BlendED

ABC BlendEd workshops, WP2 – Design

Meaningful feedback and reflection

Quick Guide

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1 Introduction

Meaningful feedback and reflection are essential for fostering student engagement and continuous growth. This guide introduces practical tools, techniques and strategies for promoting effective self and group feedback and reflection that can be applicable in both physical and hybrid learning environments to transform feedback into a dynamic and empowering experience. It assists educators to create a feedback-rich classroom culture that supports critical thinking, collaboration, and student ownership of learning.
In modern educational paradigms like PBL and ABC BLENDED, the emphasis has shifted from memorization toward active, experiential learning. Both feedback and reflection are core processes in this transformation. They help students make meaning of their experiences, improve their work, and develop the self-regulation skills essential for lifelong learning. Feedback is a powerful tool that provides students with actionable insights on how to improve and grow; reflection encourages students to think critically about their learning process, successes, and areas for improvement.

In PBL and ABC BLENDED education, where interdisciplinary, real-world problem-solving is key, feedback and reflection ensure that students develop higher-order thinking skills and maintain ownership of their learning. Feedback may arise from the teacher side (formative and summative feedback) or from the students' side (peer feedback and self-assessment). Formative feedback during the learning process helps students improve in real time and encourages iteration in design and problem-solving. Summative feedback commonly occurs at the end of a project or unit with the purpose of assessing overall performance and providing closure. Peer feedback builds collaborative skills and allows for multiple perspectives from students, it encourages reflection on one's own work while evaluating others. Self-assessment promotes metacognition and empowers students to take responsibility for their learning.

The guide is expected to promote the following learning objectives:

- Describe the role of feedback and reflection in education.
- Organize self and group-reflection sessions in learning environments.
- Integrate continuous feedback mechanisms into teaching plans and curricula.
- Explore feedback to improve student learning achievements.

2 The importance of student feedback and reflection

Student feedback plays a vital role in ABC BLENDED (Science, Technology, Engineering, Arts, Mathematics, and Entrepreneurship) and Project-Based Learning (PBL) environments. It supports deep learning, critical thinking, and continuous improvement. Without feedback and reflection, learning becomes passive. In ABC BLENDED and PBL, these practices empower students to think critically, improve their practices, innovate, collaborate, and grow.

Reflective practice is a cornerstone of effective learning that extends beyond the mere consumption of feedback. It is the process by which students actively consolidate knowledge, question their assumptions, and determine how to apply what they have learned in future contexts [1][2]. This deliberate self-examination is essential for fostering critical thinking and personal growth, preparing students to become active co-creators of knowledge rather than passive consumers [3][4].

A few concrete reasons why gathering feedback and facilitating students' reflection is important in ABC BLENDED and PBL learning settings are highlighted.

2.1 Enhancing student learning and metacognition

When reviewing their work and verbalizing it through feedback, students develop self-awareness about their learning process. Reflection helps them assess what they understand, what challenges they face, and how they can improve. By sharing feedback with the teacher and their peers, students strengthen problem-solving skills, learn about distinct points of view and distinct ways of addressing a challenge, they are encouraged for self-directed learning and take charge of their own progress.

2.2 Improving collaboration and communication

PBL and ABC BLENDED emphasize team and multidisciplinary work. Peer and group reflection ensures constructive communication and a growth mindset that promotes creative by clashing different disciplines, different concerns and different responsibilities. Systematic feedback helps students learn how to give and receive constructive criticism building teamwork skills necessary for real-world problem-solving.

2.3 Encouraging creativity and innovation

Reflection allows students to revisit and refine ideas, key aspect of iterative thinking in ABC BLENDED and PBL that stimulate creativity and innovation. Feedback encourages students to embrace failure as a learning opportunity and fosters innovation by promoting iteration and experimentation; it guides students to explore different perspectives and improve their solutions, leading to deeper understanding and more creative outcomes.

2.4 Encouraging ownership and intrinsic motivation

When feedback is student-centred and reflective, it shifts responsibility for learning onto students, increasing their engagement and intrinsic motivation. Students take ownership of their projects and become active participants in their growth.

2.5 Strengthening teacher-student connection

Feedback loops create a dialogue between students and educators, allowing teachers to adjust lessons and strategies to better support learning. It is a win-win experience for students and teachers. It ensures student-centred instruction and helps teachers address learning gaps in real-time.

2.6 Furthering students' employability

Both PBL and ABC BLENDED emphasize iterative learning cycles. Reflection and feedback provide students with actionable insights for revising and improving their projects, mirroring real-world innovation processes where professionals constantly refine their work based on input. It builds professional skills like adaptability, resilience, and communication, and prepares students for lifelong learning beyond the classroom. Group reflection and peer feedback are core elements of PBL/ABC BLENDED, where teamwork is essential. Feedback helps students develop communication, active listening, and constructive critique skills, preparing them for real-world collaborative environments.

2.7 Bridging the gap between process and product

In PBL and ABC BLENDED, the learning process is as important as the outcome. Feedback helps students focus on both, ensuring that they do not just complete a project and deliver a product but also understand and grow from the experience.

In short, the relevance of feedback and reflection in PBL and ABC BLENDED may be summarized by three of its key features:

- Critical for student growth and deeper learning
- Central to PBL and ABC BLENDED for continuous improvement
- Builds skills like self-regulation, collaboration, and critical thinking.

3 Added value for stakeholders

Being aware of the reasons why systematic feedback matters, it is now important to discuss what is the relevance of gathering student feedback for its stakeholders: teachers and students.

3.1 For Teachers: What's in it for me?

Teachers gain control of the learning process through systematic feedback and promote learning achievements.

3.1.1 Better understanding of student needs

Feedback provides teachers with a real-time window into student thinking, progress, and challenges. This insight helps adjust teaching strategies and personalize instruction.

3.1.2 Improved student outcomes

Reflection and feedback processes lead to deeper learning and more polished final projects. Teachers see tangible improvements in student work overtime.

3.1.3 Stronger classroom culture

Encouraging reflection and open feedback builds a supportive learning environment. Trust and collaboration grow, making it easier to manage group work and foster creativity.

3.1.4 Reduced grading stress

Ongoing feedback helps guide students toward success before the final submission, reducing the burden of correcting major mistakes at the end. Formative feedback during project milestones means fewer revisions after the final assessment.

3.1.5 Professional growth

Engaging in reflective practices with students also benefits teachers by fostering their own growth. Teachers become more adaptive, innovative, and responsive.

3.2 For Students: What's in it for me?

Students take ownership of their learning and improve their skills and competences.

3.2.1 More control over the learning

Feedback helps students take ownership of their learning journey. They learn to self-assess, set goals, and make improvements on their own terms. A student revising their business plan after peer feedback builds confidence and gains new entrepreneurial skills.

3.2.2 Better work and performance

Continuous feedback leads to higher-quality work, as students can refine and improve before the final assessment.

3.2.3 Development of real-world skills

Reflection and feedback build critical skills like collaboration, communication, problem-solving, and adaptability, all essential for future careers.

3.2.4 Increased motivation and engagement

Seeing progress and receiving constructive input motivates students. Reflection helps them connect their work to personal goals and interests, deepening engagement. A digital portfolio showcasing a student's growth becomes a source of pride and motivation for future projects and becomes an important bridge to the labour market.

