Journal of Educational Technology & Online Learning
Volume 5 | Issue 3 | 2022
http://dergipark.org.tr/jetol

The effect of feedback type in the e-learning environment on students' achievement and motivation

Iman Said Al-Darei [a], Abdelrahman Mohamed Ahmed [b] *

[a] The Mistry of Education, Sultanate of Oman
[b] Sultan Qaboos University, Sultanate of Oman

Suggested citation: Al-Darei, I. S. & Ahmed, A. M. (2022). The effect of feedback type in the e-learning environment on students' achievement and motivation. *Journal of Educational Technology & Online Learning*, *5*(3), 694-705.

Article Info

Keywords:

Feedback types
E-learning environment
Achievement
Motivation

Research Article

Abstract

This study investigated the effect of different types of feedback in an e-learning environment in enhancing students' achievement and motivation in the Information Technology subject. The study adopted a quasi-experimental research design. The sample consisted of 97 eighth-grade students enrolled in Sarah Umm Ishaq Basic Education School in the Al Batinah North Governorate of Oman for the academic year 2021/2022. This research applied a pre-test and post-test and motivation surveys to measure the effects of three feedback types. For the data analysis, the researchers used the descriptive statistics of means and standard deviations, one-way analysis of variance (ANOVA), and one-way repeated measures ANOVA. The results of the study showed that the types of feedback had an effect on academic achievement relative to the IT curriculum for the 8th-grade students, favoring interpretive feedback. The results also indicated that students' experiences with feedback types in the IT curriculum significantly increased their motivation and had a positive effect, particularly favoring interpretive feedback.

1. Introduction

Currently, scientific and technological progress is rapidly changing all aspects of life globally. The learning process is no exception, as instructional technology has become necessary to produce instructional outcomes that positively impact society. Modern technology can facilitate the process of learning and overcome challenges; therefore, interest has increased in how electronic learning can improve the learning process (Usman & Tasya, 2020).

The school is at the heart of this process, as all the improvements and transition mechanisms in society will be reflected in the instructional practices in the classroom and students' ideas and attitudes generally to be sustainable (Pavel, Fruth & Neacsu, 2015). Moreover, information and communication technology (ICT) needs to be effectively integrated into the educational process (Kitazawa, Nagai & Ueno, 2011). In addition, those specifically responsible for introducing technology as an educational tool (schools, teachers, and students) shall be given an objective method for its implementation.

Covid-19 has made a global impact on higher education "as universities closed their premises and countries shut their borders in response to lockdown measures" (Schleicher, 2020, p. 4). It has affected people regardless of their level of education and the majority of the schools and universities around the World

* Corresponding Author: Instructional And Learning Technology Department, Sultan Qaboos University, Sultanate Of Oman
email address: abdoelhaj@squ.edu.om

Doi: http://doi.org/10.31681/jetol.1111527
Received 27 May 2022; Revised 22 Sep 2022; Accepted 26 Sep 2022
ISSN: 2618-6586 .

were locked down in response to this crisis. During this period schools and universities have had to rely more on elearning strategies to continue learning remotely through the Internet. Teachers also had to adapt to new pedagogical concepts and modes of delivery of teaching, for which they may not have been trained (Schleicher, 2020). However, learning must continue, and the new challenges could be overcome by shifting to e-learning, which uses technological tools. Schools, colleges, and universities used live lessons and various platforms such as Google Classrooms, Moodle, Schoology, Seesaw, and Blackboard to supplement the learning process (Osman, 2020). E-learning has attributes that make it more effective than traditional teaching. Perhaps the most crucial attribute of e-learning and one of its key elements is feedback; the use of computers in e-learning offers the chance to give learners immediate feedback about their responses, whether right or wrong (Barak & Levenberg, 2016).

