ProLehre | Media and Didactics
Institute for LifeLong Learning
Technical University of Munich

# Rethinking Assessment

## A guide to enhancing learning through formative assessment and feedback

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# What's this guide about?

**Welcome to our practical guide on how to use formative assessment and feedback to promote student achievement with digital technology!**

Assessment is often perceived by instructors and students as a necessary means to an end – one that is high-stakes and stressful. We'd like to change that narrative.

Formative assessment is a powerful approach that deepens student learning and provides multiple ways for students to engage in feedback as they learn.

With time and resources in short supply, we're aware that ongoing assessment can simply sound like more work. Here's where technology can help you save time while making formative assessment and giving feedback easier, more frequent, and more inclusive.

Whether you're just starting out in teaching or already well-versed in using formative assessment in your classroom, you'll find new ideas in this guide on how to leverage its benefits and offer better feedback with the support of digital tools.

In addition to providing guidance here, we'd be happy to offer you more detailed support. Feel free to contact us at **info@prolehre.tum.de** if you'd like to speak with one of our assessment experts!

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# What can you expect from this guide?

**To give you a more concrete idea of what you'll find in our guide, here are some highlights:**

**01**

A detailed look at what formative assessment is and how it differs from summative assessment

**02**

Qualities of good feedback and its role in formative assessment

**03**

How formative assessment can maximize the potential of teaching and learning

**04**

Digital tools that can support you in delivering formative assessment and feedback

**05**

How to get started with formative assessment using best practice principles

**06**

Strategies on how to integrate inclusive and accessible teaching practices through formative assessment

# What's in this guide?

# 01 What is formative assessment?

Let's start with the basics.
What do we mean by formative assessment?
What role does feedback play in formative assessment?
And how is formative assessment different from summative assessment?

Think back to a time where you had to perform well under pressure – perhaps for a talk at an upcoming conference, writing a grant application, or an interview. Where did you start? How did you prepare? Did you ask for feedback and make revisions along the way? If you received feedback, was it helpful in shaping your final product or performance?

These may seem like obvious questions. But semester after semester, students feel the pressure to perform well, and instructors face the challenge of assessing that performance. It's an ongoing process that's high stakes for both.

Formative assessment can be a powerful ally in relieving some of the pressure associated with end-of-term assessment, bringing with it the potential of deepening student learning, building confidence, and laying the foundation for lifelong learning.

## What do we mean by formative assessment?

Formative assessment is a method of ongoing assessment that evaluates students' knowledge and monitors their progress with the goal of providing future-oriented feedback as they learn. It's formative because it gives you information on student learning to help inform your teaching.

Ranging from informal questions to draft assignments, formative assessments are regular "taste tests" that measure students' current level so that you can make decisions on how to support them in their future learning. What do students already know? How do I know this? How can I connect new information to prior knowledge for more sustainable learning?

Armed with these insights, you can provide more constructive feedback and adjust your teaching to address any learning gaps before moving forward to new material or before administering a higher-stakes assessment. Formative assessment allows you to ask yourself questions like what may still be unclear for students? How can I plan learning activities or the next stages of learning based on what I know? How can I better support students who are struggling?

At this point, you may be wondering: What's the difference between formative assessment and a learning activity? We would argue that the difference lies in the intent. Although formative assessment and learning activities share a common goal of enhancing student learning towards achieving key learning outcomes, what you do with the results from formative assessment is crucial.

Are you using them to help you and your students reflect on and make decisions about learning or teaching? How do the results inform the way or what kind of feedback you give?

To sharpen our definition further, formative assessment is assessment for learning and assessment as learning. It's usually low stakes (low or no grade attached) and used – ideally – continually throughout a course. From an assessment as learning approach, students are involved in formative assessments, evaluating themselves, peers, or even the instructor, to help shape their learning and foster autonomy.

It's also a valuable opportunity for you to reflect on your teaching practice, how you give feedback, or assess the success of a teaching strategy. How can you better support students in closing gaps between current and desired performance (e.g., opportunities for students to resubmit assignments after receiving feedback)? Based on what you know, how can you respond with forward-looking feedback? How can technology enrich the experience of giving and receiving feedback?

**Assessment for learning** provides evidence and opportunities for you to adapt your teaching practices to meet students where they're at and help them get to where they need to be. Two-way feedback is central to this process.

**Assessment as learning** actively involves students and encourages them to take ownership of their learning. Reflection as well as self- and peer assessment are key strategies that help students monitor, assess, and regulate their learning progress with the goal of building new knowledge.

The principles of assessment as learning can be seen as a spectrum where you can adjust how much and how far you'd like to guide students in self-regulation and critically evaluate their learning. What are some concrete ways that you can increasingly involve your students in learning through assessment?

# Quick tips for approaching assessment as learning

To support students, consider:

## Feed up: Where am I going?

- **Establish a clear vision of learning outcomes** (see part four) and criteria for success so that students understand what they should aim to achieve (clarify these as necessary).
- **Go through examples** of strong and weak work (e.g., anonymous student work) and ask students to evaluate them.
- **Show them the rubric** that you'll use to define quality.

## Feed back: How am I doing?

- **Provide feedback** that helps students see how their performance has reached expectations in reference to learning outcomes and what gaps still exist.
- **Encourage students to self-assess.** Ask them to identify their strengths and areas of improvement before they receive your feedback.
- **Ask them to write a reflection paragraph** at the end of a lesson, highlighting the points they have learned, what they found challenging, and the questions they may still have.

## Feed forward: How can I close the gap?

- **Offer actionable feedback** that students can use to enhance their future work or performance. In class and outside of scheduled classes, integrate more low-stakes opportunities for students to learn from feedback and put it into practice (e.g., scaffolded assignments[1]).
- **Ask students to comment on your feedback.** What might they need to do to make progress? What did they find useful (this could be done anonymously)?
- **Invite them to proactively ask** for feedback based on their self-monitoring. For instance, students could submit an interactive cover sheet (along with an assignment) where they ask for comments on specific aspects of their work.

(Adapted from Hattie and Timperley 2017, 86 with additions)

[1] https://digitallearning.northwestern.edu/article/2019/01/28/making-case-assignment-scaffolding

## What role does feedback play in formative assessment?

We've all experienced the difference feedback can make – whether it was constructive, disappointing, or somewhere in between. Feedback is one of the main drivers of formative assessment with the potential of creating an ongoing dialogue between you and your students.

It can have a powerful effect when directed at enhancing student performance rather than personal characteristics or traits (Kluger and DeNisi 1996, 276). Used well, it can help them understand where or how their work (or performance) met set standards, identify what they can do to improve next time, and guide them towards developing new knowledge and competencies (Fiock and Garcia 2019).

Aligned with assessment as learning principles, self-assessment and peer review can also be empowering sources of feedback. Self-assessment, for example, can be used for multiple purposes: probe prior knowledge (How can you respond to what students already know?), develop students' metacognitive skills through reflection (What strengths or weaknesses do students see in their own work?), or encourage students to react to your feedback (What did students find useful?). As part of this dialogue, you can give feedback that's more frequent, specific, balanced, and timely (Fiock and Garcia 2019).

Throughout a course, students should receive plenty of feedback when possible. Naturally, factors like class size, course delivery formats, or time constraints play a role in feedback delivery. You know your learning environment best. With these factors in mind, consider what good feedback looks like in your context. We'll focus on qualities of meaningful formative feedback, but these principles could also easily apply to feedback for summative assessment.

# What does good feedback look like?

**Frequent.** Consistent feedback delivered often guides students in their learning. It tells them where they're falling short (focus on task or performance) and what they can focus on to do better. When done well, it can potentially boost confidence, self-awareness, and motivate students to improve before a higher-stakes assessment.

**Specific.** Good feedback should be actionable. Can the student realistically act on this feedback? It should be clear to the student what action they need to take to strengthen their knowledge base, skills, or subsequent work. Even with positive feedback, it's useful for students to know why they did well according to the assessment criteria and what they can bring forward to achieve success in the future. Rather than "good work", consider this example: "The overall rationale behind your choice of experimental methods is solid. Can you provide a more detailed justification for why you chose method X to make it clearer to the reader?"

How can I give more personalized feedback more efficiently? Pre-written feedback or model answers on multiple-choice questions can provide tailored formative feedback that can be adapted according to class size. You might also consider giving audio and/or video feedback to make your comments clearer and more personal. As a possible alternative for larger classes, teaching assistants or tutors can support you in providing more individualized feedback.

**Balanced.** A mix of positive and corrective feedback is important to highlight what students did well and how they might build on these strengths to work towards improving their final performance. Other considerations for providing balanced feedback are: How can you provide opportunities for multiple feedback interactions with you as the instructor and/or among student peers? How will you distribute formative assessments during the course to give students ample opportunity to practice and receive feedback? How might you deliver feedback in a way that is more inclusive and accessible (e.g., audio)?

**Timely.** Feedback is most useful when it's given as soon as possible so that students can connect it to learning moments.

**Short on time?** Feedback doesn't have to be time-consuming. It can be as small as responding to a student's post in an online discussion or providing overall feedback on the results of an in-class quiz. In larger classes, self- and peer review could help reduce your feedback load while promoting active learning

(Adapted from Fiock and Garcia 2019 with additions by the authors)

Using varied approaches to these principles is part of an inclusive and accessible teaching practice that considers students' diverse needs and experiences. We'll dive deeper into how formative assessment and feedback can enhance inclusion and accessibility in part six of this guide.

### How is formative assessment different from summative assessment?

Robert E. Stake makes a clear distinction between formative and summative assessment: "When the cook tastes the soup, that's formative; when the guests taste the soup, that's summative" (Scriven 1991, 169).

**Summative assessment** evaluates student learning, knowledge, or skills at the end of a unit, course, or program (i.e., after a period of learning). It's often considered a high-stakes assessment that's formally graded, such as a unit exam, final paper, or final project.

While formative assessment mainly focuses on assessment for learning and assessment as learning, summative assessment is widely considered **assessment of learning**. Summative assessment can offer you important information: How well did my students achieve the key learning outcomes of the course? What evidence do I have of this? How can I use this information to improve course content, delivery, and future assessments?

**Assessment of learning** provides evidence of student learning to evaluate the achievement of course learning outcomes, established standards, or benchmark at a particular point in time (after a period of learning).

The final grade that students receive is high stakes. It communicates their performance to key stakeholders (e.g., themselves, instructor, admissions officers, or future employers), determining, for instance, whether they meet program entry requirements, and can be used by students to make decisions about their program progression or career options.

