

A Systematic Review of Online Peer Assessment Tools for Learning Evaluation

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Abstract

Online peer assessment is a process that uses digital platforms or tools for students to evaluate and provide feedback on their peers' work. This method aligns with Vygotsky's sociocultural theory by promoting social interaction, collaborative learning, and the use of technological tools. The purpose of this study was to review the tools used and the lessons learned from online peer assessment (OPA). The literature review identified eight tools that facilitate OPA: (1) Peer Grade (2) Turnitin Peer Mark (3) Eli Review (4) Google Classroom (5) Moodle Workshop (6) Peerceptiv (7) Online Quizzes or Interactive Exercises (8) e-Portfolio. The results show that OPA enhances learning awareness, critical thinking, and metacognitive facilitation and promotes self-regulated learning, inter-professional teamwork, collaboration skills, evaluation skills, diversification feedback, enriches accountability, and actively engages learners. Therefore, it is essential to explore and select a tool that best meets specific needs and requirements, which may necessitate future research.

Keywords: feedback tools, learning evaluation, online peer assessment, outcomes, peer feedback

Introduction

Online peer assessment (OPA), also known as evaluation, is a process that utilizes digital platforms or tools in which students review and provide feedback on the work of their peers within the same course or educational program. This evaluation encompasses various academic assignments (Skinner et al., 2002), projects (Lin et al., 2021), presentations (Day et al., 2022), or any other learning task (Palacios et al., 2022). According to Tárraga Mínguez et al. (2020), letting students be more involved in the teaching process and peer evaluation is both fair and helpful because it can help students learn more and get better at what they are doing (Amendola & Miceli, 2018). The active participation of students in the evaluation process leads to increased critical thinking (Jiang et al., 2022; Zhan, 2021), evaluative skills, and engagement in active learning when evaluating their peers. Furthermore, the act of students critiquing and improving their peers' work fosters a sense of ownership and responsibility for learning. Consequently, improvements in learning outcomes can be achieved for both self-evaluation and peer evaluation. To achieve this, students assume the roles of

both assessors and assessee of evaluation during OPA, critiquing and assessing their peers' work in areas such as substance, organization, innovation, or conformity to particular norms. The evaluation may be quantitative, with the assignment of scores or grades (Liu et al., 2019), or qualitative, with written remarks or evaluations (Kim, 2014; Zheng et al., 2018).

A significant body of evidence supports the utilization of outcome-point assessment (OPA) in both educational and instructional settings. Rosa et al. 2016 and Topping, 2023 incorporated digital platforms or learning management systems (LMS) to allow students to submit their work, view and evaluate their peer submissions, and provide feedback in a structured manner. These platforms also offer assessors anonymity and facilitate fair and impartial assessment procedures. Furthermore, Yu et al. (2005) found a web-based for peer assessment. Additionally, Lu and Law (2012) conducted research on the effects of peer grading and feedback on student performance. Their findings demonstrated that the feedback provider was a crucial predictor of student success and that affective feedback had a significant impact on the assessee's performance. Wang (2020) also mentioned that OPA promotes positive attitudes and

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behavior changes. Awada and Diab (2023) discovered that online peer review was more significant in terms of evaluating strengths and weaknesses, content, and organization compared to face-to-face peer review in an argumentative writing English as a Foreign Language (EFL) class. According to Cleland and Walton (2012), participation-based learning can be supported through the utilization of OPA.

Research Question

However, there is limited knowledge regarding the investigation of OPA in relation to the tools used for online peer assessments. Therefore, our work contributes to the literature on OPA by focusing on the tools used for online peer assessments and the lessons learned from such assessments. As such, our study aimed to address the following questions:

