

Language Assessment Feedback Towards Pedagogical Conversational Agent

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Continuous development of technology provides an opportunity to incorporate feedback in online assessments. The mode of online instruction during the pandemic was the most significant survival change. Technology enabled every teacher and student to enter a virtual classroom to make sense of education. Feedback is part of language instruction and is a powerful key to improving students' learning performance. Feedback plays an influential and crucial role in teaching and learning. Feedback is an invaluable, ultimate learning tool for learners that aids them in not committing the same error again and creates impetus. Thus, knowing about formative exam feedback is students' right because quality feedback allures them. Given students' eagerness, providing feedback is considered a good practice to be followed by all the teaching faculty. Apropos of online feedback, the present study attempts to study how pedagogical agents provide online feedback in language assessments. The study also considers the characteristics of pedagogical conversational agents that are suitable for providing feedback in online language assessment. Simply put, the study encapsulates that screen agents play an essential role in students' motivation and acceptability of learning through feedback.

Keywords: feedback, learning performance, online language assessment, pedagogical conversational agents

Introduction

Artificial intelligence is widely used in business curricula, incorporating pedagogy and learning outcomes. It also has enough usability in biological and physical sciences tutoring and feedback, with significant interaction. The timely and consistent provision of feedback is generally effective. In English teaching, feedback is essential to effective instruction (Sullivan & Higgins, 1983) as it monitors learning (Butler & Winne, 1995). Individual feedback is more effective than group feedback (Archer-Kath et al., 1994), but the quality of feedback is crucial. It should be descriptive, specific, student-friendly, relevant to the target learning, and tailored to the student's comprehension ability. Importantly, feedback leads to success (Black & William, 1998). Continuous feedback from formative assessments encourages students to improve their learning through reformulation and redrafting (Hyland, 1990, p. 285). Students should receive tailored feedback (Kozlova, 2010, p. 97). Critical reading and revision of self-writing are feedback developments (Rollinson, 2005, p. 24). Feedback is information provided to the student aimed at changing thoughts or behavior to improve learning (Shute, 2008, p. 154). They are

promoting feedback results in students' professional and personal growth, which, in turn, helps them identify their strengths, weaknesses, and opportunities. One such feedback is oral feedback based on timing, accuracy, and fluency, provided to learners after completing their speaking task (Harmer & Lethaby, 2005, p. 6). The effective correction code method uses colorful highlighting of errors and creditable writing (Valenzuela, 2005). That means the highlighted color explains the teacher's comments so the students work collaboratively to recover the errors. However, feedback is not always suitable (Huimin, 2006). Feedback aims to make the learner a competent professional (Riordan & Loacker, 2009). Individual differences in previous knowledge make a difference in learners' feedback. All feedback is not the same, but it is crucial in achieving learning outcomes (Hattie & Gan, 2011), yet the feedback cannot bring development every time we use it, and it is harmful in case of ignorance and irrelevancy (Stahl, 2021). It is important to note, however, that there is, to date, insufficient information on how teacher educators use feedback cues and the extent to which they have a shared understanding of the provision of feedback in practice (Taylor et al., 2022). Hence, studying PCAs (pedagogical conversational agents) in a natural direction is necessary for future research (Johnson et al., 2000).

Theoretical Base

Nordic pedagogy has been an ideal source for research on curricula and policies of education documents. Pedagogical leadership constitutes *organizing, facilitating core areas, and motivating and supporting*. These pedagogical leadership features are important in pedagogical conversational agents' feedback. The screen agents affect multimedia learning (MML) social presence theory, social agency theory, and interference theory of social agency. According to the social presence theory, pedagogical conversational agents (PCAs) might be helpful in learning and performance during the study using MML. The interference theory of social agency exemplifies PCAs as enticing agents that balk at the transfer ability of essential material due to its finite working memory. Hence, undesired results are probable. The achievement goal theory declares that motivation is essential to achieve learning outcomes as they are part of it, so motivation provides insights into learning to reach desired goals (Hulleman et al., 2010). Each achievement goal strongly correlates with its contextual counterpart (Bardach et al., 2020). A multidisciplinary theoretical approach is needed to make pedagogical agents' communication comprehensive (Sikstrom et al., 2022).

