The Impact of Feedback Timing and Learning Styles on Learning Outcomes in Distance E-Learning

ABSTRACT

Aims: ~~The aim of this study was~~This study aimed to investigate the impact of different feedback delivery methods (immediate via mobile learning techniques and delayed via Moodle learning management system) and their interaction with learning styles (active vs. reflective) on the acquisition of blogging design and production skills and satisfaction with the e-learning environment.

Study Design: This study followed a factorial experimental design (2 × 2), dividing students into four experimental groups based on feedback timing and learning style.

Place and Duration of Study: The study was conducted at a Saudi university in the Educational Technology course for distance learning during the academic year 2012-2013.

Methodology: The study sample included 67 students enrolled in the distance learning program, divided into four experimental groups:Group 1: Active learners with immediate feedback (n = 19); Group 2: Active learners with delayed feedback (n = 17); Group 3: Reflective learners with immediate feedback (n = 15); Group 4: Reflective learners with delayed feedback (n = 16).

Three measurement tools were used: an observation checklist to assess students' blogging design and production outputs, a satisfaction scale for the e-learning environment, and the Felder-Silverman Learning Styles Model scale to categorize students' learning styles. Immediate feedback was provided synchronously using mobile learning tools (Google+), while delayed feedback was delivered asynchronously using Moodle.

Results: The study revealed significant differences between the experimental groups that received immediate feedback in their acquisition of blogging design and production skills and satisfaction with the e-learning environment. The results indicated that groups 1 and 3 (immediate feedback) outperformed groups 2 and 4 (delayed feedback). Additionally, students with an active learning style demonstrated superior performance in both practical skills and satisfaction with the e-learning environment. Significant differences ($p < 0.05$) were found between the groups due to the interaction between feedback timing and learning style, highlighting the influence of immediate feedback and active learning on practical skill acquisition. However, no significant differences ($p > 0.05$) were found regarding satisfaction with the e-learning environment based on the interaction between feedback timing and learning style.

Conclusion: Immediate feedback via mobile learning significantly enhances the acquisition of blogging design and production skills, particularly for active learners, though its effect on satisfaction with the e-learning environment is not as strong. The study recommends utilizing mobile learning for immediate feedback and conducting training workshops for faculty on feedback strategies in e-learning.

Keywords: Immediate Feedback, Delayed Feedback, Learning Style (Active, Reflective), E-learning Environment, Mobile Learning, Distance Education.

1. INTRODUCTION

In light of the rapid growth of the philosophy of e-learning and distance education, many universities worldwide are now offering programs and courses entirely online or in a blended format. The number of students globally who are enrolled in such courses continues to grow. Numerous studies confirm that, despite the varying levels and forms of online e-learning, it is essential to consider the quality and effectiveness of this educational model. The quality of the courses is key to achieving effective learning in an e-learning environment (Xu, 2010, p. 276).

Learners in e-learning environments need guidance and feedback during and after their studies. The effectiveness of e-learning increases if the instructional design provides immediate feedback, enhancing the learning process, equipping learners with valuable experiences, and improving their skill and knowledge levels. A wide range of feedback strategies is available, including responses to specific questions, semi-automated feedback, shared comments in online forums, and personalized responses via email, phone, and other methods offered by educational technology. Moreover, the timing of feedback and the effective use of comments—if integrated into the design of e-learning—enable learners to engage in meaningful dialogue and interaction with peers and instructors, without which the instructional design may become mere plans for broadcasting static content (Brown & Voltz, 2005).

In an e-learning environment, learners are not left to face the overwhelming amount of available information alone. Instead, they are provided with guidance, support, and appropriate help at the right time, which offers numerous opportunities for directing learning and supporting communication and interaction between learners and instructors, as well as among learners themselves (Khamis, 2010). Supporting learners in the e-learning environment facilitates learning. One of the crucial factors for success in these educational environments is the proper design of e-learning resources (McPherson & Nunes, 2004).

Feedback is a fundamental component in all learning contexts, serving various purposes, including evaluating student achievements, developing understanding, increasing competencies, boosting motivation, and improving self-confidence. Feedback provides formal comments on students' work during formative

assessments of tasks and activities, such as essays, assignments, and educational projects.

It is widely recognized that assessing students' knowledge and providing high-quality feedback ~~in a timely manner~~promptly is crucial in an effective e-learning environment. However, traditional methods of delivering this vital information have many limitations. For formative assessment feedback to be effective in enhancing learning and increasing student motivation, it must possess certain qualities, including timeliness, constructiveness, the ability to motivate learners, personalization, and direct relevance to the assessment criteria and learning outcomes (Hatziapostolou&Paraskakis, 2010, p. 112).

Since effective formative feedback plays a key role in appropriately driving student learning in e-learning environments, Sorensen suggested integrating feedback as an integral part of the design of e-learning materials and student evaluation processes in distance learning environments, as it encourages student participation and enhances autonomy within social frameworks (Sorensen, 2008, p. 85). Additionally, Vandewaetere and colleagues (2011) emphasized that designing effective feedback strategies for distance e-learning environments requires further experimental research to help determine which strategic factors contribute to providing feedback aligned with learner characteristics and the necessary actions for effective learning (Vandewaetere, Desmet&Clarebout, 2011).

Many technological tools are used to provide feedback, particularly in traditional teaching, blended learning, and distance e-learning contexts. Currently, e-learning is moving towards using mobile platforms to be more accessible and convenient for users. The use of mobile devices, such as smartphones, has grown significantly in recent years and has now surpassed the prevalence of personal computers in modern professional and social contexts.

With the rapid development of smart mobile network technologies, mobile learning (M-Learning) has emerged as a new form of e-learning, extending its reach. Learning can now occur at any time and place, with the significant advantage that there are no fixed locations or specific times required for learning. This allows for personalized learning according to the learner's preferences, enriching teaching methods with innovative approaches (Wang, Tang, Zhou, 2012, p. 3071). Mobile learning offers numerous advanced applications. However, it seems that these convenient tools have not been fully utilized in learning contexts. Mobile technologies provide an effective tool for promoting teamwork, collaboration, and information sharing among students, offering opportunities for them to demonstrate their understanding and learn from others (Herrington, Herrington, Mantei, & Ferry, 2009).

Mobile wireless communication technologies have encouraged researchers to conduct more studies on mobile learning environments, which enable students to learn through mobile devices without the time and location constraints (Hwang & Chang, 2011, p. 1023). By utilizing instant text messages and widely available mobile phones, many students expect these tools to provide immediate or delayed feedback on their tasks. However, to what extent do these technologies

and communication methods provide different types of feedback, delivered in a timely, personalized manner, and help students effectively receive it?

Since feedback has become an essential element in all learning contexts, many studies and literature have addressed the various types associated with it. These include feedback based on its source (intrinsic feedback, representing the information the learner reaches on their own, versus extrinsic feedback, representing additional information provided by an external source); the timing (immediate feedback, provided right after a response, versus delayed feedback, provided after ~~a period of time~~some time); the form of feedback (verbal, auditory, multimedia); the direction of feedback (individual versus group); and the amount of feedback (partial versus complete) (Brookhart, 2008; Butler & Nissan, 1986, p. 210-216).

This study aims to benefit from employing different levels of feedback timing by varying its presentation within the electronic content provided to learners through different platforms (immediate feedback via mobile e-learning (M-Learning) versus delayed feedback via the Moodle e-learning management system) to determine which timing is more effective. Previous literature indicates that feedback is more effective when it is timely.

However, previous studies show conflicting results regarding which type of feedback (immediate or delayed) is more effective for certain learning outcomes. While ~~Al-Qawas~~Al-Qawas's study (2011) indicates that both types of feedback (immediate and delayed) have equal effectiveness on some learning outcomes, other studies suggest that neither type of feedback has a significant impact. For instance, the study by Cole and Todd (2003) found that neither immediate nor delayed feedback affected students' performance or achievement. Similarly, Abdul-Jabbar Mohammed Slumi's study (2010) revealed no significant differences in post-test results for three types of feedback (post-performance, during performance, and post-performance after a period) in assessing achievement and correcting errors in certain motor skills. Moreover, the study by Van der Kleij and colleagues (2012) found no effect of either type of feedback (immediate or delayed) on students' post-test performance in computer-based learning, although students expressed more interest in immediate feedback. Additionally, Chan and colleagues' study (2012) did not find an impact of immediate feedback on auditory learning and training to evaluate the quality of sensory perception of sound compared to repeated exposure to sounds.

On the other hand, other studies (Abdul-Haq & Bani Ata, 2006; Opitz, Ferdinand &Mecklinger, 2011; Chang, 2011; Scheeler, McKinnon & Stout, 2011; Metcalfe, Kornell & Finn, 2009; Scheeler, McAfee, Ruhl & Lee, 2006; Dihoff, Brosvic& Epstein, 2003) have shown that immediate feedback is more effective in influencing different learning outcomes than delayed feedback. Conversely, other studies (Mullet, Butler & Verdin, 2014; Nakata, 2014; Sinha, 2012) indicate that delayed feedback is better than immediate feedback for certain learning outcomes.

Thus, conflicting results emerge from previous studies concerning the timing of feedback delivery and its impact on learning outcomes and efficiency.

Researchers have examined the effects of feedback timing (immediate versus delayed) on various learning outcomes for decades, but no consensus has been reached on which timing is more suitable for learners. Hickey (2013) confirmed that a review of previous literature reveals that the optimal timing for feedback delivery remains an unresolved issue (Hickey, 2013).

This discrepancy in results underscores the need for further research that may help determine the best timing for feedback (immediate or delayed) in e-learning environments for different dependent variables. This is one of the research problems explored in this study, namely understanding the effect of feedback timing on certain learning outcomes.

In a related context, learning style is linked to the variables of e-learning program design, and thus to the types of feedback provided through these programs. Individuals vary in their learning styles when interacting with the educational material, and these individual differences influence their learning outcomes. Learning styles concern individual differences in how learners receive, organize, process, store, encode, and recall knowledge. Therefore, this study focuses on the relationship between feedback delivery variables and learning styles, investigating the preferred style for organizing cognitive or affective activity. Learning styles reflect how learners acquire and recall information through their interaction with the educational situation, aiming to align the learner's characteristics with the variables of the learning situation.

There is a clear relationship between feedback and learning styles, as individual learner characteristics raise questions about how feedback is delivered and whether it hinders or supports learning. In a study by Evans (2004), it was found that students with specific learning styles respond more positively to different types of feedback, or prefer certain types of feedback that help them develop their knowledge (Evans & Waring, 2011). In another study by Boon Smit and others (2008), learners with higher levels of prior knowledge were found to learn more with less detailed feedback, although more specific feedback was viewed morepositively. This study also showed that learners with lower levels of prior knowledge who received appropriately timed specific feedback did not experience improved performance (Smits, Boon, Sluijsmans, Van Gog, 2008).

Thus, feedback should be provided to students in a way that aligns with their learning style to increase their motivation and ensure their engagement with the feedback content (Yorke, 2003, p. 497). As Abdel Halim, F. (1995) indicated, different types of feedback and the timing of its delivery vary depending on learners and their characteristics (Abdel Halim, F., 1995, p. 63).