3.2.5 Resilience and growth mindset

Learning to give and receive feedback teaches students how to handle constructive criticism and view mistakes as opportunities. A student who struggled with early versions of a ABC BLENDED project learns to embrace iteration and sees failure as part of the process.

4 Barriers to student feedback

Feedback and reflection are essential components of effective learning, especially in ABC BLENDED and PBL environments. However, getting meaningful feedback from students can be challenging due to various factors such as lack of confidence, fear of criticism, feedback fatigue, and cultural differences. This section discusses and offers practical solutions and strategies to overcome these challenges.

4.1 Lack of experience or confidence

Students may not know how to give effective feedback or feel unsure about their opinions. They might fear being judged or think their input does not matter. They might want to avoid standing out, being in the spotlight. Younger or less experienced students may not have developed the reflective skills needed to provide constructive feedback. A student might just say “It’s fine” when asked for feedback on a group project because they don’t know how to articulate deeper insights.

To overcome students’ lack of experience or confidence, explain them the purpose of feedback and model feedback skills. Introduce scaffolded reflection questions to guide students. Use sentence starters like “One strength of this project is...” or “One thing that could be improved is...”. Conduct role-playing exercises where students practice giving feedback in a simulated scenario. Share examples of good and bad feedback to help them understand what constructive feedback looks like. In a ABC BLENDED project, instead of asking, “What do you think about your group’s performance?”, provide a more focused prompt: “How did your team manage time effectively? What could have been done differently?”.

4.2 Fear of criticism or hurting others

Students are often hesitant to give honest feedback because they don’t want to criticize peers or face conflict. In group work, students might sugarcoat feedback or avoid saying anything negative to maintain friendships.

To overcome these difficulties, build a safe and supportive environment by emphasizing that feedback is about growth, not judgment, and using anonymous feedback tools like Menti or Google Forms for more frank responses. Promote empathy in feedback by asking students to frame suggestions positively: “Have you thought about trying...” instead of “This is wrong.”. Start showing contributions are valued to build trust before moving into constructive feedback. Before a peer review session, set ground rules like “Respect others’ ideas,” and use an anonymous digital feedback form to collect suggestions that you later discuss as a group.

4.3 Feedback fatigue

If feedback requests are too frequent, overwhelming, or poorly structured, students may disengage. They can get tired of repetitive questions without seeing any real impact. Students lose motivation if they feel like their feedback doesn’t lead to change or improvement. When asked for the same type of feedback week after week without follow-up action, students stop taking it seriously.

Keep feedback relevant and impactful. Do not overdo feedback requests; focus on key moments in the learning process and plan them in advance. Keep feedback sessions short, structured, and interactive (e.g., small-group reflections). Act on the feedback students provide and show how it has impact on the results. After receiving feedback on group collaboration, share with students how you adjusted the structure of group work to better support their needs. This encourages them to keep participating.

4.4 Misunderstanding the purpose of feedback

Students often see feedback as a way for teachers to assess or judge them rather than a tool for their growth. Without clear communication about the purpose of reflection and feedback, students may perceive it as a task with no personal benefit. A student might write generic answers on a feedback form because they don't see how it will help their learning process.

Clearly explain why you are engaging them in a feedback and reflection session. Tell students how feedback will benefit them directly – link it to their success and growth. Make feedback visible by mapping it to learning goals or including it in portfolios. Use reflection journals where students track how feedback helped improve their projects. Introduce feedback as to tool to make the final project results even stronger, a superpower for improving the outcomes. Show before-and-after examples of how feedback helped previous students succeed.

4.5 Lack of time and space for feedback and reflection

Reflection requires dedicated time and a safe environment, which is often overlooked in fast-paced educational settings. When feedback is rushed, students cannot think deeply or articulate meaningful responses. A 5-minute feedback session at the end of a long class won't give students the chance to reflect thoughtfully.

Plan and create dedicated time for feedback and reflection. Build regular feedback and reflection time into class schedules (even just 10 minutes). Use exit tickets to gather quick, focused reflections. Incorporate digital portfolio platforms like Seesaw or Google Sites, where students can reflect at their own pace. For example, at the end of each milestone in a ABC BLENDED project, students may complete a reflective journal entry answering: "What did I learn today? What is my next step?"

4.6 Cultural or personal differences

Some students may come from backgrounds where giving feedback to authority figures or peers is not a common practice. Others may be naturally more reserved. Feedback cultures vary; what feels normal in one setting can feel uncomfortable in another. In a multicultural classroom, some students may hesitate to provide feedback for fear of seeming disrespectful.

Be culturally responsive and flexible. Offer multiple ways to give feedback: written, verbal, visual, etc. Encourage group discussions to reduce pressure on individuals. Be mindful of cultural norms; frame feedback in ways that feel respectful and safe for all students. Use a visual feedback tool, such as an interactive whiteboard app like Miro or Stormboard, where students can use emojis, colour codes, or short notes to express feedback in ways that feel comfortable.

4.7 Elementary practices to promote effective feedback

In general, the challenges faced by teachers and students in feedback and reflection moments can be addressed by transversal practices, such as:

- teach students how to give constructive feedback with examples and practice,
- normalize feedback as part of the learning process, showing how it leads to improvement,
- use digital tools (like anonymous surveys or reflection apps) to make it easier for students to share honest feedback,
- act on the feedback so students see that their input matters.

As a rule, make feedback fun and engaging. Use gamified feedback sessions or reflection prompts with creative elements (e.g., ask students to write a tweet-length reflection or design a "meme" summarizing their experience). Collaborate with students to co-create feedback guidelines and formats they are comfortable with. Feedback may be short; make it simple and find innovative ways of engaging students. For example, ask

• Make feedback fun: use creative approaches like gamified feedback sessions or meme-based reflections.

• Collaborate with students: co-create feedback guidelines and involve them in designing the feedback process.

• Follow up: always close the loop by showing how student feedback influenced decisions or changes.

students to pose a question about what they want to learn more about the subject of the class; this will give you an understanding of what the students have just learned and if they can relate it to other subjects.

5 Feedback and refection techniques

Several common techniques used for conducting effective self-reflection and group reflection sessions are described in this section.

5.1 Self-reflection techniques

5.1.1 Guided Reflection Prompts

Structured prompts help guide students' thinking about their learning experience [5]. These questions focus on different aspects of learning, such as the process, collaboration, outcomes, and emotions.
Example Prompts:

- *What was the most challenging part of this project? How did you overcome it?*
- *How has your understanding of the topic changed?*
- *What strategies worked well, and what would you do differently next time?*

5.1.2 Learning Journals

Students maintain journals (physical or digital) to record daily reflections on their learning, focusing on progress, setbacks, and insights [6]. Journals can be free-form or follow structured formats with prompts.

Added value
Encourages continuous reflection and documents the learning journey.

5.1.3 Digital Portfolios

Students compile their work, along with reflective annotations, in a digital portfolio (using tools like Seesaw, Google Sites, or Mahara) [7].

Added value
Allows students to see their growth over time and reflect on their progress. Ideal for project-based learning environments.

5.1.4 The "3-2-1 Reflection"

A simple structure where students write:

- 3 things they learned,
- 2 questions they still have,
- 1 thing they found interesting or surprising.

Added value
Quick and focused, promoting immediate reflection without requiring extensive writing.

5.2 Group reflection techniques

5.2.1 Think-Pair-Share

Students reflect individually on a question, pair up to discuss their thoughts, and then share with the larger group [8].