Provision of Feedback

It is a general practice during the evaluation of the instructors to check for meaningful insights in a writing document or spoken vocabulary content. The feedback from the faculty guides and informs the learners how far they are from the target performance. Thus, feedback should be generic and explain why the answers are not the right fit to score a cent percent mark or higher grades. Also, feedback must not be vast but up to the mark to clear students' hesitations. The feedback should possess frequently used words and phrases for clear understanding. The normalization of feedback is done using a template to provide feedback related to the rubrics provided before the exam to the students.

"Feedback has to fulfill the learners' emotional and cognitive needs to maximize multimedia learning" (Lang et al., 2022, p. 1).

The feedback should be about the time they spent on examination questions. Primarily, one way of providing feedback is by writing a comment/reason for those who scored lower grades in a box near the place where the teacher enters the marks/grades in a formative assessment like quizzes and assignments of writing or

presentations, so that they can see the comment given by the teacher for the smaller number of marks, because this is the best way to control their emotion and to make reason clear to them for their errors. Secondly, during online assessments, the web pages should be designed with utmost care to provide specific feedback as the test-takers require. The students should know about the whereabouts of the foreign language knowledge as the achievement emotions are essential in foreign language learning. Triennially, feedback through the audio form using some applications like Vacaroo, Clyp, VoiceThread, and Audioboo, and visual explanation is an excellent method of providing feedback that generates interest among students as it includes a human element (Chew, 2014). According to Chew, visual representation stands out from online written feedback in providing a unique way of presenting information. Human face emojis that show happiness influenced online assessment feedback to improve perceptions of social presence and characteristics of the checker, like accessibility, but do not show any impact on reactions to the feedback (Padgett et al., 2021).

Notwithstanding the need for emojis as feedback, they help provide quick support. Additionally, extra meetings/video interviews should occasionally be provided if the students need to meet in person or if the teacher wants to explain more than write detailed feedback. Furthermore, answer scripts screenshots-video with the teacher's commentary is voted on in a research study by 61% of the provided to the teachers as per their requirement of the courses they teach. Automated feedback is feedback with a blend of computational linguistics and artificial intelligence. An auto system, e.g., Automated Writing Evaluation (AWE), scans a written or spoken transcription for errors but is not limited to grammatical errors. AWE aims to write and improve through repetition or redrafting for the quality of the learning performance: lexical structures and punctuation.

Different Types of Feedback/Feedback Adaptation Strategies

Accessibility is another critical entity in online assessment feedback. When the website users cannot access the feedback, they reach out to "contact us" through a request or complaint. The frustrated users may write anything, but the primary thing to be done is to provide acknowledgment to control their emotions. Sometimes, feedback can be extended to their parents/guardians. It is annual news after the publication of results in India that a few students commit suicide after the results as they could not achieve as they expected. However, in such cases, the power of insightful continuous feedback becomes evident. It not only motivates the students but also helps them understand the industry to be done to reach the expected level of performance. Providing feedback to the students' formative assessments is a way to make them understand their strengths and weaknesses when presenting.

Depending on the type of question, the feedback should be compared to other students' work so that the students get insights into what is not there in their writing. Comparative feedback allows the students to learn from the best to achieve their best. Specific guidelines or rules for assignments or projects and rubrics related to them will be available to the test-takers so that the transparency about the evaluation process will be clear. If the exam has multiple choice questions, providing answers to the questions referring to the students' answers without revealing their identity helps the students recover from their mistakes. The feedback should be both appreciative and a guiding kind. Analytic feedback is vital so that the students do not get distracted. The provision of narrative feedback motivates the learners to learn from the directions of narration. Different types of feedback are based on variables, such as a person, effect, and use. Some of the feedback types are here, i.e., individual vs. group feedback, teacher-to-teacher feedback, peer-to-peer computer-mediated communication feedback, conative feedback, effectiveness of feedback, and utility of feedback. Each feedback has its specific function of helping

the learners—for example, conative feedback results in students' higher scores. In banal, general real-time feedback helps them understand their exam drawbacks, especially for large classes. However, feedback should be practical, targeted, appropriate, specific, timely, balanced, differentiated, and supportive.

