



# Pop Quiz with a Twist: Assessing the Effectiveness of Enhanced Two-Stage Pop Quizzes

## ABSTRACT

Pop quizzes are a useful strategic tool for keeping students engaged with the class and its content. However, traditional pop quizzes often heighten student anxiety and can promote a “cram, test, and dump” approach that undermines deep learning. This paper introduces an innovative approach, termed “pop quiz with a twist” (PQT); it integrates low-stakes, two-stage quizzes with student grading and immediate, detailed instructor feedback. Using rigorous qualitative analysis of student comments, supplemented by instructor reflections, the paper critically evaluates the effectiveness of PQT as an assessment tool and a catalyst for enhancing the classroom learning environment. Findings suggest that PQT is an effective assessment tool that can positively impact student engagement, foster deeper conceptual understanding, promote peer collaboration, reduce test-related anxiety, and contribute to a more interactive and supportive learning environment. The paper also explores implementation challenges and outlines directions for future research, highlighting PQT’s adaptability and potential applicability across postsecondary educational contexts.

## KEYWORDS

pop quizzes, two-stage assessment, collaborative learning, enhanced learning

## INTRODUCTION

Pop quizzes are a useful assessment tool for keeping students connected to the class and content. The unannounced nature can compel student attendance and motivate them to constantly engage with learning (Derera and Naude 2014; Kamuche 2007; McDougall and Granby 1996). Pop quizzes combined with frequent testing often improve student performance and retention of course material (Roediger III, Agarwal, Kang, and Marsh 2010).

However, traditional pop quizzes are not without their drawbacks. The unannounced quizzes add to students’ stress and anxiety levels (Cassady 2004; Khanna 2015; Khanna and Cortese 2016; Naylor 1997). Additionally, students follow a “cram, test, and dump” approach to quizzes, which involves intensive studying, only to forget most of the learning soon after (Fallows and Chandramohan 2001; Kamuche 2007). This exam-focused learning robs students of a deeper understanding and appreciation of course content. Deep cramming often leads to surface learning (Fallows and Chandramohan 2001) and could reduce content retention over time (McIntyre and Munson 2008).

In response to these limitations, I introduced an enhanced version of pop quizzes, termed “pop quiz with a twist” (PQT) in undergraduate-level management courses at a Canadian university. PQT is a low-stakes assessment featuring a two-stage collaborative format combined with instant, comprehensive feedback and student grading.

In the PQT model, quizzes consist of 10–15 multiple-choice questions on the chapters previously covered in class. Students complete the quiz individually, then attempt the same quiz again

as a group. During the collaborative stage, students choose their groups and can interact with anyone in the class to finalize their individual answer choices. Following the group attempt, students grade the papers (self or peer grading) while the instructor discusses each question. The students have two answer sheets, one for the individual and the other for collaborative attempts; the instructor assigns different weights to these attempts. In these management courses, quizzes in total accounted for 5–10% of the final course grade. I used this two-stage, feedback-rich, and student-centred model as an alternative to traditional quiz formats.

The literature suggests that the PQT approach could yield multiple benefits for student learning compared to traditional pop quizzes. Therefore, using evidence from student reflections and instructor observations, this paper empirically examines the effectiveness of the PQT approach from both assessment and pedagogical perspectives, guided by the following research questions (RQ):

RQ1: What is the effectiveness of PQT as a tool for learning assessment?

RQ2: What is the effectiveness of PQT as a mechanism to enhance the learning environment?

PQT is an easily implementable assessment tool across multiple course settings, and these findings could provide educators with valuable insights for adopting PQT in their courses.

## ENHANCEMENTS OF PQT AND LINKAGES TO CURRENT LITERATURE

### **Enhancements of PQT**

PQT has multiple enhancements over regular pop quizzes. The key features of PQT with the pedagogical grounding are explained below, with a summary presented in Table 1.

#### *Two-stage collaborative testing*

PQT utilizes a two-stage collaborative model where students first complete the quiz individually and then attempt the same quiz as a team (Fengler and Ostafichuk 2015; Knierim, Turner, and Davis 2015; Michaelsen, Fink, and Watson 1994; Zipp 2007). This is similar to the “team-based mini-tests” (TBM) introduced by Michaelsen and Sweet (2008), where students follow a two-stage approach in structured, preset teams. In TBM, teams are expected to reach a consensus with their answers and submit evidence-based written appeals to defend their answer as a team (Michaelsen and Sweet 2008). The PQT model promotes a fluid, two-stage collaborative process, with student-led, instantaneous team creation and less specificity in the process. This contrasts PQT from TBM, the latter of which promotes defined procedures and specific team allocations (Michaelsen and Sweet 2008). A pre-defined weighted combination of the individual and group scores determines the PQT final grade.

