

# Technology-Enhanced Teaching and Learning During the COVID-19 Pandemic



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## 1 Introduction

The Covid-19 outbreak has affected the landscape of education worldwide. Many educational institutions have adopted technology-assisted teaching and learning as a temporary essential measure to avoid face-to-face interaction in the traditional classroom and prevent the spread of coronavirus. This teaching modality is applied in a synchronous or asynchronous mode or a combination of both, assisted by a computer or mobile device connected to the Internet.

The unprecedented shift from traditional classroom teaching and learning to remote teaching during the crisis without sufficient training and preparation has raised doubts about the effectiveness of this teaching and learning modality, aroused concerns about its effects on teachers' and learners' well-being, and showed potential challenges for both teachers and students [1]. However, technology-assisted language teaching and learning should be well planned to be successful. Schools should have established careful instructional design [2]. Relevant online resources should be available to support the teaching and learning activities [3, 4]. Teachers need pedagogical and technical skills to deliver effective instruction and facilitate the learning process [5–7]. Students need relevant skills to achieve their expected outcomes and overcome challenges emerging from the technological

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divide [8]. The ultimate goal of education should be the sustainable development of individuals and society instead of “to provide a temporary access to instruction and instructional supports in a manner that is quick to set up [ . . . ] during an emergency or crisis” [9].

There is a paucity of investigations into the use of technology-assisted language teaching during the Covid-19 pandemic. Although a vast amount of research has been conducted on online teaching and learning, most of these studies were conducted in Western countries. This chapter first reviews the literature on how to effectively provide a distance education course and instruction assisted by technology. It then reviews the inherent challenges of remote teaching encountered by instructors and students and the strategies they use to teach and learn effectively during the Covid-19 pandemic. A framework for effective technology-assisted language teaching is introduced and discussed. Finally, the chapter recommends necessary training for teachers and students for effective teaching and learning on the Covid-19 pandemic. Given the possibility of unexpected similar emergent situations and school closure in the future, the education system might need to look back at relevant literature to prepare for better language teaching in crisis when the Covid-19 pandemic is over.

## 2 Current Perspectives on Technology-Enhanced Language Teaching and Learning

Online learning has become a popular and global trend in education. It affects education considerably [10] and tests hypotheses about the integration of technologies into language teaching and learning [11]. It offers technology-assisted teaching and learning opportunities that support distance education [12]. The term *technology-assisted teaching* mainly describes the use of technologies to deliver a course to students in a distance program. It has motivated the employment of online resources [13] and devices in teaching and learning [14], from which educators have developed different learning modalities, such as online, blended, and hybrid learning.

Technology-assisted learning is widely conceptualized as an alternative learning modality that is student-centered, inventive, and adaptable. Recent research has put forward the use of computer-mediated communication (CMC) as “computer-mediated learner-learner interaction provides unique opportunities for L2 learners for the active control of the topic selection and management and provides rich opportunities for learners to understand and adapt to diverse interactional patterns through collaboration among the interactants” [15]. CMC can also be used to facilitate the teacher’s live instruction in online teaching and learning. Teachers can take advantage of CMC and immerse learners in virtual environments of asynchronous and synchronous communication in which particular linguistic features emerge through interaction between users [16].

Asynchronous communication has been predominantly applied in e-learning. Accordingly, users do not need to get online simultaneously for interaction and educational outcomes [17], which allows learners to get involved in interactions with different users and do different tasks at the same time [18]. Asynchronous communication is deemed to align with the hypotheses of social constructivism in which learners receive and cognitively process the input provided by the teacher and/or other resources to develop their own knowledge; therefore, the teacher is considered a collaborator rather than an input provider [19].

Several studies identified the benefits of asynchronous learning. The study by Meyer [20] found that online learning can enhance learner autonomy as students can manage their time and consider the content of their message carefully before they send it. Regarding learner differences, different learners may spend more time doing a task than another, depending on their competencies. Also, some research has found that learners' discussions in asynchronous environments have in-depth content because they have extra time to revise their messages [21]. The study by Tu and Corry [22] confirmed this result that learners' negotiations have interesting ideas, showing their cognitive and metacognitive processes in composing and editing their messages.