Added value
Encourages individual reflection first, followed by peer discussion. This technique fosters collaboration while allowing quieter students to participate.

5.2.2 Peer Review Circles

Students form small groups and provide structured feedback on each other's work. This can be guided by rubrics or reflective questions [9].

Added value
Promotes collaborative learning and critical thinking, with multiple perspectives contributing to individual growth.

5.2.3 Fishbowl Discussion

A small group of students discusses a reflective question in the centre ("the fishbowl"), while the rest observe and take notes. The roles are then switched.

Added Value:
Develops listening and discussion skills while providing multiple perspectives on a reflection topic.

5.2.4 The Six Thinking Hats (Edward de Bono)

Participants analyze a situation from six different perspectives, represented by hats of different color [10]:

- White: Facts and information
- Red: Emotions and feelings
- Black: Caution and risks
- Yellow: Positive aspects
- Green: Creativity and new ideas
- Blue: Process control

Added Value:
Encourages balanced reflection, addressing both rational and emotional aspects of an experience.

5.2.5 World Café method

Participants rotate through multiple small group discussions on different reflective questions or topic [11]. Each table has a host who summarizes the conversation for the next group.

Added value
Promotes large-group reflection while maintaining intimacy and depth of discussion.

5.3 Blended techniques (individual and group)

5.3.1 Exit Tickets

Students write a quick response to a reflective question on a piece of paper (or digitally) before leaving class. Responses can be shared in group discussions.
Example questions:

- *What did you find most challenging today?*
- *What are your next steps?*

Added value
Provides quick feedback for teachers while helping students articulate and reflect on their learning.

5.3.2 Reflection Circles

Students sit in a circle and take turns sharing their reflections on the learning process, guided by a facilitator. This can be done with a "talking stick" to ensure each voice is heard.

Added value
Builds community and fosters open communication.

5.3.3 Reflective Dialogue Journals

Students write a journal entry, which is read and responded to by the teacher or a peer. This creates a reflective dialogue over time.

Added value
Encourages deeper reflection through interaction and continuous feedback.

6 Digital tools to facilitate feedback and reflection

Digital tools are crucial tools to facilitate feedback and reflection. In this section we discuss real-world examples and case studies showing how digital tools are applied in classrooms to facilitate feedback and promote meaningful discussions. Each example highlights specific implementation strategies, student outcomes, and lessons learned. These case studies show how digital tools can meaningfully transform feedback and discussion in various educational settings.

6.1 Perusall in a hybrid literature course

Perusall [12] is a collaborative annotation platform that transforms reading assignments into interactive discussions. Students can highlight text, leave comments, and respond to each other's annotations in real-time.

- **Features**:
    - Collaborative text annotation
    - Threaded discussions within readings
    - Automated grading of participation and quality of contributions
    - Teacher prompts to guide discussions
- **Added Value**:
    - **Deepens engagement with reading material**: Encourages students to reflect on the content and interact with peers, promoting higher-order thinking.
    - **Increased participation**: More inclusive than traditional discussions, allowing quieter students to contribute thoughtfully.
    - **Formative feedback opportunities**: Teachers can give personalized feedback on student contributions.

Case Study: Deepening Student Engagement with Collaborative Annotation [12]

- **Course Context:** A high school English class focused on American literature.
- **Objective:** To improve critical reading skills and foster peer discussion in a hybrid learning model.
- **Implementation:**
    - The teacher assigned reading passages from *The Great Gatsby* in Perusall.
    - Students were required to highlight significant passages, ask at least one question, and respond to two peers' comments.
    - The teacher monitored discussions and provided targeted feedback on analytical depth and clarity.
- **Outcome:**
    - **Increased participation:** 90% of students contributed weekly, compared to 60% before using Perusall.
    - **Higher-order thinking:** Students developed stronger analytical writing skills through sustained peer interaction.

- **Lesson Learned:** Providing clear rubrics for annotations helped students focus on deeper reflections rather than surface-level comments.

6.2 Flipgrid for reflection and peer feedback in a STEAM project

Flipgrid [13] allows students to record short video responses to teacher prompts, facilitating video-based discussions. Peers can respond with videos or comments.

- **Features**:
  - Video recording and editing tools
  - Peer-to-peer video responses
  - Moderation and privacy controls
  - Integration with Microsoft Teams and Google Classroom
- **Added Value**:
  - **Enhanced social presence**: Helps build a sense of community in online settings.
  - **Inclusive reflection opportunities**: Students can express ideas in a multimodal format, appealing to different learning styles.
  - **Authentic feedback**: Video responses add a personal touch, encouraging more thoughtful reflection.

Case Study: Using Video Responses for Creative Design Projects [13]

- **Course Context:** A middle school STEAM course on robotics and coding.
- **Objective:** To encourage reflective practice and peer feedback on project prototypes.
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- **Implementation:**
  - After building their first robot prototype, students recorded 2-minute videos explaining their design choices and challenges.
  - Peers watched and left video feedback with suggestions for improvement.
  - The teacher used Flipgrid to highlight exemplary reflections in class.
- **Outcome:**
  - **Deeper reflection:** Students were more honest and personal in video reflections compared to written journals.
  - **Increased peer interaction:** 75% of students reported that peer feedback helped them improve their designs.
  - **Lesson Learned:** Encouraging multiple rounds of feedback allowed students to refine their work incrementally.

6.3 Mentimeter for live feedback in a large lecture hall

Mentimeter [14] is an interactive presentation tool that enables real-time polling, quizzes, and word clouds to foster engagement and collect feedback.

- **Features**:
  - Live polling and quizzes

  - Word cloud generation
  - Multiple-choice and open-ended questions
  - Exportable results for analysis
- **Added Value**:
  - **Immediate feedback**: Teachers can gauge understanding and adjust instruction on the fly.
  - **Increased participation**: Students can respond anonymously, reducing anxiety and encouraging honest feedback.
  - **Data-driven insights**: Visualizations help both students and teachers reflect on learning progress.

Case Study: Real-Time Polling for Conceptual Understanding [14]

- **Course Context:** A first-year university physics course with 200 students.
- **Objective:** To assess students' conceptual understanding in real-time and spark discussion.
- **Implementation:**
  - The instructor used Mentimeter to pose multiple-choice questions during key moments in the lecture.
  - After displaying poll results, students discussed the answers in small groups and then re-voted.
  - The instructor facilitated a large-group discussion on the most common misconceptions.
- **Outcome:**
  - **Improved engagement:** Attendance and participation increased by 20%.
  - **Better understanding:** Students demonstrated a 15% improvement in test scores after implementing the technique.
  - **Lesson Learned:** Allowing students to discuss answers before voting a second time significantly enhanced learning outcomes.

6.4 Padlet for collaborative reflection in Project-Based Learning

Padlet [15] is a digital bulletin board that allows students to post text, images, videos, and links. It's a versatile tool for brainstorming, group reflections, and collaborative projects.

- **Features**:
  - Customizable boards (timeline, map, grid, wall)
  - Multimedia support (text, images, videos)
  - Real-time collaboration
  - Integration with Microsoft Teams and Google Workspace
- **Added Value**:
  - **Visual collaboration**: Encourages creativity and allows students to express ideas in various formats.
  - **Fosters reflective practice**: Students can document learning journeys, promoting metacognitive thinking.
  - **Scalable for group projects**: Facilitates both individual and group reflections.