On the other hand, many studies indicate a strong relationship between providing effective feedback to learners in e-learning environments and their satisfaction with the learning environment. Learner satisfaction plays a significant role in the vitality of learning within the electronic environment. The results of several studies emphasize that interactions between the course instructor and students in e-learning environments, as well as among students themselves, are crucial to the learning process. Timely interaction between the instructor and learners is key in enhancing student learning, and learning support, coupled with prompt

feedback from the instructor, is the main factor in achieving learner satisfaction with the e-learning environment (Singh, 2005; Young & Norgard, 2006; Dennen, Darabi & Smith, 2007; Sahin, 2007; Hermans, Haytko& Mott-Stenerson, 2009; Wu, Tennyson & Hsia, 2010).

Feedback is connected to several theoretical foundations and principles derived from different learning theories. It serves as a middle ground between behaviorist and cognitive theories. From a behaviorist perspective, feedback focuses on the automatic associations between stimuli (inputs) and responses (outputs), where it acts as a mechanism for adjusting responses. From a cognitive perspective, feedback takes into account the environment in relation to the tools that enable behavior to achieve its goal through a flexible control system. Therefore, feedback is not a theory of learning in itself but rather a facilitator of learning (El-Sharkawy, 1988, p. 298).

Meanwhile, proponents of constructivist theory believe that constructivist learning philosophy ~~opened~~ opensnew avenues for researching feedback. Constructivist learning assumes that learners construct their ~~own~~ knowledge, rather than merely receiving external information. Feedback within the context of constructivist theory provides the intellectual tools that assist the learner in building their knowledge. The learner solves complex problems through social negotiation during peer discussions and internally organized cognitive comparisons, with feedback information shaped by the learner's internal understanding (Mory, 2004, p. 770-772).

This study aims to explore the following points:

a) Identifying the timing of feedback delivery (immediate through mobile learning environments; delayed through the Moodle Learning Management System) and the most appropriate technology for delivering it to learners at the right time in distance e-learning environments. This is based on its effect on the acquisition of electronic educational blog design skills and achieving satisfaction with the e-learning environment.

b) Identifying the most appropriate learning style (active, reflective) in different distance e-learning environments, based on its effect on acquiring electronic educational blog design skills and achieving satisfaction with the e-learning environment.

c) Exploring the interaction between feedback timing (immediate through mobile learning environments, delayed through the Moodle Learning Management System) and the most appropriate learning style (~~active - reflective~~active-reflective) in relation to its effect on acquiring electronic educational blog design skills and achieving satisfaction with the e-learning environment.

2. THEORETICAL FRAMEWORK

Given that the current research aims to determine the effect of varying feedback timing (immediate vs. delayed) in a distance e-learning environment and how this

interacts with learning style (active vs. reflective) in enhancing students' skills in designing educational blogs and achieving satisfaction with the learning environment, the theoretical framework and previous literature of this study cover the following areas:

- Distance E-Learning Environments.
- Feedback: Its Concept, Characteristics, Importance, and Uses in the Teaching and Learning Processes.
- Types of Feedback, Timing of Delivery, and Methods of Delivery in Distance E-Learning Environments.
- The Relationship Between Feedback and Learning Styles.
- The Relationship Between Feedback and Satisfaction with Learning in an E-Learning Environment.
- The Theoretical Foundations and Principles Underpinning the Research.
- Standards and Specifications for Designing Content Using Both Immediate and Delayed Feedback Delivery Methods.

2.1 Distance E-Learning Environments.

The internet has been widely used over the past decade as a modern communication tool. With this increased use, global interest in utilizing e-learning in universities has grown in recent years due to advances in communication technology, among other factors. As a result, distance e-learning has become increasingly important in higher education, as it meets the needs of non-traditional students who view education as necessary for securing jobs in the information age. Additionally, it provides learners with a comfortable and flexible environment that allows for learning through different methods of learning and thinking. Many educators and researchers today are attempting to understand how individuals can learn online and how to adapt to new ideas and cultures through the use of integrated technology tools in current learning systems (Koc, 2005, p.12).

The literature (W. Bates & Gary Paul, 2006; Tsai & Machado, 2006; Kook, 2007) indicates that e-learning environments vary in the level of autonomy they provide to learners. There are three main types of these environments: Online Learning, Blended Learning, and Enhanced Learning.

Online Learning: In this environment, the educational material is delivered entirely via the ~~internet~~Internet.

Blended Learning: This environment facilitates learning by integrating online learning with traditional classroom instruction. Students and teachers spend part of the time in face-to-face teaching while working online for the remainder.

Enhanced Learning: This refers to using the network by learners to download course assignments and access various information resources that help them understand learning topics.

The current research adopts the second model, Blended Learning, where the environment facilitates learning through online content, assignments, and tests alongside traditional face-to-face classroom learning. This system is used at the Arab Open University.

E-learning is increasingly utilizing mobile platforms to be more accessible and convenient for users. The use of mobile devices, such as smartphones, has grown significantly in recent years, surpassing the prevalence of personal computers in modern professional and social contexts (Herrington et al., 2009).

With the rapid advancement of smart mobile network technologies, Mobile Learning (M-Learning) has emerged as a new form of e-learning and an extension of it. Learning occurs anytime and anywhere, with the major advantage of not being tied to fixed locations or specific times. It allows for personalized learning according to the learner's needs and learning style, enriching teachers with innovative teaching methods (Wang et al., 2012, p. 3071).

Wireless mobile communication technologies have encouraged researchers to conduct an increasing number of studies on utilizing mobile learning environments, enabling students to learn through mobile devices without restrictions on time and location (Hwang & Chang, 2011, p. 1023). These technologies can be used in various educational contexts and higher education institutions for different purposes. For example, in learning management, they can be used for scheduling, exam reminders, and notifying learners of their grades; ~~in~~ for reference purposes, they can provide dictionaries, e-books, and office applications; for interactivity, they can be used for responding to simulations and games; for data collection, they can assist with note-taking, audio recording, navigation, and GPS-based positioning; and for collaboration, they can be used for podcasting, blogging, and instant messaging between learners (Herrington et al., 2009, p. 134).

With the enormous progress in communication technology, providing effective, efficient, and individualized feedback is not only possible but also applicable. Mobile learning tools have the potential to develop effective, efficient, and personalized feedback with their various functions. Feedback through mobile learning technologies can be more immediate and direct than handwritten feedback or feedback sent via email or learning management systems like Blackboard. For example, with a tablet, instructors can read students' electronic work, write notes, and provide feedback by hand using digital ink, making the feedback process more personal. Including handwritten comments on students' electronic work adds a more human touch to the feedback process (Xu, 2010, p. 287). Additionally, by using instant text messaging and widely available mobile phones, many students expect that these tools will provide immediate feedback on their tasks (Chang, 2011, p. 16).

In light of the characteristics and advantages of mobile e-learning, this research seeks to utilize its potential—within one of the experimental treatments—by providing immediate feedback to learners through mobile e-learning technologies, in contrast to delayed feedback delivered through the Moodle Learning Management System.

2.2Feedback – Its Concept, Characteristics, Importance, and Uses in Teaching and Learning Processes

2.2.1 Concept and Characteristics of Feedback

Feedback holds a significant position in learning-related research as one of the most commonly employed practices by teachers to achieve desirable educational outcomes. It is also one of the primary tools used in formative assessment, providing learners with insights into their performance during the learning process.

Feedback is defined as a set of information that alerts an individual to whether their performance is correct, incorrect, or incomplete. This prompts the individual to correct any errors or omissions, allowing them to achieve the best possible performance with minimal mistakes, thereby adjusting their subsequent behavior (El-Basyouni & El-Mowafi, 1991, p. 123). Others define it as the knowledge of the result of one or more responses that can improve or modify subsequent responses. It provides information about current behavior that can be used to improve future performance (Taras, 2013, p. 33).

Given that this research focuses on feedback in e-learning environments, Abdel Halim, F. (1995, p. 85) defined it as the process through which information is provided to the learner after their response, informing them whether their response was correct or incorrect. It reinforces correct responses, guides incorrect ones, and provides appropriate remediation until the learner arrives at the correct responses. Khamis (2015) also defined feedback in e-learning environments as information provided by the teacher to the learner based on their response, explaining whether the response was correct or incorrect and why (Khamis, 2015, p. 224).

Some confuse the concept of feedback with reinforcement. Abdel Halim, F. (1995) emphasized the difference between the two concepts. Feedback refers to the process of providing information to the learner after their response, whereas reinforcement refers to the effect of this information on the learner. When feedback is provided after a response, it may strengthen the response if correct or weaken the tendency to repeat it if incorrect (Abdel Halim, F., 1995, p. 60-61). Kamal Zaytoun (2004) also noted that feedback and reinforcement are not synonymous; while feedback provides information following responses,

reinforcement is the effect of that information on the learner (Zaytoun, 2004, p. 200).

The literature identifies three key characteristics of feedback: reinforcement, motivation, and informational functions. The importance of feedback in the learning process is linked to these characteristics, which are essential for facilitating learning and reinforcing knowledge (Fikry, 1992, p. 869-873; Narciss, 2013, p.12; Thurlings et al., 2013, p. 12; Shute, 2008, p. 156-157):

Informational Function: Provides the learner with information to determine whether their response is correct or incorrect.

Motivational Function: Keeps the learner alert and engaged by making the learning situation interesting, helping them to exert more effort and adopt effective strategies for improving their performance.

Reinforcement Function: Strengthens correct responses, increasing the likelihood of their repetition in the future.

2.2.2Importance of Feedback and Its Uses in Teaching and Learning

Feedback plays a fundamental role in teaching and learning. Learning becomes easier when learners receive information about whether their performance is correct or incorrect. Delivering this information appropriately and at the right time can lead to further learning (Abu Hatab & Sadiq, 1996, p. 534).

El-Sharkawy (1998) noted that feedback information plays a crucial role in evaluating and reinforcing learned responses. Experimental studies have shown that changes in the amount and timing of feedback information lead to changes in the efficiency and speed of learning (El-Sharkawy, 1998, p. 283). Abu Hatab and Sadiq (1983, p. 387) also emphasized that feedback assumes that learning becomes easier when learners are informed about the correctness of their response and why. If their response is incorrect, feedback guides them towards the error, which helps in self-correction and control.

Psychological and educational literature highlights the critical role feedback plays in learning. It increases academic achievement, facilitates long-term memory retention, helps organize recall, and assists learners in focusing on their mistakes. Correcting wrong responses weakens incorrect associations formed between questions and incorrect answers in memory. Feedback also stimulates the learning process and enhances motivation. It clarifies to learners where they stand in relation to the desired goal and how much time they need to achieve it (Abu Hatab & Sadiq, 1983, p. 387; El-Sharkawy, 1998, p. 283).

Feedback is an essential element in all learning contexts and a core component of formative assessment systems. It provides learners with information about their current knowledge status, aiming to improve learning. Additionally, it offers assistance (e.g., through hints, explanations, or examples) to help learners

identify mistakes and overcome obstacles, enabling them to become more efficient in their learning (Narciss, Sosnovsky, Schnaubert, et al., 2014). Learners need feedback that is not only immediate but also effective, helping them build concepts and achieve course objectives (Nicol & MacFarlane, 2006, p. 205-206).

Research has shown the positive effects of immediate feedback on student learning, as it enhances active interaction between teacher and student. This timely interaction through feedback helps students acquire knowledge and skills and positively impacts their learning (Young & Norgard, 2006; Dennen et al., 2007).