However, asynchronous learning does not always engage students in the learning process effectively. Research by Rourke and Kanuka [23] analyzed students' reports and showed evidence of students' low cognitive engagement. Results showed that asynchronous communication might fail to engage students socially in group work as cohesion between group members is insufficient, failing to achieve the group's goals. Also, in traditional teaching, teachers may employ various tools to motivate students, facilitate their learning, and collaborate with them in person. Considering the limitations of courses without a teacher available to give live instruction, immediate feedback, and instant advice, some researchers argue for the teacher's presence in engaging students in the learning process [24, 25].

Synchronous computer-mediated communication (SCMC) provides opportunities for direct communication between teachers and students and/or between peers through text chat and/or video calls. The nature of SCMC is that it allows for communication in discourse in which chat sequences require learners' concentration to follow the threads of messages and participate in discussions meaningfully. Regarding social presence, synchronous chat is widely considered to be simpler to detect social presence than in asynchronous discussion [26].

Several studies have attempted to compare the impacts of these synchronous and asynchronous learning modalities. Research by Schwier and Balbar [26] compared the effects of these two models in a graduate course and found that synchronous communication was effective for content in discussions. Also, synchronous computer-mediated communication assists live instruction to students and encourages live interaction between students, while the use of the asynchronous mode is prioritized for providing more time, concentration, and deeper thinking. Previous research identified an insignificant difference in student achievements in an educational psychology course in which half of the students adopted asynchronous interaction and the other half used synchronous text chat [27]. In an attempt

to compare the effects of the learning modes in content learning, the study by Kuyath [28] found that the students who synchronously interacted significantly outperformed those using emails to discuss the course content in the posttest. Given the importance of communication in the classroom, the endeavor by Moradi and Farvardin [29] found insignificant difference in the quantity of negotiations between a face-to-face class and a synchronous class. However, it is important to note that the quality of negotiation contributes greatly to academic achievements.

Regarding the benefits and drawbacks of synchronous and asynchronous computer-mediated communication, several studies have suggested the combination of these two modes. Some research has indicated that students used these two modes for different purposes [30]. They used SCMC when they needed urgent responses and negotiations and asynchronous mode when they wanted to leave the recipient sufficient time to think or make an important decision. Researchers also identified the efficacy of SCMC [31]; meanwhile, they argued for the importance of asynchronous CMC. Some researchers [32–35] recommend a combination of face-to-face, synchronous, and asynchronous learning to develop the learning outcomes to the most.

### **3 Computer-Mediated Communication and Interaction Approach**

Given that interaction is a driving force in the language learning process, the interaction approach hypothesizes the relationships between input, output, and corrective feedback [36]. Accordingly, input is defined as learners' exposure to the target language, output as language use opportunities, and corrective feedback as a modification to learners' linguistic knowledge. Second language development takes place in the interactional processes in which interlocutors negotiate meanings, and their language is modified from relevant corrective feedback [37].

The interaction approach has motivated strings of research. The first string is on negotiation [38, 39] and students' perceptions of communication [40, 41]. Another string is on the effects of interactional feedback on language development [42, 43]. Some other studies investigated the impacts of recasts on L2 learning [44]. The final string is about the efficacy of feedback [45, 46]. Overall, these studies have provided positive results that interaction and linguistic features used in interaction influence learners' L2 development.

The emergence of technology-assisted language teaching, particularly computer-mediated communication, has motivated a vast amount of research testing the hypotheses of the interaction approach. Although computer-mediated communication was originally used to describe communication synchronously or asynchronously mediated by the computer, advances in technology have extended the boundaries of CMC with a growing interest in using mobile devices (e.g., mobile phones). This research strand has manifested itself with confirmed evidence about

how learners' second language develops from social synchronous and asynchronous interaction with others and how technology assists the L2 learning process.

A literature review also reveals the benefits and challenges of task-based learning and teaching in technology-mediated environments [47]. Accordingly, L2 learners perform significantly better in face-to-face communication than in CMC regarding the quality of their interaction. This claim provides further research on comparing the quality of L2 learners' interaction in the two environments.

## **4 Research on Remote Teaching in Crisis Situations**

During the Covid-19 pandemic, schools worldwide have been suddenly compelled to adopt online teaching to prevent the spread of the coronavirus. This unprecedented transition has aroused concerns about technology-assisted teaching and learning. Potential challenges from a lack of social interaction, students' and teachers' insufficient training, and miscommunication between teachers and students on video calls provoke the concerns of teachers, parents, and students.