Case Study: Documenting the Learning Journey in a Biology Class [15]

- **Course Context:** A high school biology class studying ecosystems.
- **Objective:** To promote reflective thinking and track group progress during a month-long research project.
- **Implementation:**
    - Students used Padlet to create a shared "research wall" documenting progress, challenges, and reflections.
    - Each group posted weekly updates, including photos of their work, notes, and questions for peer feedback.
    - The teacher provided weekly feedback and prompted deeper inquiry by posing questions on their boards.
- **Outcome:**
    - **Visible learning progress:** Students had a clearer sense of their development over time.
    - **Collaborative culture:** Groups engaged in meaningful discussions outside of class hours.
    - **Lesson Learned:** Setting expectations for thoughtful reflections (not just descriptions) improved the quality of contributions.

6.5 EdPuzzle for pre-class preparation in a flipped classroom

EdPuzzle [16] enables teachers to embed questions and notes into videos, turning passive video watching into an interactive learning experience.

- **Features**:
    - Embed multiple-choice and open-ended questions
    - Track student progress and responses
    - Integration with Google Classroom
    - Library of pre-made content
- **Added Value**:
    - **Active engagement with video content**: Students must engage with the material to proceed, promoting attentiveness.
    - **Formative assessment tool**: Provides immediate feedback on comprehension.
    - **Supports flipped classroom models**: Encourages pre-class preparation and deeper in-class discussions.

Case Study: Interactive Video for Chemistry Concepts [16]

- **Course Context:** A high school chemistry class covering chemical reactions.
- **Objective:** To ensure students come to class prepared and with a basic understanding of new concepts.
- **Implementation:**
    - The teacher assigned short videos on EdPuzzle with embedded questions at key points.
    - Students had to answer questions correctly before moving to the next section of the video.
    - The teacher reviewed responses before class to tailor in-class discussions.

- **Outcome:**
    - **Better preparation:** 85% of students completed pre-class assignments compared to 50% with traditional reading homework.
    - **Targeted instruction:** The teacher could address specific misconceptions identified in the responses.
    - **Lesson Learned:** Open-ended questions prompted deeper reflection than multiple-choice questions.

6.6 PollEverywhere in a debate-based history class

PollEverywhere [17] allows for real-time polling during lectures or discussions, with instant results displayed as charts or word clouds.

- **Features**:
    - Live multiple-choice, open-ended, and clickable image questions
    - Anonymous responses
    - Integration with PowerPoint and Google Slides
    - Exportable reports
- **Added Value**:
    - **Promotes inclusivity**: Anonymity encourages participation from all students.
    - **Immediate classroom adjustment**: Teachers can adapt lessons based on live feedback.
    - **Engages students in large classrooms**: Keeps attention and involvement high.

Case Study: Building Consensus through Real-Time Polls [17]

- **Course Context:** An upper-secondary history class on World War II.
- **Objective:** To promote discussion and gauge shifting opinions during class debates.
- **Implementation:**
    - Before the debate, students responded to a PollEverywhere question on whether the U.S. should have dropped the atomic bomb.
    - After hearing both sides of the argument, students re-voted.
    - The teacher displayed results, prompting a discussion on what caused students to change or maintain their views.
- **Outcome:**
    - **Critical thinking:** Students became more reflective and open to different perspectives.
    - **Active learning:** The debate combined with polling kept engagement high.
    - **Lesson Learned:** Anonymous responses made students more comfortable sharing controversial opinions.

7 Feedback and reflection in PBL/ABC BLENDED cycle

Phase	Activity	Feedback Method	Reflection Technique
1. Launch	Introduce driving question	Teacher clarifies goals, provides initial guidance	Students reflect on prior knowledge and expectations
2. Investigation	Research and explore	Formative feedback from teacher and peers	Guided reflection logs, daily journals
3. Ideation	Brainstorm solutions	Peer feedback on ideas and prototypes	Think-Pair-Share
4. Creation	Develop product or solution	Teacher gives targeted feedback on drafts	Weekly self-assessment and group reflection
5. Presentation	Share final product	Summative feedback with rubric	Outcome-based reflection prompts
6. Review	Reflect and refine for the future	Peer and teacher feedback on process	Digital portfolios, showcase reflections

7.1 Common challenges and solutions

Challenge	Solution
Ensuring meaningful, not superficial, reflection	Provide structured prompts and clear rubrics.
Resistance to peer feedback	Build a classroom culture of trust and respect.
Managing feedback in large classes	Use digital tools to automate and scale feedback processes.
Time constraints	Integrate feedback and reflection into daily routines.

7.2 General reflection prompts

General Reflection Prompts

1. **Process-Oriented Reflection**:
   - *What steps did you take to reach this point? Which step was the most challenging?*
   - *How did your initial plan change during the project? Why?*
2. **Collaborative Reflection**:
   - *How did your team communicate and collaborate?*
   - *What role did you play in the group, and how did it evolve?*
3. **Outcome-Based Reflection**:
   - *What are you most proud of in this project? Why?*
   - *How could your final product be improved if you had more time?*
4. **ABC BLENDED-Specific Reflection**:
   - *Which disciplines (Science, Technology, Engineering, Arts, Math, Entrepreneurship) contributed the most to your solution? How?*

- *How did this project change how you think about real-world problems?*

7.3 Facilitating reflection in PBL and ABC BLENDED

Feedback and reflection are core components of deep learning. Reflection allows students to connect theory with practice and encourages critical thinking about what worked, what did not, and why. It promotes creative and adaptive thinking in PBL and ABC BLENDED projects, which often involve multiple iterations.

7.3.1 Techniques for promoting Feedback and reflection

- Journals and Learning Logs: Encourage personal reflection on progress and challenges.
- Guided Reflection Prompts: Help structure reflection with targeted questions (e.g., "What would you do differently next time?").
- Think-Pair-Share: Combines individual reflection with peer discussion.
- Digital Portfolios: Allow students to document and reflect on their work over time.

7.3.2 Digital tools for feedback and reflective practice

- Flipgrid: Video-based reflection, encouraging students to express thoughts in a multimodal way.
- Padlet: Visual collaboration for group reflections and brainstorming.
- Seesaw: A portfolio tool for younger students to reflect on their learning journey.
- Wakelet: Helps students curate and reflect on digital content they've created or encountered.

8 Using AI for feedback and reflective practice

The integration of artificial intelligence (AI) into educational practices is a significant paradigm shift, particularly within the critical domains of student feedback and reflection. AI is not a mere replacement for human educators but a powerful partner capable of fundamentally transforming the learning cycle. Its primary value lies in its ability to provide immediate, personalized, and consistent feedback, grounded on massive datasets, at an unprecedented scale, which frees educators to focus on the higher-level pedagogical tasks.

AI tools enhance learning outcomes by accelerating the feedback loop, personalizing instruction to meet individual student needs, and promoting fairness through the consistent application of evaluation criteria. AI can act as a catalyst for metacognition and reflection by scaffolding the learning process and empowering students to perform effective monitoring and control of their learning path.

Bringing AI into the teaching and learning process gives rise to transformative impacts at all levels. The successful and ethical integration of AI into the education pipeline is subject to significant challenges, requiring a balanced and human-centric approach, but it will enable a more effective, and equitable learning experience.