The following text outlines some significant features of feedback that are commonly available in the literature. Effective feedback is specific and deals with goal-oriented learning and challenges. Corrective feedback must be for a spoken or written piece of language. Teacher-led corrective feedback is more beneficial for the student's improvement. The teachers must offer the students practice time to work on self-reflection after getting the feedback to continue their cognitive process. Feedback based on theory is corrective feedback that helps learners choose what is applicable. Corrective feedback concerns learners' errors (Kawaguchi & Ma, 2012). Depending on the given feedback time, it is of two types. They are immediate/synchronous feedback and delay/asynchronous feedback; again, it has been divided into audio feedback vs. visual text feedback, depending on the feedback modality (Fiorella & Mayer, 2021). Based on time, Schroth (1992) bifurcated feedback into immediate feedback and delayed feedback, whereas based on the source, Andre and Thieman (1988) bifurcated the feedback as self-generated feedback and externally provided feedback, but Moreno (2004) divided feedback into simple feedback and elaborate feedback relying on the level of elaboration or extension of feedback. External feedback uses external sources, such as a teacher, peer, or parent, even in a computer-based learning environment. Internal feedback uses self-assessment of their learning outcomes or self-explains how the present performance differs from the target performance.

According to Moreno (2004), simple feedback vs. elaborative feedback usually relies on the information in the feedback. It is essential to provide students with simple feedback, such as whether their performance is correct. However, elaborate feedback explains correct and incorrect responses in larger effect sizes in computer-based studies (Bangert-Drowns et al., 1991). The effectiveness of feedback is related to a range of factors, from internal factors, e.g., meta-cognition, to external factors, e.g., the task level of learners (Azevedo & Bernard, 1995). Elaborate feedback aids learners in cognitive elaboration and enhances deep understanding (Anderson & Reder, 1979). Constructive feedback clears students' high-grade expectations and helps bring positive results. Continuous feedback on all the courses makes them open to all kinds of reflections of pedagogues, so the learners welcome the feedback in a sportive way to discuss the specifics with them. Indeed, it is necessary to create a healthy and safe environment, training students to mutually share peer feedback, because they can have a qualitative review as all belong to the same course (Zong et al., 2020). Negative feedback is critical, because it must be polite and collaborative and develop a working relationship between learners and teachers. Constructive feedback always carries motivation that helps with language skills development. Polite and positive appeal feedback (Porayska-Pomsta & Mellish, 2013) is possible with agents' social intelligence (Wang & Wu, 2008) that provides academic motivation among students. Positive feedback creates inherent motivation in students. Academic motivation and polite feedback are essential to develop second-language speaking skills among learners. The formative assessment follows continuous feedback throughout the academic teaching before the summative assessment. The feedback should be provided right after the exams while providing their score so that the teacher will not miss any reason behind the low scores and the students get a correct place of impression to correct their performance during examinations. Most students expect an excellent/passing grade irrespective of their performance in the exam, so it is difficult for them to bear lower grades/failures. Hence, it is advisable to provide their feedback fresh to avoid misinterpretations. Oral and written feedback, positive or negative feedback,

immediate *vs.* delayed feedback, or explicit *vs.* implicit feedback/evaluative (judgmental) *vs.* descriptive feedback regarding achievement or competence is also mentioned in the literature.

Feedback Review

Cambridge literature warns that the focus of feedback should be announced beforehand to the learners. While developing a community among students, cognitive, social, and emotional support for the students will be the basis for the classroom (Hattie & Gan, 2011). Pedagogical conversational agents can generate verbal social cues (e.g., feedback) during MML interactions. Considering that feedback is most effective when it fosters cognitive processes (Azevedo & Bernard, 1995; Bangert-Drowns et al., 1991). The teacher assesses the formative assignments periodically and uses analytic scoring (Bacha, 2001). The three inferences, prompts, a monitoring prompt, and error explanations all together aid in producing meaningful feedback. Error correction needs to be included, along with grammar errors and punctuation mistakes. In a study of Czech students, these errors include omission of definite and indefinite articles, use of personal pronouns in the middle of the text, long sentences, redundancy, errors using prepositions, punctuation, collocations, or absence of persuasive conclusion. It is important to maintain a balance between providing feedback on the form and content of a piece of work to ensure comprehensive and effective feedback (Ur, 1996). For Czech EFL students, direct corrective feedback is suitable (Zaman & Azad, 2012). Providing corrective feedback to Bangladeshi students learning English as a foreign language is highly valued (Klimova, 2015).

