al-Qura University?
5. Does the level of self-regulation differ by the instructional type (blended learning/online learning) among theoretical major students at Umm Al-Qura University?

2. Theoretical framework

The theoretical framework of this research reviews the following items.

2.1. Blended learning

2.1.1. Blended learning definition

Blended learning uses a mixture of different communication tools to teach a specific subject, including direct speech in a lecture hall, communication through the Internet, and self-learning (Rasmussen, 2003). Recent studies on educational technology have used the concept of blended learning to refer to the deliberate blending of face-to-face and online instructional activities and aim to stimulate and support learning. Cleveland-Innes and Wilton (2018) reported that the simplest definition of blended learning is the usage of traditional classroom teaching methods and online learning for the same students studying the same content in the same course. Thus, blended learning in this research can be defined as a planned and deliberate blending between face-to-face and online instructional activities to create an integrated learning environment, which facilitates the achievement of desired learning outcomes with a high level of quality and effectiveness.

2.1.2. Blended learning advantages

Blended learning relies on the integration between the traditional and e-learning environments and it is considered a meeting point between the principles of the behavioral theory for the traditional learning environment design, and the principles of the constructivist theory for the e-learning environment design. Thus, the blended learning environment allows the learner to build his/her knowledge independently through research and discovery from online resources and interaction within a cooperative context with his/her peers and friends in each classroom-learning and online learning environment (Zemke, 2002; Chew, 2008; Suleiman, 2016).

Blended learning advantages include enhancing learners' skills to deal with information and communication technologies and developing their skills in searching, selecting, processing, and storing information. Besides, itenriches human aspects and social interaction between learners and students. Increasing the self-learning efficiency by providing independent learning resources that depend on the self and positive interaction of the learner and increasing the motivation toward learning Achieving integration between the educational experiences gained from traditional learning and the experiences gained from e-learning to develop academic achievement, skills, and attitudes toward learning (Vaughan, 2007; Linder, 2016; Namyssova et al., 2019; Smith and Hill, 2019).

2.1.3. Blended learning styles

Choi (1997) reported that there are three approaches to integrating e-learning and classroom instruction are as follow:

1. Introductory approach: E-learning is used to introduce information and guide the learner to the educational activities within the lecture.
2. Integrating approach: E-learning is used to allow learners to apply what they studied in the lecture.
3. Skelton approach: Alternating traditional lecture and e-learning through a course-perhaps one or two hours a day to fully understand the activities and academic content.

Horn and Staker (2011) reported that the blended learning patterns in educational institutions could be identified in five main groups according to the roles of teachers, spatial space, delivery method, and study schedules. These patterns are as follows:

1. Face-to-face driver: The teacher is supposed to deliver most of the students' curriculum and works in the technology lab directly through online teaching and inside the classroom.
2. Rotation: The students navigate between fixed schedules of self-paced online learning and traditional face-to-face learning in the classroom with the teacher.
3. Flex: Most of the curriculum is delivered through online platforms. Teachers teach online and provide direct support through small group sessions.
4. Online lab: Online lab platforms are employed to deliver the curriculum to the students within the school. Students participating in this blended learning style usually take the traditional curriculum and have traditional study schedules.
5. Online driver: Platforms and teachers in this mode deliver the curriculum to students, students work remotely and face-to-face, but face-to-face interaction is optional as many times as needed.

The researchers chose the rotation style of blended learning in defining the blended courses that the research sample dealt with.

2.1.4. Blended learning and self-regulation

Zimmerman and Moylan (2009) reported that when students in classrooms are told about what to do and how to do each task, they may not have the

opportunity to develop the resourcefulness, persistence, and initiative needed to develop their ability in self-regulation. Students can develop self-regulation skills over time, but they need clear instructions, support, scaffolding, and routines that support the development of these skills (Zimmerman, 2002).