1. What tools are used for online peer assessments?
2. What lessons have been learned from online peer assessment?

Methodology

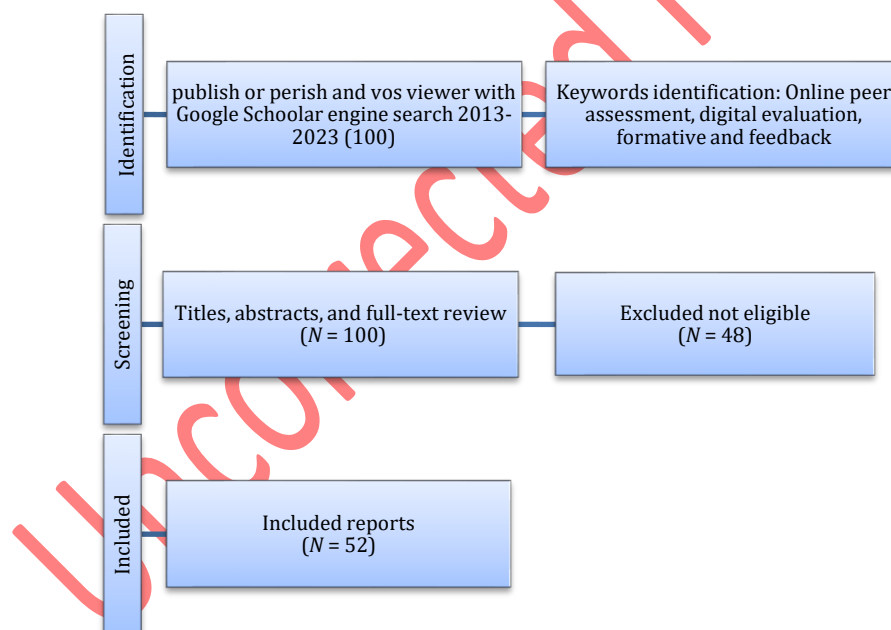
This study utilized a systemic review, a rigorous and organized technique for examining and synthesizing previous research papers and academic articles on the effectiveness of online peer assessment. In order to present an unbiased and comprehensive overview of the available evidence, a comprehensive search of relevant literature was conducted. To achieve this, the study the study focused on the following key elements:

1. Identifying relevant and pertinent literature to the research questions of the study, we employed the use of the Publish

or Perish & Vos viewer application in conjunction with the Google Scholar engine search from 2013 to 2023.

2. Specific criteria were set up to choose studies that should be included in the review. These criteria took things like online peer assessment, technology for assessment, digital evaluation, formative, and feedback into account.
3. Review screening and study selection were carried out in accordance with a predetermined process. Initially, titles and abstracts were scrutinized to identify potentially relevant papers, followed by a full-text review of these articles to determine their eligibility.
4. Data extraction and synthesis: Relevant data, such as research design, sample size, methodology, major findings, and other relevant information, were systematically extracted from the selected studies. The data was then examined and synthesized to identify patterns, themes, and trends in the literature.
5. The quality and reliability of the included studies were evaluated using predetermined standards and instruments to ensure the credibility of the findings. This assessment aids in identifying potential biases or limits in the research under consideration as well as the robustness of the supporting data. Lastly, research ethics must be considered. In this case, no human participants were involved, and instead, data from published studies were utilized. The study received official permission in the form of a welcome letter from the Institutional Review Board (IRB) of the Faculty of Universitas Musamus Merauke, Indonesia. The review method employed in this research is depicted in Figure 1.

Figure 1
Review Technique



Results and Discussion

In response to the first research question, "What tools are used for online peer assessments?" The study discovered the following online platforms that facilitate peer evaluation:

(1) PeerGrade: A widely utilized online peer assessment tool that enables students to evaluate their peers' work across various assignment types, including essays, coding projects, and presentations. Students can provide feedback based on predefined criteria or customized rubrics. PeerGrade also offers anonymity, instructor oversight, and automated grading (Lu & Law, 2012).

(2) Turnitin Peer Mark: While primarily known as a plagiarism detection tool, Turnitin also provides Peer Mark, a peer assessment feature. Instructors can create assignments, and students can review and provide feedback on their peers' submissions. Peer Mark offers options for structured reviews, open-ended comments, and ratings based on rubrics (Li, 2018; Li & Li, 2017).

(3) Eli Review: A web-based platform designed specifically for writing and composition courses, Eli Review focuses on developing student feedback and revision skills. It includes guided peer review, instructor oversight, and analytics to track student progress in providing constructive feedback (Lafien, 2020).

(4) Google Classroom: Although primarily a learning management system, Google Classroom also provides basic peer assessment capabilities. Instructors can create assignments and enable students to share their work with peers for review and feedback. These platforms provide a convenient and efficient way for students to receive feedback on their work from their peers. Additionally, they allow instructors to monitor and guide the assessment process (Hilal et al., 2022, Neumann & Kopcha, 2019, Wang, 2020).