Although they carry different purposes, formative and summative assessments are opportunities for you as well as students to assess progress towards achieving learning outcomes. They can work in tandem – ideally, summative assessment builds on formative assessment and feedback while aligned with teaching/learning activities and intended learning outcomes. Information and feedback from summative assessments can also have formative uses when used to guide future learning or teaching practice.

The graphic on the following page from the National Forum for the Enhancement of Teaching and Learning in Higher Education in Ireland (2017) shows the dynamic interplay of assessment for/as/of learning in formative and summative contexts.

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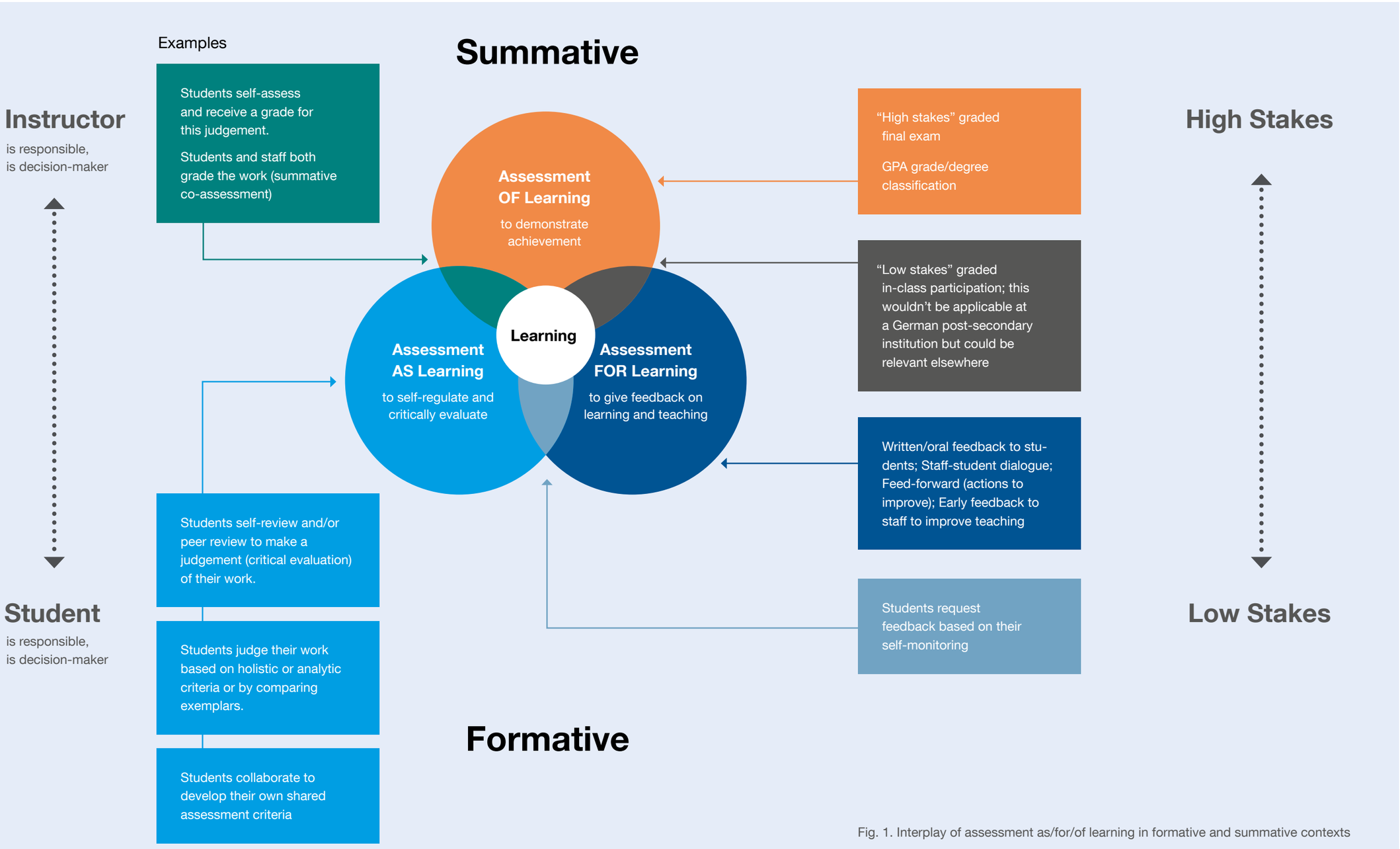



Fig. 1. Interplay of assessment as/for/of learning in formative and summative contexts

# 02

# Why formative assessment?

What do you, students, and other stakeholders have to gain from formative assessment? Why integrate it in your course?

We recognize that both students and instructors are juggling many different demands. You and your students may be thinking: In another packed semester, is formative assessment worth my time? I already have so much material to cover; where will I fit it in? If assessments aren't graded, shouldn't I direct my time and efforts towards assignments or exams that will be assessed?

Educational research has impressively shown that formative assessment is effective – in maximizing the limited time you and your students have, in focusing your energy on areas that need attention, and in deepening student learning. We'd even go so far as to suggest that they can save you time in the long run.

Regular formative assessments give students opportunities to see where they stand and to ask questions well before a high-stakes assessment. They can improve student performance on summative assessment, reducing stress (e.g., students will already be familiar with the question types found on the final exam), failure rates, and the time spent grading rewrites. Despite the reservations you may have, we invite you to consider its value in teaching and learning.

# Benefits at a glance: for instructors

## 1. Maximize teaching performance

Sometimes, it's hard to tell what students already know, if they're learning, or they're struggling, especially when they don't seem to have any questions. Formative assessments make evidence of learning and its barriers visible. With the results, you can see their current level and decide how you can best support students moving forward (e.g., provide immediate feedback, use a different teaching strategy, or fine-tune a quiz).

Formative assessments can also be an opportunity to receive feedback on your teaching and involve students in this process. Encourage them to reflect on assessment and feedback (can be done anonymously): What did you learn from this activity? What type of feedback would you find most useful and why?

## 2. Lead to more effective guidance

Many instructors would like to give their students more frequent, personalized feedback but are short on time and/or resources. Leveraging digital tools can help you save time while supporting your students more effectively.

Online discussion boards, email, audio, or video feedback are only a handful of ways that you can give immediate feedback. Audio and video feedback, for instance, can provide students with personal, detailed observations while saving time spent writing handwritten or typed comments. In the long-run, formative assessments are part of a more sustainable teaching practice that helps you identify where to focus your efforts.

## 3. Foster connections

We often discuss how we can keep students engaged and advance their well-being, but it's easy to overlook the motivating factors that contribute to the well-being of the instructors. Building connections is important in the classroom, especially in an online learning environment.

During a busy semester, positive interactions and seeing students' progress can be meaningful reminders that your efforts matter. More opportunities for ongoing interactions and feedback with your students can be motivating while allowing you to be more connected, receive feedback on your teaching, and build trust.

# Benefits at a glance: for students

## 1. Maximize learning

Students often want to know: What can I do to succeed? Am I on the right track? Where should I focus my efforts? With many students juggling a full course load, it's only natural for them to concentrate on learning content that will be assessed and wonder why they should pour limited resources into an assignment or quiz that will not contribute to their final grade.

When used consistently throughout a course, formative assessments encourage continuous learning. Students have more chances to practice what they've learned, receive feedback from you (and their peers), ask questions, and create more of a dialogue around how they can use feedback to improve future work.

Quizzes, practice exercises, and small group discussions are only a few ways (of many) where students can test their understanding over time and progressively deepen their learning, potentially reducing their study time and sparing them the stress of "cramming" at the end of term.

## 2. Develop relevant skills

Students want to know what they're learning is or will be relevant for the future. Formative assessment and feedback can play a critical role in helping them build knowledge and improve on essential skills that will serve them in future courses and their professional lives.

But with many demands on their time, students are sometimes skeptical of how formative assessments will benefit them now or in the future. Explaining how peer review, for example, will help them develop various skills, such as communication, collaboration, and self-regulation that will serve them on an assignment, in a course to come, or today's workforce can be motivating.

## 3. Foster classroom community and student motivation

Students want to feel that their instructors are interested and invested in their progress and well-being. Particularly in larger classes, students can easily be distracted, lose motivation, and feel anonymous. Fostering self-efficacy (whether we think we have the ability or skills to succeed at something) can have a significant impact on motivation, success factors for learning, and achievement (Schneider & Preckel 2017, 27).

Formative assessment plays a crucial role here in providing opportunities for students to succeed and learn from others who have mastered a concept. Actively involving students in their own learning and assessment can create a collaborative environment where students can learn from one another, feel valued for their contributions, and ask for support when they're struggling.

Student motivation and self-esteem are also more likely to be enhanced through many low-stakes assessments with feedback targeted towards progress (Nicol and Macfarlane-Dick 2006, 12). It's encouraging for students to know when they're on the right track. Alternatively, if they're in danger of falling behind, feedback from formative assessments can prompt them to act before a higher-stakes assessment.

# Benefits at a glance: for universities/external stakeholders

## 1. Expand our understanding of assessment and its purposes

Students are living in an era of increased flexibility and choice. While this has its advantages, new undergraduate students are faced with more possibilities than ever and with making big decisions that will shape their future: Which major should I choose? Would a micro degree be right for me?

Formative assessments can help students gauge early in the term whether a course (or degree program) is a good fit for them. More importantly, they could lead to a conversation with you or an advisor that could guide them in making more informed decisions.

Perhaps a student has done poorly on several low-stakes activities, realizing that another course or degree program may be more aligned with their interests or future goals. Or that same student might need advice on how more effective study strategies could help them succeed in their current course of study.

In either case, students need more information and guidance to make important choices. University-wide initiatives that incorporate students' and instructors' views can play a critical role.

## 2. Support student retention and success

The student example in point number one touches on the complex factors that impact student retention in higher education. When students leave before completing their degree, it can have wider implications on universities and society at large (e.g., loss of highly trained individuals entering the workforce).

Ongoing formative assessment can be an early intervention strategy to identify barriers and challenges that affect engagement, retention, and persistence. From there, students can be directed to support services or resources that address their specific needs.

It is vital to ask how universities can help support students and instructors: Are there campus-wide actions that could be taken to proactively reach disconnected students? How can universities address instructor disengagement and burnout?