Blended learning can play an effective role in students' self-regulation development. According to Setyaningrum (2019) and Tucker (2021), the goal of the various blended learning models is to give students more control over the time, place, and path of their learning. This displacement in control from teachers to learners requires learners to develop and hone their self-regulation skills. Laer and Elen (2017) reported that a blended learning environment has some features to support self-regulation. Blended learning provides the learners the chance to control all aspects of their learning experience:

- Time, place, pace, and path.
- Adapting the learning experience and tasks to meet individual student needs.
- Providing active involvement with the content, the teacher, and peers through communication, collaboration, and feedback.
- Increasing the opportunities to think deeply about work and reflect on students' experiences.
- Encouraging students to define the task, set goals, select strategies, and engage in metacognitive skill-building.

2.2. Online learning

2.2.1. Online learning definition

There are several definitions for the concept of online learning. According to the definition of the North American Council for Online Learning, online learning is "education in which instruction and content are delivered over the Internet."

Sener (2015) described online learning as an approach allowing students to complete a course or an entire academic program remotely through the Internet, without communication in a physical environment and without face-to-face interaction. Online learning means instructing learners through various technological tools available over computer networks such as web, email, chat, groups, new text, audio, and video conferencing (Indira and Sakshi, 2017).

Some researchers defined online learning as a system that allows students to deliver full instructional content and interact with their instructors and peers via internet technologies.

2.2.2 Online learning advantages

Online learning helps students learn from any place and at any time according to their abilities with no time restrictions. The students can plan and direct their learning, which can motivate, develop confidence and self-esteem, improve learning outcomes, save on travel expenses, and books bought.

In addition, students have the opportunity to gain technical skills in using information communication technology (ICT). Students share ideas, resources, and tasks and access information on current events, interact with experts, and use online databases. The integration of digital tools and resources contributes to creating new teaching and learning models (Indira and Sakshi, 2017; Basak et al., 2018).

2.2.3. Online learning models

Indira and Sakshi (2017) proposed the following two models for online learning:

1. Wrap-around model: This online learning model is based on previously published study materials such as textbooks, and CDs, and includes online guides, activities, and discussions on these resources. Individuals other than those who developed the online courses may teach these courses. Collaborative learning activities in the form of group work, peer discussion, and online assessment are considered the most important foundations of this online learning style.
2. The integrated model: This form is the closest to offering a completely online course. These courses are often offered through a comprehensive learning management system. These courses include presenting topics in full electronic format through the Internet, online conferences and virtual classrooms, online small group-based collaborative learning activities, and online assessment of learning outcomes. This integrated model eliminates the differences between teaching and learning in favor of facilitating learning.

The researchers chose the "integrated model" to define the online courses that the research sample dealt with.

2.2.4. Online learning and self-regulation

Student enrollment in online courses has grown steadily over the years and is expected to continue in the future.

The growth of online learning is not without its challenges. Dropout rates in online learning can be twice as high as in a traditional classroom format. Lack of self-regulating ability is an important reason for dropout rates from online courses.

This may be because students are not aware of the effort and organization required to be successful in online courses. Limited self-regulation skills may also be another reason (Levy, 2007; Lee and Choi, 2011; Cho and Shen, 2013; Wandler and Imbriale, 2017).

An online course or program cannot change the innate characteristics of the online learner, but good and purposeful design can provide support to help

learners with some self-regulation passes the course and helped them develop their self-regulating learning strategies (Barnard-Brak et al., 2010). Wandler and Imbriale (2017) and Burns (2020) discussed strategies for improving students' self-regulation skills in the online learning environment. Online instructors should be concerned about online readings, videos, or links to material that discuss the importance of self-regulation and how to be successful online, such as goal setting, time management, and test preparation.

Creating an online spreadsheet, form, or other data entry item can allow students to enter and track their study habits. The recorded information can help students reflect on their efforts in courses and how they can arrange their efforts if they do not achieve their academic goals. Instructors should consider creating a short assessment (3-4 questions) to include in the learning management system for students to complete at the beginning and end of each module every week.

Using a questionnaire containing several questions about students' self-regulatory practices can help students record and reflect on study habits required to enhance their learning experience and outcomes. Guiding student learning is particularly effective for self-regulation, especially in task strategies, time management, interest enhancement, and seeking help.