Animated pedagogical agents can perform f2f interaction in language classrooms as well. When the students are on the right way to improve their knowledge, give students a thumbs up. Similarly, pedagogical agents use smiling for okay, nodding in approval and agreement, and total physical response (TPR) to praise. The effects of delay of feedback benefited slow learners. It is verbal feedback on transfer with conjunctive concept formation tasks. In a research study, the verbal feedback conditions of a study are right-wrong, right-nothing, and nothing-wrong. The right and wrong options feedback's inference is quick learning in the beginning. The findings of the delayed feedback showed that it slows down learning initially, but ultimately, a long delay powerfully facilitates the transfer of language knowledge in new situations (Schroth, 1992). The delaying feedback is to provide time for students to reflect on how they learn may be more effective (Butler & Winne, 1995).

Balanced feedback develops on targeted feedback and focuses more on form, meaning, and sociocultural appropriateness, as these elements are more meaningful in language acquisition and communication than grammar corrections, so it is important to encourage students to apply proper forms of basic grammar and vocabulary while producing the English language. Moreover, allowing the students to understand the appropriateness of vocabulary that fits the purpose in the context is essential, because social conventions are different among cultures and languages. Hence, appropriateness is more important than grammatical errors because it sounds familiar to language conventions and culture. Differentiated feedback is differentiated instruction that was built with context-based or specific feedback. The general language errors among learners are from content and language, so the feedback should reteach and advise the relevant material to support content-related language. The supportive feedback relates to prompt, ongoing, and consistent synchronous feedback. This feedback positively transfers language elements like content, skills, and strategies. In an empirical survey with Immediate *Knowledge of Results* (KR), feedback using a task was motivating. Also, the study revealed that attractive feedback cues stop negative emotions in below-average-performance learners using a delivery mode of "no feedback *vs.* text, color, sound, *or* animation feedback". The students' preferences during the test are

“effort”, “enjoyment”, “pride”, and “boredom”. After the test, they show an “expectancy of success” and “attainment value” in a digital pen-tablet environment with more joy and low frustration. The study adds that these types of feedback reduce the performance of learners when compared to emotional feedback perception to some extent. Notwithstanding what the students relate, the study paraphrases the inference as all the feedback conditions used in developing motivation are independent of their performance outcome.

Pedagogical Conversational Agents (PCAs)

Though the innovation of pedagogical conversational agents (PCAs) is in the 20th century, they were less popular before the pandemic. The description of PCAs in literature is because of their appearance and function. In the literature, they have a variety of names, such as embodied agents (EA)/interface characters/conversational agents (CAs) and on-screen agents. The agents are computer programs that act on self-direction (Gulz et al., 2011). The agents appear as avatars (Salen & Zimmerman, 2005), auto tutors (D’Mello & Graesser, 2012), conversational agents (Dennis et al., 2015), and static agents (Frechette, 2010). The pedagogical conversational agent is a lively character who appears on web pages with an on-screen image to aid learners in a multimedia learning environment. The PCAs have varied roles like learning partners/ virtual tutors/embodied conversational agents and are different from virtual and non-player characters. Animated entertainment applications are synthetic agents (Elliott & Brzezinski, 1998) different from pedagogical conversational agents. Pedagogical agents are better than cartoon agents (Yılmaz & Kılıç-Çakmak, 2012). The agents with two different views are better than the front-view human agents (Peng et al., 2020).