Mory (2004) discussed four perspectives on how feedback supports learning: first, feedback can serve as a stimulus to increase response rate and/or accuracy; second, it can act as a reinforcer that automatically links responses to prior stimuli; third, it can verify or alter the correctness of the previous response; and finally, feedback can act as scaffolding to help students build internal schemas and analyze their learning processes (Mory, 2004, p. 746-747).

Others have noted that feedback in the educational context serves multiple functions, including:

- *Cognitive Functions:* Enhancing information processing.
- *Metacognitive Functions:* Enhancing self-evaluation and reflection.
- *Motivational Functions:* Reinforcing correct responses or encouraging effort and perseverance (Narciss, 2013, p. 16-17; Thurlings, Vermeulen, Bastiaens et al., 2013, p. 12; Shute, 2008, p. 156-157).

2.3Types of Feedback, Timing of Delivery, and Methods of Delivery in Distance E-Learning Environments

2.3.1Types of Feedback and Timing of Delivery

Psychological literature and research studies (El-Gharib, 1990, p. 446-447; El-Sharkawy, 1998, p. 283; Abu Hatab&Sadiq, 1996, p. 481-483; Brookhart, 2008, p. 5-7; Narciss et al., 2014, p. 58P; Narciss, 2013, p. 14-15) indicate that feedback takes various forms, and its impact on learning differs based on these forms as follows:

2.3.1.1Feedback based on the target group (individual vs. group): Individual feedback refers to information provided to each learner individually, while group feedback is given to all learners simultaneously, aimed at identifying and correcting errors for both individuals and the group.

2.3.1.2Feedback based on the amount of information (quantitative vs. qualitative) / (detailed vs. brief): Quantitative feedback provides the learner with information about their performance, while qualitative feedback informs the learner whether their response was correct or incorrect.

2.3.1.3Feedback based on form (verbal vs. non-verbal): Verbal feedback can be written, consisting of comments or grades provided to the learner, or auditory, delivered through spoken comments from the teacher or via computer in an e-learning environment. Non-verbal feedback includes sensory elements such as drawings, images (static or animated), music, or sound effects, used in electronic programs.

2.3.1.4Feedback based on source (internal vs. external): Internal feedback refers to information the learner derives from themselves, while external feedback is provided by the teacher or others.

2.3.1.5Feedback based on timing (immediate, staged, delayed/postponed): Immediate feedback is delivered directly after a behavior, right after the learner completes a task or immediately upon finishing it. Staged feedback is provided after the learner completes each phase of a task, while delayed feedback is given after a period of time following task completion.

As such, feedback differs in terms of form and level of detail, affecting how the learner processes the information. The impact of feedback on learning depends not only on the type of information provided but also on how the learner handles the feedback. Researchers have identified two main factors that determine the effectiveness and efficiency of feedback: the design of the feedback content and how it is received. Feedback varies in both its semantic and structural dimensions (Hattie & Timperley, 2007, p. 102-103).

Regarding the semantic dimension of feedback, which refers to its content, previous literature points to four sub-dimensions of feedback (ranging from minimal content to highly complex) (Martínez-Argüelles, Badia-Miro, Hintzmann, et al., 2011):

- *Error identification and correction:* Provides feedback to the learner regarding the correction of their mistakes.
- *Answer correction:* Feedback highlights the correct answer or provides the correct solution.
- *Task improvement:* Feedback provides content aimed at improving the submitted work.
- *In-depth and detailed information:* Feedback offers deep or detailed information to encourage continued progress and future learning.

Regarding the structural dimension, which refers to the forms of feedback delivery in a particular context, feedback in an e-learning environment can take various forms (Martínez-Argüelles et al., 2011), including:

- *Delivery method (using virtual communication tools):* Formative assessments are conducted using a technological platform that integrates two or more tools for providing feedback.

- *Personalization of feedback (individual vs. group):* Feedback may be general for all students or personalized for each student based on their individual characteristics.
- *Timing of feedback delivery:* Various studies have examined immediate vs. delayed feedback and its effect on improving learning. To ensure effective feedback, it must provide students with sufficient information to meet learning objectives.
- *Feedback medium:* Feedback in an e-learning environment can be delivered through text, multimedia (audio or video recordings, images, or screenshots), and can be received as attached files or directly in messages.

Many researchers have explored good practices for providing feedback, but there is no consensus on the most effective type of feedback for learners and why (Nelson & Schunn, 2009, p. 375-376). Not all feedback improves performance. While feedback can have a positive impact on learning under certain conditions, it can also be ineffective or even negative under other educational circumstances. Therefore, research on feedback does not only address whether it improves learning but also how it does so (Gielen, Peeters, Dochy, et al., 2010, p. 305). However, there is general agreement that feedback should be timely, accessible, and most beneficial when it helps learners apply knowledge and informs future learning (Hatziapostolou&Paraskakis, 2010; Gibbs & Simpson, 2004).

After examining the various feedback types, the researcher selected feedback based on timing (immediate vs. delayed) for the following reasons:

- It is challenging to experiment with all types of feedback simultaneously.
- There is consensus that feedback should be timely, whether immediate or delayed.
- The timing of feedback delivery (immediate or delayed) aligns with the characteristics of learners in distance e-learning systems. Some learners may require immediate feedback at every step or task, while others prefer delayed feedback after completing their assignments.
- There is a lack of studies examining the timing of feedback delivery (immediate vs. delayed), particularly in distance e-learning environments.
- It is essential to determine the effectiveness of immediate feedback in mobile learning (M-learning) systems compared to delayed feedback provided through learning management systems (Moodle) on learning outcomes for students at the Arab Open University, especially considering that delayed feedback is the predominant practice among e-learning practitioners. Many assign tasks and provide feedback only after submissions or tasks are completed, in contrast to immediate feedback.

There is conflicting research on the effect of immediate vs. delayed feedback on various learning outcomes.Some relevant studies include:

Mullet et al. (2014) examined the effect of feedback timing (immediate feedback after assignment submission vs. delayed feedback after one week) on engineering students. Results indicated that students who received delayed feedback performed better on subsequent exams involving new problems based on the same concepts.

Nakata (2014) studied the optimal timing of feedback (immediate vs. delayed) for learning foreign language vocabulary. The results showed that delayed feedback significantly impacted learning outcomes regardless of the frequency of errors during the learning process.

Sinha (2012) investigated the effect of immediate vs. delayed feedback on multiple-choice questions. The results indicated that delayed feedback improved performance on subsequent short-answer test questions.

Van der Kleij et al. (2012) found no effect of immediate or delayed feedback on student achievement in computer-based learning, although students showed more interest in immediate feedback. Similarly, Chan et al. (2012) found no impact of immediate feedback on auditory learning or sensory perception training compared to repeated exposure to sounds.

Other studies (Chang, 2011; Scheeler et al., 2011; Opitz et al., 2011) suggest that immediate feedback has a stronger impact on learning outcomes than delayed feedback. Conversely, other research (Mullet et al., 2014; Nakata, 2014; Sinha, 2012) indicates that delayed feedback is more effective in some learning contexts.

Thus, research on feedback timing has produced conflicting results regarding its impact on learning outcomes and efficiency. Researchers have explored the effects of feedback timing (immediate vs. delayed) for decades, and the optimal timing for feedback delivery remains unresolved (Hickey, 2013). Therefore, a key research problem is determining the appropriate timing for feedback delivery (immediate vs. delayed) and the methods for delivering it to learners.

2.3.2Technologies for Delivering Feedback in E-Learning Environments in a Timely Manner (Immediate – Delayed)

Various technological tools are used to provide feedback, particularly in traditional teaching methods, blended learning, and distance e-learning. But to what extent do these technologies and communication methods offer different types of feedback, delivered in a timely and personalized manner?

There are several alternative methods for delivering formative assessment feedback to students in distance e-learning environments. Electronic solutions

are increasingly used by instructors due to the numerous benefits they offer. These benefits include quick feedback delivery, helping students effectively receive comments, and generating suitable evidence of the feedback's quality through various electronic methods, as mentioned by several researchers (Krause, Stark & Mandl, 2009, p. 160), including:

- Electronic annotations on student work: Several software packages allow instructors to add comments or annotations directly on student submissions, which must be submitted electronically. Modern versions of this software (e.g., Adobe Reader for PDFs, version 9 and above, or the review feature in Microsoft Word) enable instructors to annotate student work, then save, print, or resend the feedback to students via email.
- Sending comments via email: Email can be a simple and effective way to deliver formative feedback to students. However, this communication method doesn't always solve the problem of providing individualized feedback, and students may find it difficult to interpret and manage organized feedback through email.
- Discussion boards and educational forums in Learning Management Systems (LMS).
- Automated feedback from specialized software or during responses to online assessments in LMS systems: Automated feedback in e-learning environments can be standardized (where every student receives the same feedback, such as knowing the correct answer) or adaptive (where feedback is tailored based on student responses). In e-learning environments, feedback should prevent mistakes caused by superficial information processing. Students with little prior knowledge particularly need feedback that points out their individual errors (Krause et al., 2009, p. 160).

As e-learning increasingly employs mobile platforms for greater accessibility and convenience, the current research proposes the use of a free mobile app for smartphones and tablets as a platform for managing mobile learning. This allows for easy, real-time interaction between instructors and students. The app "Google+" (Google Plus) is a social network created by Google, enabling instant communication through desktop computers, tablets, or smartphones (iPhones) running different operating systems (Android, iOS, Blackberry). This app can be used as an "electronic platform" offering the following features (Google Plus Guide; Taylor, Schugar& Penny, 2014):

- *Creating circles:* This feature allows for creating groups of people connected by a certain relationship, such as social, professional, or educational. Circles help organize people based on their relationships, enabling content to be shared with relevant individuals.
- *Conducting video calls (Hangouts):* This feature allows up to 10 people to talk together via video, chat, or share files and screens. Users can instantly switch between text and video chats. With this feature, users can gather groups of friends for a group chat or engage in individual or group text conversations with people in their circles.

- *Posts:* In Google+, people gather to discuss shared interests. This feature allows instant posts and viewing others' posts, which can be text, images, videos, links, or location tags. Posts can be shared individually with others or collectively with a circle, appearing in their feeds.
- *Responding to notifications via email and SMS:* Google+ allows instant notifications via email or SMS for various actions, such as comments on a user's post, someone adding the user to their circle, or reminders of events. Each action is immediately reported to the user through notifications.

The researcher suggests that using the free "Google Plus" app on mobile devices opens the door to future applications for effective mobile learning (M-Learning). These applications include:

- Distance learning systems as a medium between teacher and student for teaching, immediate communication, task submission, and receiving immediate feedback.
- Distance learning systems as a medium for collaborative learning between students for joint tasks, scientific discussions, and sharing information flexibly and quickly.
- Creating virtual classrooms by dividing students into groups using the "circles" feature.
- Offering educational or training courses for students or teachers via video calls, or using Hangouts for group voice conversations, which can substitute for traditional text chat rooms.
- Using screen-sharing features for practical training or observing others' skills in real-time.
- Facilitating collaborative work on sketches (Sketchpad) and file sharing (Google Docs) for teachers and students alike.
- Sharing posts that allow teachers or students to pose questions, share videos, photos, or links with selected circles, instantly appearing in their feeds.
- Instant access from any device (desktop, tablet, or smartphone), overcoming many challenges in distance learning, such as receiving immediate feedback and ensuring students' timely attendance.