2.3. Self-regulation

2.3.1. Self-regulation definition

Schunk and Zimmerman (2007) defined self-regulation as an internal cognitive process that enables the individual to direct his/her activities to achieve goals through goal setting, self-observation, self-judgment, and self-reaction. While Mahmoud (2020) defined self-regulation as a process where an individual can set his/her goals and control the behavior toward the task he/she performs in a way that he/she can control his/her emotions and self-assessment during and after the performance.

The researchers agreed with the definition of Jakešová et al. (2016) about self-regulation. According to Jakešová et al. (2016) self-regulation, in general, refers to an individual's processes for setting his/her goals, directing himself/herself, making his/her decisions, and controlling his/her motives. It also includes dealing appropriately with an individual's challenges while trying to accomplish tasks and achieve goals.

Another concept that has emerged from self-regulation is called self-regulated learning, which is a form of self-regulation. This is based on its importance in increasing students' ability to adopt strategies to generate their self-ideas, feelings, and activities to achieve their educational goals (Wang, 2010).

During self-regulated learning, learners attempt to reduce the discrepancy between their learning goals and current learning performance by adapting their perceptions, influences, and behaviors to the demands of the learning task (Zimmerman and Schunk, 2011).

2.3.2. Self-regulation importance

According to Markazi and Badrigargari (2011), that self-regulation is one of the most important factors affecting learners' social and interpersonal relationships. Furthermore, self-regulation is one of the predictors of academic success for learners. This is because it develops meta-cognitive skills and the motivational behavior that leads to the achievement of their educational goals.

The process of self-regulation among learners is important as it helps to increase performance efficiency and ensure academic achievement, as well as prepare them to move toward the future and use time efficiently. Therefore, the educational environment and its preparation play a role in increasing learners' self-regulation levels. The nature of learners' self-regulation is that learners benefit from the results of feedback on their previous learning experiences and arrange strategies, goals, and requirements for later learning (Matric, 2018).

The importance of self-regulation in education can be summarized on the following points (Boekaerts, 1999; Cassidy, 2011; Matric, 2018):

1. Gaining the learner's ability to plan control cognitive and emotional side, and meditation on the outputs of performance (whether positive or negative). This makes it easier for the learner to gain positive learning experiences.
2. Enabling the learner to understand the metacognition processes and now the requirements of the assigned tasks, and be aware of the effectiveness of the learning strategies, leads to better performance and motivation in learning.
3. Developing the learner's ability to self-learning, make decisions, issue judgments, and self-criticism.

2.3.3. Self-regulated learning models

Self-regulated learning contains the following three components (Schraw et al., 2006):

1. Cognition includes skills necessary to encode, memorize, and recall information.
2. Meta-cognition refers to the skills that enable learners to understand and monitor cognitive processes.
3. Motivation includes the beliefs and attitudes that affect the use and development of cognitive and metacognitive skills.

Derby (2013) stated that various models for self-regulated learning emerged from different learning theories. The most popular self-regulated learning models have emerged from social cognitive theory (Pintrich, 2000; Zimmerman, 2000; Schunk and Usher, 2011) and information processing theory

(Winne 2001; Winne and Hadwin, 2012). However, self-regulated learning models are very similar. The models of Zimmerman (2000; 2002), and Pintrich (2000; 2004) contain similar stages and processes, as shown in Table 1.

Table 1: Self-regulated learning phase and processes

Forethought	Performance	Self-Reflection
Task Analysis	Monitoring	
Perception of the task and context	Metacognitive monitoring	
Goal setting	Monitoring of motivation and effect	
Assessing prior knowledge	Monitoring of performance and progress	Self-judgment
Assessing metacognitive Knowledge	Self-observation of behavior	Self-evaluation
Strategy planning	Self-questioning	Casual attribution
Self-Motivation Beliefs	Control	Self-Reaction
General motivation	Strategy selection and adaptation	Affect/ self-Satisfaction
Self-efficacy	Resource allocation	Adaptive or defensive reaction
Outcome expectations	Increase or decrease effort	
Task interest	Increase or decrease persistence	
Goal orientation	Seeking help	
Task value		

As shown in Table 1, learners in the forethought phase engage in two micro-processes: Task analysis and self-motivation belief assessment:

- Task analysis: learners assess the learning task and its nature, and then set goals to accomplish the learning task. After goal setting, learners plan strategies to achieve their goals.
- Self-motivation belief assessment: Learners assess their motivation to initiate their strategies. Thus, high motivation results from several factors, such as high self-efficacy, an expectation that the learner's behaviors will produce a positive outcome, an interest in the learning task, a perceived value in completing the learning task, and an interest in mastering the learning task.