(5) Moodle Workshop: The module is a widely-used open-source learning management system that enables instructors to set up peer assessment activities and define evaluation criteria. Students can then assess their peers' work and provide feedback according to the predetermined criteria. This approach has been found to be effective in promoting deeper learning and improved performance (Wilson et al., 2015).

(6) Peerceptiv: The online platform designed to enhance critical thinking and writing skills through calibrated peer review. Students evaluate multiple submissions, receiving feedback that helps them improve their own work. The platform uses algorithms to ensure fair and reliable assessment, promoting consistent and high-quality feedback (Li, 2023; Wu & Schunn, 2022).

(7) Interactive Online Tools and Simulations: Provide immediate feedback to learners, helping them assess their understanding, reinforce learning, and identify areas where they may require additional support. These tools have been found to be effective in promoting active learning and enhancing the overall educational experience (Butarbutar, 2021; Krusche & Seitz, 2019).

(8) An Electronic Portfolio: Also known as an e-Portfolio, is a digital collection of various academic and professional assets, such as documents, artifacts, and other digital media, that showcase a student's skills, accomplishments, and experiences (Costello & Crane, 2013). Essentially, an e-Portfolio (Welsh, 2012) serves as a digital representation of an individual's academic and professional work, which is organized in a manner that highlights their strengths and achievements. The content of an e-Portfolio includes a diverse range of materials, such as written documents, images, videos, presentations, and various multimedia elements. Educational institutions often utilize e-Portfolios to enable students to document their academic progress, display their projects, and reflect on their learning experiences (Lorenzo & Ittelson, 2005). The digital nature of e-Portfolios makes them highly accessible and shareable, and they serve as dynamic and evolving records of an individual's growth and development over time.

With regard to the second research question, "What lessons have been learned from online peer assessment?" our investigation revealed that teachers and students had the opportunity to participate in online peer assessments within the instructional context in a limited number of lessons.

(1) Enrich Learning Awareness: Lin et al. (2021) maintain that peer assessment can reinforce the weaknesses of PBL. The findings of this study indicate that online participation and the fairness of peer assessment are crucial factors in determining the success of online learning environments. However, this did not simultaneously improve the benchmarking reliability. Nevertheless, they acknowledged that biased markings sometimes occurred, necessitating the use of a group awareness tool. This tool is effective in increasing online student participation, interactions, and contributions during peer assessment. Similarly, Liu and Tsai (2005) demonstrated that web-based knowledge acquisition in peer assessment can be used to support conceptual awareness. They suggested that a web-based triadic portfolio for acquiring knowledge can enable teachers and students to engage in reflective thinking and learning evaluations. So, to get people to think about how they teach and learn and to keep an eye on their conceptual awareness, technology can be used to create assessment interventions.

(2) Critical Thinking And Meta-Cognitive: According to Lu & Bol (2007), it has been demonstrated that students who participate in anonymous peer review processes tend to perform better on their writing performance tasks and provide more critical feedback to their peers. Furthermore, Zong et al. (2021) conducted a review of OPA for feedback motivation. They examined

four student factors that influence the review of peers, including rules, rewards, achievements, and motivation for pleasure.

With regard to this, our study is pertinent to Valero et al. (2019), who conducted an exploratory intervention as an eligible piece of literature on OPA. They provided feedback on the students' argumentative essay writing quality using four different feedback types: feedback (FB), feedback forward (FF), feedback with feedforward (FB+FF), and undirected feedback (UF). The results of the study showed that directed peer feedback-based scripts were efficient for combining feedback. Moreover, the diversity of peer feedback has a significant impact on online learning outcomes.

(3) Promoting Self-Regulated Learning: Students must accept responsibility for their learning (McMahon & Oliver, 2001). Hsu & Huang (2015) found that the OPA can be used as an instructional tool to promote self-regulated learning. Peer assessments generally yield lower results than self-assessments. Additionally, regular self- and peer-assessment activities have been shown to increase engagement and encourage students to play an active role in their learning (Willey & Gardner, 2010). The application of online technologies has the potential to enhance and innovate traditional frontal teaching methods (Amendola & Miceli, 2018).