## 3. Showcase their academic experience

Reimagining how we use assessment can benefit students as they prepare for further education or to enter the workforce. Prospective employers (and graduate schools) are interested in seeing evidence of skills (e.g., self-leadership), the ability to operate in a digital environment, and adaptability.

While important, official academic transcripts and degree certificates, unfortunately, tend to offer limited snapshots of student achievement, often excluding the learning experiences – on and off campus – that have contributed to their success.

In both formative and summative contexts, ePorfolios potentially combine assessment for/as/of learning principles and provide an accessible platform for students to highlight foundational skills, knowledge, and development that would otherwise be omitted from official academic records.

They give employers and admissions officers a more holistic picture of how different educational pathways – including coursework, extracurricular activities, and work experiences – have shaped a student's academic career so far and how the knowledge as well as skills gained translate to the workplace or continued learning.

03

# When might formative assessment be effective in your course?

How do you know when to use formative assessments in your course? What are some digital tools that can help you carry out formative assessments and give feedback more effectively?

Knowing when to implement low-stakes assessment can be a challenge, especially in an online environment. Have you ever faced any of the following situations?

- **You've just covered a complicated topic** or concept and aren't sure whether students have understood it. They haven't asked any questions, so everything seems clear. Isn't it?
- **You're teaching a large class.** How can you engage and motivate more of your students?
- **You'd like to encourage your students** to take more responsibility for their own learning and become more independent learners. How can you support them?
- **You're interested in giving better** and more timely feedback.
- **You've assigned a major project**, assignment, or presentation that will make up the students' final grade. You've noticed that many students seem to leave the bulk of their work near the end of term and ask for your help at the last minute. You're often disappointed with the quality of their work or performance. What can you do?
- **Your course is taught online.** How can you help students see low-stakes assessments as learning opportunities that can also serve them in an online class even though they're ungraded? How can you include all students in formative assessment with digital tools?
- **You want to give your students more feedback,** but there are 200 students in your class. How can you provide feedback more efficiently or empower students to leverage each other as sources of feedback (all the while promoting collaborative skills)?

If you answered yes to any of the examples above, you're in good company. And for each of these examples, we would encourage you to use it as an opportunity to implement formative assessment. To look at how this might apply more practically to your course, let's take a step back and consider two approaches.

## How do you know when to use formative assessments in your course?

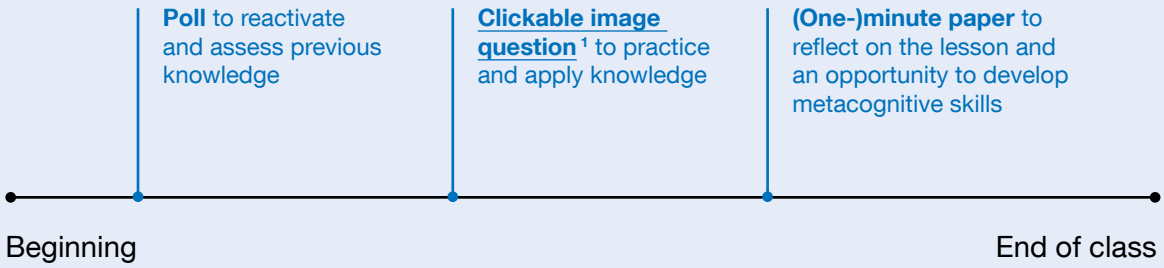
Formative assessment can be carried out at **specific key moments during or after a lesson** (e.g., What do your students know/understand now?) or **continuously over the course of a semester** (e.g., How have your students progressed in achieving specific learning outcomes?

How does their current performance compare to the beginning of term or to a previous submission?). Do you, like in the first example, have a lecture with a concept or topic that students find challenging? Integrate formative assessments at key points in your lecture that serve as check-ins for you and your students.

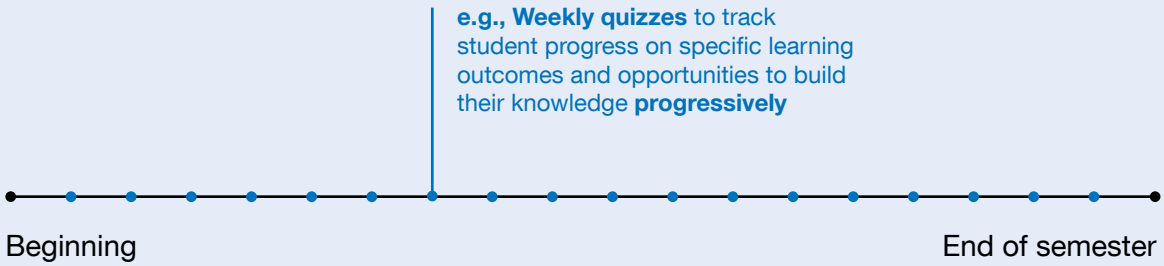
What if you have a large class like in scenario two? Formative assessments are prime opportunities to help you and your students track their development, receive frequent feedback, and motivate them to build on their knowledge progressively throughout the term.

Giving weekly quizzes or using the same scoring guide over the course of a semester are only two ways that you and your students could leverage to monitor and evaluate their progress in reaching specific learning outcomes. As you plan out your course, you may find it valuable to use a combination of "at-the-moment" and longer-term formative assessment throughout the term. But first, what might these two approaches look like on their own?

### Formative assessments at specific moments in time




### Formative assessments over the semester




[1] https://support.polleverywhere.com/hc/en-us/articles/1260801546470-Clickable-image-questions

Whether you decide to assess student learning "at the moment," on a longer-term basis, or both, reflect on a few key questions:

- What do I want to assess and learn from the results?
- How will I provide feedback to students? What digital tools could best support me?
- What factors might influence which formative assessment I use (e.g., course modality, class size, resources)?
- What purpose does this formative assessment strategy serve in supporting students? (e.g., encourages deep learning or identifies common misconceptions)

If you're new to integrating low-stakes assessment in your course, we'll cover some ways that you can get started with formative assessment in part four.

## What are some digital tools that can help you carry out formative assessments?

Now that we've covered some ways to help you decide when to integrate formative assessment in your course and how you might use the feedback, let's dive into some practical applications. To narrow down the many options available, we'll highlight a few formative assessment strategies that you can use in different course modalities with technology.

# Synchronous applications (scheduled classes on-campus/online/hybrid)

| Name | What do you want to assess? | How is it done? | Digital tools | Time investment |
|---|---|---|---|---|
| (One-) minute paper | Student knowledge and skills<br><br>(e.g., understanding[1]) | **When?** Several minutes before the end of class<br><br>Ask students to respond to one or two short questions (could be done anonymously): What was the most meaningful thing you learned in today's class? What questions do you still have?<br><br>Review results before next class to clarify or elaborate. | Tweedback [2]<br><br>Miro* [3]<br><br>Padlet* [4] | Low<br><br>**useful in large classes** |
| **Alternative:** Muddiest point | Student knowledge and skills<br><br>(e.g., understanding) | **When?** Same as above<br><br>This is a variation of the (one-)minute paper. Ask students to reflect on the lesson and write about the point that was the most unclear for them. | Same | Same |
| Survey or polling questions | Student attitudes, values, and self-awareness (e.g., self-awareness of their values and attitudes)<br><br>**Alternative:** Student knowledge and skills (see **peer instruction** on next page) | **When? Option 1.** At the beginning of class: To gauge students' preconceptions or perceptions on a topic<br><br>**When? Option 2.** During class: The results can be shown in real time and used immediately for feedback or in the next session (e.g., exit poll).<br><br>**When? Option 3.** Over the course of a unit or semester: Use pre- and post-assessment polls or self-assessment surveys to track changes and development.<br><br>Direct students to fill out a short questionnaire (one to three questions). It's best delivered anonymously so that students feel free to answer honestly.<br><br>**Tip**: If it's your first time doing this with your students, be sure to give them enough time to read the question, think about it, and respond. You can set a time limit. | Mentimeter [5]<br><br>Tweedback [2]<br><br>Moodle<br><br>Poll Everywhere* [6] | Low to medium<br><br>**useful in large classes** |

* Please be advised that digital tools that have been marked with an asterisk (*) may not meet data protection requirements in Germany.

[1] Cognitive process categories in the following tables are from Bloom's Revised Taxonomy (Krathwohl 2002, 215). For more details, see part four of this guide.

[2] https://wiki.tum.de/display/lehre/Tweedback
[3] https://wiki.tum.de/display/learnsocial/Miro
[4] https://wiki.tum.de/display/learnsocial/Padlet
[5] https://wiki.tum.de/display/learnsocial/Mentimeter
[6] https://www.polleverywhere.com/how-it-works

| Name | What do you want to assess? | How is it done? | Digital tools | Time investment |
|---|---|---|---|---|
| Peer instruction | Student knowledge and skills<br><br>(e.g., potentially from remembering to evaluating: aim to use for analyzing and evaluating) | Students consider a concept question [1] (e.g., multiple-choice polling question) on their own (2-3 minutes). Then, they are shown the real-time results and in small groups (3-4 students), they take 2-3 minutes to discuss their individual answers (explain how they arrived at that answer) and "peer instruct" one another, attempting to reach consensus on the correct answer.<br><br>After the group discussion, students answer the same question again (individually), transitioning into a class discussion prompted by student explanations of their group's conclusions.<br><br>You can clarify or expand on their findings as needed or adapt this process to suit your context. | Tweedback [2]<br><br>Mentimeter [3]<br><br>Kahoot!* [4] | Low to medium<br><br>**useful in large classes** |
| Weekly quiz | Student knowledge and skills<br><br>(e.g., potentially from remembering to evaluating) | **When? Option 1.** Before and/or after a new topic is introduced: Outline key learning outcomes for each lecture to students. Write five questions based on those outcomes and add to an overall question bank. They can be used later for a subsequent quiz (see **option 2**) or summative assessment. Use question types that will appear on graded assessments. This way, students can practice specific question types before a summative assessment.<br><br>**When? Option 2.** Over the course of a semester: Give several quizzes (building on knowledge from previous quizzes) that gradually prepare students for a higher-stakes summative assessment. Consider allowing students to attempt the quiz multiple times or complete it as a two-stage quiz [5] so that they might exchange or receive feedback from peers and see alternative approaches (e.g., peer instruction). You could also incentivize their participation by offering bonus points. | Moodle<br><br>Kahoot!* [4] | Medium to high (initially)<br><br>**useful in large classes (e.g., multiple-choice questions)** |

* Please be advised that digital tools that have been marked with an asterisk (*) may not meet data protection requirements in Germany.