The two-stage approach can improve grades (Leight, Saunders, Calkins, and Withers 2012; Mitchell and Melton 2003; Sandahl 2010) and motivation (Hodges 2004; Kapitanoff 2009), reduce test anxiety (Kapitanoff 2009; Muir and Tracy 1999), and students view it positively (Mitchell and Melton 2003; Woody, Woody, and Bromley 2008; Zimbardo, Butler, and Wolfe 2003). However, prior studies report divergent findings in relation to content retention and actual learning (Leight et al. 2012; Mitchell and Melton 2003). Team testing could also lead to less individual accountability and grade inflation for low achieving students (Bacon 2011).

#### *Instant feedback*

Meta-analyses show a scholarly consensus that relevant feedback is a powerful influence on student achievement (Hattie 1987; Hattie and Timperley 2007; Wisniewski, Zierer, and Hattie 2020), and that teachers’ immediacy with feedback further enhances learning (Witt, Wheelless, and Allen 2004). With the typical lag of days or weeks before receiving feedback, students may have forgotten

the test questions and the challenges faced during the test. While auto-graded online quizzes can provide instantaneous grades and some feedback, it is hard to clarify any confusion or nuances across answer choices in MCQs (Leight et al. 2012). In contrast, with PQT, the instructor reviews the quiz immediately after the two-stage completion, offering instant feedback. Therefore, students immediately received scores, feedback, and clarification on why their responses did not receive full marks.

### *Student grading*

Student grading is an inherent element of PQT. In summarizing the literature, Sadler and Good (2006) identified four types of benefits from student grading: pedagogical, metacognitive, logistical, and affective. Pedagogically, the process of judging the correctness of an answer deepens students' understanding of the topic. Being involved in the grading process can demystify the testing process, influencing students at a metacognitive level. Logistically, students receive grades immediately, which reduces the instructor's grading time, and affective change leads to a greater sense of shared ownership of the learning process (Bennett 2011; Sadler and Good 2006). In both self- and peer-grading modes, students gained valuable insights into the grading process. The immediacy of the grade with student intervention provides an enhanced experience compared to an auto-graded online quiz.

### *Low-stakes assessment*

Two-stage assessments have traditionally been used in high-stakes exams (e.g., midterm and finals) (Hodges 2004; Knierim et al. 2015; Leight et al. 2012). Even in TBM (Michaelsen et al. 1994), the process is quite structured with significant weight on course grades. In contrast PQT can be implemented as a series of low-stakes, in-class pop quizzes totaling only 5–10% of the final grade. This positions the quizzes primarily as formative checkpoints that support practice, feedback, and improvement rather than as high-consequence evaluation (Kemery and Stickney 2014). This shift toward learning aligns with evidence that reducing the stakes of quizzes can improve learning outcomes. For example, Khanna (2015) compared students' final exam scores in classes with no quizzes, graded quizzes, and ungraded quizzes. They found that students taking ungraded quizzes outperformed other groups, suggesting that low-stakes quizzes may positively impact learning while reducing stress.

**Table 1.** Summary of the features of the Pop Quiz with a Twist (PQT) with perceived benefits

| Features of the PQT approach    | Potential benefits                                                                                                                                                                                                                   |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Two-stage collaborative testing | <ul style="list-style-type: none"> <li>- Enhanced learning with combined individual and group effort</li> <li>- Improved grades and motivation</li> <li>- Weighted scores to balance accountability and collaboration</li> </ul>     |
| Instant feedback                | <ul style="list-style-type: none"> <li>- Immediate scores and error clarification</li> <li>- Opportunity to correct misconceptions</li> <li>- Enhanced understanding while the material is fresh</li> </ul>                          |
| Student grading                 | <ul style="list-style-type: none"> <li>- Deeper topic comprehension through active involvement in assessment</li> <li>- Instant grades and lighter instructor workload</li> <li>- Increased student ownership of learning</li> </ul> |
| Low-stakes assessment           | <ul style="list-style-type: none"> <li>- Focus shifts from grading to learning</li> <li>- Stress reduction</li> <li>- Repeated practice for better long-term retention</li> </ul>                                                    |

Thus, PQT's enhanced features are pedagogically grounded in good teaching practice. The next section presents the data and analysis, followed by the results and discussion, which examine the answers to the research questions. The final section discusses challenges to PQT implementation and future research directions, followed by the conclusion.

## METHOD

I collected data from three in-person undergraduate courses, Introduction to Human Resources (HR), Organizational Behaviour, and Recruitment and Selection, where PQT was implemented between 2020 and 2022. First-year students took the Introduction to HR course, while second- or third-year students typically enrolled in the other two courses. Each 80-minute class met twice a week with 35–40 students. The instructor administered three pop quizzes (10–15 MCQs) per course, following the PQT format described earlier, with the best two counting toward final grades.

### **Student reflections as qualitative data**

After the third quiz, students submitted optional written reflections on their PQT experience. The instructor passed out reflection sheets with the final quiz and collected these sheets separately to maintain anonymity, as per the ethics clearance. This yielded 110 student reflections from in-person classes (2020–2022). Anonymity prevented linking responses to grades, and it also likely encouraged honesty, creating a tradeoff between authenticity and analytical depth.