Several studies have explored the impact of mobile learning technologies in providing immediate feedback. Some key studies include:

Xu (2010) studied the effect of tablet use in providing feedback on student participation and achievement, particularly in blended e-learning courses. The results indicated that students overwhelmingly preferred digital feedback via tablet over face-to-face feedback during lectures. The study found a significant increase (96%) in student participation when they received immediate, individualized feedback.

Nortcliffe and Middleton (2011) explored the use of smartphones as a tool for delivering learner-friendly voice feedback, finding that smartphones were more suitable than other technologies for managing time and offering quick feedback.

Martínez-Argüelles et al. (2011) evaluated the use of multimedia tools (audio, video, images) for providing feedback. The study concluded that students preferred multimedia feedback, and immediate feedback had the most positive impact on learning.

These studies highlight the benefits of immediate electronic feedback, improving students' understanding and motivation (Xu, 2010), as well as enhancing the quality and efficiency of feedback (Nortcliffe & Middleton, 2011). Immediate feedback in mobile learning environments enhances students' academic performance and learning engagement (Hwang & Chang, 2011), while mobile systems facilitate synchronous learning (Huang et al., 2008).

In light of these findings, the current research uses mobile learning technology (M-Learning) to provide immediate feedback, compared with delayed feedback through the Moodle learning management system used at the Arab Open University.

2.4The Relationship Between Feedback and Learning Styles

The cognitive approach to learning assumes that learning is a process in which the learner interacts with direct or indirect experiences, developing and growing through the mental and cognitive processes they engage in. This helps them build self-specific experiences defined by their learning style. Research into learning styles is an important area in cognitive psychology, especially when the focus shifted from evaluating a learner's performance from others' perspectives to understanding how learners perceive their own learning. Consequently, many studies have been conducted to explore how students learn, rather than how much they learn, emphasizing students' preferred methods of learning (Abu Hashem, 2010).

In the field of educational technology research, learning styles are connected to variables related to the design of e-learning programs and, consequently, to the types of feedback provided through those programs. Individuals differ in their learning styles when interacting with the educational material presented to them, which is linked to individual differences and influences learning outcomes. Learning styles concern these individual differences, including how learners receive, organize, process, store, and recall knowledge. Hence, this research focuses on how feedback (immediate or delayed) relates to learning styles, seeking to uncover which learning style is most conducive to organizing cognitive or emotional activity. Learning styles reflect how learners acquire and retrieve information through their interaction with educational settings, aiming to align learner characteristics with educational circumstances.

Previous literature and studies indicate a strong relationship between feedback and learning styles. Learners' individual characteristics raise questions about how feedback should be delivered and whether it supports or hinders learning. Studies also examine the relationship between feedback design and the learner's individual learning style. Evans (2004) found that students with specific learning styles may respond more positively to different types of feedback, or some types of feedback may be preferred, helping them develop their knowledge (Evans & Waring, 2011).

MiekeVandewaetere and colleagues (2011) summarized a variety of individual learner characteristics that may be crucial in processing feedback and its effectiveness in computer-based learning environments. They categorized these into three groups: (a) Cognitive factors such as prior knowledge, working memory capacity, intelligence, cognitive style, and goal orientation; (b) Affective factors such as motivation, mood, and certainty; and (c) Behavioral factors closely related to cognitive and affective factors, such as self-regulation or behavioral variables like the number of attempts and exercise-solving methods. These factors highlight the need to differentiate between relatively stable learner characteristics, such as gender, intelligence, learning styles, or cognitive styles, and characteristics that evolve or change over time during the learning process, such as knowledge, skills, motivation, and behavior (Vandewaetere, et al., 2011, p. 122-124).
In another study, Smits et al. (2008) found that learners with high levels of prior knowledge could learn more from less detailed feedback, although more specific feedback was generally viewed more positively. The study also showed that learners with lower levels of prior knowledge who received appropriately timed, specific feedback did not experience significant performance improvement (Smits, et al., 2008).

Various theoretical and experimental models of learning styles have emerged. This research will focus on the Felder-Silverman Learning Styles Model. Felder and Silverman (1988) argue that students have preferred learning styles that they use when receiving and processing information. There is significant variation among students in these styles. Some prefer concrete information, such as facts and experimental data, while others prefer abstract information like theories, symbols, and mathematical models. Some students lean towards visual information like images, diagrams, and charts, while others favor verbal information and oral interactions. Some students prefer learning through trial and error or imagining situations, while others prefer reflection and understanding before hands-on application.

The model proposes four dimensions of learning preferences:Processing (active vs. reflective),Perception (sensing vs. intuitive),Input (visual vs. verbal), andUnderstanding (sequential vs. global) (Zywno, 2003). The Felder-Silverman model classifies learning styles into four bipolar types:

- *Active vs. Reflective Style:* Active learners prefer experimenting and working in groups, while reflective learners prefer abstract thinking and individual work.

- *Sensing vs. Intuitive Style:* Sensing learners focus on concrete facts and concepts, while intuitive learners prefer abstract thinking and theoretical reasoning.
- *Visual vs. Verbal Style:* Visual learners prefer visual forms like images and diagrams, while verbal learners prefer oral or written explanations.
- *Sequential vs. Global Style:* Sequential learners prefer learning step-by-step, while global learners prefer to think about the bigger picture.

The current research will focus on identifying the most suitable learning style (active or reflective) in different distance e-learning environments and how this interacts with the timing of feedback (immediate or delayed) in terms of their impact on acquiring skills in designing educational blogs and achieving satisfaction with the e-learning environment.

2.5The Relationship Between Feedback and Learning Satisfaction in E-Learning Environments.

Several factors influence learners' satisfaction with learning in e-learning environments. Many studies indicate a strong relationship between teacher support and learner satisfaction, with learner satisfaction playing a vital role in the vibrancy of e-learning environments. Some research findings emphasize that for blended e-learning environments to be effective, human and technological factors must be considered, such as individual attitudes, interaction, teaching techniques, and feedback design strategies that impact learner satisfaction (Wu, Tennyson, Hsia, & Liao, 2008).

Young and Norgard (2006) highlighted that inadequate learner satisfaction remains a barrier to the successful adoption of blended e-learning systems. While LMS systems allow teaching and learning to take place 24/7, one study revealed persistent dissatisfaction among students regarding online learning due to delayed feedback from instructors. The study surveyed 233 participants, finding that around 90% agreed that teacher-student interaction was crucial for the learning process, with timely teacher-learner interaction being essential for enhancing student learning (Young & Norgard, 2006).

Wu et al. (2010) examined the determinants of student satisfaction in blended e-learning environments, finding that both synchronous and asynchronous interaction had a positive effect on performance expectations and satisfaction. The study recommended that teachers provide tools for effective interaction, encourage positive learner engagement through communication and collaboration, and offer positive feedback in blended e-learning environments to create a positive learning atmosphere and facilitate the learning environment.

Hermans et al. (2009) investigated the factors contributing to student satisfaction in online courses, finding that ease of use, interactive environments, and the instructor's role significantly influenced learner satisfaction. Similarly, Sahin (2007) identified factors such as teacher support, student collaboration, active

learning, and self-direction as critical to learner satisfaction in e-learning environments.

The comprehensive results of previous studies show that interactions between instructors and students, as well as among students, are crucial for the learning process. Timely interaction between teachers and learners is essential for enhancing learning, and learning support, along with timely feedback, is key to achieving learner satisfaction in e-learning environments (Singh, 2005; Young & Norgard, 2006; Dennen et al., 2007; Sahin, 2007; Hermans et al., 2009; Wu et al., 2010).

This research aims to investigate the impact of feedback timing and its delivery through different e-learning environments (immediate through mobile learning vs. delayed through Moodle) on learner satisfaction in e-learning environments.

2.6The Foundations and Principles Underlying the Research.

The literature suggests that the role of feedback in education is based on theoretical principles from several learning theories. Behavioral association theories emphasize that individuals change their behavior when they understand the outcomes of their previous actions. These theories highlight the reinforcing role of feedback, which stimulates learner motivation and directs their efforts toward learning. Additionally, feedback helps solidify and reinforce information, improving performance in subsequent educational tasks.

Most previous studies on feedback have approached it from the perspective of behaviorism (association theory) and information processing theory. According to this approach, feedback corrects incorrect information received by the learner from external sources. Al-Sharqawy (1988) adds that feedback represents an intermediate concept between association theory and cognitive theory. From the behavioral perspective, feedback focuses on the automatic connections between stimuli (inputs) and responses (outputs), and it serves to regulate these responses. From the cognitive perspective, it considers the formation of the environment in connection with the tools used to achieve behavior goals through flexible control systems. Therefore, feedback is not a theory of learning but rather a facilitator of learning (Al-Sharqawy, 1988, p. 298).

Constructivist learning theory introduced a new perspective on feedback. Constructivist learning assumes that learners build their own knowledge rather than merely receiving external information. In this context, feedback provides cognitive tools that help learners construct their own understanding. Learners solve complex problems through social negotiation in discussions with peers, as well as through internally organized cognitive comparisons. In this sense, feedback is determined by the learner's internal understanding (Mory, 2004, pp. 770–772).

Mory (2004) identified the applications of feedback within constructivist learning theory as follows:

- Directing the learner's behavior toward internal reality to facilitate knowledge construction.
- Helping the learner build their own symbols and meanings.
- Providing feedback within the context of the learner's human experiences.
- Offering cognitive and mental construction tools for the learner.

Thus, providing learners with appropriate reinforcement and feedback to help guide them in improving performance and generating the required behavioral responses is one of the key steps in instructional design from the behavioral perspective (Khamis, 2003, p. 31). Moreover, offering both immediate and delayed feedback is a principle of instructional design based on constructivist theory. Providing learners with interactive, immediate information helps them construct their own knowledge when needed. It also offers explanations and assistance on using the technology embedded in the course—such as email, content management systems, and tools and software—which are easily accessible when needed. These are all key principles of instructional design for e-learning courses from a constructivist perspective (Khamis, 2003; Abu Khattwa, 2010; Mödritscher, 2006).

Thus, the current research's provision of both immediate (through mobile learning technologies) and delayed (through the Moodle learning management system) feedback is theoretically grounded in the instructional design principles derived from behavioral, cognitive, and constructivist learning theories.

2.7 Standards and Specifications for Designing Electronic Content Using Immediate and Delayed Feedback Methods.

Several researchers have proposed criteria and specifications that make feedback effective for learning. Gibbs and Simpson (2004) described some of these standards, including that feedback should (a) be sufficient in frequency and detail; (b) focus on student performance, learning, and controllable actions rather than personal characteristics; (c) be delivered to students at the right time (immediately or when further assistance is requested); and (d) be appropriate to the task's goals and standards, and suitable for the students' understanding level (Gibbs & Simpson, 2004, pp. 12-25).

Mory (2004) also outlined good practices for delivering feedback in an online learning environment. These include providing feedback that is immediate, timely, and comprehensive, offering formative and continuous feedback during online group discussions, providing immediate feedback on student grades, and ensuring feedback is constructive, supportive, objective, specific, purposeful, and personalized (Mory, 2004, p. 757).