[1] https://uwaterloo.ca/centre-for-teaching-excellence/teaching-resources/teaching-tips/learning-activities/active-learning/peer-instruction-and-concept-tests
[2] https://wiki.tum.de/display/lehre/Tweedback
[3] https://wiki.tum.de/display/learnsocial/Mentimeter
[4] https://kahoot.com/
[5] https://www.saltise.ca/teaching-resources/strategies/two-stage-exam/

# Asynchronous applications (outside of scheduled classes)

| Name | What do you want to assess? | How is it done? | Digital tools | Time investment |
|---|---|---|---|---|
| Survey or polling questions | Student attitudes, values, and self-awareness<br><br>(e.g., towards course delivery and/or content) | Same as above in synchronous modality. Use the anonymous results to make decisions about your teaching practice. Consider sharing what was raised and how you intend to address potential issues so that students see that giving feedback is worthwhile. | Moodle | Low to medium<br><br>**useful in large classes** |
| Concept maps | Student knowledge and skills<br><br>(e.g., potentially from remembering to evaluating) | Ask students (individually or in small groups) to create a diagram showing relationships between important concepts and ideas (from the lecture, course overall, and/or other learning experiences) with linking words or phrases that describe how the ideas are related to each other.<br><br>Alternatively, provide students with a concept map (e.g., of an assigned reading, medical diagnosis) and ask them to evaluate it. | Miro* [1]<br><br>Moodle | Low to medium |
| Student-generated quiz questions | Student knowledge and skills<br><br>(e.g., creating) | Divide students into pairs or small groups to create a question and the answer on a topic from the previous lecture. To go one step further, ask them to write a question based around a key learning outcome from that lesson. Model examples with students in advance.<br><br>To motivate students or involve them in assessment, you may decide to include their question on a practice exam or the final exam with their permission.<br><br>**Alternative:** This could also be done near the end of a synchronous class session. | JeopardyLabs [2]<br><br>Moodle<br><br>Kahoot!* [3] | Medium<br><br>**useful in large classes** |

* Please be advised that digital tools that have been marked with an asterisk (*) may not meet data protection requirements in Germany.

[1] https://wiki.tum.de/display/learnsocial/Miro
[2] https://jeopardylabs.com/
[3] https://kahoot.com/

| Name | What do you want to assess? | How is it done? | Digital tools | Time investment |
|---|---|---|---|---|
| Discussion forums | Student knowledge and skills<br><br>(e.g., potentially from understanding to evaluating) | Ask students to respond to an open-ended question, topic, problem, etc. (could be student-generated). | Moodle<br><br>Flipgrid* [1]<br><br>Padlet* [2] | Medium<br><br>If you have a large class, tutors or teaching assistants could support you with feedback, potentially lowering the time investment. |
| Scaffolded assignments | Student knowledge and skills<br><br>(e.g., creating) | Break a final assessment (e.g., research paper, presentation) into smaller units (e.g., topic proposal, annotated bibliography, introduction) to support students as they develop the necessary knowledge and skills.<br><br>This also allows students to receive regular feedback on their work before they are graded on the final product or performance.<br><br>Alternatively, scaffold (break a larger, more complex assignment into manageable "chunks") and sequence assignments so that they begin with concrete tasks before moving into more active and/or reflective ones.<br><br>You can find an example of a scaffolded approach [3] to assessment from the University of Queensland. | Moodle | High<br><br>Tutors or teaching assistants could support you with feedback, potentially lowering the time investment.<br><br>You might also consider including self- or peer assessments to help focus your feedback efforts. |

* Please be advised that digital tools that have been marked with an asterisk (*) may not meet data protection requirements in Germany.

[1] https://static.flipgrid.com/docs/Teacher_Guide.pdf
[2] https://wiki.tum.de/display/learnsocial/Padlet
[3] https://www.uq.edu.au/teach/uqassess/?p=885
[4] https://vcsa.ucsd.edu/_files/assessment/resources/50_cats.pdf

**Looking for more ideas?**

Here's a more comprehensive list of classroom assessment techniques [4] (Angelo and Cross 1993).

# Ways to give formative feedback

As with formative assessment strategies, technology can help support you in giving good feedback more effectively. Let's look at six key ways.

| Name | What do you mean? | When would it be effective? | Digital tools | Time investment |
|---|---|---|---|---|
| Self-assessment | Students reflect on and evaluate their own learning or performance. | To involve students in assessment; to provide opportunities for reflective learning; to develop metacognitive skills | Moodle<br>Flipgrid* [1] | Medium<br>**useful in large classes** |
| Peer review | Students evaluate their peers' work and provide constructive feeback on how they can improve it. | To involve students in assessment; to provide more frequent or individualized feedback to many students (as a complement or supplement to instructor feedback); to encourage students to consider alternate approaches to an assignment; to evaluate team members in group work<br>This can also be effective for scaffolded assignments. | Moodle<br>Peerceptiv* [2]<br>Peergrade* [3] | Medium to high<br>**useful in large classes** |
| Annotations | Written notes or comments added digitally to assignments | To promote student engagement<br>Try this as a self-assessment option. Students annotate their own work to demonstrate where and how they have addressed assignment criteria before submission. Guide them with clear instructions on what they should annotate. Show students several examples. | Moodle<br>Microsoft Word: e.g., highlighting tools, embedded comments, or track changes (document could then be uploaded to Moodle) | Medium to high |

* Please be advised that digital tools that have been marked with an asterisk (*) may not meet data protection requirements in Germany.

[1] https://static.flipgrid.com/docs/Teacher_Guide.pdf
[2] https://peerceptiv.com/how-it-works/
[3] https://www.peergrade.io/

| Name | What do you mean? | When would it be effective? | Digital tools | Time investment |
|---|---|---|---|---|
| Audio feedback | A file of your voice giving feedback to students | To personalize your feedback and avoid misinterpretation | Moodle<br>SoundCloud* [1]<br>Audacity* [2] | Medium to high<br>Although the initial time investment to get used to giving audio feedback may be higher, it can be a timesaver in the long run and a quick way to communicate directly with your students. |
| Video feedback | Video file of you providing feedback to students as a screencast, a "talking head," or a mix of both | To guide students through your comments with visual support.<br>To demonstrate best practices or a process; for example, you would like to walk students through a complicated problem with multiple steps. | PowerPoint (screencasts) [3]<br>Camtasia [4]<br>Panopto [5] | High (initially)<br>It can save grading time in the long run.<br>**useful in large classes** |
| Digital rubric | Online scoring guide used to assess students' work | Use a rubric whenever possible.<br>To clarify assessment/performance expectations from the beginning (no surprises before summative assessment); to provide more specific and balanced feedback; to grade more efficiently, objectively, and fairly (increases reliability among multiple graders) | Moodle | High (initially)<br>It can save grading time in the long run.<br>**useful in large classes** |

* Please be advised that digital tools that have been marked with an asterisk (*) may not meet data protection requirements in Germany.

[1] https://community.soundcloud.com/industry
[2] https://www.audacityteam.org/
[3] https://wiki.tum.de/pages/viewpage.action?pageId=999719144
[4] https://wiki.tum.de/display/lehre/Camtasia
[5] https://www.panopto.com/

## Questions to help evaluate the effectiveness of a formative assessment strategy & digital feedback tool

**Keep in mind:**

- What information are you receiving about your students' knowledge, learning, and skills?
- How will you use the data to inform your next steps (i.e., determine whether to review content, offer more practice, use a different formative assessment strategy, or move on to new material)?
- Is this digital tool serving you and your students effectively?
- How are students responding to this formative assessment strategy or digital feedback tool?
- What adjustments can you make to your teaching to better support student learning?

04

# How do you get started with formative assessment?

Let's start with the essentials.
What is constructive alignment?
How can it apply to formative assessment and feedback?

Imagine that you're planning a trip abroad. This is the first trip that you've taken in a long time, and you want it to be memorable. You have a general idea of where you'd like to go and what you'd like to do, but what's worth seeing? Where should you stay? How long?

Now that you think of it, a friend of yours has been there several times. She has some excellent advice on how to narrow down your choices, experiences that are off the beaten path, and even some missteps to avoid. What suggestions would you take with you?

Trivial as this scenario may sound, it mirrors the challenges that many students encounter in a new course. They generally know the basic itinerary from the course description: the destinations you'll take them to, perhaps the schedule, and activities.

They'll learn about the basics of linear algebra or valuation in finance, but what are the main attractions that they should be sure to focus on? And what can they skip? What should they take away from this learning experience by the end of the semester?

## Why is constructive alignment a good starting point?

In preparation for the questions above, your response starts with the basics of good course design. We've all likely left a lecture with our heads swimming with new information, wondering what the main takeaways were, or written an exam where some of the questions asked for content that wasn't covered in class.

How can we do better for our students? This is where constructive alignment comes in. An approach to course design, constructive alignment is based on the premise that students construct knowledge, skills, and experiences from what they do to learn.

For students to then construct meaning, instructors need to create conditions for deeper learning by closely aligning three interrelated components: intended learning outcomes, teaching/learning activities, and assessment. It's an iterative process where individual elements may need to be revised to ensure that they are in alignment.

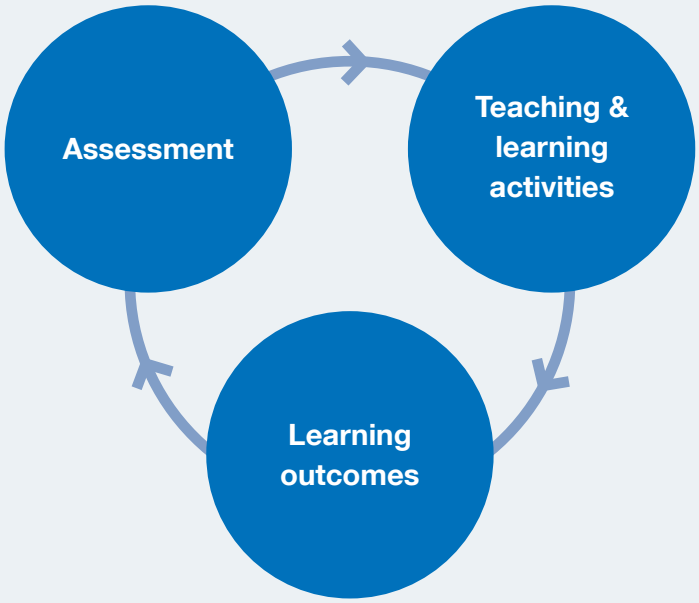



Fig. 2. Constructive alignment (adapted from Biggs and Tang 2007)

At the heart of constructive alignment are the intended learning outcomes for your course. In other words, they're a curated collection of measurable goals for students. Well-defined learning outcomes are strongly linked to student achievement (Schneider & Preckel 2017, 24) and foundational to making decisions in course planning and assessment.