The role of AI in the reflective process is not to generate a polished reflective paper, but to provide a scaffold for reflection itself. AI can act as a "tireless tutor," offering hints and guidance when students veer off track in their problem-solving without giving them the final answer [18][19]. This approach encourages learners to work through their own solutions and reflect on their errors, reinforcing understanding in a way that passive consumption of a finished answer cannot [20]. In this sense, AI is best employed as a supportive tool that aids – rather than replaces – the student's intellectual effort [21].

8.1 Feedback and reflection in teaching and learning aided by AI

The advent of AI, particularly generative AI (GenAI), presents a transformative opportunity to revolutionize pedagogical practices, especially in the crucial domains of feedback and reflection, which are fundamental to student learning and development [22][23]. AI transforms feedback and reflection from a static, one-time event, into a dynamic, continuous, and personalized process. These tools can help educators save time while providing more personalized and timely support to students.

Exploring AI for self or group feedback and reflection is useful not only for teachers but also for students. AI tools assist students' feedback and reflection by providing instant, personalized, and adaptive guidance, identifying learning gaps, and offering tailored suggestions for improvement in writing, problem-solving, self-assessment and guided reflection. AI tools foster deeper learning by promoting active engagement with feedback, enabling critical evaluation of AI-generated suggestions, supporting metacognition and encouraging consistent learning through real-time support.

Raising students' awareness to the possibilities and hazards of the use of AI in feedback and reflection empowers them to explore effective new ways of self-assessment and learning.

AI offers powerful features for enhancing how feedback and reflection are conducted in educational settings, especially in ABC BLENDED / PBL contexts. A set of key capabilities is detailed in this section.

8.1.1 Personalized feedback at scale

Effective feedback is a cornerstone of deep learning, yet its traditional implementation is often hampered by logistical and human constraints. Educators face immense and often overwhelming grading workloads, which can lead to significant delays between a student's submission and the receipt of feedback. This latency is a critical issue, as delayed feedback can render it less impactful, allowing misconceptions to take root before they can be addressed. The administrative burden of grading also limits the time available for educators to engage in one-on-one student support, curriculum development, and other high-impact, human-centred activities.

AI can analyse student work (essays, code, problem solving, …) and performance data to provide instant tailored suggestions, recommendations, corrections and resources to address specific knowledge gaps. This encourages students to act immediately on feedback while the learning is still fresh and reduces teachers' workload. Analysing student responses (text, code, speech) in real-time and providing instant feedback is crucial for learning, as the gap between action and feedback is minimized. AI writing assistants, such as Grammarly's Expert Review[1] or Jenni[2], highlight weaknesses in argumentation and suggests ways to strengthen reasoning. Empirical studies have shown that AI-assisted writing feedback improves structure, coherence, organization, and accuracy of student writing [24].

AI prompts students with guided reflection questions based on their progress. Learning logs (aka reflective journals) [25][26] can be automatically summarized, showing learning patterns – AI-based journaling tools, such as Day One[3] or Rosebud[4], provide students with prompts like: "What part of this project challenged you most, and how did you overcome it?".

AI tools can generate personalized reflective prompts and guide students in assessing their learning processes and identifying areas for growth. AI algorithms can tailor feedback to each student's specific needs, knowledge gaps, and learning pace. It can highlight patterns that a human instructor might miss in a large class

[1] https://www.grammarly.com/a/ai-agents/expert-review
[2] https://app.jenni.ai/
[3] https://dayoneapp.com/
[4] https://www.rosebud.app/

8.1.2 Facilitating self-reflection and metacognition

AI tools can prompt students with guided reflection questions based on their work and performance ("Why did you choose this method?", "What would you do differently next time?"), summarize students' learning logs or reflective journals [25], and help learners identify patterns of strengths and areas needing development. Such tools scaffold self-regulation, enabling learners to plan, monitor, and evaluate their own learning. A recent study [26] shows that AI prompts helped higher-education students understand and control their learning processes more effectively.

> After a project submission, an AI tool can present the student with a customized reflection questionnaire that references specific parts of the work.

8.1.3 Enhancing peer feedback

AI can assist in peer review by helping students frame constructive feedback, ensuring that comments are balanced, respectful, and targeted (rather than vague or purely critical). This scaffolding can improve the quality and usefulness of peer feedback in PBL settings. Recent work [27] shows that GenAI-driven assistance increases clarity, relevance, and specificity of peer feedback.

8.1.4 Data-driven insights

AI tools analyse large datasets to find trends and patterns in student performance, offering insights that human educators might miss. When analysing heterogeneous sources of information covering distinct dimensions of the learning process, such as student interactions and performance over time, AI can visualize progression of skills such as creativity, collaboration or problem-solving. Dashboards or analytics allow both students and teachers to see where improvement has occurred and where persistent difficulties lie. GenAI tools have been linked to improved academic achievement when they support shared metacognition and collaborative reflection via dashboards and peer feedback [28].

8.1.5 Inclusive and accessible feedback

AI tools can provide feedback in multiple formats – such as text, audio, and video – and in a variety of languages, accommodating diverse learning preferences and supporting non-native speakers. Multimodal systems make it possible for students with different accessibility needs (e.g., visual or auditory impairments) to receive guidance in the format that best suits them, fostering equitable participation [29][30]. For example, an AI platform might deliver verbal feedback or translate written comments into a learner's first language to ensure full comprehension [31][32]. Emerging large language models also enable adaptive interfaces – combining speech, text, and visuals – to enhance understanding across cultures and ability levels [33].

8.1.6 Teacher empowerment

Human grading can be influenced by unconscious biases and inconsistencies, including the *halo effect*, where a learner's previous performance affects current judgments, and simple evaluator fatigue [34][35]. AI based assessment systems help reduce these issues by applying consistent evaluation criteria across all students, thereby promoting more uniform and objective scoring [36]. Automated Essay Scoring (AES) tools, for example, have been shown to provide stable and reproducible scores for complex written responses, a feature especially valuable in large-scale assessments where human subjectivity can introduce significant variation [36][37]. This algorithmic consistency supports fairness by ensuring that student work is evaluated on an equitable basis, independent of grader mood or prior expectations [34][37].

By automating routine and administrative tasks – such as grading, scheduling, lesson-plan generation, and rubric creation – AI tools can significantly reduce teacher workload, with some estimates indicating reductions of up to 70% [19][38]. This time-saving function is not an end in itself but a means to a greater pedagogical objective. A persistent challenge for educators is the lack of time for meaningful student engagement [39]. Reducing administrative burdens enables a more human-centred pedagogy in which teachers can devote more energy to direct interaction and individualized guidance. By handling tasks such as grammar checking or basic concept mastery, AI frees educators to "do what humans do best: inspire, mentor, and build genuine connections" [18]. This shift represents a redefinition of the teacher's role – from an administrative focus on content delivery and assessment to a creative, relational role emphasizing higher-order guidance and personal support. The technology supports teacher expertise rather than replacing professional judgment [18][19].

AI tools can offer feedback in various modalities (text, audio, video) or languages, to support students with different learning preferences or non-native speakers [40]; these features are instrumental in Universal Design for Learning (UDL)[5].

8.1.7 Continuous formative assessment

AI makes it feasible to have feedback not just at one point, but continuously during all the learning process: during drafts, intermediate reflections, peer reviews, etc. This shifts the learning model toward ongoing improvement and eases formative assessment (assessment is a diagnostic process of collecting information to understand strengths and weaknesses for ongoing improvement) rather than only summative evaluation (evaluation is a judgmental process of figuring out the overall effectiveness, value, or quality of something based on predefined criteria). For example, chatbots that provide metacognitive or affective feedback improve retention, transfer, and metacognitive sensitivity compared to neutral feedback [41].