The necessity of a finer-grained analysis of PCA’s characteristics was suggested by Schroeder and Adesope (2014). The technology-based soft agents are humanoids or non-humanoids in 2D and 3D models. The 3D-humanoid agent is the most used form, particularly for large projects, whereas 2D humanoids are for small projects. IClone-2 was one of the software used to create these soft agents. Baylor and Kim (2005) classified agents into three types, whereas Clarebout, Elen, Johnson, and Shaw (2002) classified agents into four types. The first type of agent is a demonstrating agent, which shows how to perform (Schroeder & Gotch, 2015). The second type of agent is a coaching agent that assists the learner with feedback/tips. The third type is an information source agent, which provides resources, and the last type of agent is a testing agent, which examines the related content. Overall, all the categories the agents deal with are speaking with interaction, controlling their movements, and controlling the virtual learning environment. Agents with more modalities give more information, e.g., a likable appearance, a neutral appearance or face (Bringula et al., 2018), some agents with text information (Moreno et al., 2001), some agents with modern synthesized speech (Craig & Schroeder, 2017). Some are cartoon-like with animation in a multimedia learning environment (Muniady & Mohamad Ali, 2020). A variety of agents are with verbal feedback (Veletsianos & Navarrete, 2012), some agents with specific gestures (Davis et al., 2021), some others matching the gender (Arroyo et al., 2013), and some more are competitive agents (Chen & Chen, 2014).

Agents’ Characteristics

The manageable level of intimacy of agents’ characteristics is through smiling, speaking, and eye contact. The services of effective embodied agents served better learning motivation with joy rather than neutral embodied agents and text-only situations. Hone, Axelrod, and Parekh (2005) stated that female pedagogical conversational agents fit well and are more effective in students’ frustrating situations. The pedagogical conversational agents

are more like humans as they are represented with a human voice rather than a computer-generated voice with simulated lip movements and spoken narration (Lin et al., 2013). Giving feedback is an essential responsibility of conversational agents (Dennis et al., 2015), where a conversational agent/dialogue system tries to talk to a human through text, graphics, gestures, haptics, and speaking. The design of agents constitutes a human voice (actual human voice recording) or a synthesized voice (Chiou et al., 2017). Speaking is a text string sent to a speech synthesizer. Generally, synthesized speech is used to give voice to agents in synchronization with the lip movements and the timing of a pitch and accent. They can speak and add their nonverbal expressions and movements. For example, a short baton-like movement with hands to the speech (Cassell et al., 1994) adds intonation, pitch, and accents to emphasize the importance of the speech/words (Pierrehumbert & Hirschberg, 1990). Central social and physical fidelity constitutes an acoustic type of speaking that interacts with the learner and computer. Quality is the measure of social and physical fidelity by matching lip movements with speech sounds so that the social presence of the agent influences the learners during the learning improvement process. The split attention effect requires learners' visual resources for text and animation during an agent's dialogue presentation on screen as text (Moreno et al., 2001).

As required, full-body, half-body agents, or single-featured pedagogical agents are being used in teaching. If the body is more than the head, it is an agent. For example, Jack is a human figure software (Badler et al., 1993). The agents with a whole body and voice are the better agents (Wang et al., 2018). It is evident from the studies that there is more retention and augmentation of learning performance among the students with PCA feedback (Baylor & Kim, 2009) as they perform physical movements with the body parts of Avtar. The movements include expressions of countenance using eye gaze, eye contact, and gestures, e.g., waving and pointing with the fingers; ergo, PCAs benefit language learning and encourage natural motivation (Castro-Alonso et al., 2021). Hence, Mayer and DaPra (2012) called these beneficial features "social cues". One social cue is interpersonal communication through nonverbal emotional behavior and facial expressions (Motley & Camden, 1988). Agent body movement control involves animation clips of the body, eye gazing, locomotion, countenance, and gestures. The locomotion includes head, shoulders, neck, torso, hands, fingers, and eye movements.

The service of effective embodied agents served better learning motivation with joy rather than neutral embodied agents and text-only situations. Female pedagogical conversational agents fit well and are more effective in students' frustrating situations (Hone et al., 2005). Agents are for motivation, learning, and improvement of self-efficacy and information. Expert agents master the knowledge of a domain and improve learning outcomes. Learning is more effective with domain content feedback, because students connect to headings or passages in the text resources. The results of previous studies show that the learners prefer the same gender agent as their tutor. Many students prefer feminine gender agents (Makransky et al., 2018). Most users selected fictional identities rather than real ones for the agents. The feedback is of many types. It occurs within the context or as more specific about a domain's knowledge, punctuation in writing, or appropriateness in speaking. Different scholars have contrasting opinions about domain knowledge when providing feedback.