Additionally, both student outcomes and soft skills such as responsibility, critical thinking, and time management have supported the use of OPA (Orsmond et al., 2004). Broadbent and Poon (2015) noted that time management, metacognition, effort regulation, and critical thinking were positively correlated with academic success in online higher education settings. However, self-regulated learning strategies in online education have a significant impact on academic achievement. SRL elements can be integrated into online peer assessment tools, enabling students to reflect on their work and identify areas of improvement. Students who reflect on themselves are better equipped to identify their strengths and weaknesses, control their learning, and develop self-control techniques to enhance their performance. As a result, educators can create a regulated and encouraging learning environment by incorporating behavioral theories into online peer assessment systems. This method promotes active participation, supports the acquisition of knowledge and skills, and fosters the development of students' self-control and critical thinking skills.

(4) Interprofessional or Teamwork Behavior: The item response theory (Hambleton et al., 1991) is what systemic uses to look into how OPA changes interprofessional or teamwork tests. In this vein, Black et al. (2021) developed a new system online tool, known as the "comprehensive assessment of team member effective or CATME," for assessing the growth and ability of teamwork skills through online self-and peer assessment. The examination results demonstrated that the self-assessment items possessed an excellent ability to distinguish among the following three behaviors: teamwork contribution, teammate contribution, and maintaining team harmony. Additionally, Shortridge et al. (2019) employed the Team Performance Observation Tool (TPOT) to evaluate teams in terms of performance, structure, leadership, and monitoring. The TPOT was determined to be efficient in enhancing inter-professional teamwork, responsibility, and communication.

(5) Project-Based Learning Skills: The OPA application serves a dual purpose beyond simple learning assessment. It also facilitates the evaluation of peer behavior during project-based learning (PBL) discussions. Teacher interventions in online peer assessment discussions have been suggested, with (Dingel & Wei, 2014, Hou et al. 2007) finding that online PBL can differentiate among peers' prior comprehension, new comprehension, knowledge exploration, and construction (Touimi et al., 2013). However, students struggle to assess their peers' new knowledge, leading to the need for teacher intervention. To improve the quality and characteristics of peer feedback, Usher and Barak (2018) compared campus and online learning, narrowing down the study to 339 students in three learning modes: on-campus, small personal online (SPOC), and massive open online courses (MOOC). The results showed that the most dominant feedback quantity was in MOOC mode. On-campus students provided higher-quality feedback, and their peer grading correlated better

with the grades assigned by the teaching assistants. This implies that self-regulation, strategic instruction, and interest in course subjects are the three potential elements for quantity and quality OPA development. While the potential of OPA in PBL is significant, interoperability between e-learning platforms remains one of the major challenges of project-based learning assessment. Peer assessment can increase student engagement, foster critical thinking and reflection, and increase online participation (Lin et al., 2021). Peer feedback can be implemented in an online learning environment to support project-based learning (Ching & Hsu, 2013). Moreover, social contributions are more important than cognitive contributions when evaluating peers through team project-based learning (Huang et al., 2022).

(6) Collaboration Skills: Collaborative online peer learning processes in higher education promote critical reflection and self-assessment (Shen, 2005) confirmed that collaborative examinations significantly enhance interaction and promote higher-order learning. Social loafing can reduce individual efforts when working in a group (Sluijsmans & Strijbos, 2010). Pedagogical requirements for student peer-review-based discipline-specific and computer science and software engineering have been suggested by Kollar & Fischer (2010). Online peer assessment provides a platform for social interactions and collaborative learning, which aligns with Vygotsky's emphasis on social learning. Through online peer assessment, students engage in the evaluation and feedback of their peers' work, fostering social interaction (Butarbutar et al., 2023a, b) communication, and the development of higher-order thinking skills (Hou et al. 2007; Zheng et al., 2018).

Vygotsky's theory emphasizes the role of cultural tools and artifacts in cognitive development. Online peer assessment uses digital technologies (Stenalt, 2021) and platforms as cultural tools that enable students to engage in collaborative learning, share ideas, and provide constructive feedback. These digital tools facilitate social interactions and knowledge construction processes, as emphasized by (Vygotsky & Cole, 1978). Online peer assessment tools foster peer learning and collaboration, as students assess and provide feedback to their peers, engaging in discussions, exchanging ideas, and learning from each other. This collaborative aspect of online peer assessment promotes a deeper understanding of the subject matter and enhances critical thinking and communication skills (Ardiningtyas et al., 2023; Hou et al., 2007; Nur et al., 2022; Zhan, 2021).