The performance phase consists of two micro-processes: Monitoring and control:

- Monitoring refers to the learners' efforts to maintain awareness of their motivation, cognitive processes, and progress toward their goal achievement.
- Control refers to defining the management and modification of the motivation, cognitive processes, and strategies used to achieve their goals.

In the self-reflection phase, learners engage in two micro-processes: Self-judgement and self-reaction:

- Self-judgment: Learners evaluate their performance against an internal standard and then attribute the success or failure of their performance to themselves or an uncontrollable factor
- Self-reaction: Learners self-react to their performance in two ways. First, learners rate how satisfied they are with their performance. Learners' satisfaction with their performance produces a negative or positive affective reaction. Second, learners combine their causal attributions with their self-satisfaction and adopt conclusions about changing their future approaches.

2.3.4. Characteristics of self-regulated learners

Self-regulated learners are good at planning to achieve their goals. They have the activity and perseverance to achieve their goals and are capable of dealing with the challenges they face. They are more aware of cognitive and metacognitive strategies that achieve their goals. They can direct their attention, motivation, and emotion to achieve their goals. They are good at self-monitoring and evaluating their performance.

They have positive beliefs about their ability to accomplish various tasks. They know very well how to create an environment around them that will help them achieve their goals. They are good at generating ideas and stimulating feelings until they achieve their goals (Wang, 2010; Samruayruen, 2013; Jakešová et al., 2016).

In preparing a self-regulation assessment questionnaire for the research sample at Umm Al-Qura University, the researchers have benefited above and reviewed what has been mentioned around self-regulation measurement scales (Brown et al., 1999; Markazi and Badrigargari, 2011; Derby, 2013; Zimmerman, 2000; Mahmoud, 2020).

3. Research methodology and procedures

3.1. Research methodology

In this study, descriptive and analytical approach was used. This approach aims to examine scientific phenomena and problems by realistically describing them and scientifically analyzing them to answer research questions about the effect of the instructional type (blended learning vs. Online learning) on self-regulation among students at Umm Al-Qura University.

3.2. Research population

The study population consisted of students at Umm Al-Qura University in Saudi Arabia in the academic year 2021–2022.

3.3. Research sample

The study sample consisted of 376 students at Umm Al-Qura University. Table 2 shows the descriptive statistics of the sample based on gender, specialization, and instructional type variables.

Table 2: Descriptive statistics of the study sample

The Variable	Variable Levels	Frequency	Percentage
Gender	Male	146	38.8%
	Female	230	61.2%
Specialization	Practical	154	41.0%
	Theoretical	222	59.0%
Instructional type	Blended	233	62.0%
	Online	143	38.0%

3.4. Research tool

The research tool is represented in a questionnaire to identify the students' self-regulation level at Umm Al-Qura University. The questionnaire consisted of 31 items in its initial form to measure the following dimensions: Planning items, monitoring items, and evaluation items.

Planning items are consisted of 11 items and are related to defining goals, putting them in a procedural form, defining a mechanism for dealing with time, and choosing priorities).

Monitoring items consisted of 13 items and are related to the follow-up and self-management in everything an individual does to maintain motivation and move towards achieving goals. Evaluation items consisted of 7 items and are related to making individual judgments about the work to be accomplished and the aspects of his personality related to it. The 5-point Likert scale was based on answering the questionnaire axes so that the grades are assigned to them after they were corrected (5/4/3/2/1).