Deep knowledge of a domain is not necessarily needed for all the agents to reflect through non-verbal moments because nonverbal feedback is beneficial in providing primary, immediate, and short feedback (Bates et al., 1992). In contrast, feedback requires knowledge of those domains because knowledge in the domain will provide extensive feedback for the students' insights into their performance lag (Van der Lans et al., 2015). An agent can instruct each individual and substitute for absent students. The role of the agents can be an expert/motivator/mentor/peer (Clarebout et al., 2002). Agents with both a physical presence and voice are found

to be better compared to voice-only agents. Agents with additional instructional tools perform better (Arroyo et al., 2013) with elaborate feedback (Lin et al., 2013). Embodied conversational agents with enveloped feedback worked well, including conversation ability and nonverbal behaviors like nodding heads, resulting in better than emotional feedback (Cassell & Thorisson, 1999).

Technological Aspect of Agents

Interaction software (Martin et al., 1998), simulation authoring software (Munro et al., 1993), and speech recognition and generation software by Entropic Research can produce a rich, immersive virtual environment that allows the best interactions between the learners and agents as the agents can speak and hear in a stereoscopic 3D environment. Nonverbal behaviors of agents' feedback would be unremarkable as it gives an impression of students' utterances and actions without distracting them. Adele, a PCA, was designed with pedagogical technology modalities that allow it to be used on desktop platforms and web browsers by using internet learning material with interactive interfaces for medical courses (Laureano-Cruces et al., 2014). Persona, an agent from the German Artificial Intelligence Research unit, provides online help instructions and online resources with synthesized speech (Andre et al., 1999). Herman can track the task status and order of the components of the music and start background music that suits the students' completion of activities. Jack, another agent, moves and points his finger to the objects on a presentation. Their body language makes a sense of disagreement when the students commit mistakes or cartwheel across the screen when the student is perfect. Steve, an animated pedagogical conversational agent, can trace the location of students and track the visual attention of the learners in the interactive virtual environment, because the software of virtual reality indicates Steve to find what is in the student's view so the agent can give a temporary break to the demonstration to make the learners attentive. Some agents may trace the location of other agents for team training. Some agents track other agents and events, e.g., speech events. Schmidt, Nunez, and Steinicke (2019) used an astronaut agent, in the look of Neil Armstrong, with synthesized speech, though it is not a match.

In contrast, the agent, Gandalf, supports entire multimodal conversation between humans and computers by combining speech with facial expressions, gestures, and intonation. It traces the learner if she/he wears a suit (Cassell & Thorisson, 1999). An animated learning companion acts more like a peer than a teacher (Chan & Baskin, 1990). An automated agent, the troublemaker, sounds weird, but it is like a naughty companion that gives learners sometimes incorrect information to check and improve a student's confidence (Frasson et al., 1996). None of these auto-companions appear like animated characters, yet a 2D face agent with human countenance is more beneficial than automated agents. Animated pedagogical agents are capable of intelligent tutoring systems because they answer questions, provide explanations, ask questions, probe into, and check the level of skills.

Modalities

Agents with signaling conditions give students higher post-test scores (Johnson et al., 2013). The students confused by two agents perform better (D'Mello et al., 2014). Nielsen, Daugaard, Scavenius, and Juul (2022) studied improved vocabulary with agents. Backing this, the research on autistic children with agents in multimedia environments has evidence of improved vocabulary (Bosseler & Massaro, 2003). Moreno et al. (2001) experimented with an imaging agent and instructional material. They found no difference in learning with/without image agents, while Johnson et al. (2013) stated that the agent's presence gave better results than before. It does explain that the image agents of Moreno et al. (2001) are too far in motivating and improving learning gains

compared to the embodied locomotive agents. However, when the virtual agent is not visually present like a voice agent, the effect of elaborate feedback is equivalent to simple feedback. Few studies exclaimed that human-like multi-modality agents perform better than less human-like agents because agents' ability to provide various types of verbal feedback augments the effect of the agent's presence. Enthusiastic agent recognition performance is enhanced with low cognitive load (Beege et al., 2020). However, there was no unified evaluation of the persona of agents. Overall, the studies with the learners reveal that these agents were not considered highly human-like, and there has been no improvement in agents in recent years (Mayer & DaPra, 2012; Schroeder & Adesope, 2014; Craig & Schroeder, 2017; Davis et al., 2021).