The learners cannot be left alone in the face of a large amount of data without some guidance in the learning path through e-learning. Teachers use feedback to improve results, correct errors, and complete the necessary skills. In general, feedback can be classified based on the type, source, form, amount of information, and the time-point at which it is provided (Dabell, 2018). In terms of type, feedback is classified into three types: confirmative, corrective, and interpretive (Schwartz, & Griffin, 1993). Confirmative feedback means telling the learner that the answer is correct or false only, whereascorrective feedback tells the learner that the answer is correct or false, while providing the correct answer. On the other hand, interpretive feedback is telling the learner the correct answer and explaining the reason "why the answer is correct or false" (Van Der Kl et al, 2012).

In the Sultanate of Oman today, e-learning is mandated in schools at the national level. Therefore, teachers have to integrate e-learning tools such as platforms and applications that increase the effectiveness and efficiency of the teaching process. These tools provide various options to enhance the interaction between the teacher and learner with many electronic ways continuously, effectively, and immediately to implement the feedback. These e-learning experiments also allow us to test the appropriate types of feedback so that teachers can find more conscious choices. However, the previous studies on types of feedback have not produced any clear consensus in favor of one type over another. For example, some researchers (Ismail, 2015; Ibrahim & Jafar, 2016; Ahmed, 2017) have confirmed the effectiveness of corrective feedback in achieving learning outcomes in terms of achievement, skills performance, and the attitudes of students. They recommended expanding further studies on corrective and interpretive feedback in an e-learning environment with students. However, others (Anafi, 2017; Hammad, 2018; Ramzi, 2020; Ibrahim, 2020) have shown the effectiveness of interpretive feedback in developing various learning outcomes. On the other hand, a 2018 study (Jiyoon, EunJin & Innwoo, 2018) indicated that the information included in the feedback did not affect academic achievement. Moreover, these researchers found that the increase in the amount of information of feedback does not necessarily increase academic achievement. However, to the best of our knowledge, no study on the effect of feedback types in e-learning has been performed within the Arab Gulf, or specifically within the Sultanate of Oman. Moreover, there is a lack of studies focusing on various types of feedback in an e-learning environment. Therefore, this study seeks to investigate the effect of different types of feedback in an e-learning environment in enhancing students' achievement and motivation in the Information Technology subject in the Sultanate of Oman.

2. Literature

Wang & Hwang (2004, p. 410) define e-learning as "information and communications technology-enhanced learning by delivering learning contents and activities via an intranet, interactive TV, satellite broadcast, video/audio, and CD-ROM". Many academics have confirmed this definition, considering e-learning to provide electronic educational content through computer-based media to the learner in an active way that allows interaction between the content, teacher, and students, whether synchronous or asynchronous (Sharifabadi, 2006).

Phielix et al. (2011) defined feedback as an interactive process that gives a perception of a learner's success to guide, assist, and promote learning. They affirmed that feedback is used to identify the strengths and weaknesses of the students, such that the strengths can be improved while weaknesses can be minimized and corrected. According to Chen, Breslow & DeBoer (2018), feedback is a compass to point the learners in the right direction and allow them to arrive at the correct answers without wasting time on mistakes and failed attempts. The researcher described feedback in e-learning as notes or illustrations delivered by the computer in response to a learner's behavior in computer-based instruction. This can assist students in recognizing mistakes and misconceptions, as well as guiding how to correct them.

The feedback helps learners in raising the level of performance in achievement tests and motivating them toward learning. Many studies have discussed the effectiveness of feedback in enhancing achievement and motivation. For example, Kartal (2010) reviewed the relevant literature of software programs developed for teaching French to adults as a foreign language in the Multimedia Language Learning Centre at Charles-de-Gaulle University in Lille, France. According to this review, feedback plays an important role in the modern learning environments designed today using technology in the instructional field. Feedback in multimedia language learning applications has been found to not only inform learners about the effects of their activities in the curriculum and motivate them by consolidating their information on whether the response was correct or incorrect, but to form the essence and ensure the continuity of communication between machines and learners. It encourages students to consider their responses by reminding them of the correctness and relevance of their answers as soon as they are offered.