What knowledge, skills, and competencies should students be able to demonstrate by the end of the semester (or learning unit)?

Formative and summative assessment help monitor student progress and measure to what extent they have reached those outcomes while teaching and learning activities foster the knowledge, skills, and competencies needed to evidence learning outcomes.

In short, constructive alignment serves as a clear road map that tells you and your students:

| Students | Instructors | Constructive alignment |
|---|---|---|
| Where they're going | What should students know, be able to do, or master by the end of the course? | Learning outcomes |
| How they'll get there | How will students learn? | Teaching & learning activities |
| How they'll know if they've arrived | How will you evaluate whether students have truly achieved the intended outcomes? | Assessment |

## What does a good learning outcome look like?

| Stem | By the end of this lesson, you will be able to |
|---|---|
| **Action verb** | explain |
| **Concept** | how key environmental factors influence plant growth and development |
| **Context** | in an arid climate. |

# How can it apply to formative assessment?

## Reimagining constructive alignment for formative assessment

As you were reading the trip planning scenario at the beginning of part four, could you imagine travelling abroad without consulting a friend, a travel guide, or – the more likely alternative – the internet?

We'd likely all agree that a quick internet search has saved us the frustration of finding out later that the highlight of a trip was closed for renovations or from booking a hotel that was poorly rated. We want students to take responsibility for their own learning. But how can we expect them to do so without guidance and support?

When aligned with constructive alignment principles, formative assessment consistently provides you and your students with critical feedback on how they're doing (in reference to the learning outcomes) and offers opportunities for you and them to close learning gaps.

This could take the form of forward-looking feedback that students can apply to future assignments or of adjusting your teaching to include an extra practice activity in class because many students struggled with a problem set. In the following sections, we'll give you some best practices and strategies centred around these three components.

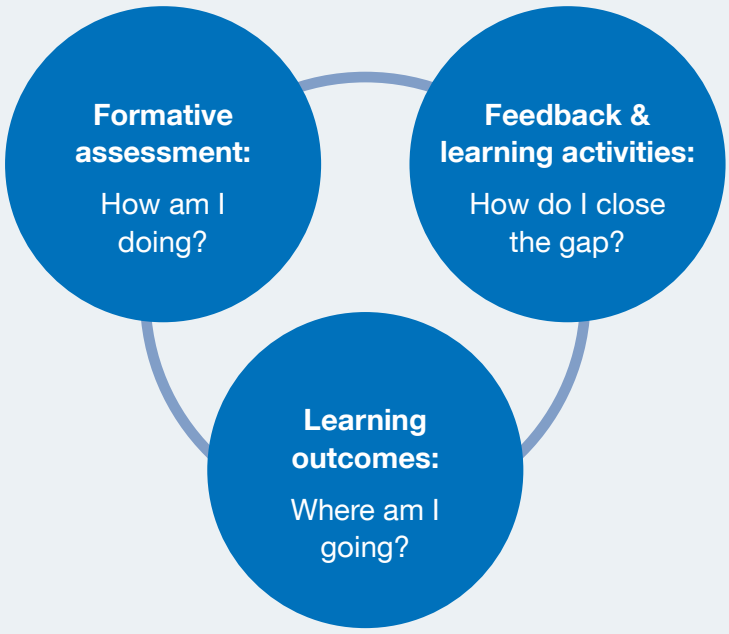



Fig. 3. Reimagining constructive alignment for formative assessment

# Quick tips on how you can use constructive alignment

### 1. Where am I going:

Write **intended learning outcomes** based on what students should know or be able to do by the end of the semester (or learning unit).

These will help you determine whether you're truly assessing what you mean to assess (**validity**) but also provide focus for the teaching and learning activities that you do in class.

As a starting point, try to think of the long-term takeaways that you hope a student would remember if you were to meet them again years later.

### 2. How am I doing:

Create **formative** (and **summative assessments**) that measure progress towards achieving the outcomes. How can the outcomes best be assessed based on what has been practiced and modeled in the classroom?

### 3. How do I close the gap:

Design **teaching** and **learning activities** that will support students as they learn and progressively set them up for success in preparation for summative assessment. Learning activities and formative assessment can function as assessment for learning (see **quick tips for approaching assessment as learning** in part one).

In-class activities should give students plenty of opportunities to practice what they will be asked to do on an exam. If students are mostly asked to recall knowledge in class, but the final exam requires them to evaluate a process, are learning activities and assessment well aligned? Is the exam fair?

# Setting intended learning outcomes

A

**Where am I going?**

To keep things simple, let's focus on defining learning outcomes within the context of preparing a lesson. As you write the outcomes for your lesson, connect them to the overarching learning outcomes that you have set for the larger learning unit and/or course [1].

**1. Begin with the question: What is the most important thing that students should know and/or be able to do by the end of the class?**

In general, learning outcomes should be written from the perspective of the student, describing the content, skills, and/or attitudes that they'll be able to master or value by the end of the course.

In planning a lesson, aim for the most important outcomes (no more than eight learning outcomes). For your course module over the whole semester, we'd recommend having six to eight learning outcomes that you can break down into six to eight smaller outcomes for a 90-minute class.

To start small, focus on writing one outcome (the highest level or broadest outcome) that you can evaluate with a formative assessment strategy and is realistically achievable within the time frame of your class.

**2. Choose an action verb that corresponds to the level of learning that you expect from your students for this lesson.**

The adapted version of Bloom's Taxonomy [2] (Krathwohl & Anderson 2001) on pages 7 and 8 in the given link is a useful framework that divides cognitive processes into six categories of increasing complexity.

Each level of the taxonomy includes measurable verbs that correspond to that level. Although the cognitive domain is the most popular of the taxonomies, similar taxonomies for the affective and psychomotor domains can also be useful for learning experiences that explore emotions or performance (also detailed in the link above).

Remember that learning outcomes should be measurable (i.e., a behaviour that can be observed and assessed) to determine if students have been successful in their learning.

Avoid verbs that can't be measured or observed easily (e.g., be familiar with, understand, know, learn, appreciate). It shouldn't be a list that simply describes tasks, activities, or content planned for that session.

[1] https://www.monash.edu/learning-teaching/TeachHQ/Teaching-practices/learning-outcomes/quick-start
[2] https://portal.mytum.de/archiv/komp_ssz/ArchiveFolder_20210325_150056/20210325_165400/0
[3] https://elearn.sitehost.iu.edu/courses/tos/gen2/
[4] https://learning-objectives.easygenerator.com/

**3. One way to approach setting learning outcomes is by including the following elements:**

- a short stem, such as “By the end of this lesson, students will be able to…”
- an action verb that shows the depth of learning expected
- a statement of learning describing what the student should demonstrate
- a statement of context defining how this learning will be applied (optional)

**4. Share and explain your learning outcomes to your students at the beginning of class so that they have a solid reference point.**

You may need to explain terms, such as evaluate and analyze, using concrete examples in class, explaining how you would approach a problem, or going through model answers.

From a lesson and course perspective, good learning outcomes allow you to define the range and level of learning activities (e.g., make focused decisions about selecting course content) and the criteria that you’ll use to assess student progress accurately and effectively.

For students, clear learning outcomes can help them identify what they need to aim for to complete a learning unit or the course successfully, decide if the course is a good fit for their academic trajectory, and take responsibility for their learning progress.

**Writer’s block?**

These online tools can support you in writing learning outcomes.

» Learning Outcome Generator[3]
» easygenerator[4]

# Three ways to begin using formative assessment

B

## How am I doing?

**1. Start small.**

Based on your learning outcomes for the lesson, we'd recommend choosing a formative assessment strategy that requires a low time investment and implementing it at a key moment during a specific part of your class.

Would you like to reactivate students' prior knowledge with a poll? Perhaps you want to check for understanding at the end of a complicated lecture with a one-minute paper? From there, to help narrow down the list of digital tools, start with one that is already integrated into Moodle. Getting started may be easier because you're already familiar with the learning management system.

You may experience teething problems at first, so try it several times and evaluate the results. Technical problems or navigating the unfamiliar may be common obstacles that you'll face. Students might also need some time to see the value in a new or unfamiliar formative assessment strategy.

For instance, asking them to do a (self-) reflection task (e.g., one-minute paper) may not come naturally to many students and requires active learning. Be transparent about why you value using formative assessment in class and how it'll foster their ability to achieve learning outcomes.

**2. Use student feedback to promote deeper learning.**

Formative assessment needs to be thoughtfully applied. Conducting a poll without asking students to reflect on the results or discuss what they might mean is a lost learning opportunity and fails to leverage one of the key purposes of formative assessment – providing feedback to move learning forward.

If students can't see how formative assessment supports their learning, why should they be motivated to do it? When choosing a formative assessment strategy, consider how it'll be used to help them achieve the main learning outcome for the lesson and decide how you'd like to respond (e.g., in real time, asynchronously, by offering more opportunities for practice, or by involving students).

## Quick tips on how you can use student feedback

- Clarify overall misconceptions or mistakes seen in student responses.
- Show one or a selection of sample responses from past student work or adapt student responses to preserve anonymity and a positive learning atmosphere where students don't feel singled out. Ask students to evaluate it, identifying if and where the student/s went wrong.
- Highlight interesting individual or aggregate responses and use them to complement a learning activity (e.g., to spark class discussion).

**3. Foster self-regulation.**

Engage students in self-reflection and encourage them to monitor, reflect on, and be proactive about their learning. Formative assessments like one-minute papers, polling questions, or reflection journals can be used to provide students with multiple opportunities to self-assess their learning and can be adapted to your context depending on learning outcomes, class size, desired time investment, and resources.

Students need guidance on how to plan, monitor, reflect on, and evaluate their learning. As with anything new, we would recommend weaving opportunities for self-regulated learning in small, but meaningful ways.

## Quick tips on using polling questions to encourage student self-regulation

- **Share with students early on** – ideally, the first day of class – why you've decided to use polling and how it can support them in achieving course learning outcomes. To help familiarize students with the technology, you could ask a few introductory questions (e.g., Where are you from? Why are you taking this course?).