8.1.8 Challenges

While potential is large, studies also highlight certain pitfalls and conditions that matter for effective implementation:

- Over-reliance on AI can lead to reduced critical thinking or student passivity, if students accept AI outputs without questioning [42]. Human oversight is needed; teachers are expected to verify, adapt, and contextualize AI output for domain relevance and appropriateness.
- Feedback from AI is sometimes seen as less motivating or lacking the empathy and motivational nuances of human feedback [43]. Again, the natural integration of AI tools in the classroom with teacher oversight is of critical importance.
- Practical and ethical challenges, including low technological readiness, lack of replicability and transparency, insufficient privacy, bias in AI models, fairness, plagiarism [44], require a balanced approach that combines technological safeguards with critical digital literacy for teachers and students alike. A clear set of institutional policies, transparent evaluation protocols, and ongoing teacher training to safeguard learners and uphold ethical standards is needed.

AI tools have significant potential to make feedback and reflection more personal, frequent, scalable, and informed, which aligns well with the goals of ABC BLENDED / PBL education: fostering student ownership, metacognitive awareness, iterative improvement, and equity. However, to realize this potential, educators and institutions need to put in place supporting practices: AI literacy, ethical guidelines, blended AI + human feedback models, and reflective practices built into curricula.

8.1.9 Designing AI-resistant assignments

The rise of GenAI demands for a shift in assignment design. Simply asking for a traditional reflective paper is no longer sufficient for assessing authentic student thought, because current AI models can generate convincing reflective content [45][46]. To counter this, educators are encouraged to design assignments that foreground the process of learning over the final product [47].

Assignments can be made “AI-resistant” by requiring students to document their engagement with AI tools—for example, detailing the prompts they used, the versions they discarded, and the justifications for their choices [45]. This method compels students to supply AI with course-specific information and context, which in turn forces a level of genuine reflection before any automated system can generate convincing output [46]. Reflective prompts such as “What did you learn?”, “Why is it important to you?”, and “How will you use it?” further support authentic self-assessment [47].

This need for new assignment designs underscores a broader educational imperative: the development of AI literacy. The challenges posed by generative AI to traditional assessment reveal a critical gap in educational preparedness. Students must learn to use AI critically, to question and argue with it, and to take ownership of their own words – skills that go

[5] UDL is an approach to teaching and learning that gives all students equal opportunity to succeed, a framework for curriculum development that creates flexible learning environments to accommodate diverse learners by providing multiple options for engagement, representation of information, and methods of action and expression.

beyond academic integrity to become fundamental competencies for the modern world [21][48]. Consequently, AI literacy – understanding how AI works, its limitations, and how to use it ethically and effectively – should be a core component of the curriculum for students, teachers, and administrators alike [19].

8.2 Important considerations and best practices

AI tools are powerful students' allies in making feedback more timely, personalized, and actionable, while also providing structured pathways for deeper student reflection on their own learning processes. Teachers benefit when being empowered to deliver a more productive and engaging teaching, gaining time to high level and motivating education tasks while AI deals with the time-consuming and demotivating basic massive tasks. However, these benefits arise only when AI is used in a conscious and transparent way.

8.2.1 Guidelines for students

Critical evaluation: students should critically evaluate the feedback provided by AI tools, recognizing that the information is not always correct.

Engage critically: students should be encouraged to treat AI as a tool for inquiry and scaffolding, not as a source of final answers. GenAI outputs are potentially unreliable and untrustworthy since they have not undergone a thorough review or a critical screening process. This approach fosters independent thought and deepens understanding recognizing that the information is not always correct and needs validation.

Validation: students are encouraged to validate AI-generated answers against other non-AI sources to ensure accuracy.

Proofreading: Generative AI should not be used to make material changes to work in draft, as proofreading one's own work is an essential academic skill.

Accountability and transparency: students are responsible for their own learning and should engage thoughtfully with AI feedback, using it as a tool to enhance their critical thinking and learning process.

Data privacy: students should be made aware that their input data may be used for AI training and should understand the privacy implications of the tools they use. This is particularly critical for research work, unpublished scientific papers and innovative essays that might generate patent applications.

8.2.2 Guidelines for teachers

AI as a tool, not a replacement: the most effective use of AI is to augment human teachers, not replace them. The empathy, context, and nuanced understanding of a human educator are irreplaceable.

Adopt hybrid feedback models: educators should combine the efficiency of AI-generated feedback for low-stakes or routine tasks with human feedback for complex, higher-level assignments that require creative judgment and mentorship.

Privacy and data security: always check the privacy policy of any AI tool, especially concerning student data. Prefer tools that are compliant with regulations like FERPA (in the U.S.) or GDPR (in Europe).

Critical evaluation: teach students that AI feedback is not infallible. They must learn to critically evaluate the suggestions from an AI, just as they would any other source.

Prompt crafting: the quality of interaction with generative AI (like ChatGPT) depends heavily on the quality of the prompt. Teaching students how to craft effective prompts is a valuable skill in itself.

Teach AI and reflective literacy: integrate discussions on AI ethics, its limitations, and how to critically evaluate its output. This prepares students to be both critical consumers and responsible co-creators with AI.

Start small: Beginning with low-stakes assessments and pilot programs before expanding to more significant evaluations allows for a controlled and measured approach to AI adoption.

8.2.3 Guidelines for educational institutions

Establish ethical frameworks: institutions should form multidisciplinary oversight committees to develop clear and actionable guidelines for AI use. These frameworks must prioritize transparency, fairness, and accountability.

Ensure equitable access: addressing the high implementation costs and resource disparities is critical to prevent AI from inflating existing inequities among students and schools. Although we may rely on open GenAI tools, such as ChatGPT, Google Gemini, Deepseek, there are other particularly suited for feedback and reflection in education that are not open for public free use, such as Formative or MagicSchool.ai.

Mandate vendor transparency: institutions must demand clear documentation from ed-tech vendors about their algorithms, the data used for training, and their privacy policies to ensure compliance with legal frameworks and ethical standards.

8.3 Ethical and implementation imperatives

The rapid integration of AI into classrooms brings not only opportunities but also profound responsibilities. Effective adoption requires educators and institutions to confront the ethical dimensions of AI – issues of bias, privacy, academic integrity, and the indispensable role of human judgment. Rather than treating these as afterthoughts, schools must embed ethical safeguards and clear implementation strategies from the outset, ensuring that AI enhances learning without compromising fairness, transparency, or student trust [19][21][48].

8.3.1 Algorithmic bias and systemic inequity

While AI is often acclaimed for its potential to reduce human bias in grading, it introduces a new and potentially more insidious form of bias known as algorithmic bias [49][50]. Algorithms trained on data that are not inclusive or representative can "reproduce the very achievement gaps schools are working to eliminate" [48]. This can manifest in automated essay-scoring systems that show biases against non-native English speakers or specific regional dialects, or in adaptive learning software that systematically steers certain students toward easier material [49].

This situation presents a critical paradox: AI is simultaneously a solution to and a source of bias. The claim that AI reduces human bias is a primary justification for its adoption, yet a closer look at the technology reveals that the problem of bias is not eliminated but rather relocated. The responsibility of the educator shifts from being a potentially biased grader to an ethical auditor [19]. This new role requires educators to conduct "regular bias audits" and ensure that AI systems are trained on diverse, inclusive datasets [48]. This underscores a fundamental principle: a "human-in-the-loop" is not an optional feature but an ethical necessity for maintaining fairness and equity in educational AI [51].