Additionally, Bitchener & Knoch (2010) conducted a study aimed at investigating the extent to which types of corrective feedback could help learners learn and advance in English as a Second Language (ESL). The results showed that three types of corrective feedback were effective in increasing students' level of learning and understanding. Moreover, Martínez-Argüelles et al. (2013) wrote an essay examining the cognitive aspect of feedback in a virtual learning environment from the student's viewpoint. A survey of Business Administration students at the Universität Oberta de Catalunya (UOC) was conducted with 182 students divided into two classes. The results showed that 90% of students place a high or extremely high value on receiving feedback from their teachers in e-learning, believing that it is more important than receiving feedback in a face-to-face environment. Feedback was found to be beneficial in two ways: it facilitates learning and motivates students. Personalized feedback significantly affects the student, who appreciates it because it makes their learning experience more straightforward, profound, and meaningful.. Furthermore, it was found to have a strong motivating impact on students, which has not been adequately explored by other studies. Such an impact should not be overlooked, especially in an online environment with a high dropout rate.

Another study by Ismail (2015) examined the impact of two different feedback types (corrective/interpretive) in a flipped classroom environment on certain learning outcomes for students in the home economics department. According to the findings, corrective feedback produced the best results in terms of achievement, while interpretive feedback produced the best results in terms of ability and attitude. They suggested that practical courses be prepared for staff to practice using various approaches and forms of feedback on their learning courses. Additionally, Ahmed (2017) measured the effect of the interaction between the level of feedback (corrective/interpretive) and the learning style (simple/deep) in personal learning environments on the achievement and learning efficiency of educational technology students. He found the greatest impact of the interaction between the interpretive feedback and the students with the deeper learning style. Hammad (2018) conducted a study on the effect of the difference in the level of feedback (corrective and interpretive) within the electronic cloud learning environment on the achievement of graduate students in statistics; the results indicated that students excelled in the achievement test because of receiving interpretive feedback.

In addition, Aafia (2019) examined the effect of the feedback types (corrective/interpretive) in the electronic structural evaluation environment on the development of engineering drawing skills among the

students of industrial education colleges. The results showed that there was a statistically significant difference between the two groups, and the interpretive feedback led to better performance in the achievement test. Furthermore, Abdul-Barr (2019) conducted a study on the effect of the interaction between the types of feedback (corrective/interpretive) and the learning style (active/reflective) on the development of academic achievement and engagement in learning the basics of school mathematics among students at the College of Education; the research found a statistically significant effect (0.05) of the interaction, and the students of the second experimental group, namely the active students who were provided with interpretive feedback, outperformed the students of the other groups. In addition, Ibrahim (2020) studied the effect of the two types of feedback (corrective/interpretive) on achievement, skill performance, and product evaluation of educational website programming skills in the micro-learning environment via the mobile web among students who were computer teachers. The results showed a significant difference between the mean scores of the two experimental groups in favor of interpretive feedback in all variables, the first being achievement. Some studies conducted by (Ahmed, 2017; Hammad, 2018; Ibrahim, 2020; Aafia, 2019; Abdul-Barr, 2019) indicated that interpretive feedback is more effective on achievement and motivation. However, Ismail (2015) confirmed the positive effect of both corrective and interpretive feedback, but in terms of achievement, the corrective feedback performed better than the interpretive feedback.

In light of the reviewed literature above, we should note an inconsistency in the results of previous studies on the impact of the different amounts of information provided within the feedback and the most effective type of feedback. However, none of the previous researchers, to the best of the author's knowledge, addressed the feedback effect within the school level to investigate its effects on students, especially on the achievement and motivation in an e-learning environment. Therefore, this study focuses on three types of feedback, namely confirmative feedback, corrective feedback, and interpretive feedback. Confirmative feedback only informs the learner that their answer is wrong, corrective feedback informs them that their answer is wrong and provides the correct answer, and interpretive feedback provides the learner with additional information related to the correct or wrong answer. The current study investigated the effectiveness of using each type separately in order to gain insight into the adequacy of using confirmative and corrective feedback and to determine whether there is a need to use interpretive feedback as being more effective or if all types should be provided to the learner.