In general, for feedback to improve cognitive skills and learning outcomes and enhance learning, much of the literature agrees that feedback should have the following qualities:

Timeliness (immediate, staged, or delayed): Feedback is most effective when delivered in a timely manner, allowing students to apply it to current and future assessments.

Motivational: Feedback can have either a positive or negative effect on students' motivation and emotional states, influencing their engagement in the learning process. Therefore, feedback in formative assessment should be constructive, increasing the learner's motivation and encouraging them.

Individualized/Personalized: Each student has unique strengths and weaknesses. To be effective, feedback should empower learners to improve their performance and be personalized to enhance their strengths and address their weaknesses individually.

Manageable: Feedback should be detailed enough to ensure that students clearly understand their strengths and weaknesses. However, overly detailed feedback with too many comments may overwhelm students, making it difficult to identify the most important information. Therefore, feedback should be manageable and allow students to easily interpret and apply the comments that are most relevant to them.

Directly connected to assessment criteria and learning outcomes: Assessment criteria and achievements should be clear, unambiguous, relevant, and aligned with learning outcomes. Formative assessment feedback should clarify how well the student is meeting each criterion and identify gaps in knowledge and specific areas of misunderstanding.

From the literature, it is evident that the timing of feedback is crucial in enhancing the learning process and improving student performance. The purpose of providing feedback at the appropriate time (whether immediate or delayed) is to help students use it when needed. The general rule for determining the timing of feedback is for the teacher to ask themselves: When do students want to hear my comments? Students need immediate feedback while they are still working toward the learning goal, still thinking about the learning goal, or still engaged in the task. They need delayed feedback when there is still enough time for them to continue working toward the goal (Brookhart, 2008, p. 10).

Regarding the timing of feedback, Mory (2004) outlined good practices and standards for both immediate and delayed feedback (Mory, 2004, p. 757):

Immediate feedback: Mory (2004) describes it as corrective information given to learners as quickly as possible through computers and software that allows learners to learn and be tested. Good practices for immediate feedback include:

- It should be step-by-step.
- It should be immediate after each session or after studying each module.
- Learners should be able to exit it at any time.

- It should be under the learner's control.
- It should provide immediate feedback to correct misconceptions.
- It should answer learners' questions immediately.

***Delayed* feedback:** Mory (2004) describes it as rich, corrective information given after a specified delay during the learning or testing process. Good practices for delayed feedback include:

- It should be provided at least one hour after the learning session ends.
- It should be delivered within 1 to 24 hours after the end of each learning session.
- It should be provided within 1 to 7 days of completing learning sessions or units.
- It should be given before the next session.
- It should be delivered when learners still have time to act on it (Brookhart, 2008, p. 10).

The researcher has followed these standards when providing both immediate feedback (through mobile learning technologies) and delayed feedback (through the Moodle learning management system) in experimental treatments to achieve certain learning outcomes among university students studying in a distance learning format.

3.METHODOLOGY AND PROCEDURES

Since the current research aims to identify the impact of different timings for providing feedback (immediate vs. delayed) in a remote e-learning environment and its interaction with learning styles (active vs. reflective) in achieving certain learning outcomes (developing skills in designing and producing educational blogs, and achieving satisfaction with the e-learning environment) among students at the Arab Open University, the research followed the following steps and procedures:

3.1 Identifying the Criteria for Designing and Developing Feedback (Immediate and Delayed) in the Remote E-Learning Environment.

The researcher prepared a list of criteria for designing feedback (immediate and delayed) in the remote e-learning environment by following these steps:

- Reviewing previous literature and scientific studies that addressed feedback, its characteristics, and the methods and technologies for delivering it in e-learning environments.
- Defining the theoretical foundations for providing feedback.
- Identifying the good conditions and specifications for providing feedback (immediate and delayed), particularly in e-learning environments.
- Preparing a list of criteria for designing feedback (immediate and delayed) in the remote e-learning environment.

- Verifying the validity of the feedback design criteria by presenting them to experts in educational technology to ensure the reliability of the criteria. The researcher benefited from the opinions given to revise the wording of some criteria. Thus, the final version of the list (Appendix 2) was deemed suitable for use in designing the experimental treatments used in the current research.

3.2 Designing and Developing the Experimental Treatment.
To achieve the stated research objective, the researcher designed and developed the experimental treatment following the widely used ADDIE instructional design model, as follows:

3.2.1 Analysis Phase: The following steps were undertaken:

Identifying learners and their educational needs: The learners are enrolled in the general education diploma program at the Arab Open University (Saudi Arabia branch), which offers its academic programs based on the blended e-learning model. Students spend 75% of their learning time remotely and meet face-to-face with the course instructor every 15 days. The course description requires students to acquire practical skills and training through remote e-learning systems. Therefore, they need timely, constructive feedback directly linked to assessment criteria and learning outcomes.

Defining the general goal: The experimental treatment aims to determine the appropriate timing for providing feedback (immediate via mobile learning; delayed via the Moodle learning management system) and the most suitable technology for delivering it in remote e-learning environments, measured by its impact on developing skills in designing educational blogs and achieving satisfaction with the e-learning environment.

Defining the learning content: In line with the approved description of the "Educational Technology" course studied by students in the general education diploma program at the Arab Open University, the theoretical and practical units cover the following topics in educational technology: (1) the electronic whiteboard and its uses in teaching; (2) Web 2.0 technologies; (3) podcasting techniques; and (4) mobile learning technologies. These units are linked to the practical skills students need, such as designing and producing an educational blog, which is one of the dependent variables in the current research.

3.2.2Design Phase: In this phase, student tasks, activities, and timelines were defined. The students' roles and responsibilities in completing the tasks were also determined. Specifications and criteria for the timing of immediate and delayed feedback were established based on the previous research steps. These criteria included timeliness, constructiveness, personal delivery, and direct relation to the evaluation criteria of the learning task.

3.2.3Development Phase: In this phase, the e-learning content was developed and uploaded to the Moodle system. This content is studied remotely by both experimental groups, with the only difference being the timing and method of

feedback delivery (immediate via mobile learning tools versus delayed via Moodle). Based on this, two experimental treatments were developed for providing feedback:

First Experimental Treatment: Developed for providing immediate feedback using mobile learning tools (Google+ tools). Regardless of the learning style, learners in this experimental group received immediate feedback on their inquiries regarding the learning task they were completing, immediately after completing each stage or the task itself, either individually or in groups, and in written, auditory, or multimedia formats (audio and video). This was facilitated by using Google+ tools on tablets or smartphones (iPhones), which allowed real-time interaction between learners and the course instructor or among themselves. The following tools were utilized:

Creating Circles: This tool allowed the course instructor to group students into *one* circle connected by their study of the course, enabling them to share content and common interests and solve problems they encountered.

Video Calls (Hangouts): This tool enabled learners to have individual or group video calls, share files, and screens with the instructor or peers, allowing *real*-time feedback and problem-solving.

Sharing Spaces: Google+ allowed *real*-time content sharing among students and instructors, whether in text, images, videos, or links, fostering immediate peer and instructor feedback.

Responding to Notifications via Emails and SMS: This tool provided learners with instant notifications for every post, comment, or *discussion*, ensuring immediate feedback upon task completion.

Second Experimental Treatment: Developed for providing delayed feedback using Moodle tools. Regardless of the learning style, learners in this group received delayed feedback, delivered 1 to 48 hours after submitting their inquiries or completing the task. The feedback was provided individually or in groups, primarily in written form. The tools used within the Moodle system included:

Moodle's Email System: This was used for providing feedback after each task stage or inquiry regarding the design and production process.

Discussion Boards: A dedicated board was created for students to post problems encountered during their studies or while completing assignments. The instructor responded within 24 to 48 hours, providing written feedback.

3.2.4Implementation Phase: In this phase, learners actively used the experimental treatment material, with feedback provided either immediately or delayed, as detailed in the previous steps.

3.2.5Evaluation Phase: This final phase involved the application of evaluation tools (an observation card for assessing student outcomes, a satisfaction scale for the e-learning environment, and a learning style scale). These tools were administered electronically to facilitate final grade calculation. Faculty responses were also gathered to ensure the experimental treatment's adherence to electronic course design standards.

3.3 Development of Research Tools.
Achieving the research objectives required the development of the following measurement tools:

3.3.1 Observation Checklist: This checklist was designed to observe students' outcomes in creating educational blogs.

3.3.1.1Purpose of the Observation Checklist: The checklist aims to measure students' behavioral performance in designing and producing educational blogs using a content management system (Blogger).

3.3.1.2 Defining the Dimensions of the Scale: To define the dimensions and items of the scale, the researcher reviewed relevant theoretical frameworks and previous studies on blog design (Hsu, C. C., 2011; Hsu, C. C., 2012; Collison et al., 2006). Based on these sources, the observation checklist was constructed. The checklist consists of four sub-skills, each with several behavioral tasks that students must sequentially perform with specific accuracy to score a performance point. These skills are:

- Dimension 1: Skill in designing the general layout of the blog (user interface design), which includes eight observable behavioral tasks.
- Dimension 2: Skill in designing templates, backgrounds, fonts, colors, images, graphics, videos, and links while considering technical standards, with 21 observable tasks.
- Dimension 3: Skill in adhering to scientific standards for designing the educational blog, with six observable tasks.
- Dimension 4: Skill in ensuring the blog's functionality and interactivity, with five observable tasks.

3.3.1.3 Scoring System: The checklist uses a three-point scale: high performance earns three points, medium performance earns two points, low performance earns one point, and no points are awarded if the skill is not performed. The checklist includes 40 sub-skills or behavioral tasks, with a maximum score of 120 points (representing excellent performance) and a minimum score of 40 points (indicating poor performance in blog design and production).

3.3.1.4 Validity and Reliability of the Checklist: The checklist was reviewed by educational technology experts to ensure its appropriateness for the research objectives, accuracy, and coverage of the relevant skills. Necessary revisions were made based on the reviewers' feedback. The researcher also applied the checklist to a pilot group of students who had previously taken the course but

were not part of the main research sample. Internal validity was calculated using a correlation matrix between the checklist's dimensions and the total score, with correlation coefficients ranging from 0.319 to 0.783, all statistically significant at the 0.01 level, indicating the internal consistency of the checklist. Reliability was calculated by observing the pilot group's performance during the blog design and production task, with a second observer from the educational technology department also assessing the performance. The reliability was determined using Cooper's formula, with agreement rates between 83.6% and 90.1%, indicating the checklist's reliability. The final version of the checklist is thus suitable for the current research.

3.3.2 Satisfaction Scale for the E-Learning Environment.

3.3.2.1 Purpose of the Scale: The scale aims to measure students' satisfaction with the e-learning environment.

3.3.2.2 Defining the Scale Dimensions: To define the dimensions and items of the scale, the researcher undertook the following steps:

- Reviewed theoretical frameworks and various definitions in the field of e-learning and satisfaction with the e-learning environment.
- Utilized insights from previous studies and the tools they employed (Singh, 2005; Kiriakidis, 2008; Shee& Wang, 2008; Hermans et al., 2009; Wu et al., 2010; Chang, 2011).