To verify the validity and reliability of the questionnaire, it was administered to a sample of 110 students at Umm Al-Qura University, and then the following steps were followed:

3.4.1. Validity of the questionnaire

The validity of the questionnaire was verified in two ways:

1. The validity of the arbitrators: The questionnaire items were presented to seven specialized arbitrators in their initial formats. This validity is to judge the appropriateness of the questionnaire axes, the clarity of items, and linguistic formulation appropriateness. In light of the arbitrators' suggestions, the questionnaire items were modified. The arbitrators' agreement rate on the questionnaire's items ranged from 85% to 100%, which is an acceptable rate. Therefore, no item was deleted from the questionnaire items.
2. Internal consistency: The correlation coefficient between the degree of each item, the total degree of the axis it belongs to, and the results in the questionnaire are shown in Table 3.

Table 3: The values of the correlation coefficients of each item degree with the total degree of the dimension to which it belongs in the questionnaire

Dimension	No of items	Pearson Correlation Coefficient
Planning	11	From 0.515** To 0.780**
Monitoring	13	From 0.491** To 0.757**
Evaluation	7	From 0.503** To 0.820**

As clearly shown by Table 3, the correlation coefficients are statistically significant at the 0.01 level, the values of the correlation coefficients ranged from 0.491** to 0.820**, and the internal consistency did not result in any items being deleted. Thus, the number of items in the questionnaire remained is 31.

The correlation coefficient between the degree of each dimension and the total degree of the questionnaire was also calculated, and the values of the Pearson correlation coefficient were among the dimensions of the questionnaire: Planning, monitoring, evaluation, and the total degree of the questionnaire as a function at the level (0.01), and the values were 0.878**, 0.940**, 0.816**, respectively.

3.4.2. Questionnaire reliability

The reliability of the questionnaire was calculated through Cronbach's alpha method. The Cronbach's alpha coefficient scores were calculated for each of the questionnaire dimensions separately and as a whole before deleting the individual degree and after deleting it. The results are shown in Table 4.

Table 4: Questionnaire reliability coefficients values

Dimension	N of items	Cronbach's Alpha	Cronbach's Alpha if Item Deleted
Planning	11	0.740	From 0.705 To 0.735
Monitoring	13	0.852	From 0.820 To 0.844
Evaluation	7	0.826	From 0.780 To 0.791
The whole Questionnaire	31	0.915	From 0.899 To 0.905

As Table 4 clearly shows, the values of the reliability coefficients of the Cronbach alpha ranged from 0.740 to 0.915, which are in an acceptable range. The Cronbach alpha values obtained when deleting the items reduce the questionnaire reliability coefficient. Based on the aforementioned information, it is evident that the search tool has validity and reliability. In its final form, it consists of 31 items for measuring the self-regulation level of Umm Al-Qura University students.

4. Research results

4.1. Results of the first question

The first question states: "Does the level of self-regulation differ by the instructional type (blended learning vs. online learning) among students at Umm Al-Qura University?"

An independent samples t-test was used to answer this question and identify the significance of the differences between the mean scores of the total sample of students using the blended learning courses and the students using the online learning courses in the dimensions of self-regulation and its total score. The results are shown in Table 5.

Table 5: T-Test results for the learning system variable used for the total sample in self-regulation

Self-regulation	Instructional type	N	Mean	Std. Deviation	t	Sig.
Planning	Blended	233	45.12	6.949	2.842	.005
	Online	143	43.02	6.963		
Monitoring	Blended	233	50.94	9.405	2.713	.007
	Online	143	48.29	8.867		
Evaluation	Blended	233	28.56	5.325	1.570	.117
	Online	143	27.69	5.077		
Total score	Blended	233	124.62	19.903	2.734	.007
	Online	143	118.99	18.454		

As Table 5 clearly shows, there are statistically significant differences between the mean scores of students using the blended learning courses and students using the online learning courses in the planning and monitoring dimensions and the total scores of self-regulation in favor of students using the blended learning courses. Also, no significant difference was observed between them in the evaluation dimension. This means that blended learning is more effective in developing students' self-regulation compared to online learning.