3. Methodology

3.1. Research Model/Design

This study adopted a quasi-experimental research design to investigate the effect of feedback types in e-learning in enhancing the 8th-grade students' achievement and motivation in IT. It applied the method of three experimental groups with an achievement test and a motivation survey. Data Collecting Tools

The study used the following instruments for data collection:

The Pre-Test and Post-Test: The researchers devolved the pre and post-test for this study. The content of the pre-test and post-test was similar, but the order of the questions was varied to avoid the set response effect. It was designed to measure the knowledge and skills of eighth-grade students in IT in the unit called "Social Media ". The tests contained 29 questions that were categorized into four types (multiple choice questions, true/false questions, fill-in-the-blank questions, and essay questions). Based on the Ministry of Education (MOE) assessment scheme of the IT subject, eighth-grade students have only one test per semester. The percentage of the test was 30% so, the full mark of the test was 30 marks and it required one lesson to complete.

Motivation Survey: Before starting the experiment, the students were administered a perceived motivation survey to ensure that those students had equal motivation in the three groups. Additionally, after completing the feedback types, the students' perceived motivation for the IT subject was measured using the

Instructional Materials Motivation Survey (IMMS). The 36 items on the IMMS were used to assess participants' motivation in terms of Keller's motivation model (Keller, 1983) with four components of Attention, Relevance, Confidence, and Satisfaction. The researchers adapted 32 items from another study's survey done by Sharifabadi (2006), after they get her permission, that used the same IMMS and was translated into Arabic. The survey items were graded on a three-point Likert scale. The scale's Cronbach's Alpha reliability coefficient was found to be 0.85, indicating high reliability.

3.2. Sampling or Study Group

The participants of this study were all eighth-grade students enrolled in the Omani government schools in the Al Batinah North Governorate for the academic year 2021/2022. The Sarah Umm Ishaq Basic Education School was chosen for the study sample because its location was geographically suitable for the researchers and there were three eighth-grade classes taught by the same teacher, meeting needs of this study. Moreover, the researchers did not interfere in the arrangement of the students of the three classes of the eighth grade but took them as they were distributed by the school administration. Therefore, there were no extraneous variables that affect the results of the study. The sample consisted of 97 students as they were divided by the school into three classes, taken as three experimental groups. The age of the students was between 13 to 14 years old. All of the students were Omanis and they shared a close level of cultural background and different levels of academic performance according to their previous IT course records.

3.3. Data Analysis

In this research, the pre and post-test and motivation survey were analyzed to track the changes using the statistical descriptive of means and standard deviations. One Way analysis of variance (ANOVA) from the Statistical Package for Social Sciences (SPSS) software, version 22.

3.4. Validity and Reliability

The validity and reliability of the test: A review panel of 12 subject matter experts assessed the content validity of the achievement test. Reliability was measured after the test was piloted in the same school where the researcher teaches. It was calculated by the "Cronbach's Alpha" coefficient after the test experiment on the pilot sample, which was (0.88), a high percentage indicating that the test is reliable.

The validity and reliability of the questionnaire: A review panel of 4 educational technology experts assessed the content validity of the questionnaire. The scale's Cronbach's Alpha reliability coefficient was found to be 0.85, indicating high reliability.

3.5. Pilot Study

The researchers did one lesson pilot study to test the research treatment (the feedback activities) and instruments. The piloting was done with grade eight students. The piloting sample consisted of (10) students of grade eight in Knooz Al-Elam for Basic Education School in Al-Dakhliya Governorate. It was chosen because the researcher teaching this class. From the data collected from the pilot, the researcher made some changes in the instruments such as modifying the time of some activities, adding a more interactive activity, and deleting some items from the motivation survey instrument. Another major change in type three of the feedback activities was that it was planned to open some links for further information using the Internet. However, from the pilot, it was found that the students were facing difficulties in the speed of the network and they needed more time to finish the task. Therefore, the researcher decided to change type three of the feedback activity to a multimedia-based activity.