A study on teachers' and students' concerns about the use of technology-assisted language teaching during the Covid-19 pandemic in Saudi Arabia enrolled 735 participants (61 language teachers and 674 language students) who had to adopt the online teaching and learning mode [48]. While the teachers identified most of the students' concerns, there were some differences in the students' and teachers' ratings. First, the teachers did not recognize how boring the virtual classes were to the students. The teachers also raised their concerns about the reliability of online test results and students' concentration in virtual learning. The teachers and students were concerned about two main limits of virtual education: lack of interpersonal relationships and a sense of group work. The researchers concluded that virtual students need support and resources to achieve their goals and expected outcomes. Orientation in academic honesty may be necessary because cheating can be of different forms, which some students may not recognize. The researchers argued that a better understanding of technology acceptance could change teachers' and students' beliefs.

Another study investigated Indonesian high school students' willingness to participate in virtual L2 English classes and their familiarity with the technology needed for virtual learning during the Covid-19 pandemic [49]. The study employed Google Form to administer a 1–5 Likert-scale survey to 85 students. The results, mainly based on descriptive statistics, showed that many students could not use and were unsure about their ability to use the technology needed for e-learning. Also, students expressed their high level of willingness (agree and strongly agree) to participate in e-learning. The researchers argued that readiness to participate in online learning mainly stems from students' willingness to participate and technical skills. Therefore, it is advised that schools offer students a training course for e-learning.

Concerned about students' engagement in learning, teachers can use some strategies to engage students in remote learning during the Covid-19 pandemic [50, 51]. The three main types of engagement are learner-learner, learner-teacher, and learner-content [50]. Teachers can first break the ice by letting students introduce themselves, followed by collaborative tasks. These activities make students feel that they belong to a class and interact with their classmates rather than with the teacher personally. Groupwork activities may improve students' interaction and foster idea-exchanging opportunities [52]. Teachers can ask informal and follow-up questions, give scaffolding feedback, and use personalized emails. Learner-learner engagement and teacher-learner engagement can contribute to the success of remote teaching because it may foster students' uptake of knowledge and skills [53] and enhance students' sense of social presence [50]. Students might be required to work with provided structured texts and interact with content in social media, e.g., watching video clips. Teachers should use authentic materials to make them feel part of the real world.

The study by Iglesias-Pradas and associates [54] investigated the impacts of the sudden shift from face-to-face education to distance education on teachers and students in a Spanish context. The results showed that most teachers and students preferred using videoconferencing by using the technological tools they were familiar with to deliver synchronous instruction. Amazingly, students' academic results were significantly better than the achievements of those students in face-to-face learning. However, it is unlikely to conclude that the teachers' adoption of technology-assisted teaching is a better alternative. The researchers argued that the students' learning strategies and self-regulation were the main driving force behind their academic achievements. The researchers conclude that the digital tools used by teachers, delivery methods they adopted, and class size do not have significant impacts on the learning outcomes.

The study by Misirli and Ergulec [55] explored Turkish parents' experiences and perspectives on technology-assisted teaching. The study involved 983 parents with children taking an online course at different education level during the lockdown time. The qualitative and quantitative findings indicated that children in preschools and primary schools received more parent support than did middle school students. Some parents even engaged in their children's learning. Parents were also concerned about a wide range of problems, including, for instance, infrastructure (e.g., Internet access), social interaction, course length, motivation, and evaluation. The researchers suggested six areas to improve remote teaching in the crisis: (1) content, (2) assistance to students in need, (3) interaction, (4) live class time, (5) communication between teachers/ administrators and parents, and (6) parents' guidance.

The study by Shamir-Inbal and Blau [56] made insights into teachers' experiences in the challenges and benefits of technology-assisted teaching in terms of pedagogy, technology, and organization. The study administered an online questionnaire with open-ended questions to 133 primary and secondary teachers at many schools in Israel. The findings showed that pedagogical challenges mainly derived from teachers' adaptability to the new teaching modality, understanding

students, and interpersonal communication. Also, insufficient support from authorities and institutions' slow response. Teachers also reported teachers' and students' inadequate training and unpreparedness. However, all the participants admitted that technology-assisted teaching was an alternative to face-to-face teaching in terms of learning continuity.