This result is due to the characteristics of the blended learning environment that can support self-regulation. Blended learning gives the learner the ability to control and manage all aspects of his learning experience: Time, place, and pace. Through communication, collaboration, and feedback, the content enables active engagement with teachers and peers. Merging between online and face-to-face support eliminates the atmosphere of isolation that the student may feel in an online environment only. Encouraging students to define the task, set goals,

select strategies, and engage in metacognitive skill-building. This is consistent with studies and literature addressing the impact of blended and online education on the development of self-regulation (Laer and Elen, 2017; Setyaningrum, 2019).

4.2. Results of the second question

The second question states**:** "Does the level of self-regulation differ by the instructional type (blended learning vs. online learning) among male students at Umm Al-Qura University?"

To answer the question, an independent samples t-test was used to identify the significance of the differences between the mean scores of the male students using the blended learning courses and the male students using the online learning courses in the dimensions of self-regulation and their total score. The results are presented in Table 6.

Table 6: T-Test results for the learning system variable used by male students in self-regulation

Self-regulation	Instructional Type	N	Mean	Std. Deviation	t	Sig.
Planning	Blended	90	45.00	6.923	2.512	.013
	Online	56	42.14	6.274		
Monitoring	Blended	90	51.73	9.354	3.373	.001
	Online	56	46.62	8.103		
Evaluation	Blended	90	28.61	5.061	2.005	.047
	Online	56	26.95	4.566		
Total score	Blended	90	125.34	19.049	3.104	.002
	Online	56	115.71	16.808		

Table 6 shows that there are statistically significant differences between the mean scores of male students using the blended learning courses and male students using the online learning courses in all dimensions of self-regulation (planning, monitoring, and evaluation). The findings also show that the total score is in favor of male students using the blended learning courses. This means that blended learning is more effective in developing male students' self-regulation than online learning.

The main reason for this is those male students have a weaker level of self-regulation than female students. This finding is consistent with the results of several studies (Babakhani, 2014; Milad et al., 2018).

Therefore, they need an educational environment with certain characteristics in which they can

develop their self-regulation. These features are available in blended learning compared to online learning, as previously mentioned in a study conducted by Laer and Elen (2017) and a study by Setyaningrum (2019).

4.3. Results of the third question

The third question states: "Does the level of self-regulation differ by the instructional type (blended learning vs. online learning) among female students at Umm Al-Qura University?"

To answer this question, the independent samples t-test was used to identify the significance of the differences between the mean scores of the female students using the blended learning courses

and the female students using the online learning courses in the dimensions of self-regulation and

their total score, and the results came as illustrated in Table 7.

Table 7: T-Test results for the learning system variable used by female students in self-regulation

Self-regulation	Instructional Type	N	Mean	Std. Deviation	T	Sig.
Planning	Blended	143	45.20	6.988	1.661	.098
	Online	87	43.59	7.353		
Monitoring	Blended	143	50.44	9.435	0.853	.395
	Online	87	49.36	9.213		
Evaluation	Blended	143	28.52	5.503	0.491	.624
	Online	87	28.16	5.352		
Total Degree	Blended	143	124.16	20.475	1.123	.262
	Online	87	121.10	19.239		

Table 7 clearly shows that there are no statistically significant differences between the mean scores of female students using the blended learning courses and female students using the online learning courses in all dimensions of self-regulation (planning, monitoring, and evaluation) and their total score. This means that the effect of blended and online learning on female students' self-regulation is equal.

The main reason for this is that female students already have a high level of self-regulation compared to male students, and are able to study more independently. They can monitor and evaluate their progress efficiently. This finding is consistent with the results of several studies (Babakhani, 2014; Milad et al., 2018). Their self-regulation skills than are not affected much by the style of the

instructional environment, whether blended or online.

4.4. Results of the fourth question

The fourth question states: "Does the level of self-regulation differ by the instructional type (blended learning vs. online learning) among practical major students at Umm Al-Qura University?"

To answer this question, the Independent Samples T-Test was used to identify the significance of the differences between the mean scores of the students with practical majors, who use the blended learning courses, and the students with practical majors, who use the online learning courses in the dimensions of self-regulation and its total score. The results came as illustrated in Table 8.