3.6. Research Procedures

The experiment lasted for eight weeks. It started on the 19th of September and ended on the 18th of November. The procedural steps of the data collection were as follows:

1. Prior to the experiment: The teacher conducted the pre-test for the students online on the Google Forms, and then administered the motivation survey to the students online.
2. After completing the pilot study and ensuring that the three groups were equal in cognitive and motivational aspects, the basic study experiment was carried out as follows:
    a. A meeting was held with the students of the three experimental groups to clarify the objectives of the study, the mechanism of the experiment, and how to deal with the applications (e.g., WordWaal, Nearpod, …) of the current study.
    b. A username was specified for each student represented in her ministerial email and added to the Google Classroom environment, and each student was sent the classroom entry enrollment code.
    c. Training was provided for the teacher in when and how to use the feedback types after each lesson.
    d. Teaching the specified unit: In the first week of the first semester, the teacher explained the topic of the lesson to the students. At the end of the lesson, she administered the different feedback types for the students as formative assessment activities. The first type was confirmative feedback, in which students were required to answer the question and only received the feedback as to whether the answer was true or false (Group One). The second type was confirmative feedback, in which students were required to answer the question and they received the feedback as to whether the answer was true or false along with an indicator of the right answer (Group Two). The third type was interpretive feedback, in which students were required to answer the question and received the feedback as to whether the answer was true or false along with an indicator to the right answer and an explanation of why this answer was correct (Group Three). Each type of activity was allotted a certain amount of time. The activities took 10-15 minutes for each lesson except for the third group, which was given 20 minutes to provide the students enough time to read the additional information and watch the media included.
    e. After the experiment: The lessons finished after two months based on the MOE plan for IT. The teacher conducted the post-test for the students online on the Google Forum. She then administered the motivation survey to the students online. The students' scores in all previous measurement tools were then collected in preparation for the statistical treatment of the data.

4. Findings and Discussions

In order to analyze data to track the changes, three main types of statistical analysis were conducted:

- The statistical descriptive of means and standard deviations.
- A one-way analysis of variance (ANOVA) & repeated measure ANOVA

To ensure that the three groups receiving different types of feedback (confirmative, corrective, and interpretive) were initially equal in the level of achievement and motivation, the test and motivation survey were applied before the experiment. To verify the significance of these differences statistically, a one-way ANOVA was used. The findings indicated that the three groups were equivalent in academic achievement with a significance of "0.41 (p>0,05)"and they were equivalent in motivation for the IT subject with a significance of "0.08 (p>0,05)" before the treatment started.

Students' Achievement

The researcher statistically analyzed the students' scores in the achievement test using the means and the standard deviations of these scores as shown in Table 1.

Table 1.

Descriptive statistics on achievement for the three experimental groupsVariable

	Groups	Type of Test	N	Mean	Std. Deviation
Achievement	G1	Pre-test	32	10.76	2.86
		Post-test		15.45	6.59
	G2	Pre-test	33	11.22	2.83
		Post-test		16.91	6.89
	G3	Pre-test	32	11.72	2.98
		Post-test		19.59	5.39

It is evident from Table 7 that achievement increased after the implementation in an e-learning environment; students in all experimental groups performed better, particularly those who got interpretative feedback, where the mean score increased from 11.72 to 19.59. That means the students showed moderate achievement when compared to the students who received corrective feedback (M = 16.91), while the students who received confirmative feedback showed the least improvement (M = 15.45).

Moreover, a one-way repeated measure ANOVA was used to see if there were statistically significant differences between feedback types (confirmative, corrective, and interpretive); the multivariate test (Wilks' Lambda) is reported in Table 2.

Table 2.

Multivariate test of the effects of feedback types on the achievement

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Achievement Wilks' Lambda	0.43	126.52	1.000	94.00	0.001	0.58

Table 2 indicates that the value of Wilks' Lambda is 0.43 with p<0,001. Referring to Cohen's rules of thumb for interpreting the effect sizes, 0.5 represents a medium effect size. Therefore, in this case, the effect size according to Table 2 is 0.58, which is greater than 0.5, indicating that the difference between the three groups' means was statistically significant.