- **During class:** Before starting a new learning unit (and at the end of learning unit), polling questions can help students gauge what they already know, identify areas that they aren't confident about, and make decisions about where they should focus their efforts to start closing the gap. Real-time results allow you and your students to evaluate their current level and adjust instruction in the moment or later.

- **Depending on the polling results,** they could be used as a platform for discussion, peer instruction, practice, or feedback. Using pre- and post-assessments (e.g., within the same lesson, mid-semester compared to the beginning of the term) can be motivating for students to track their progress or take action if they're falling behind.

- **After class:** Polling questions can also give students the opportunity to reflect, self-assess their learning, and use retrieval practice[1] asynchronously.

  Ask students to rate their confidence in their understanding of a key concept (or the connections between that concept and content from a previous class). You could adopt a Likert scale from 1 – very unclear (no understanding) to 5 – very clear. Based on the responses, you could provide clarification, extra practice, or resources in the next class.

  To go one step further, students who rated their understanding as a 3 or lower could be asked to write questions about the concepts before the next class. The same poll and collection of student questions could be used as check-ins for key concepts in upcoming lessons or practice questions for exam preparation.

Another approach could be to pair results from another formative assessment strategy with polling questions to encourage students to regularly track their development and adapt future learning. Perhaps you did a one-minute paper with your students a few weeks ago and would like to assess their progress.

In a poll, students choose one of the top three problem areas that they still feel unsure about. Ask them to write questions or comments about what they continue to find unclear about this concept and feedback they might find helpful (e.g., further clarification, personalized feedback, resources). This could also be done as an exit poll before the end of class.

See the teaching resources page from Washington University in St. Louis for more ideas on polling[2].

[1] http://pdf.retrievalpractice.org/RetrievalPracticeGuide.pdf
[2] https://ctl.wustl.edu/resources/polling-overview/

# Three ways to enhance feed-forward guidance

C

**How do I close the gap?**

**1. Support students to engage more fully with formative feedback while learning.**

We often associate feedback with graded assessments, overlooking the opportunities for giving and receiving feedback in formative assessment as well as learning activities. Students are likely to consider comments on written assignments or presentations as feedback, but may fail to see collaborative work, ungraded quizzes, or peer review as alternative forms of valuable feedback. We often assume that students are on the same page as us concerning feedback, but it's important to remember that they bring different experiences and perceptions to the classroom. An open approach to feedback can empower them to reflect on their role in the feedback process and take ownership of their progress.

### Quick tips on how to make feedback a more visible part of learning

- At the beginning of the semester, talk to your students about what meaningful feedback looks like to them, the forms it might take, and how you plan to give feedback. It may also be helpful to discuss expectations about when, how, and from whom (e.g., peers) they will receive feedback in your course.
- Explain to them how quizzes, practice exercises, or group discussions are ways that they can test their understanding and receive immediate feedback – from you and their peers.

**2. Make use of different strategies to give timely feedback (especially in large classes).**

As we have outlined in part three, written feedback is not the only way to provide feedback. Use a mix of different approaches, including online discussion, written (automated) feedback, and audio or video feedback according to your context and provide timely feedback so that students can use it to shape their future work or performance.

### Quick tips on giving quick feedback to large groups

- Common errors or misconceptions from student work can be addressed with the entire class. Ask students to explain why the answer is incorrect, how they arrived at their answer, or why a set of given examples are misconceptions.
- They can think about their response individually and discuss in small groups before sharing their findings with the whole class and receiving guidance from you (e.g., think-pair-share).
- It can be a valuable opportunity for students to make initial assessments while deepening their own understanding. This also means you don't need to spend time giving the same feedback to every student and can focus on providing personalized feedback to individual students as necessary.

**3. Integrate ways for students to apply your feedback on future assignments or assessment.**

Pre- and post-assessment polls, interactive cover sheets, and scaffolded assignments are only a handful of ways that students can track their progress and use the feedback they've received towards future improvement. They are also opportunities to engage students in dialogue about their work or current performance.

## Quick tips on using an interactive cover sheet[1] to engage students in the feedback process

- Show students an example of an interactive cover sheet and how it will provide them with concrete feedback that they can use to improve their subsequent work, supporting them in achieving learning outcomes.
- Model meaningful comments and questions so that students know what a good comment or question looks like and what is expected of them.
- Ask students to request comments on specific aspects of their work (usually a single page). This encourages them to critically reflect on what they've produced and proactively ask for your comments, allowing them a decisive role in the feedback they receive. This strategy can also be potentially time-saving as it provides you with a focused approach to giving specific, detailed comments on how students can improve.
- As a variation on this strategy, ask students to use cover sheets to comment on how they have used your or a peer's previous feedback in the coursework they are submitting. This would be particularly effective for scaffolded assignments that build on student knowledge or skills.

[1] https://blogs.kcl.ac.uk/aflkings/rich-in-formal-feedback/interactive-cover-sheets/

Much like giving feedback, with multiple-choice questions, we all have an opinion on how to do it. But do we do it well?

A popular and yet, often misunderstood form of assessment, multiple-choice questions can be an effective way to quickly gauge how your students are doing and give timely feedback. In the following chapter, we'll look in detail at the misconceptions surrounding multiple-choice questions and how to leverage its benefits in formative assessment.

05

# In focus: Developing multiple-choice questions for formative assessment

What are the parts of a multiple-choice question? Can multiple-choice questions be effective in formative assessment? What are some strategies for overcoming challenges in creating them?

From quizzes to polls, multiple-choice questions lend themselves well to various types of formative assessment. They're an efficient way of assessing where students are at but aren't easy to develop and come with their own set of challenges. With this in mind, we'd like to showcase this versatile assessment format and offer advice on creating good multiple-choice questions.

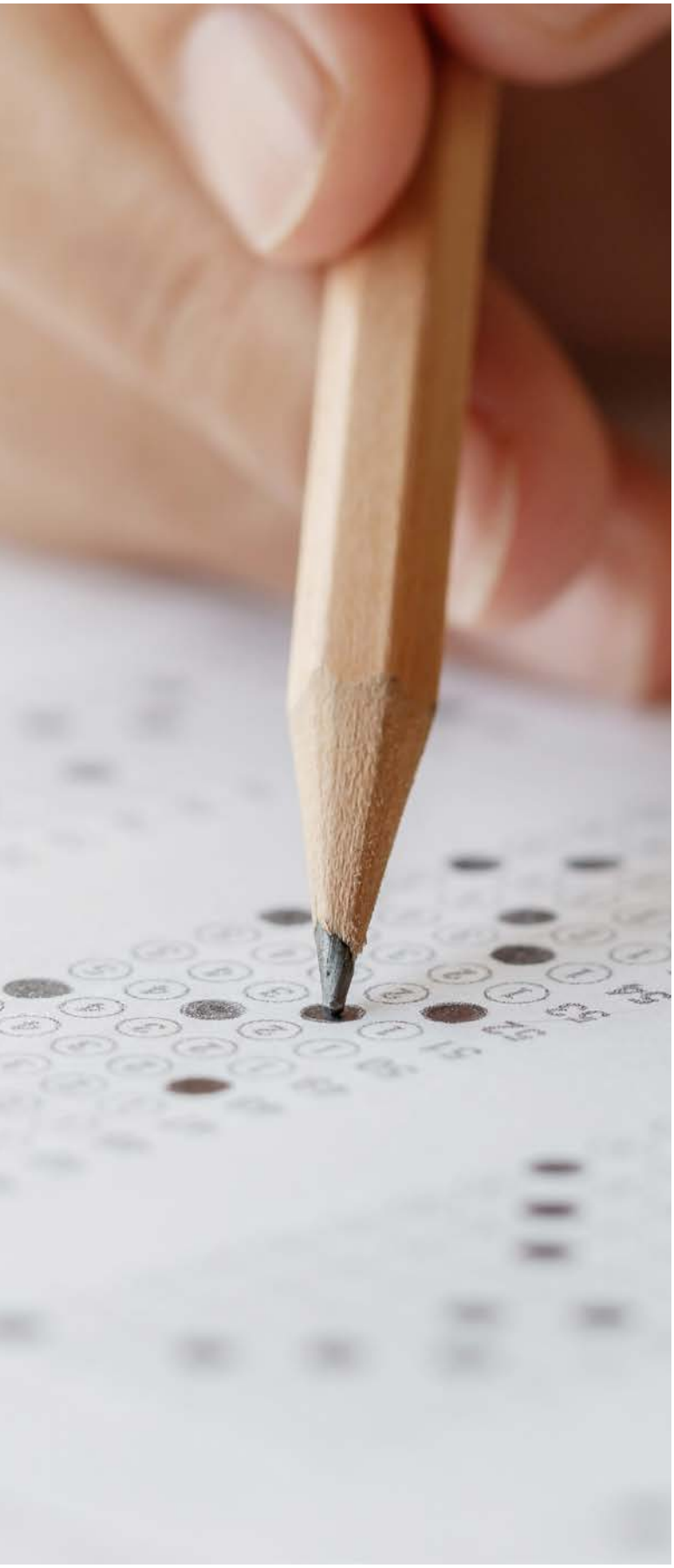
## What are the parts of a multiple-choice question?

To make sure we're on the same page as we dive deeper into multiple-choice questions, let's start with some key terms. A multiple-choice question provides students with a set of options where more than one answer may be selected.

At the Technical University of Munich, single-choice or single-select questions are a type of multiple-choice question that is very common for summative assessment (where test-takers are asked to choose only one response), but multiple-choice questions (i.e., multiple answers) are also possible in formative assessment.

| Stem | What are the components of constructive alignment? |
| --- | --- |
| Distractor 1 | Learning outcomes, teaching and learning methods, learning conditions |
| Key | Learning outcomes, teaching and learning activities, assessment |
| Distractor 2 | Learning outcomes, teaching and learning activities, assessment |
| Distractor 3 | Learning outcomes, teaching and learning activities, assessment |


- The **stem** identifies the question or problem.
- The **options** are a set of alternatives that contain the distractors and key.
- A **distractor** is a plausible but incorrect option meant to determine which students have acquired the necessary knowledge to answer the question correctly and those who have not yet mastered it.
- The **key** is the best answer to the question or solution to the problem.