In short, the studies surveyed above have investigated different aspects of remote teaching and learning. Some attempted to explore aspects of language learning and learners [48, 49]. Others, although investigating educational aspects, gave implications for improvements of the application during the sudden shift to online instruction [51, 54–56]. As teachers' and students' experiences mainly reflect the context, further studies can raise the voice of teachers and students in other contexts in the world.

## 5 Technology Acceptance Model

To situate technology-assisted teaching in emergency, the Technology Acceptance Model [57] framework should be considered. Technology Acceptance Model posits that the acceptance of technology should depend on three main dimensions: perceived usefulness, perceived ease of use, and user acceptance of the technology. During the Covid-19 pandemic, a digital or technological tool is a medium for teachers to deliver instruction to students. The unprecedented use of and sudden adoption of this teaching mode exposes inherent uncertainties, such as the length of remote teaching, users' familiarity with the tool, available resources for teaching and learning, and assessment resources. Therefore, without prior experience with digital tools to be accepted [58], some teachers and learners may not have sufficient time to assess the tool(s) that they have to use. The acceptance of technologies is mainly based on their perceptions and familiarity with the digital tool.

Technology Acceptance Model is used to understand “predictors of human behaviors towards potential acceptance or rejection of the technology” [59]. It was first developed by Davis (1989) [57] with three dimensions and then modified with two main dimensions: perceived usefulness and perceived ease of use [60]. These two primary dimensions can be predicted by “previous experience with technology, enjoyment, self-efficacy, computer anxiety, and social norm” [48, 58].

Some researchers argue that Technology Acceptance Model does not particularize educational technology [61]. Current criticisms against this model have mainly focused on its lack of essential factors. First, it mainly takes into account internal factors. In fact, in deciding on a technology to use, group, social, and cultural factors should be cautiously considered because the usefulness and ease of technology can be perceived differently by different users, societies, and cultures [62]. Accordingly, educational technology should consider two other predictors: subjective norm and perceived playfulness.

This model has been recently modified. With recently added factors, the model becomes nonlinear. The choice of technology is not confined to the concepts of

usefulness and ease to use, but it makes an environment a playful place. A learning environment is not only a place to study, but it should also satisfy the learner's enjoyment; therefore, a choice of technology for education should especially take into account the newly added factors.

## 6 Responsive Online Teaching in Crises

Another framework that should be considered in technology-assisted language teaching is responsive online teaching in crises [63]. This conceptual framework describes the essential elements to consider in distance education as an alternative in an emergency. Although this framework was developed from teachers and designers' opinions about technology-assisted teaching, it is proposed by the researchers to be used in future crises.

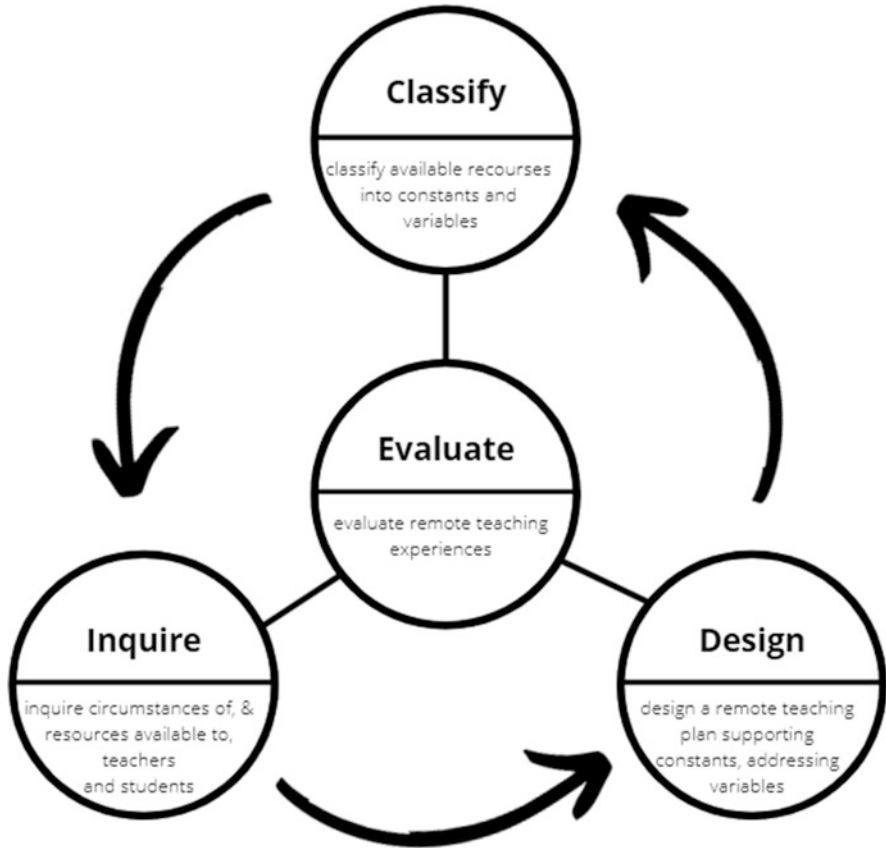
Based on the four components in a learning environment, technologies, users, configurations of the platform, and environment, researchers propose that responsive emergent online teaching should be assessed regularly [63]. The evaluation should take into account three main phases: inquiry, classifying resources, and designing.