8.3.2 Student privacy and data

AI tools rely on vast amounts of data to function effectively, raising serious concerns about student privacy and security [48]. A significant risk is that student work, which is considered intellectual property, and personal information may be used to train AI models without explicit consent or knowledge—a clear breach of privacy.

To address these concerns, strict legal frameworks are in place including the General Data Protection Regulation (GDPR) [52]. Institutions are ethically and legally obligated to carefully vet ed-tech vendors and establish clear, transparent policies on how student data are collected, stored, and used [21]. The emergence of dedicated, on-device processors and Large Language Models for institutional/subject data processing offers a potential solution by keeping sensitive data on the device, thereby mitigating the risks associated with cloud-based platforms and providing instantaneous, secure feedback without reliance on external servers [48].

8.3.3 Academic integrity

The proliferation of AI tools challenges traditional notions of academic integrity by making it easier for students to generate work that is not their own [45]. This can lead to a reliance on AI that undermines the fundamental purpose of the learning process itself. The solution is not to prohibit AI but to re-engage with the core objectives of an assignment.

Institutions must develop clear, transparent policies on AI usage and provide guidance on how students can engage with these technologies ethically [21]. This involves teaching students to critically evaluate AI-generated content rather than passively relying on it [45]. The focus must shift to fostering the critical-thinking skills necessary for students to assess the accuracy, source, and potential biases of AI outputs [48].

8.3.4 The Human-in-the-Loop model

A consistent theme across the research is that AI should be a supplement, not a substitute, for the human educator [51]. The human elements of "empathy, mentorship, and the ability to inspire" are irreplaceable [22]. The most effective AI implementations treat the technology as a "teacher's thought partner and assistant," enabling educators to provide higher-level guidance while the AI handles routine tasks [19]. Students consistently report that teacher-provided feedback is more helpful and trustworthy than AI-generated feedback, particularly when the source is disclosed [48]. This reinforces the essential, relational quality of human feedback, which an algorithm cannot fully replicate [51].

8.4 AI tools for feedback and reflection in education

Artificial intelligence (AI) tools are rapidly becoming integral to how educators and students exchange feedback and engage in reflection. These technologies, from automated writing evaluators to conversational chatbots, can provide timely, personalized responses that help learners identify strengths, address misconceptions, and plan next steps. By analysing patterns in student work and offering adaptive prompts, AI supports both individual self-reflection and collaborative group discussions. When used with clear pedagogical goals and human oversight, AI tools act as scaffolds rather than replacements, enhancing the depth and immediacy of feedback while preserving the educator's essential role in guiding meaningful learning.

While the field is rapidly evolving, here are some examples of AI tools and their applications in education.

8.4.1 General-purpose

Tools like **ChatGPT** and **Google Gemini** provide features that can be explored for feedback and reflection by both students and educators. Students can use them to generate ideas, get help with outlining a paper, or receive feedback on their writing. These tools offer suggestions for improvement and help students reflect on their work by asking thoughtful questions. Educators can use them to brainstorm feedback activities or to create rubrics and assignment instructions.

Here are a few (follow the hyperlinks to reach them); some are available online while others can be installed in your own computer and used offline.

General purpose on the cloud

- **ChatGPT**
- **Google Gemini**
- **Deepseek**
- **Perplexity AI**
- **Claude**
- **Microsoft Copilot**

General purpose on your computer

- **LM Studio**
- **Ollama**

8.4.2 Specialised education platforms

Specialized education platforms offer dedicated environments for teaching, learning, and assessment, providing tools that go beyond general-purpose software. These platforms range from open-access solutions that are free to use—often developed by academic communities or non-profit organizations—to commercial products supported by subscription models and professional services.

Open-access solutions

Riff: Developed by the Institute of Design at Stanford University to sharpen reflective skills, Riff is an AI-powered chatbot that asks personalized and thought-provoking questions to guide students in a deeper reflection process. Riff's upcoming AI-mediated synthesis feature will allow educators to analyse and evaluate students' reflections collectively and longitudinally, helping them assess learning goals, track progress, and identify new learning outcomes.

Microsoft Reflect (in Teams for Education): A dedicated tool that uses AI to help educators create check-ins and polls to gauge students' emotional well-being and reflect on their learning process. It provides insights into the class's emotional trends.

Mentimeter + AI integrations: Collects anonymous feedback and can summarize class responses for reflective discussion using some general purpose GenAI tool.

Google's AI in Google Classroom: Suggests personalized resources and reflection prompts based on performance.

Brisk Teaching: This Chrome browser extension provides AI feedback on Google Docs, using rubrics and offering "glows" (strengths) and "grows" (areas for improvement).

Commercial products

Formative with Luna: This is an all-in-one platform for real-time instruction and assessment, with its AI assistant, Luna, at its core. Luna can generate and edit various activities, digitize static PDF worksheets, and provide AI-powered scaffolds and hints to support students. The platform offers flexible feedback options, including audio, visual, and written feedback, and features dashboards that enable ongoing collaboration among teachers and track student progress. A key feature for student reflection and growth is Luna's ability to help students "Improve My Score" by targeting missed concepts without simply giving away the answers, fostering a productive approach to revision. The strategic partnership between Formative and Newsela underscores a shared philosophy of integrating AI purposefully and with a strong foundation in educational research.

Curipod: This platform is designed for interactive, school lessons that prioritize student engagement and voice. Its AI provides rubric-aligned, real-time feedback that enables students to get feedback, reflect, and revise in a seamless process. It is noted by educators for fostering a natural desire for every student to do their very best by providing immediate feedback and incorporating peer review. Curipod is purpose-built to spark discussion and critical thinking through open-ended prompts and polls, and its lessons are designed to be teacher-led and community-centred.

MagicSchool.ai: This generative AI platform primarily focuses on saving teachers time with over 80 powerful tools. Its Writing Feedback tool allows educators to provide constructive, personalized feedback based on custom criteria, which enhances assessment and supports differentiated instruction. A notable and unique feature is the "Restorative Reflection" tool, which generates assignments based on restorative practices for disciplinary incidents, demonstrating AI's potential to support social-emotional development in the classroom. MagicSchool also offers student-facing tools for building AI literacy, such as chatbots for tutoring and writing feedback, allowing students to engage with AI in a safe and structured environment.

FeedbackFruits: This tool offers "Automated Feedback" to provide instant, personalized reviews on technical aspects of academic writing, allowing instructors to focus on content-related feedback.

HyperWrite's Reflection AI: A specialized tool designed to generate insightful reflections based on provided information, useful for reflective essays or journal entries.

Gradescope (by Turnitin): AI-assisted grading that speeds up assessment and provides consistent feedback, especially in large classes.

Seesaw (with AI tagging): Helps students create digital portfolios, while AI organizes reflections and highlights growth patterns.

Grammarly, Paperpal, Jenni: These are AI-based writing assistants that help students refine their written work. Paperpal is valued for its academic focus, providing language suggestions that meet the high standards of academic publishing, which is a feature highly regarded by students and researchers alike.