In an experimental study, Betty's Brain, a teachable agent, provided self-regulated learning feedback that helped students develop increased metacognitive learning with reflective knowledge-building. In computers, tutors track students' knowledge in their performance and provide constructive feedback, whereas pedagogical agents track students' communication designs and provide feedback that helps better comprehension. MCQs are used to test low/basic levels of knowledge (Bremner et al., 2018), and open-ended questions are used to test high levels of knowledge (Ozuru et al., 2013). In language learning, the agents can play many roles like providing suggestions and information based on their progress in a lesson (Baylor & Kim, 2005; Moreno et al., 2001) and either give non-verbal feedback through nods and disapproval head movements (Johnson et al., 2000) or verbal feedback on learners' actions and performance in evaluations (André et al., 1999; Cassell & Thórisson, 1999).

Agent Feedback

Feedback is considered an essential instructional tool but often needs to be addressed. The range of feedback strategies is on the rise from time to time. PCAs perform tutoring functions like human tutors by parroting dialogues and reporting unimportant properties as intelligent feedback (Heffernan & Koedinger, 2002). Pedagogical conversational agents give timely instructional prompts and feedback (D'Mello et al., 2014). Pedagogical conversational agents enable students to use software to remove obstacles, if any. Nowadays, many higher educational institutes use asynchronous platforms like videos and discussion boards to share their material and provide feedback on formative assessments like midterm exams, quizzes, and assignments on virtual platforms like Blackboard and WIZIQ. Providing technology-enhanced feedback is a usual practice in Finland education. If there are many pedagogical agents, students can choose and personalize them based on their preferences and necessities. In an environment of computer-assisted instruction, they are human-like characters (Reategui et al., 2007) with animations, audio-texts, hand-arm movement actions, and empathic behaviors that improve interaction with emotion with users. They support motivation and give feedback (Salim et al., 2007). They also can give enhanced real-time or synchronous feedback. Higher education students receive technology-enhanced and timely feedback that is positive for teacher-made decisions, and students welcome technology-enhanced, timely feedback (Carless & Boud, 2018).

Scaffolding is one of the supports provided by the pedagogical agents (Belland, 2014). Devolder et al. (2012) stated that they can endorse language learning and the cognition process. Blended features can promote metacognition (D'Mello et al., 2012; D'Mello et al., 2014). The scaffolding process can be done by providing many forms like hints, prompts, feedback, illustrations, or interactive features (Devolder et al., 2012). Self-regulatory learning strategies of the agents are through prompts and feedback in response to students' needs. The improvement constitutes both cognitive and metacognitive processes. Cognitive strategies include functions like paraphrasing, note-taking, writing implications, or making results, and metacognitive strategies include

activation of previous knowledge, relevant content checking, and evaluation of comprehension ability. The pedagogical agents also generate feedback on sub-goals.

Most studies on feedback compare elaborated and timely feedback presenting knowledge on the correct response (KCR) and further information on simple feedback providing knowledge of result (KR) or KCR. This study used bug-related tutoring feedback (BRT-feedback), offering strategic information for error correction but no immediate KCR. The results show that BRT feedback significantly benefits achievement and motivation more than KR-KCR feedback. *Elaborated feedback* provides additional information, and *bug-related feedback* offers explanations for correcting errors (Schimmel, 1988). It is, for example, possible to combine elaborated feedback, tutoring, and master learning strategies to design *informative tutoring feedback* (ITF) and provide strategically useful information for task completion but does not immediately present the correct solution (Narciss & Huth, 2006). Most of the prior studies on BRT feedback have focused on learner achievement and neglected the impact of BRT feedback on motivation. They foster mindful processing of bug-related information that positively impacts achievement *and* motivation. BRT-feedback effects are evaluated using multi-digit written subtraction, i.e., informative tutoring feedback that allows assisted multiple responses to try for an item by providing strategically useful information for error correction, but no immediate KCR. The results of this study indicated that the BRT kind of feedback effectively fosters achievement *and* motivation.