First, we should consider two main elements for effective teaching: teachers and students. Inquiry into teachers' knowledge, skills, and time should be initiated because teachers may need time to prepare for their teaching. Some teachers may need time to familiarize themselves with the technology to use. Also, the pedagogies that they will apply should be workable and compatible with the technology. As students are the main participants in the learning process, teachers should ensure that the technology to be used and resources to satisfy students' needs should be accessible to students. Students' health and safety should also be considered. These concerns should be revisited regularly by examining teachers' and students' experiences.

After considering the factors in the inquiry phase, it is necessary to classify them. Teachers and students may have some shared characteristics and variables. For instance, in a wealthy district, students may afford and easily access technologies needed, such as computers and the Internet; however, in another district, some students may not have the required technical devices. Classifying students into groups can help administrators and teachers better understand students' needs, expectations, and difficulties to maximize the effects of technology-assisted teaching in emergencies.

The work by Means and associates [64] proposed three main considerations in online teaching: whether, when, and how. The study by Whittle and associates [63] referenced this proposal and introduced eight dimensions of course design for online teaching in an emergency. In this final phase, the teachers should consider the eight dimensions in which the course design reflects the factors in the classification phrase. Accordingly, constants might serve as the course foundation, and teachers can view variables as means to maximize individual learning.





**Fig. 1** A three-phase process of remote teaching in emergency [63]

The eight dimensions of the design phase include (1) critical learning goals, (2) teacher-student ratio, (3) communication method, (4) building agency, (5) assessment, (6) social role of the instructor, (7) pedagogy and the student role, and (8) feedback. Some of these dimensions (e.g., teacher-student ratio) may be predetermined, but others (e.g., feedback) occur during the teaching process and depend on students' performance and progress. Regarding the communication method, both synchronicity and asynchronicity can be used for different purposes (Fig. 1).

However, this framework may need to be modified [63]. First, the framework was developed from a small-scale study, with four teachers and five instructional designers in the US context. Second, although the study proposed to include students as agents in the framework, the study did not reflect students' opinions. Third, administrators should not be outsiders in evaluating an educational practice. Further studies may test this model by including all types of stakeholders in other contexts.

## 7 Bloom’s Digital Taxonomy

The activities that students can do in the online classroom are different from those in the traditional face-to-face classroom. In the online classroom, students mainly use digital tools to make their learning meaningful. Given the importance of an authentic learning experience in the online classroom, Bloom’s digital taxonomy proposed six groups of activities that students can do in online classrooms [65].

Blooms’ digital taxonomy outlines the activities students can do by using digital tools that transform student thinking and achieve learning outcomes. Each group of activities corresponds to a level of thinking skills (Fig. 2). The lowest order thinking level is remembering in which students can memorize information by bookmarking, copying, highlighting, and searching for information. Understanding, as a higher order thinking level, requires interpretation of concepts by using such tools as blog writing, tweeting, tagging, and advanced searching. Instructors can ask students to calculate and illustrate information by drawing a diagram, edit a text, and present opinions. These activities aim to help students develop their competence to apply what they have learned. As an important competence in the taxonomy, analyzing



Fig. 2 Blooms’ digital taxonomy [65]

is defined as establishing associations and interrelations between concepts. Such activities as mind mapping, conducting a survey, linking, and validating can be used to develop this competence. A higher order thinking level is evaluating which may be set through grading, testing, reviewing, and moderating. These activities aim to give students opportunities to judge and critique a perspective and decide which option(s) should be applied. Activities that require the highest order thinking level include blogging, filming, podcasting, and directing. These activities provide opportunities to create things.