The scale consists of 36 items distributed across five dimensions:

- Dimension 1: Ease of use of the system, measuring satisfaction with the system's user-friendliness and the learner's ability to complete tasks (6 items).
- Dimension 2: System functions, measuring satisfaction with the system's flexibility in providing access to educational materials and assessments (6 items).
- Dimension 3: Interactions (support from teachers and peers), measuring satisfaction with collaboration among students and between students and faculty (8 items).
- Dimension 4: Timeliness of feedback, measuring satisfaction with the timing of feedback in the e-learning environment (11 items).
- Dimension 5: General satisfaction with the learning atmosphere, measuring learners' attitudes toward the positive environment that facilitates learning (5 items).

3.3.2.3 Scoring System: The scale is based on a five-point Likert scale, where responses range from "highly satisfied" (5 points) to "very dissatisfied" (1 point). The maximum score for the satisfaction scale is 180, indicating a high level of satisfaction, and the minimum score is 40, indicating very low satisfaction.

3.3.2.4 Validity and Reliability of the Scale: The satisfaction scale was reviewed by expert judges to ensure its relevance, accuracy, and comprehensive coverage of the targeted areas. Revisions were made based on their feedback. The researcher then applied the scale to a pilot group of students, calculating internal validity using a correlation matrix between the scale items and the total score. Correlation coefficients ranged from 0.396 to 0.837, all statistically significant at the 0.01 level, indicating internal consistency. Cronbach's alpha was calculated to assess reliability, resulting in a value of 0.718, confirming the scale's reliability for use in the current research.

3.3.3Learning Styles Scale.

The researcher employed the Felder-Silverman Learning Styles Model (Felder & Silverman, 1988), which classifies students across four bipolar dimensions. These dimensions were discussed earlier in the research framework.

3.3.3.1 Description of the Inventory: The inventory consists of 44 items, with 11 items for each dimension. The bipolar dimensions are: active-reflective, sensing-intuitive, visual-verbal, and sequential-global. Each item has two choices (A & B), where the first choice represents one pole, and the second choice represents the opposite pole. A score of 1 is given for choice A and -1 for choice B. Each dimension is measured by 11 items, and there is no total score. Students are classified based on their preferences as follows:

- Scores between -3 and +3 indicate no strong preference for either style.
- Scores between -5 and -7 or +5 and +7 indicate a moderate preference for one style.
- Scores between -9 and -11 or +9 and +11 indicate a strong preference for one style.

The researcher used the Arabic version of the inventory, translated by Al-Hashem (2010). Students completed the Arabic version and then entered their responses into the English version on the official website:[https://learningstyles.webtools.ncsu.edu]. Upon completion, the site generated results.

3.3.3.2 Psychometric Properties of the Original Inventory: Many studies have verified the validity and reliability of the Learning Styles Inventory across different university student samples and cultures. It has been translated into more than six languages, with consistently high validity and reliability scores across studies (Filippidis & Tsoukalas, 2009). The researcher will follow these established psychometric properties for this research.

3.4 Selection of the Research Sample.

A purposive/convenience sample was selected from students at the Arab Open University, Dammam Branch, in the Kingdom of Saudi Arabia. These students were enrolled in the "Educational Technology" course during the second

semester of the 2012/2013 academic year. The total number of students in the sample was 67, with an average age of 27.03 years and a standard deviation of 3.56, divided into four experimental groups according to the research variables and experimental design.

3.5 Determining the Experimental Design.

Based on the research methodology and variables, the factorial design (2x2) was adopted, which measures the effect of two independent variables, each with two levels (Mohammad Atiya Khamis, 2013, p. 214). Consequently, four experimental groups were formed as follows:

Group 1: Active learners receiving immediate feedback (19 students).

Group 2: Active learners receiving delayed feedback (17 students).

Group 3: Reflective learners receiving immediate feedback (15 students).

Group 4: Reflective learners receiving delayed feedback (16 students).

3.6 Conducting the Research Experiment.

The researcher undertook the following steps to achieve the research objectives, which proceeded through three main stages:

3.6.1Pre-Application of Research Tools.

- Reviewed literature and previous studies related to the research topic to inform the design and implementation of the research tools.
- Developed and validated measurement tools, including the observation checklist for skills in designing and producing educational blogs and the satisfaction scale for the e-learning environment.
- Selected the study sample from students enrolled in the "Educational Technology" course in the general diploma in education program at the Arab Open University (Saudi Arabia branch).
- Applied the Felder-Silverman Learning Styles Inventory to the study sample to identify learners with an active (practical) learning style versus those with a reflective learning style.
- Ensured the equivalence of the groups before applying the experimental procedures. The results showed no statistically significant differences between the experimental groups on these variables, indicating that they were equivalent. The equivalence of the groups in some experimental control variables, such as mastery of basic technical skills required for the e-learning environment and access to computers, smartphones, or tablets, was also verified using an electronic questionnaire designed for this purpose.

3.6.2 Experimental Treatment Procedures.

In this phase, students actively engaged with the experimental treatment material. Regardless of their learning style (active or reflective), the students needed feedback and remote monitoring of their work. Feedback was provided using one of two different methods,which details the implementation of the experimental treatments for the current research.

The experimental treatments took place over ten weeks during the second semester of the academic year 2012-2013, starting in the second week of the semester and ending in the twelfth week, according to the course schedule. The procedural steps for implementing the experimental treatments were as follows:

- Students enrolled in the general diploma in education program at the Arab Open University studied the "Educational Technology" course remotely via a blended e-learning system over 16 weeks, including five scheduled face-to-face meetings with the course instructor.
- In the first face-to-face meeting, students received the course textbook and study schedule and followed the remaining educational activities with the instructor via the university's Moodle learning management system (LMS).
- During the first meeting, the instructor introduced the electronic content of the course, which included lecture presentations (PowerPoint slides, PDF files) to be studied individually through the LMS.
- As part of the final assessment for the "Educational Technology" course, students were required to complete practical training remotely on one of the content management software tools for designing and producing educational blogs.
- Assignment: Students were required to complete practical tasks, including designing and producing an educational blog in their field of specialization using one of the necessary content management systems.
- Students in the experimental groups receiving immediate feedback (34 students) were asked to provide the instructor with a Gmail account (or create a new one) and join the course circle through the mobile learning platform (Google+) for real-time communication and feedback. Students in the groups receiving delayed feedback were instructed to communicate with the instructor via the university's Moodle discussion board and email.

3.6.3Post-Application of Research Tools.

- After the students submitted their assignments and projects within the specified time frame, they uploaded them electronically for the instructor to evaluate and grade.
- The research tools (observation checklist, satisfaction scale for the e-learning environment, and learning styles inventory) were applied post-treatment to measure the effects of the different feedback timing and delivery techniques (immediate via mobile learning tools vs. delayed via Moodle) on students' skills in designing and producing educational blogs and their satisfaction with

the e-learning environment, and to assess how this interacted with their learning styles.

- Data was analyzed statistically, and the results were discussed. Recommendations and suggestions were also provided.

4. RESULTS AND DISCUSSION

The interpretation of the results based on testing the research hypotheses is as follows:

4.1 Results Related to the Impact of Feedback Timing (Immediate via Mobile Learning Environment - Delayed via Moodle LMS) on Acquiring Educational Blog Design Skills and Satisfaction with the E-learning Environment.

The current research results indicated statistically significant differences between the mean scores of the experimental groups that received immediate feedback in acquiring educational blog design and production skills and satisfaction with the e-learning environment. These differences are attributed to the timing of feedback (immediate via mobile learning environment - delayed via the Moodle LMS). The results showed that the experimental groups (1 and 3) that received immediate feedback via mobile learning technologies outperformed the groups (2 and 4) that received delayed feedback via the Moodle LMS. This result can be explained as follows:

The use of synchronous communication tools, such as the Google+ application via tablets or smartphones, provided students in these experimental groups with real-time interactions with the course instructor. This allowed them to ask questions or submit tasks (such as posting blog links) and receive immediate feedback. Students in these groups were able to get real-time feedback as they completed each task, which involved designing and producing educational blogs using the "Blogger" platform, without any delays. Additionally, the ability to be present simultaneously, anywhere via mobile devices, enabled them to exchange ideas and have real-time text or voice conversations to solve problems they faced during the blog design process. They could continue discussions with the instructor and other students using group communication tools such as "Hangouts," which improved their focus and task completion.

The screen-sharing feature also allowed the instructor to monitor the student's work step-by-step, providing real-time feedback on tasks and queries either individually or to the group as a whole. Additionally, the shared workspace feature enabled remote students to share posts (text, images, videos, or website links) and view others' contributions, facilitating collaborative learning. The ability to respond to notifications via SMS also allowed students to receive immediate alerts for every post made by the instructor or peers, enhancing real-time engagement. The mobile learning platform preserved the text of discussions and

feedback provided by the instructor during the blog design process, enabling students to review feedback at any time.

The ease of performing learning activities using smartphones and tablets also reduced the time required for the instructor to provide quick, accurate feedback on learning tasks. Overall, the specific tools and features of this experimental treatment allowed for real-time feedback on every task performed by the students. Whenever a student made any modification to their blog or completed a step, it appeared instantly on the instructor's and all students' devices. This immediate feedback contributed to more positive outcomes for students in acquiring blog design and production skills. Since the feedback was always timely, encouraging, and aimed at improving students' work, it also fostered student satisfaction with the e-learning environment. In contrast, those who received delayed feedback, which was provided two days later (48 hours) via email or asynchronous discussion forums in the Moodle platform, were less satisfied.

These findings are consistent with several previous studies. For instance, XU, Y. (2010) found that 96% of students in his study reported that immediate feedback provided electronically by the instructor using a tablet was extremely helpful in understanding the content and increased their motivation to learn. Similarly, Nortcliffe and Middleton (2011) concluded that smartphones were more convenient than other technologies for providing feedback in various formats and helped instructors manage time and effort in commenting on and grading students' work. The study participants also enjoyed the use of personal smartphones for receiving feedback and appreciated the quick response, which improved the quality and impact of the feedback on their learning. Hwang & Chang (2011) showed that formative assessment based on mobile learning improved students' academic achievement and attitudes toward learning. Furthermore, Huang et al. (2008) found that mobile learning systems facilitated synchronous learning by enabling students to access lessons effectively through a wide range of tools. Chen et al. (2008) highlighted that the instant communication features of mobile devices enhanced learning processes and peer interactions by providing timely access to learning materials, data transfer, browsing capabilities, and short message services.

In summary, the current study aligns with previous research, confirming that mobile learning environments are effective tools for providing immediate feedback, improving academic performance, enhancing learning outcomes, and increasing student satisfaction in distance e-learning environments.

4.2 Results Related to the Impact of Learning Styles (Active - Reflective) on Acquiring Educational Blog Design Skills and Satisfaction with the E-learning Environment.

The results showed statistically significant differences at the 0.01 level between the mean scores of students with active and reflective learning styles in their performance on both the observation card for blog design and production skills

and satisfaction with the e-learning environment, in favor of the active learners. This means that active learners outperformed in both tasks. The researcher explains this result as follows:

Active learners prefer learning through experimentation and group work. They tend to acquire and understand information through practical, applied activities and collaborative efforts. This aligns with the experimental treatment used, which involved practical learning activities, including designing and producing educational blogs in groups. The synchronous presence of students, regardless of time or place, and the use of mobile devices facilitated the exchange of ideas and real-time conversations (text or voice) to solve problems encountered during the blog design process. Students could continue the conversation simultaneously through the group communication tool "Hangouts." The shared workspace feature allowed students to instantly share their contributions, view others' work, and follow the progress of assigned tasks.