Korner and Brown (1952) describe giving synchronous feedback as using a mechanical third ear. Using a Bluetooth earpiece or Bug-in-Ear device (BiE) in the classroom is two-way walkie feedback. Later studies revealed that BiE use is an excellent way to give feedback without disturbing the class (Rock et al., 2014; Scheeler et al., 2006). The study shows that the greater the number of PCAs, the more output with adequate explanation and individual motivation. Also, the feedback suggestions of the PCAs come with a delay, giving the learners time to process information efficiently. The elements studied in the previous research contribute to this study, including personalized language, politeness, attention, feedback, social fidelity, memory, personality, interactivity, and gestures. Personalized language and politeness in virtual reality (VR) agent applications positively affect learning outcomes and social presence (Moreno & Mayer, 2004). Gunawardena and Zittle (1997) elaborate on using PCAs as enhancers of academic performance by comparing students with those who do not use PCAs in their studies. Emotional feedback with/without options reduced students' confusion, intensified natural motivation, and increased perception of the conversational agent (Lang et al., 2022) or pedagogical conversational agent (Dennis et al., 2015).

Inference

Feedback improves learners' knowledge and corrects their misconceptions from a cognitive perspective. The importance of self-regulation in the learning process emphasizes the effects of feedback on cognitive and meta-cognitive processes. Delayed feedback may be better for supporting knowledge transfer, whereas immediate feedback may be more effective in the short term and for supporting the development of procedural skills (Scheeler et al., 2006). Firstly, the feedback process helps learners correct errors without giving them the correct answers. Then, the teachers ensure learners will attend mindfully to process the information. Finally, they let the learners choose evaluation methods that allow a multifaceted impact on individual and situational conditions. Synchronous and individualized feedback benefits to get more learning (Ferguson, 2011). According to the guidelines of the ITF framework, students are allowed to get feedback once they respond to their questions. Secondly, elaborate feedback elements should be provided not immediately after their performance but later step

by step to use and reuse in multiple attempts to master the target learning and generate acoustic feedback to prevent interventions (Moreno et al., 2001). Narciss (2012, p. 126) formulated feedback as a process that allows a learner to analyze the score received with the target score and work on achieving it in the next attempt. Based on the interactive two-feedback-loops framework model, Narciss (2012) and other researchers in other studies verbalized that scheming and examining the strategies of interactive tutoring feedback is challenging. The research literature suggests immediate feedback is associated with faster and better learning. However, delayed feedback is typically associated with more excellent long-term knowledge retention.

Pedagogical conversational agents have a human-like look and present their presence with an image or personality (Elliot & Murayama, 2008). They have persona characteristics like conversation, verbal feedback, personalized speaking, synthesized voice, human voice, social fidelity, social memory, and interactive behavior. They can show attention during variability and express emotionality through nonverbal feedback and goal-directed gestures. Agents' politeness and increased inspiring levels intensify motivational benefits. They generate collaboration activity employing engagement and have a unique identity with personalized language. They work relentlessly to achieve goals, so they are goal/outcome-oriented. Therefore, these features aid in academic success. They improve learning performance by facilitating learning, guiding learners, getting learning gains, and improving learner impressions. They are intelligent enough to provide feedback from a cognitive load perspective, and their interactive behavior is seen through reactions to a learner's actions, e.g., providing verbal feedback. They can provide corrective and positive feedback on learning and cognition.

Conclusion

Taken together, feedback definitions and the empirical evidence strongly support the feedback of pedagogical conversational agents. Many studies admitted that pedagogical conversational agents' feedback is highly encouraging due to multiple human characteristics with many modalities. The study aims to acknowledge and sum up pedagogical conversational agents' potential feedback that seems conspicuous in the channel of getting appropriate language learning improvement, and they are already in tutor roles of teaching science and business fields; ergo, it is advisable to use them in English language instructional practices due to two reasons. Primarily, the agents are suitable to provide corrective, immediate, and elaborate feedback. Secondly, the availability of verbal, timely feedback with facial expressions. Though these pedagogical conversational agents are helpful in various fields, the studies cover limited research in English language studies. Therefore, depending on their human characteristics, this study gave a decent image of the agents' use in gaining from their feedback in ESL/EFL classrooms. Altogether, they perform well and are good at providing feedback, yet there is scope for the research to verify whether they can completely fulfill themselves with the human element.

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