## Can multiple-choice questions be effective in formative assessment?

It's our firm belief that multiple-choice questions are versatile and effective in formative contexts. Ideally suited to online assessment, many digital tools (e.g., quiz features in Moodle, polls, or surveys) offer you and your students immediate feedback on their progress where the results can be used for further discussion to signal that students need more practice or confirm that they're ready to move on. We'll cover some strategies later on how to overcome challenges in creating multiple-choice questions.

Commonly associated with summative assessment, multiple-choice questions often provoke mixed reactions. While some favour multiple-choice assessments for reliability and easy and objective scoring (especially attractive for large classes), others perceive it to be only useful in testing knowledge recall and consider it time-consuming to develop well-designed questions.

Many of us have encountered multiple-choice exams before – or have created them – making it likely that we harbour certain misconceptions concerning multiple-choice questions.

Despite your reservations, we invite you to read on as we dispel some common myths about this assessment format and provide strategies to help you meet typical challenges in developing multiple-choice questions.

# Common myths about multiple-choice questions

| Myths | Facts |
|---|---|
| Multiple-choice questions are only good for assessing lower order cognition (e.g., recalling isolated facts). | Although often targeted towards lower order cognitive domains, well-designed multiple-choice questions can also test higher order cognition, such as analysis and evaluation. Please see the section, "How can you write multiple-choice questions that assess higher order cognition," on the next page for strategies. |
| The more distractors, the better. | Appropriate for most contexts, multiple-choice questions should include three options, meaning one correct answer (key) and two plausible distractors (Rodriguez 2005, 10). Reducing the number of alternatives from five options to three doesn't affect item discrimination and reliability in general. But as the number of options increases, it becomes more difficult to create plausible distractors. |
| Multiple-choice assessment isn't versatile. | Multiple-choice questions are an efficient testing format that translates well to online assessment where digital scoring offers real-time feedback to large groups (e.g., polling), and a broad range of content can be assessed (particularly important for summative assessment). Depending on how you construct the stem for multiple-choice questions, you can test not only students' understanding of facts or prior knowledge, but also higher levels of cognition. Integrating audio, video, or scenarios can also be leveraged to make assessment more authentic and develop the skills students will need in a future role.<br><br>It also gives you the opportunity to analyze student performance on individual questions and use the information to provide formative feedback, improve future assessments, or as a launch pad for further discussion and learning. You could even ask students to identify the key learning outcomes with which individual questions are aligned. |

# Quality measures for multiple-choice questions

Even in formative assessment, quality measures are an important consideration when designing good multiple-choice questions to ensure the quality of assessment and whether students have achieved the learning outcomes you set out to evaluate. Which ones should you keep in mind?

**Validity** of an assessment refers to how effective it is in measuring what it is intended to measure (e.g., course learning outcomes are assessed representatively in your chosen assessment method).

**Reliability** tells you how consistently an assessment method measures what it aims to measure (e.g., a student who takes the same test twice, but at different times, should produce similar results).

**Objectivity** refers to achieving independent results that aren't affected by external influences. Test items that can be evaluated objectively have one best answer where the scorer doesn't need to use their judgment to decide whether it is an acceptable response.

**Item discrimination** refers to an item's effectiveness in differentiating between students who know the content and those who don't.

# What are some strategies for creating multiple-choice questions?

We're aware that multiple-choice assessment comes with its challenges. But we have some practical advice on how to move past these common obstacles.

## How can you write multiple-choice questions that assess higher order cognition?

In our guide, we'll be focusing on strategies on how to evaluate higher order learning with multiple-choice questions. For general recommendations on designing quality multiple-choice questions, you can refer to the guide from the TUM Centre for Study and Teaching (unfortunately only available in German at this time).

So, what do we mean by multiple-choice questions that test higher order thinking? In short, they're questions that can't be easily looked up on the internet or in a textbook (i.e., from applying to evaluating).

Although lower cognitive levels, such as the recall of factual information, are also valuable in assessment, we should challenge students to apply their foundational knowledge to develop more complex skills in formative assessment.

## Try item flipping.

A common way to formulate multiple-choice questions is starting with a concept and asking students to identify the best definition. Savvy test-takers, however, can correctly answer these questions by recalling what they've memorized without having understood the concept. Instead, turn this approach on its head by providing a scenario and having students choose the underlying concept that fits the given scenario best. To answer the question correctly, students need to fully understand the options and evaluate which one would be the best fit (Scully 2017, 6).

## Focus on evaluating students' ability to problem solve.

A vignette, problem, or situation – ideally set in a real-life context – requires students to use knowledge or skills in a more complex way, potentially mirroring what they'd need to do in the real world. For instance, case clusters (commonly associated with problem-based learning in the clinical sciences) are an effective way to test higher order thinking and problem-solving skills that could be adapted to your discipline. It involves a brief case description followed by a series of multiple-choice questions (e.g., three) related to the case (Case and Swanson 2001, 44). Each question looks at a different aspect of the case and is often used to assess foundational knowledge. In designing case clusters, it's important to avoid creating questions that require students to know the correct response to one question to successfully answer the next one (hinging). Likewise, be careful not to give away hints to the answers to earlier questions in later questions (cueing).

## Go beyond assessing the "what" and "who" and ask the "why" and "how".

One strategy is to focus on the process rather than the result. Give students a question (e.g., a calculation) with errors in the problem-solving process and ask them to identify where the mistake was made, requiring them to analyze or potentially evaluate the information presented (Bücking 2014, 17).

Another way to avoid inadvertently testing recall and assess higher order learning is to ensure that the way content was presented in class doesn't appear in the same format on a formative assessment. For instance, if you gave examples that were taken from reading assignments or asked your students to analyze information from a table, consider using a different form of visual representation to assess those same skills instead.

## Add space for a few short-answer questions as a supplement to multiple-choice questions.

In this way, students can explain how and/or why they arrived at their answer in writing and are also required to use higher-order thinking skills to justify their responses. This gives you useful information as it makes their thought processes or knowledge gaps visible so that you can decide the next steps in providing feedback. It could be a good chance for students to ask questions, learn from their peers, or receive guidance from you.

## How can you save time in developing multiple-choice questions?

**A question bank.**
If possible, we'd recommend maintaining a question bank where you could recycle or vary questions that you, your students, or a team have created. You might also consider progressively developing and storing well-designed questions for re-use in different courses or contexts across your discipline to pool resources and increase assessment sustainability, which is especially relevant if you're planning a graded multiple-choice exam.

A team approach to preparing exam questions can be particularly useful when questions assess knowledge from several different disciplines (e.g., sciences) or require wider expertise within your discipline.

A collection of multiple-choice questions that you've used in class could be made accessible through Moodle and useful for students to practice on for summative assessment. If you're starting from scratch, develop two or three questions that you can use to assess your students formatively on a regular basis. Alternatively, try writing the questions after class when the course material is still fresh in your mind.

**Student-generated multiple-choice questions** can also be a good starting point (see part three of this guide). You can either revise their questions as necessary or build on them later with your own questions for a final exam. Making use of student errors or misconceptions from formative assessment allows you to create more effective distractors. Identify which incorrect responses appear the most frequently in a quiz or short answer questions, for example, and use them as potential distractors when designing multiple-choice questions.

**Item templates** [1], often used in medicine, can be adapted and used to produce multiple questions from the same template. In the link that we've provided, see pages 38 and 39 for examples.

**Limit the number of alternatives.** As we've outlined in the facts above, creating plausible distractors is more difficult when the number of options is high. Focus on developing three good alternatives; it's important to design options that require a high level of discrimination.

[1] https://www.researchgate.net/publication/242759434_Constructing_Written_Test_Questions_For_the_Basic_and_Clinical_Sciences

## Quick tips on creating plausible distractors

- Consider starting with writing the best answer, ensuring that it's objectively and undeniably more "correct" than the distractors (Scully 2017, 6).

- From there, use the common errors or misconceptions that students make or have in other formative assessments or learning activities to develop convincing distractors. What mistakes do most students make when solving this problem? What do they usually confuse this concept with?

- Write distractors that are relatively the same length as the best answer (ideally, keep them short) with homogeneous content.

- Avoid using adverbs of frequency, such as "always" or "never" in the options, potentially lowering the plausibility of your distractors. Test-savvy students can narrow down the alternatives based on the likelihood that the best answer is among the less absolute options.

# What are examples of good multiple-choice questions?

## Scenarios

**Why use it?** They offer a range of possibilities to assess higher order learning with the potential to set them in a real-world context. For example, scenarios can involve presenting data to be analyzed, a complex situation (e.g., case study), describe a scientific problem, or set the groundwork for key-feature questions [1].

**Example:**

While Amy is presenting her proposal to the group, Josh is thinking about his weekend fishing trip. Even though he is not listening to a word Amy is saying, he manages to occasionally nod his head in agreement.

**Josh's behavior is an example of:**

a) pseudolistening*
b) premature replying
c) attentiveness to the context
d) conversation sidetracking

Source: Zimmaro 2016, p. 28.

[1] https://mcc.ca/media/CDM-Guidelines.pdf

## Questions with audio or video

**Why use it?** When well-conceived, audio or video questions require students to apply higher order thinking skills and can potentially be more authentic in presenting issues, concepts, problems, or scenarios as they'd occur in the real world.

**Note to instructors:** There's a wide range of video content available on the internet, but we'd recommend creating your own. The ones on the internet are mostly educational resources and will probably give away some of the answers not only in the video but also in the title or description. By using your own material, you can also ensure that you provide all the necessary information. We've included our own video (credit: Sofía Vio) below to give you an idea of what a video could look like.