This alignment between the experimental treatment and the learning style of active learners led to better performance in both blog design skills and satisfaction with the e-learning environment. In contrast, reflective learners, who tend to prefer abstract thinking, working alone, and taking time to process information, found it more difficult to adapt to the immediate feedback provided. This is consistent with the delayed feedback that was more suitable for reflective learners, as provided via asynchronous discussion forums in the Moodle system.
These findings are also consistent with previous studies that emphasized the importance of timely interactions between the instructor and students, as well as peer-to-peer interactions in the learning process. Timely feedback from the instructor was found to be critical in enhancing student learning and achieving satisfaction with the e-learning environment (Singh, 2005; Young & Norgard, 2006; Dennen et al., 2007; Sahin, 2007; Hermans et al., 2009; Wu et al., 2010).

4.3 Results Related to the Interaction Between Feedback Timing (Immediate via Mobile Learning Environment - Delayed via Moodle LMS) and Learning Styles (Active - Reflective) on Acquiring Educational Blog Design Skills and Satisfaction with the E-learning Environment.

The research results indicated statistically significant differences at the 0.05 level between the mean scores of students in their performance on the observation card for blog design and production skills, attributed to the interaction between feedback timing (immediate via mobile learning environment - delayed via Moodle LMS) and learning style (active - reflective). This suggests that the interaction between feedback timing and learning style significantly influenced students' acquisition of blog design skills. The results showed that active learners benefited the most from immediate feedback through mobile learning, as they prefer active, group-based learning in a social context. The experimental treatment provided a synchronous communication environment via mobile devices, where real-time feedback helped them exchange ideas and solve problems during the blog design process, leading to effective skill acquisition.

However, the results showed no statistically significant differences at the 0.05 level in student satisfaction with the e-learning environment due to the interaction between feedback timing and learning style. This indicates that the interaction between feedback timing and learning style did not affect student satisfaction. This result can be explained by the fact that, regardless of learning style, the first and third experimental groups that received immediate feedback through mobile learning showed similar satisfaction levels with the real-time feedback and its ease of use through wireless communication technologies. As a result, the interaction between feedback timing and learning style did not influence satisfaction compared to the second and fourth experimental groups, which received delayed feedback via Moodle LMS.

5. CONCLUSION

The study revealed several key findings. First, students who received immediate feedback through a mobile learning environment outperformed those who received delayed feedback via the Moodle LMS in acquiring educational blog design skills and demonstrated higher satisfaction with the e-learning environment. Additionally, students with an active learning style achieved better results in both skills acquisition and satisfaction compared to those with a reflective learning style. Furthermore, the interaction between feedback timing and learning style significantly affected students' performance in acquiring blog design skills, particularly benefiting active learners who received immediate feedback. However, this interaction did not significantly impact student satisfaction with the e-learning environment. These findings emphasize the importance of timely feedback and learning style alignment in enhancing learning outcomes and student satisfaction in e-learning environments.

6. RECOMMENDATIONS AND SUGGESTIONS

In light of the current research findings and the results of related previous studies and research projects, the researcher provides a set of recommendations and educational applications to be utilized as practical strategies when designing e-learning content, as follows:

- Guide students with an active learning style toward synchronous e-learning environments to maximize the benefits of receiving immediate feedback during their study of online courses.
- Utilize mobile learning environments (M-Learning) as they offer effective tools for providing immediate feedback. Using personal smartphones to deliver feedback to remote learners and promptly responding to their tasks enhances the quality of feedback and its impact on learning outcomes, while also increasing student satisfaction when learning in an online environment.
- Mobile learning systems should be employed as they facilitate synchronous learning. The ability to access learning materials, transfer data, browse content, and send short messages through mobile devices helps users receive feedback information in a timely manner.

- It is essential to conduct training workshops for faculty members and e-learning course designers on various strategies for delivering effective feedback in online learning environments. Additionally, they should be trained in how to provide feedback using synchronous wireless communication technologies, especially considering that feedback for students should be immediate, timely, and tailored to individual learners.

The study also suggests conducting further research to compare the impact of different types of feedback content and delivery methods on enhancing various learning outcomes, including:

- Conducting a study to examine the effect of different feedback dimensions (error identification and correction - providing the correct answer) / (detailed and in-depth information - concise and quick information) on certain learning outcomes of students.
- Investigating the effect of the interaction between the specificity of feedback (individual - group) and learning style (active - reflective) in a synchronous e-learning environment on certain learning outcomes.
- Exploring the impact of the interaction between feedback format (concise text - detailed multimedia) in a synchronous e-learning environment and learning style (visual - verbal) on certain learning outcomes of students.

REFERENCES

Abdel Halim, F. (1995). Computers in Education. Cairo: Dar Al-Maarif.

AbdelHaq, E.&Bani Ata, A.(2006). The effect of immediate and delayed feedback on improving the performance of handstand and cartwheel skills on the floor exercise mat. An-Najah University Journal for Research in Humanities, 20(3), 52-67.

Abdul-Jabbar, R. F., Mohammad, A. A. S., &Slumi, A. A. (2010). The influence of some types of feedback on learning activity of disc throwing. *Dirasat: Educational Sciences, 35*(2).Retrieved from https://archives.ju.edu.jo/index.php/edu/article/view/385

Abu Hashem, E. M. (2010). Construct validity of the Felder-Silverman learning styles model among university students. King Saud University Journal of Educational and Islamic Sciences, 24, 1-35.

Abu Hatab, F.& Sadiq, A. (1983). Educational Psychology (2nd ed.). Cairo: Anglo-Egyptian Library.

Abu Hatab, F.& Sadiq, A. (1996). Educational Psychology (5th ed.). Cairo: Anglo-Egyptian Library.

Abu Khatwa, E. A. (2010). Principles of designing e-courses derived from learning theories and their educational applications. E-Learning Conference in Enhancing Knowledge Societies, Bahrain, University of Bahrain, Zain eLearning Center, April 6-8.

Bates, W., & Poole, G. (2006). Effective Teaching with Technology in Higher Education (M. R. Alabrash, Trans.). Saudi Arabia: Ministry of Higher Education, Joint Translation Project between the Ministry of Higher Education and Obeikan Printing and Publishing.

Biesinger, K., & Crippen, K. (2010). The effects of feedback protocol on self-regulated learning in a web-based worked example learning environment. *Computers & Education, 55*(4), 1470-1482. https://doi.org/10.1016/j.compedu.2010.06.013

Brookhart, S. M. (2008). *How to give effective feedback to your students*. ASCD. ERIC Number: ED509138.

Brown, A. R., & Voltz, B. D. (2005). Elements of effective e-learning design. *The International Review of Research in Open and Distance Learning, 6*(1), 1-7.

Butler, R., & Nissan, M. (1986). Effect of no-feedback, task-related comments, and grades on intrinsic motivation and performance. *Journal of Educational Psychology, 78*(4).

Chan, K. M., Li, M., Law, T. Y., &Yiu, E. M. (2012). Effects of immediate feedback on learning auditory perceptual voice quality evaluation. *International Journal of Speech-Language Pathology, 14*(4), 363-369.https://doi.org/10.3109/17549507.2012.679746

Chang, N. (2011). Pre-service teachers' views: How did e-feedback through assessment facilitate their learning?.*Journal of the Scholarship of Teaching and Learning, 11*(2), 16-33.

Chen, G. D., Chang, C. K., & Wang, C. Y. (2008). Ubiquitous learning website: Scaffold learners by mobile devices with information-aware techniques. *Computers & Education, 50*(1), 77-90. https://doi.org/10.1016/j.compedu.2006.03.004

Cole, R. S., & Todd, J. B. (2003). Effects of web-based multimedia homework with immediate rich feedback on student learning in general chemistry. *Journal of Chemical Education, 80*(11), 1338-1341. https://doi.org/10.1021/ed080p1338

Collison, S., Davis, C. J., Heilemann, M., Oxton, J., Powers, D., Rutter, R., & Sherry, P. (2006). *Blog design solutions*. Friends of ED.

Dennen, V. P., Darabi, A., & Smith, L. J. (2007). Instructor-learner interaction in online courses: The relative perceived importance of particular instructor actions on performance and satisfaction. *Distance Education, 28*(1), 65-79. https://doi.org/10.1080/01587910701305319

Dihoff, R. E., Brosvic, G. M., & Epstein, M. L. (2003). The role of feedback during academic testing: The delay retention effect revisited. *The Psychological Record, 53*(4), 533-548. https://doi.org/10.1007/BF03395451

El-Basyouni, M.S. & El-Mowafi, F.H. (1991). The effectiveness of some types of feedback in developing cognitive and emotional aspects among middle college

students in Oman. Journal of the Faculty of Education, Mansoura University, 25(1), January.

El-Gharib, R. (1990). Learning: An Explanatory and Directive Study (4th ed.). Cairo: Anglo-Egyptian Library.

El-Qawas, M.A. (2011). The effectiveness of immediate and delayed feedback on the achievement of second-year secondary science students in mathematics and their motivation towards learning it. Ismailia Faculty of Education Journal, 1(1), 199-246.

El-Sharkawy, A. M. (1988). Learning: Theories and Applications (3rd ed.). Cairo: Anglo-Egyptian Library.

El-Sharkawy, A. M. (1996). Learning Styles: Series of Educational Psychology, Abstracts of Arab Research and Studies (Vol. 1). Cairo: Anglo-Egyptian Library.

El-Sharkawy, A. M. (1998). Learning: Theories and Applications (5th ed.). Cairo: Anglo-Egyptian Library.

Evans, C., & Waring, M. (2011). Student teacher assessment feedback preferences: The influence of cognitive styles and gender. *Learning and Individual Differences, 21*(3), 271-280. https://doi.org/10.1016/j.lindif.2010.11.011

Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. *Engineering Education, 78*(7), 674-681.

Fikry, J. M. (1992). The effectiveness of using some forms of feedback in teaching mathematics at the preparatory stage. Journal of the Faculty of Education, Assiut University, 2(8), 869-873.

Filippidis, S. K., & Tsoukalas, I. A. (2009). On the use of adaptive instructional images based on the sequential–global dimension of the Felder–Silverman learning style theory. *Interactive Learning Environments, 17*(2), 135-150. https://doi.org/10.1080/10494820701869524

Freney, M. H. P., & Wood, D. (2008). The delivery and management of feedback and assessment in an e-learning environment. *The International Journal of Learning, 15*(2), 169-178.

Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports students' learning. *Learning and Teaching in Higher Education, 1*(1), 3-31.

Gielen, S., Peeters, E., Dochy, F., Onghena, P., &Struyven, K. (2010). Improving the effectiveness of peer feedback for learning. *Learning and Instruction, 20*(4), 304-315. https://doi.org/10.1016/j.learninstruc.2009.08.007

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81-112. https://doi.org/10.3102/003465430298487

Hatziapostolou, T., &Paraskakis, I. (2010). Enhancing the impact of formative feedback on student learning through an online feedback system. *Electronic Journal of e-Learning, 8*(2), 111-122.

Hermans, C. M., Haytko, D. L., & Mott-Stenerson, B. (2009). Student satisfaction in web-enhanced learning environments. *Journal of Instructional Pedagogies, 1*(1), 1-19.