(7) Team-Based Learning Skills: Team-based learning (TBL) is a valuable skill for OPA applications, as evidenced by the findings of Jung et al. (2022), who conducted a study on the correlation between self and peer evaluations and found it to be highly significant. Our analysis of narratives on teamwork contributions in OPA identified four categories of problems, including role allocation, communication among team members, lack of preparation, and disgruntled presentations. We believe that our study can contribute to future efforts to improve team-based learning in the context of OPA (Babakr et al., 2019; Hughes et al., 2004; Trautmann, 2009; Yu et al., 2005). Peer assessment is a key component of OPA, promoting reciprocal learning and higher-order thinking skills such as critical thinking, perspective-taking, and metacognition. The collaborative process encourages students to gain various perspectives and expertise from their peers, contributing to the overall quality of group projects.

To design and implement effective OPA assessments, a range of digital tools can be utilized for peer assessment, as outlined in previous research (Cheng et al., 2014; Topping, 2009). These tools can include writing, oral presentations, portfolios, test performance, and other skilled behaviors. The research conducted by Hou et al. (2007) and Zheng et al. (2018) has demonstrated the potential of peer assessment strategies in the classroom to improve critical thinking and metacognitive skills, as well as knowledge construction. Lin (2018) has proposed methods for promoting socially shared regulation of learning (SSRL) and individual self-regulated learning (SRL). Additionally, computer-supported collaborative learning (CSCL) environments can facilitate the implementation of these strategies.

(8) Diversification of Feedback: Online peer assessment tools offer a more diverse range of perspectives during the evaluation

process, extending beyond the feedback of instructors or teachers. Students can receive feedback from peers who possess different knowledge, experiences, and perspectives. These tools are useful for obtaining feedback on various aspects of student performance, including formative, summative, internal, external, formal, informal, instructional, and corrective assessments (Sekendiz, 2018, Suen, 2014, Welsh, 2012). The diversification of feedback can provide a more comprehensive evaluation of learning outcomes (Tseng & Tsai, 2007). Peer assessment can support students in developing their learning processes independently, reflecting on their progress, and receiving constructive feedback from their peers (Bong & Park, 2020).

The immediate feedback provided by online peer assessment technologies is a crucial aspect of the evaluation process. This aligns with the principles of behaviorism, which emphasizes the importance of providing learners with immediate feedback. The prompt exchange of student feedback can serve as a form of reinforcement, directing students towards desired behaviors and assisting them in making necessary improvements to their work. Students can benefit from multiple viewpoints and gain a deeper understanding of the subject matter by receiving comments from their peers (Lerchenfeldt & Taylor, 2020).

(9) Development of Evaluation Skills: Participation in online peer assessments is crucial in the development of students' evaluation and feedback-giving skills. This process not only benefits the recipient of the feedback but also enhances the abilities of the students providing feedback. Through the critical analysis and evaluation of others' work, students improve their metacognitive skills and engage in self-reflection (McLuckie & Topping, 2004, Zheng et al., 2023) emphasized the transferable nature of these skills in learning evaluation (Nikolic et al., 2018).

(10) Promotes Active Learning: Integrating comparisons with other studies provides a broader context and validates this study's findings. For instance, Adesina et al. (2023) highlighted that peer assessment increases student engagement and accountability. Similarly, Latifi et al. (2021) found that peer evaluations lead to higher-quality work and improved learning outcomes. These findings align with the results of the current study, which demonstrated the effectiveness of online peer assessment tools in enhancing students' writing skills through active learning and engagement.

From a global perspective, the integration of online peer assessment tools in educational systems worldwide has the potential to democratize and enhance the learning experience. In many parts of the world, traditional assessment methods are teacher-centered and often lack opportunities for students to engage in reflective and critical evaluations of their peers' work. By leveraging technology, online peer assessment tools can transcend geographical and cultural barriers, providing a platform for diverse student populations to interact with and learn from one another.

A significant advantage of these tools is the promotion of collaborative learning environments. When students from different cultural backgrounds engage in peer assessments, they are exposed to varying perspectives and approaches to problem-solving, enriching their own understanding and broadening their global outlook. This cultural exchange can foster empathy, tolerance, and a deeper appreciation of diversity, which are crucial skills in an increasingly interconnected world.