This finding is consistent with some studies (e.g. Ahmed, 2017; Hammad, 2018; Ibrahim, 2020; Phielix ,2011; Chen, Breslow & DeBoer, 2018). On the other hand, the results of this study were in disagreement with some previous studies (Loorbach et al, 2015; Ismail, 2015). The inconsistency between the findings of the previous studies and the current study may be due to differences in age, experience, culture, or the amount and quality of support and assistance required.

For an in-depth analysis to explore where exactly the differences between the three groups are found, a pairwise comparison was conducted, and the results are presented in Table 3.

Table 3.

A Pairwise Comparison of the Three Groups in Post-test Scores

			95% Confidence Interval	
(I) Name of Group	(J) Name of Group	Sig.	Lower Bound	Upper Bound
Confirmative	Corrective	0.36	-2.99-	1.08
	Interpretive	0.02	-4.59-	-0.52-
Corrective	Confirmative	0.36	-1.08-	2.99
	Interpretive	0.13	-3.64-	0.46
Interpretive	Confirmative	0.02	0.52	4.59

	Corrective	0.13	-0.46-	3.64

Table 3 illustrates that there is no significant difference between the score means for the post-test of confirmative feedback group and corrective feedback group (p=0.36), and between the interpretive feedback group and corrective feedback group (p=0.13). However, there is a significant difference between the mean scores for the post-test of the confirmative feedback group and the interpretive feedback group (p=0.02). Also, it can be seen above in Table 1 that the mean score of the confirmative feedback group (M=15.45) is less than the mean of the corrective feedback group (M=16.91), but this difference is not statistically significant (p=0.66).

These statistics in the previous tables (1, 2 and 3) reported from a one-way repeated measure of variance (ANOVA) indicate a significant effect of the types of feedback on student achievement (Wilks' Lambda = 0.43, F (3,94) = 126.52, p < .001, η2 = (0.58) and proves that the use of interpretive feedback in IT lessons statistically and positively affected students' achievement. In addition, the findings indicate a gradual positive change in the interpretive feedback across the three groups but favoring interpretive feedback.

Students' Motivation

The means and standard deviations of the students' scores in both motivation surveys (before and after) were calculated for the three groups as shown in Table 4"

Table 4.

Descriptive Statistics of the Motivation for the three experimental groups

Variable	Groups	Type of survey	N	Mean	Std. Deviation
Motivation	G1	Pre- Motivation	32	2.95	0.14
		Post- Motivation		3.38	0.42
	G2	Pre- Motivation	33	3.03	0.12
		Post- Motivation		3.09	0.39
	G3	Pre- Motivation	32	3.01	0.14
		Post- Motivation		3.68	0.53

In Table 4, there is an increase in motivation after the implementation of feedback in e-learning. The results showed that the students in all experimental groups had high motivation, especially those who received interpretive feedback, where motivation increased to 3.68 from M=3.01, compared to 3.38 for those students who received confirmative feedback, which indicated a high motivation level; whereas the students who received corrective feedback were the least affected with a mean score of M = 3.09.

Additionally, the researchers examined the significance of the differences between the averages of the three feedback groups using a one-way repeated measure ANOVA to see if there were statistically significant differences; multivariate test results (Wilks' Lambda) are reported in Table 5.

Table 5.

Multivariate test of the effects of feedback types on the motivation

Effect	Value	F	Hypothesis df	Error df	Sig	Partial Eta Squared
Motivation Wilks' Lambda	0.59	66.41	1.000	94.00	0.001	0.41

Table 5 indicates that the value of Wilks' Lambda is 0.59 with p = 0.001. Referring to Cohen's rules of thumb for interpreting the effect sizes, 0.41 represents a medium effect size. Therefore, in this case, the effect size according to Table 5 is 0.41, which is less than 0.5. This illustrates that the difference between the three groups' means was statistically significant.

The motivation survey results support what other studies (Al Kalbani, 2019; Aafia, 2019) confirmed, namely that as students receive feedback on their work, their motivation increases and consequently their achievement will increase as well.

For an in-depth analysis to explore where exactly the differences are found between the three groups, a pairwise comparison was conducted. The results are presented in Table 6.