Herrington, J., Herrington, A., Mantei, J., Olney, I., & Ferry, B. (2009). *New technologies, new pedagogies: Mobile learning in higher education*. University of Wollongong.

Hickey, D. (2013). Case study: A comparison of immediate and delayed feedback in the context of online testing with fourth-class students. http://hdl.handle.net/10344/3579

Hsu, C. C. (2011). Factors affecting webpage's visual interface. *Computer Science, 3*(2011), 1315-1320.

Hsu, C. C. (2012). Evaluation criteria for blog design and analysis of causal relationships using factor analysis and DEMATEL. *Expert Systems with Applications, 39*(1), 187-193. https://doi.org/10.1016/j.eswa.2011.07.006

Hsu, C., Yeh, Y. C., & Yen, J. (2009). Development of design criteria and evaluation scale for web-based learning platforms. *International Journal of Industrial Ergonomics, 39*(1), 90-95. https://doi.org/10.1016/j.ergon.2008.08.006

Huang, Y. M., Kuo, Y. H., Lin, Y. T., & Cheng, S. C. (2008). Toward interactive mobile synchronous learning environment with context-awareness service. *Computers & Education, 51*(3), 1205-1226. https://doi.org/10.1016/j.compedu.2007.11.009

Hwang, G. J., & Chang, H. F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers & Education, 56*(4), 1023-1031. https://doi.org/10.1016/j.compedu.2010.12.002

Khamis, M.A. (2003). Educational Technology Processes. Cairo: Dar Al-Kalima Library.

Khamis, M.A. (2009). E-Supporting: Educational Technology in Egypt, 19(2), 1-2.

Khamis, M.A. (2010). Towards a comprehensive theory of e-learning. In Proceedings of the First Symposium on Applications of Information and Communication Technology in Education and Training (April 12-14). King Saud University, Riyadh.

Khamis, M.A. (2013). Theory and Educational Research in Educational Technology. Cairo: Dar Al-Sahab for Publishing and Distribution.

Khamis, M.A. (2015). E-Learning Resources: Individuals and Media (Vol. 1). Cairo: Dar Al-Sahab for Printing and Publishing.

Kiriakidis, P. (2008). Online learner satisfaction: Learner-instructor discourse. *College Teaching Methods & Styles Journal (CTMS), 4*(1), 11-18. https://doi.org/10.19030/ctms.v4i1.5043

Koc, M. (2005). Individual learner differences in web-based learning environments: From cognitive, affective, and social-cultural perspectives. *Turkish Online Journal of Distance Education-TOJDE, 6*(4), 12-22.

Kook, J. K. (2007). Student-centered online support for learning computer programming: Student perceptions and preliminary study. *International Journal of Instructional Technology and Distance Learning, 4*(8).

Krause, U. M., Stark, R., & Mandl, H. (2009). The effects of cooperative learning and feedback on e-learning in statistics. *Learning and Instruction, 19*(2), 158-170. https://doi.org/10.1016/j.learninstruc.2008.03.003

Litzinger, T. A., Lee, S. H., Wise, J. C., & Felder, R. M. (2007). A psychometric study of the index of learning styles. *Journal of Engineering Education, 96*(4), 309-319. https://doi.org/10.1002/j.2168-9830.2007.tb00941.x

Martínez-Argüelles, M. J., Badia-Miro, M., Hintzmann, C., & Plana-Erta, D. (2011). Evaluation of multimedia tools and e-feedback in virtual learning environments. *Proceedings of the European Conference on e-Learning, 6417-6425.*

McPherson, M. A., & Nunes, J. M. B. (2004). The role of tutors as an integral part of online learning support. *European Journal of Open and Distance Learning, 1*(1), 1-10.

Metcalfe, J., Kornell, N., & Finn, B. (2009). Delayed versus immediate feedback in children's and adults' vocabulary learning. *Memory & Cognition, 37*(8), 1077-1087. https://doi.org/10.3758/MC.37.8.1077

Mödritscher, F. (2006). E-learning theories in practice: A comparison of three methods. *Journal of Universal Science and Technology of Learning, 3*, 3-18.

Monahan, T., McArdle, G., &Bertolotto, M. (2007). mCLEV-R: Design and evaluation of an interactive and collaborative m-learning application. *International Journal of Emerging Technologies in Learning (IJET), 2*(2), 2007. https://doi.org/10.3991/ijet.v2i2.91

Mory, E. H. (2004). Feedback research revisited. *Handbook of Research on Educational Communications and Technology, 2*, 745-783.

Mullet, H. G., Butler, A. C., Verdin, B., von Borries, R., & Marsh, E. J. (2014). Delaying feedback promotes transfer of knowledge despite student preferences to receive feedback immediately. *Journal of Applied Research in Memory and Cognition.2*(2), 222-229.https://doi.org/10.1016/j.jarmac.2014.05.001

Nakata, T. (2014). Effects of feedback timing on second language vocabulary learning: Does delaying feedback increase learning?.*Language Teaching Research, 19*(4), 504-525. https://doi.org/10.1177/1362168814541721

Narciss, S. (2013). Designing and evaluating tutoring feedback strategies for digital learning environments on the basis of the Interactive Tutoring Feedback Model. *Digital Education Review, 23*, 7-26.

Narciss, S., Sosnovsky, S., Schnaubert, L., Andrès, E., Eichelmann, A., Goguadze, G., & Melis, E. (2014). Exploring feedback and student characteristics relevant for personalizing feedback strategies. *Computers & Education, 71*, 56-76. https://doi.org/10.1016/j.compedu.2013.09.011

Nelson, M. M., & Schunn, C. D. (2009). The nature of feedback: How different types of peer feedback affect writing performance. *Instructional Science, 37*(4), 375-401. https://doi.org/10.1007/s11251-008-9053-x

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199-218. https://doi.org/10.1080/03075070600572090

Nortcliffe, A., & Middleton, A. (2011). Smartphone feedback: Using an iPhone to improve the distribution of audio feedback. *International Journal of Electrical Engineering Education, 48*(3), 280-293. https://doi.org/10.7227/IJEEE.48.3.6

Opitz, B., Ferdinand, N. K., & Mecklinger, A. (2011). Timing matters: The impact of immediate and delayed feedback on artificial language learning. *Frontiers in Human Neuroscience, 5*(8), 1-9. https://doi.org/10.3389/fnhum.2011.00008

Sahin, I. (2007). Predicting student satisfaction in distance education and learning environments. *Turkish Online Journal of Distance Education (TOJDE), 8*(2), 113-119.

Scheeler, M. C., McAfee, J. K., Ruhl, K. L., & Lee, D. L. (2006). Effects of corrective feedback delivered via wireless technology on preservice teacher performance and student behavior. *Teacher Education and Special Education, 29*(1), 12-25. https://doi.org/10.1177/088840640602900103

Scheeler, M. C., McKinnon, K., & Stout, J. (2011). Effects of immediate feedback delivered via webcam and bug-in-ear technology on preservice teacher performance. *Teacher Education and Special Education, 34*(4), 312-321. https://doi.org/10.1177/0888406411401919

Shee, D. Y., & Wang, Y. S. (2008). Multi-criteria evaluation of the web-based e-learning system: A methodology based on learner satisfaction and its applications. *Computers & Education, 50*(3), 894-905. https://doi.org/10.1016/j.compedu.2006.09.005

Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research, 78*(1), 153-189. https://doi.org/10.3102/0034654307313795

Singh, H. K. D. (2005). Learner satisfaction in a collaborative online learning environment. Retrieved January, 26, 2006.

Sinha, N. (2012). The effects of immediate versus delayed feedback after multiple-choice questions on subsequent exam performance (Doctoral dissertation, Rutgers University-Graduate School-New Brunswick).

Smits, M. H., Boon, J., Sluijsmans, D. M., & Van Gog, T. (2008). Content and timing of feedback in a web-based learning environment: Effects on learning as a

function of prior knowledge. *Interactive Learning Environments, 16*(2), 183-193. https://doi.org/10.1080/10494820701365952

Sorensen, P. (2008). Feedback and assessment. *Malaysian Journal of Distance Education, 10*(2), 85-105.

Taras, M. (2013). *Feedback on feedback: Reconceptualising feedback in higher education: Developing dialogue with students.* Routledge.

Taylor, P., Schugar, J., & Penny, C. (2014, March). Reinventing the classroom with Google+. In *Society for Information Technology & Teacher Education International Conference (Vol. 2014, No. 1, pp. 1352-1353)*.

Thurlings, M., Vermeulen, M., Bastiaens, T., & Stijnen, S. (2013). Understanding feedback: A learning theory perspective. *Educational Research Review, 9*, 1–15. https://doi.org/10.1016/j.edurev.2012.11.004

Tsai, S., & Machado, P. (2006). E-learning, online learning, web-based learning, or distance learning: Unveiling the ambiguity in current terminology. *Elearn Magazine: Education and Technology in Perspective*. https://doi.org/10.1145/566778.568597

van der Kleij, F. M., Eggen, T. J., Timmers, C. F., & Veldkamp, B. P. (2012). Effects of feedback in a computer-based assessment for learning. *Computers & Education, 58*(1), 263-272. https://doi.org/10.1016/j.compedu.2011.07.020

Vandewaetere, M., Desmet, P., &Clarebout, G. (2011). The contribution of learner characteristics in the development of computer-based adaptive learning environments. *Computers in Human Behavior, 27*(1), 118-130. https://doi.org/10.1016/j.chb.2010.07.038

Wang, Y., Tang, S., & Zhou, Y. (2012, April). A preliminary study on instructional design model in M-learning. In *Consumer Electronics, Communications and Networks (CECNet), 2012 2nd International Conference on (pp. 3070-3073)*. IEEE. https://doi.org/10.1109/CECNet.2012.6202295

Wu, J. H., Tennyson, R. D., & Hsia, T. L. (2010). A study of student satisfaction in a blended e-learning system environment. *Computers & Education, 55*(1), 155-164. https://doi.org/10.1016/j.compedu.2009.12.012

Wu, J. H., Tennyson, R. D., Hsia, T. L., & Liao, Y. W. (2008). Analysis of E-learning innovation and core capability using a hypercube model. *Computers in Human Behavior, 24*(5), 1851-1866. https://doi.org/10.1016/j.chb.2008.02.008

Xu, Y. (2010). Examining the effects of digital feedback on student engagement and achievement. *Journal of Educational Computing Research, 43*(3), 275-291. https://doi.org/10.2190/EC.43.3.a

Yorke, M. (2003). Formative assessment in higher education: Moves towards theory and the enhancement of pedagogic practice. *Journal of Higher Education, 45*(4), 477-501. https://doi.org/10.1023/A:1023967026413

Young, A., & Norgard, C. (2006). Assessing the quality of online courses from the students' perspective. *The Internet and Higher Education, 9*(2), 107-115. https://doi.org/10.1016/j.iheduc.2006.03.001

Zeytoun, K. A. (2004). Educational Technology in the Age of Information and Communication. Cairo: Alam Al-Kutub.

Zywno, M. S. (2003, June). A contribution to validation of score meaning for Felder-Soloman's index of learning styles. *American Society for Engineering Education Annual Conference & Exposition, 119*, 1-5. https://doi.org/10.18260/1-2--12424