Furthermore, online peer assessment tools can address resource constraints in educational institutions, particularly in developing countries. By utilizing digital platforms, schools can implement peer assessments without extensive physical resources or infrastructure. This can lead to more equitable access to quality education, as students in under-resourced areas can benefit from the same pedagogical practices as those in affluent regions.

However, online peer assessment tools must be carefully managed to ensure fairness and reliability. Cultural differences in communication styles, feedback preferences, and educational values can affect the effectiveness of peer assessments. Educators must provide clear guidelines and training to students on how to provide and receive constructive feedback, ensuring that the process is beneficial for all participants (Kerman et al., 2024; Lu & Law, 2012).

Online peer assessment tools have the capacity to stimulate active learning by involving students in the evaluation process. This methodology not only encourages students to participate in the assessment and evaluation of their peers' work, but also promotes a deeper understanding of the subject matter. The active engagement that results from this process can lead to increased motivation (Butarbutar, 2021), deeper learning, and a heightened sense of ownership over the learning process (Butarbutar et al., 2019; Liu et al., 2018).

(11) Enrich Accountability: Online peer assessment tools commonly utilize rating or scoring mechanisms to promote student accountability. The knowledge that their work will be evaluated by their peers often leads to increased effort, higher-quality work, and a stronger sense of responsibility for learning. This enhanced accountability can result in improved learning outcomes (Hasyim et al., 2024; Patchan et al., 2018).

Limitations of the Study

In summary, despite its limitations, ongoing technological advancements and research have the potential to address the challenges facing online peer assessment and enhance its ability to promote collaborative learning and skill development. Reliability and Consistency: The quality of peer assessments may fluctuate, resulting in inconsistencies in the evaluations provided by different peers. Some students may not take the task seriously, or may not possess the necessary expertise to offer accurate feedback. Personal biases, friendships, cultural differences, and conflicts may have an impact on the subjective and biased assessments that result from this. Technical issues such as poor internet connectivity, platform glitches, and unfamiliarity with online assessment tools may also affect the effectiveness of the process. The lack of accountability and consequences of inaccurate or inappropriate feedback may be a limitation. Implementing and managing online peer assessments is time consuming and requires significant resources. Additionally, variances in students' skill levels may lead to unequal feedback, with students with advanced skills struggling to provide constructive criticism to their peers.

Practical Applications and Future Prospects of OPA

In keeping with practical applications, the prospects of OPA can be applied as follows:

(1) Skill Development: Enhance critical thinking and analytical skills through evaluating and providing feedback on peers' work. Benefit from diverse perspectives, broadening understanding of different approaches and ideas.

(2) Reduced Instructor Workloads: Utilize peer assessment to distribute grading workload, particularly in large classes. Encourage active learning by engaging students in the learning process and promoting responsibility for their own and peers' learning.

(3) Promoting Active Learning: Mimic real-world scenarios where professionals review and provide feedback on each other's work. Encourage students to take responsibility for their own and peers' learning.

(4) Advanced Technology Integration: Continued integration of advanced technologies, such as artificial intelligence, for accurate and efficient peer assessment. Develop sophisticated feedback models to address subjectivity and bias in evaluations.

(5) Gamification Elements: Incorporate gamification elements to enhance student engagement and motivation during peer assessments.

(6) Research and Best Practices: Conduct further research on best practices for implementing online peer assessment across different disciplines and educational levels. Facilitate global collaboration through online peer assessment, allowing students from different parts of the world to learn from each other.

(7) Adaptive Learning Platforms: Integrate with adaptive learning platforms that tailor the peer assessment process to individual student needs and learning styles.

Conclusion

To this end, the use of online peer assessment aligns with Vygotsky's sociocultural theory by promoting social interactions,

collaborative learning, and technological tools. It provides a platform for students to engage in higher-order thinking skills, offers opportunities for peer support within the zone of proximal development, and supports cognitive development through social interactions and digital technology. Online peer assessment tools diversify feedback, promote formative assessments, develop evaluation skills, foster active learning, increase accountability, and facilitate peer learning and collaboration. These tools offer a valuable addition to traditional evaluation methods supporting a holistic and comprehensive approach to learning assessment. While there were only a few examples of available online peer assessment tools in the previous section, future research is needed to explore and choose the one that best fits specific needs and requirements. By promoting cognitive growth, fostering social relationships, and increasing students' drive to learn, online peer assessment can improve educational outcomes.

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