Table 6.

A pairwise comparison of the three groups in post-motivation

			95% Confidence Interval	
(I) Name of Group	(J) Name of Group	Sig.	Lower Bound	Upper Bound
Confirmative	Corrective	0.02	0.03	0.26
	Interpretive	0.03	-0.25-	-0.02-
Corrective	Confirmative	0.02	-0.26-	-0.03-
	Interpretive	0.00	-0.40-	-0.16-
Interpretive	Confirmative	0.03	0.02	0.25
	Corrective	0.00	0.16	0.40

Table 6 illustrates that there is a significant difference between all means of the groups' post-motivation. The large difference was between the interpretive feedback group and the corrective feedback group (p=.0.00). This is followed by the difference between the confirmative feedback group and the corrective feedback group (p=0.02). The least difference was between the interpretive feedback group and confirmative feedback group (p=0.03).

These statistics in the previous tables (4, 5, and 6), reported from a one-way repeated measure of variance (ANOVA), indicate a significant effect of the types of feedback on student motivation (Wilks' Lambda = 0.59, F (3,94) = 66.41, p < .001, $\eta 2$ = (0.41) and prove that the use of interpretive feedback in the IT subject lessons statistically and positively affects students' motivation. Moreover, it suggests that there was a gradual positive change in the interpretive feedback across the three groups.

5. Conclusion and Suggestions

Feedback plays an important role in modern learning environments designed using technology in the instructional field. It is a vital part of the communication process, being a way to help students to learn and understand the content being studied. Different types of feedback are used in the instructional process, and thus there is a need to investigate which type is effective in increasing students' level of learning and understanding. It is also necessary to explore the types that may ensure the continuity of communication between the teachers and learners and the content. This study aimed to investigate the effect of different types of feedback in an e-learning environment in enhancing students' achievement and motivation in the Information Technology subject. The findings of the study showed that the types of feedback had an effect on academic achievement relative to the IT curriculum for the 8th-grade students, favoring interpretive feedback. The results also indicated that students' experiences with feedback types in the IT curriculum significantly increased their motivation and had a positive effect, particularly favoring interpretive feedback.

Based on the results of this research, the following recommendations can be proposed, focusing on three categories:

Policymakers

There are four main recommendations stated for the Ministry of Education (MOE) administrators and policymakers. First, as the use of interpretive feedback has the power to enhance academic achievement, they should arrange teacher-training courses on strategies for providing appropriate and effective feedback in an e-learning environment to enhance students' learning and motivation. This could be done by the Specialist Center for Professional Training of Teachers. Second, they should support schools with high-speed Internet connections to enable teachers to use applications on the Internet to implement motivating

activities in the classroom. Third, they should consider the e-learning environment the primery priority, allowing students to rapidly complete various learning tasks using interactive tools that allow interaction between teachers and students.

Teachers

Four recommendations are made to assist teachers in implementing appropriate feedback in their classrooms. First, they should focus on providing interpretive feedback to students in an e-learning environment to improve learners' learning effectiveness, motivation, and successful completion of the learning activities. Secondly, they should provide a range of learning resources, such as sound, images, motion, video clips, simulations, and visual presentations in their interpretive feedback. Thirdly, they should apply the findings of learning theories to design electronic courses delivered via the Internet, particularly strategies of delivering feedback and appropriate reinforcement for each learner. Fourthly, they should create a workgroup community to share their activities in many subjects in order to better provide suitable feedback to students.

Researchers

Considering the study results, the current study suggests future studies and research as follows:

- A further study with similar variables of the current study should compare the results to a control group to avoid any bias and strengthen the study's findings.
- The current study should be applied to a larger sample and for a longer period to verify the effect accurately, thus, obtaining results that can be generalized widely.
- The effect of other classifications of feedback on students' achievement and motivation should be studied.
- The effect of feedback types (confirmative, corrective, and interpretive) on academic achievement and motivation among students of other grades should be studied within different environments such as blended learning, flipped learning, distance-learning, or mobile learning environments.

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