Table 8: T-Test results for the learning system variable used by students with practical majors in self-regulation

Self-regulation	Instructional Type	N	Mean	Std. Deviation	T	Sig.
Planning	Blended	106	43.93	6.862	3.804	.000
	Online	48	39.38	6.945		
Monitoring	Blended	106	49.11	8.962	3.344	.001
	Online	48	44.10	7.771		
Evaluation	Blended	106	27.36	5.441	1.633	.104
	Online	48	25.85	4.951		
Total score	Blended	106	120.41	19.406	3.439	.001
	Online	48	109.33	16.328		

It is evident from Table 8 that there are statistically significant differences between the mean degrees of students with practical majors who use the blended learning courses and students with practical majors who use the online learning courses in the planning and monitoring dimensions and the total score of self-regulation in favor of students who use the blended learning system. In contrast, there is no significant difference between them in the evaluation dimension. This means that blended learning is more effective in developing practical major students' self-regulation compared with online learning. This is due to the nature of studying scientific and practical subjects, where they require many strategies to be learned, such as organizing, planning, self-evaluation, optimal use of time, asking for help, and other self-regulatory strategies for learning. This has been confirmed by many studies (Al-Husseinan, 2010). Therefore, they need an educational environment with certain features that support these strategies, and these features are available in blended learning compared to online learning, as mentioned before in a study by Laer and Elen (2017) and a study by Setyaningrum (2019).

4.5. Results of the fifth question

The fifth question states**:** "Does the level of self-regulation differ by the instructional type (blended learning vs. online learning) among theoretical major students at Umm Al-Qura University?"

To answer this question, the independent samples t-test was used to identify the significance of the differences between the mean scores of the students with theoretical majors, using the blended learning courses, and the students with theoretical majors, using the online learning courses in the dimensions of self-regulation and its total score. The results are shown in Table 9.

Table 9 shows that there are no statistically significant differences between the mean scores of students with theoretical majors using the blended learning courses and students with theoretical majors using the online learning courses in all dimensions of self-regulation (planning, monitoring, and evaluation) and its total score. This means that the effect of blended and online learning on theoretical major students' self-regulation is equal.

The reason for this is studying theoretical subjects that require the use of a limited number of cognitive strategies such as memorization and retrieval and limiting teaching strategies based on recitation and lecture. This finding has been confirmed by other studies such as Al-Husseinan (2010). Their self-regulation skills are not considerably affected by the style of the instructional environment, whether blended or online.

Table 9: T-Test results for the learning system variable used by students with theoretical majors in self-regulation

Self-regulation	Instructional Type	N	Mean	Std. Deviation	T	Sig.
Planning	Blended	127	46.11	6.892	1.389	.166
	Online	95	44.86	6.238		
Monitoring	Blended	127	52.46	9.528	1.660	.098
	Online	95	50.40	8.668		
Evaluation	Blended	127	29.56	5.033	1.404	.162
	Online	95	28.61	4.910		
Total score	Blended	127	128.13	19.702	1.668	.097
	Online	95	123.87	17.591		

5. Conclusion and recommendations

There is a discrepancy among the results of studies that are concerned with the impact of blended learning and online learning in developing learning outcomes. There is also a discrepancy among the studies that aimed to examine the relationship between self-regulation and other variables such as gender and academic specialization. The importance of this study came to explore the difference between blended learning and online learning on the development of self-regulation as one of the most important indicators of students' academic success, taking into account the variables of gender and academic specialization.

In light of the research findings, some recommendations are proposed. Higher education institutions should adopt a strategy to expand the provision of blended courses to students. They also need to provide financial and technical support for university faculty members to adopt blended learning models in teaching. Saudi universities are required to provide training courses for faculty to develop their skills in effective design for blended courses.

This research is a starting point for further research and studies in e-learning, e.g., conducting further studies to identify the different impacts of blended and direct education on the development of other variables, such as student' participation in e-learning environments, exploring the most appropriate blended learning styles needed to develop students' self-regulation skills, identifying the most appropriate strategies for developing self-regulatory skills in e-learning environments, and preparing a proposed designing model for the blended learning environment and its impact on the development of students' self-regulation skills.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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