**Example:**

Please watch the following video on the dissection of a flower and answer the questions below:
https://youtu.be/nuL6zURbQoA

**1. Which of the following floral formulas best describes the species in the video?**

a) *K(5) C5 A(∞) G(1)

b) *K(5) C5 A(∞) G(5)*

c) *K(5) C(5) A(∞) G(1)

d) *K(5) C(5) A(∞) G(5)

**2. Which of the following floral diagrams is the best representation of the species in the video?**

a) 

b) 

c) 

d) 

**3. Based on the floral features shown in the video, which family does the species in the video belong to?**

a) Solanaceae

b) Convolvulaceae

c) Malvaceae*

d) Caryophyllaceae

**4. Which of the following fruit types does not appear in the family of the species shown in the video?**

a) Capsule

b) Schizocarp

c) Follicle*

d) Berry

**Further ideas** on how questions with audio or video could be applied to different contexts include:

- Questions on analyzing (e.g., behaviour, languages, procedures)
- Questions on applying knowledge to make appropriate decisions (e.g., in emergency cases or in response to safety issues in the laboratory)

## Questions showing partial steps

**Why use it?** Effective for assessing the "how" or a process.

**Example:**

**The following proof seems to show that 1 = - 1:**

$$1 = (-1)\cdot(-1) = \sqrt{(-1)(-1)} = \sqrt{-1}\cdot\sqrt{-1} = i\cdot i = i^2 = -1$$

**Which of the following steps is incorrect?**

a) $1 = (-1)\cdot(-1)$

b) $(-1)\cdot(-1) = \sqrt{(-1)(-1)}$

c) $\sqrt{(-1)(-1)} = \sqrt{-1}\cdot\sqrt{-1}$ *

d) $\sqrt{-1}\cdot\sqrt{-1} = i\cdot i$

e) $i\cdot i = i^2$

f) $i^2 = -1$

**Further ideas** on how questions showing partial steps could be applied to different contexts include:

- Questions on applying (e.g., formulas, methodology)
- Questions on analyzing (e.g., computer code, formulas, procedures)

## How can you use technology for support?

One of the easiest ways to start formatively assessing your students with multiple-choice questions is to use the digital tools available in Moodle. You can create multiple-choice questions with Quiz and Feedback activities. While a Quiz gives you several setting options for feedback and scoring, the Feedback function allows your students to submit their answers anonymously.

Not sure where to start? We're here to guide you (see our separate document with step-by-step instructions).

**Looking for more examples?**

This handout [1] from McGill University in Canada provides examples according to the revised version of Bloom's taxonomy.

[1] www.mcgill.ca/skillsets/files/skillsets/mcq_handout3.pdf

06

# How can you enhance inclusivity with formative assessment?

What do we mean by accessibility and inclusion?
How can you integrate accessible and inclusive teaching practices with formative assessment and feedback?

Students bring different experiences, knowledge, attitudes, and abilities to the classroom, and instructors can leverage this diversity to enrich students' learning experiences.

As we've been advocating the benefits of formative assessment from the beginning of this guide, it may come as no surprise that we'd recommend integrating more opportunities for formative assessment and feedback as one way to create an **inclusive** learning environment that allows for all students to regularly engage in learning with equal **access**.

## What do we mean by inclusion and accessibility?

We see **inclusion** as embracing all forms of diversity – age, gender, race, ethnicity, socioeconomic background, disability/ability, religious beliefs, ideologies, and even personality traits, such as introversion (adapted from Hogan and Sathy 2019). Teaching inclusively means fostering the diverse strengths that you and your students bring to the classroom, especially those of underrepresented students, and being mindful of how systems of power and privilege [1] could be at play in the classroom. Inclusive teaching goes beyond "treating everyone the same" and doesn't happen automatically simply because you have a demographically diverse class. It requires thoughtful planning and implementation from course design to assessment.

**Accessibility** aims to increase learning access and reduce barriers for all students regardless of ability or disability. This involves taking steps to minimize obstacles that might occur in digital content, teaching and learning activities, and assessment. For example, providing captions in video lectures can ensure that any student – whether they are learning in a noisy environment or are hearing impaired – can access course content.

[1] https://tatp.utoronto.ca/teaching-toolkit/effective-strategies/privilege-power-and-justice/

If you're new to thinking about teaching inclusively and more accessibly, this can seem overwhelming and time-consuming. We aren't pushing for a complete redesign of your course but we encourage you to consider small ways that you could implement inclusive teaching practices in formative assessment and feedback.

Before getting to concrete strategies, we have some questions that you can reflect on to identify potential areas specific to formative assessment and feedback that might benefit from a more inclusive mindset.

## Reflection questions

- Who is being left out because of this formative assessment strategy? (adapted from Hogan and Sathy 2019)
- Who is often speaking up? Who remains silent? How can I facilitate discussion or add more structure to invite all voices into the conversation? How can I provide varied opportunities for participation (e.g., include students who are uncomfortable sharing their ideas with the whole class)?
- Would my course benefit from having more structure (e.g., integrating more low-stakes assignments and/or assessments and more frequent feedback)?
- Can I better prepare students for summative assessment and support their learning by incorporating more typical test questions in formative assessments?
- How can I apply Universal Design for Learning (UDL [2]) principles to increase accessibility and inclusivity in designing formative assessments and giving feedback?
- How can I assess the inclusiveness and accessibility of my teaching practices?
- How can I involve my students in creating a more inclusive and accessible learning environment?

[2] https://teaching.uic.edu/resources/teaching-guides/inclusive-equity-minded-teaching-practices/universal-design-for-learning-udl/

## How can you integrate inclusive teaching practices with formative assessment?

As we have suggested throughout this guide, we believe that small steps can make a difference in enhancing the student learning experience. The list below gives you a range of practical strategies on how you can be more inclusive and introduce accessibility in your teaching.

**1. When planning the formative assessments for your course,** consider how your teaching practices or assessment design might influence students with different abilities and pose potential barriers to learning. This could be as simple as ensuring that everyone has enough time to participate in formative assessments in synchronous sessions.

For instance, students with mobility and coordination difficulties may take longer to access and interact online. Why not plan for additional time for students to access an in-class poll so that everyone can engage? Alternatively, you might consider integrating more asynchronous online discussions where students can submit audio clips or video so that different learners can participate more fully when using a keyboard or mouse is a challenge.

**2. Vary the ways that students are asked to demonstrate their understanding on formative assessments.** As much as possible, encourage them to use different modes of expression – written, oral, visual, or creative (e.g., video) – so that they have multiple opportunities to build on their strengths and develop new skills.

**3. Think-pair-share is an inclusive formative assessment strategy** that allows time for students to process and prepare responses to questions individually before discussing them with a partner or small group and later, the whole class. It's critical to give students enough time to read and think about the questions on their own before pairing off and sharing their ideas.

Otherwise, more confident students may monopolize discussions, leaving quieter students feeling overwhelmed or that their ideas are less valuable. When done well, this strategy has the potential to give every student a chance to share their thoughts with at least another classmate, increasing their sense of involvement in formative assessment and opportunities to receive feedback from their peers, which is especially useful for large groups.

If you find that the same students are repeatedly dominating the conversation, consider assigning all students individual roles (e.g., facilitator, timekeeper, reporter). While students are paired off, you can use this time to monitor their discussions to give general feedback later or offer students some extra encouragement.

As a variation on this strategy, you could ask students to respond to questions asynchronously or review questions in advance and be prepared to discuss them in the next class to give students more time to reflect. Students could also participate anonymously to help put introverted students or those with minority viewpoints at ease.

**4. Consider assessing students before and after class.** This could be a quiz on a reading that they were required to do before a lecture or an asynchronous online discussion to deepen their understanding of a concept. Pre- and post-class formative assessments encourage students to learn and think about their progress over time while discouraging cramming.

**5. Before students hand in a formative assignmen**t, ask them to self-assess according to a rubric or identify areas where they'd most benefit from your feedback (e.g., interactive cover sheet). You could also have them perform self-assessments at key points in the term. In this way, you help involve students in the shared responsibility for and awareness of their learning.

**6. Invite confidential feedback from your students** (e.g., at several key points in the course or mid-semester) on the formative assessment strategies you've implemented and/or your feedback. One way to approach this is to use **start-stop-continue** where you ask students to tell you:

- *what you should **start** doing* (e.g., offering more practice exercises in class).
- *what you should **stop** doing* (e.g., rushing through how to use a new tool).
- *what you should **continue** doing* (e.g., giving weekly quizzes).

This could be done with a digital tool, such as Tweedback. After collecting the results, it's important to discuss them with students so that they feel that their voices are part of an ongoing dialogue and understand what you're willing to change (or not) and why. Highlighting feedback from students also allows them to build an awareness of the different needs of their classmates. You may also find it useful to either post the summary of the results in Moodle so that students can review them before discussing them in class. Alternatively, you might consider asking a colleague or team member from ProLehre [1] to observe your class and offer feedback on the inclusiveness and accessibility of your class session.

[1] https://www.prolehre.tum.de/en/prolehre/programs-services/teaching-development/

## Extra tips: How can you think more accessibly about course design?

Inclusive and accessible teaching practices naturally go beyond formative assessment and giving or receiving feedback. One of the easiest ways to begin thinking about accessibility is how learning content is presented in your class sessions. What possible barriers to learning may appear in your slides? How could they be made more accessible for all students? To further motivate you as we end this guide, we'd like to highlight some final quick tips focused on improving the accessibility of your course design. Our hope is that these ideas will help level the playing field and improve the chances of success for all students.

## Quick tips on accessible course design

**1. Ensure that there is enough contrast between the foreground text and background.** Some people can't read text with bright colours or when the contrast between the text background isn't strong enough.

**2. Include image and media alternatives in course content.** This might include providing visible links to audio transcripts or an alternative (alt) text to describe the content or function of images. A separate full-text description of data or information represented in complex graphs could be required for blind/visually impaired students who rely on a screen reader to access course notes, for example.

**3. Avoid using colour alone to convey information.** If you've marked something in colour to highlight its importance, consider also making the text bold or underlining it so that students don't need to rely solely on colour perception to interpret meaning. Similarly, when using colour to set various elements apart, give additional information like labels (e.g., triangle A and B) to make it clear for all students.

**4. Minimize obstacles to learning in your course material.** If you're using Word documents and PowerPoint, you can use the "Accessibility Checker" [1] in the newest versions of Word and PowerPoint to identify and fix accessibility issues as you develop content.

For video recordings of your lectures, provide captioning and transcripts. Captions, for instance, can benefit all students whether they are deaf/hard of hearing, have attention-deficit/hyperactivity disorder, their native language is or isn't German or English, and when sound quality is poor. And whether you're creating lecture videos or a screencast, Panopto, for example, offers transcripts in both English and German.

**Extra tip**: Moodle also has an "Accessibility Checker" that will identify accessibility issues, such as insufficient contrast between the foreground text and background as well as images with missing or empty alternative text.

Adapted from the W3C Web Accessibility Initiative.

[1] https://support.microsoft.com/en-us/office/improve-accessibility-with-the-accessibility-checker-a16f6de0-2f39-4a2b-8bd8-5ad801426c7f
[2] https://accessiblecampus.ca/tools-resources/educators-tool-kit/teaching-tips/teaching-students-with-deaf-blindness/

**Ready for more ideas?**

The Educator's Accessibility Toolkit [2] has a range of resources on accessibility.

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Scan the QR code above to access all of the links referenced in our guide in one PDF document.

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