8.5 Practising AI for feedback and reflection in ABC BLENDED/PBL

This section presents examples of hands-on activities to help educators and student-teachers explore how artificial intelligence can enhance formative assessment and reflective learning. Through guided exercises, participants will experiment with AI-driven tools to collect and interpret feedback, support self- and peer-reflection, and design Project-Based Learning (PBL) tasks that leverage ABC BLENDED principles. These practical activities bridge theory and classroom application, building confidence in integrating AI ethically and effectively into everyday teaching.

8.5.1 Icebreaker: reflection prompt generator

Tool: ChatGPT (or similar LLM)

Exercise (10 min):

1. In pairs, teachers input a PBL scenario (e.g., “students designing a sustainable city model”).
2. Ask ChatGPT to generate 3 reflection prompts for students.
3. Each pair shares which prompt they think would be most engaging for learners.

Learning outcome: Teachers see how AI can scaffold reflective questioning tailored to specific projects.

> *When ChatGPT is prompted “generate three reflection prompts for students whom I have assigned the following PBL scenario “design a sustainable city model" it might output:*
>
> ***Decision-Making and Trade-offs***
> *What key trade-offs did you encounter when balancing environmental, social, and economic priorities in your city design, and how did you justify your final choices?*
> ***Collaboration and Problem-Solving***
> *How did working with your team influence the solutions you developed, and what specific moments of collaboration improved (or challenged) your design?*
> ***Application and Future Impact***
> *Which aspects of your model could realistically be implemented in today’s world, and what further research or innovation would be needed to make them viable?*
>
> *These prompts encourage metacognition about the process, the team dynamics, and the real-world relevance of the project—key elements of both PBL and ABC BLENDED learning.*

8.5.2 Feedback at scale with AI grading

Tool: Gradescope (Turnitin) or Google Classroom with AI plugins

Exercise (20 min):

1. Provide participants with a set of sample student solutions (e.g., a math problem or short essay).
2. Teachers use AI-assisted grading to apply a rubric and generate feedback.
3. Discuss how automated feedback compares with human feedback.

Learning outcome: Teachers see how AI saves time while keeping consistency and fairness.

8.5.3 Differentiation: the AI feedback assistant

Tool: ChatGPT, Google Gemini or similar

Exercise (15 min): To practice using AI to generate differentiated feedback on a single piece of student work.

1. Scenario: Provide all participants with the *same* short, mediocre student essay (e.g., on online/hybrid learning).
2. Task 1 (Struggling Student): Prompt: *"Act as an instructional coach. Provide encouraging, specific feedback on this essay for a student who struggles with writing. Focus on one strength and one area for improvement related to organizing main ideas. Use a supportive tone."*
3. Task 2 (Advanced Student): Prompt: *"Act as an advanced writing tutor. Provide feedback on this essay for a high-performing student. Challenge them to improve their thesis statement to be more nuanced and to integrate a counter-argument. Be direct and analytical."*
4. Discussion: In pairs, compare the AI's feedback for the two scenarios. Was it effectively differentiated? How could you, as the teacher, use this AI-generated text as a *draft* for your own final feedback?

Learning outcome: Critically use generative AI to create differentiated written feedback. This outcome targets both practical AI literacy (prompting, editing, ethical use) and assessment competence (designing constructive, differentiated feedback).

8.5.4 Socratic reflection

Tool: ChatGPT, Google Gemini or similar

Exercise (20 min):

1. Scenario: A student has just solved a math problem (provide a simple algebra problem and solution).
2. Task 1 (Bad Prompt): Ask the AI: "Did the student solve this problem correctly?" (It will just say "Yes").
3. Task 2 (Good Prompt): Participants must craft a prompt that makes the AI facilitate reflection. Example: "Your role is to help students reflect on their problem-solving process. Do not give answers. Here is a math problem and a student's solution. Generate 3 questions you could ask this student to help them explain their reasoning and think about whether their method would work for all similar problems."
4. Discussion: Share the best prompts. How does this change the student's cognitive load? Why is asking questions more powerful for learning than just verifying an answer?

Learning outcome: Crafting prompts that force AI to ask questions instead of giving answers.

8.5.5 Rubric generation

Tool: ChatGPT, Google Gemini or similar

Exercise:

1. Scenario: You are teaching a 10th-grade history class and assigning a Document-Based Question. A Document-Based Question (DBQ) is a type of essay question, commonly found in history courses, that requires students to analyse a historical issue using a set of provided documents. Students must develop a thesis statement, use the documents as evidence to support their argument, and incorporate outside historical knowledge to provide context and strengthen their analysis. The goal of a DBQ is to demonstrate critical thinking, analytical skills, and the ability to construct a cohesive, evidence-based argument from historical sources.
2. Task 1 (the rubric): Prompt: "Generate a detailed, 4-point rubric for a high school history DBQ essay. Criteria should include: Thesis Statement, Document Analysis, Argument Development, and Outside Contextualization."
3. Task 2 (the exemplar): Prompt: "Using the rubric you just created, write a short introductory paragraph for a DBQ on the Civil War that would score a '4' on the Thesis Statement and Document Analysis criteria."

4. Discussion: How useful is this AI-generated rubric as a starting point? What would you need to modify? How could showing students the AI-generated exemplar and then co-creating a rubric with them be a powerful activity?

Learning outcome: Use AI to create clear success criteria, a key part of the feedback cycle

8.5.6 Group discussion: Pedagogy and Ethics

Use these questions to guide a full-group discussion:

1. Bias and accuracy: We know AI can hallucinate and contain bias. How do we teach students to be critical consumers of AI feedback?
2. Privacy: What student data are we comfortable putting into a third-party AI tool? Why must we read the Terms of Service?
3. Equity: How do we ensure the use of AI feedback tools doesn't widen the digital divide? What alternatives exist for students without access?
4. The Human element: Where do you, the teacher, draw the line? What feedback must *always* come from a human? (e.g., feedback on creativity, empathy, personal encouragement).

Output: Co-create a classroom poster titled "Our guidelines for using AI feedback".

8.5.7 Swift group diagnostic assessment

Tool: ChatGPT, Google Gemini or similar, and Google Forms

Exercise (20 min):

1. Task 1 (setup): Prepare a questionnaire in Google Form, or similar online survey tool, with one single question, for instance "What is the most challenging aspect of this subject for you?".
2. Task 2 (gather feedback): Ask students/participants to answer the questionnaire at the first time you meet them and after briefing them on the subject/work to perform.
3. Task 3 (clustering): Download the responses and ask ChatGPT, or similar tool, to group them in clusters and to label each cluster with meaningful keywords.
4. Discussion: At the next time you meet the class, discuss with them their concerns and briefly explain how they will overcome them.

Learning outcome: Performing swift group diagnostic assessment with AI.

8.6 Conclusion

The adoption of AI in education is not a question of *if*, but *how*. When used thoughtfully and responsibly, AI tools have the potential to deliver on the long-promised goal of personalized and adaptive learning at scale. They can empower students with immediate, targeted feedback and foster a culture of reflection and continuous improvement that is often difficult to achieve with traditional methods.

The key to unlocking this potential lies in a balanced and intentional approach. AI's strengths in efficiency, personalization, and consistency must be leveraged while being acutely aware of its inherent limitations and the significant ethical challenges it presents. The future of AI in education is not one where machines replace humans, but rather one where they enable a more effective, humane, and equitable learning experience. The human element of teaching, centered on empathy, mentorship, and inspiration, remains and will continue to be the most powerful and irreplaceable force in the classroom.

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