Online classroom activities outlined by Bloom's digital taxonomy demonstrate different-order thinking levels. Teachers should be aware of this taxonomy to apply the right tool to obtain the right objective. The use of a particular activity should be based on the learners' needs, personal goals, and current abilities to help them achieve the learning outcomes.

## 8 Recommendations

The critical review above indicates some recommendations for remote teaching and remote language teaching during the Covid-19 pandemic. Accordingly, remote language teaching depends on sociocultural factors, characteristics of the stakeholders, available technologies, and course objectives.

First, the Technology Acceptance Model can be a reference for a technology choice. Investigations into perceived usefulness and perceived ease, which are based on stakeholders' prior experience, can help choose technology for first-time use in an emergency. Training should be offered to those in need. However, education should consider teachers' and students' emotions and well-being. A learning environment is not only a place for students to receive input and produce output but also provides learners with opportunities to enjoy their learning with joyful activities. The duration of a session, therefore, should be taken into account.

Second, school administrators should inquire about related issues. Evaluation of the circumstance might be the foremost thing to do. Administrators should consider the severeness of the circumstance. Is it necessary to apply remote teaching? Such school capacities as resources, available facilities, and technology accessibility should be examined cautiously to implement the subsequent steps. Teachers' experience, qualifications, and capabilities, e.g., technical skills and pedagogical abilities, should be investigated. Online resources should be available and accessible to students. Teachers and students must be informed of emergency remote teaching right after making a decision. Information should be sent to teachers and students via trustworthy and official channels to ensure they get updated. Regular evaluation is needed to improve the quality of teaching and learning.

Third, self-regulation is a crucial factor in online learning. As teachers' supervision of students' work might be impossible, students may not concentrate on their work or do not take the course seriously. Learner autonomy works best for those who are self-regulated. Parental guidance may be of help, especially for young

kids. However, parents' excessive interference with coursework might undermine self-efficacy and the learning outcomes or even violate ethical issues. Parents are especially advised to minimize distractions from family activities during class hours and encourage their children's learning.

Fourth, teachers may need to reference Bloom's digital taxonomy to know what activities can be employed to assist learners in achieving the expected outcomes. Teachers might need to consider learners' current competencies to scaffold their uptake [53]. They can ascertain that the activities they require students to do aim at developing the right ability.

Finally, teachers and students should have the right to express their concerns because they are directly involved in teaching and learning. Opinions of parents, especially those of young learners, should be considered. Their perspectives should be collected on an iterative basis to modify and improve the teaching and learning quality, especially in contexts where prior preparation is marginal.

Be advised that different places may have different contextual factors, and different crises that occur at other times may have different characteristics. Although the current literature in the field provides us with references for our research and practice, practitioners should consider contextual factors to satisfy local needs and expectations, maximize the learning outcomes, and predict obstacles in the process.

## 9 Conclusion

Developments in technology have advanced language teaching and learning to a certain extent. Learners are given diverse education opportunities, such as online, blended, and hybrid learning. Teachers can use technology inside the classroom and use it to enhance out-of-class learning opportunities for students. Technology-enhanced language teaching and learning are generally affected by many factors. It might be crucial for people responsible to prudentially consider a technology to use, which should be accessible, easy to use, and useful. Given the importance of social interaction in language education, the accepted technology should have appropriate configurations to facilitate interaction between students and teachers, resulting in language learners' fostered competence. However, technology should not be accepted once and used forever. A historical account shows that technology has been developing, and software or platforms should be modified to meet stakeholders' needs. It might be necessary for school administrators to collect users' opinions. In language teaching and learning, consulting experts in the field may benefit the success of teaching and learning.

Nevertheless, teachers and learners are the ones who use the adopted technology and may know what should be modified. In teaching and learning, it is essential for teachers and learners to know the goals and expectations of the program. Setting goals and understanding the course objectives might benefit learners in terms of academic achievements. Teachers can consider the digital taxonomy to assist learners in making academic progress.

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