The instructor's observational notes from multiple semesters supplemented these reflections and offered insights into observed student behaviour and implementation challenges. Observational data from a single instructor could introduce bias, so it mainly supplemented the primary data from students.

### **Analysis of qualitative data**

Student reflections ranged from a few sentences to short paragraphs. Using reflective thematic analysis (Braun and Clarke 2006) with NVivo, two coders independently analyzed the data. The first coder was the author/instructor, and the second, a research assistant uninvolved in PQT implementation, provided an external perspective. Through iterative coding, discussion, and thematic mapping, the two coders developed a standardized codebook (Locke, Feldman, and Golden-Biddle 2020) with 16 research-driven codes, achieving 93% inter-coder agreement (Campbell, Quincy, Osserman, and Pedersen 2013).

## RESULTS AND DISCUSSIONS

### **PQT in the classroom: Evidence-based analysis of the effectiveness of PQT**

Selecting from many conceptualizations, in this paper, the learning environment is identified as a pedagogical setting with interwoven teaching and learning processes (Abualrub, Karseth, and Stensaker 2013). Based on this model, elements of the learning environment include relationships between the teacher and students and relationships among students. It also considers the role of supportive learning technologies, curriculum alignment in relation to learning outcomes, learning climate, students' perception of the learning environment, and finally, the potential link between learning environment and learning outcomes (Abualrub et al. 2013, 96). The following section presents empirical evidence based on student reflections and instructor observations on how PQT contributes to these learning environment elements, and it examines PQT's effectiveness as an assessment tool.

*The first quiz: The surprise, the relief, and the engagement*

Each course had three short unannounced quizzes per semester. The first quiz began with familiar signs of student anxiety, such as last-minute cramming and nervous glances (Fallows and Chandramohan 2001; Kamuche 2007), followed by 15 minutes of silent individual work. Afterward, the instructor told students:

Now that you have completed your quiz individually, you are to complete it again as a group. This time you can talk to anyone in the class, and you can choose a different answer than before. You have about 10 minutes.

This initiated a series of positive responses, starting with surprise and visible relief, followed by energetic engagement. The surprise and novelty of the approach (Bacon and Stewart 2022; Barto, Mirolli, and Baldassarre 2013; Johnson 1973) transformed class dynamics, bringing a level of excitement rarely witnessed in quizzes. Excitement and enthusiasm can positively contribute to multiple facets of the learning environment, including relationships among students, learning climate, and students' positive perception of the class environment (Abualrub et al. 2013; Bacon and Stewart 2022). While later quizzes lost the element of surprise, students' eagerness to collaborate grew, revealing stronger teamwork and greater awareness of each other's strengths.

*The joy of quiz-taking!*

Although students rarely view quizzes as enjoyable, 60% of students used words like “enjoy,” “love,” and “great” to describe their PQT experience. For example, students said:

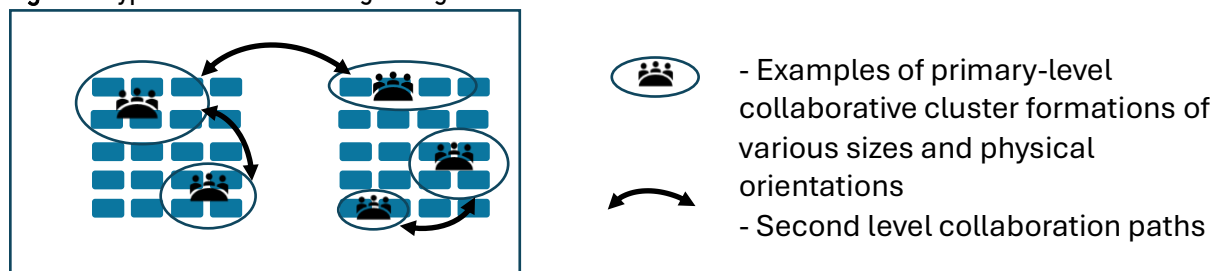
- “I enjoyed the immediate correction and the group discussion.”
- “I enjoy it because it allows us to see what we did wrong and to learn what we didn't know.”
- “I really enjoy the quizzes in this format because I feel that I am able to learn more concepts and understand them better, because there is less stress and pressure.”

Enjoyment in the process, driven by alignment between goals and tasks (Linnenbrink 2007), supports engagement and deeper learning (Obergrösser and Stoeger 2020; Pekrun, Goetz, Frenzel, Barchfeld, and Perry 2011). Bacon and Stewart (2022) recommended the use of novel and fun challenges to stimulate student engagement with course content. Therefore, the enjoyment experienced with PQT could motivate and engage students toward deep learning and better retention.

*Collaborative learning: Processes, actions, and outcomes*

**Collaboration clusters and interaction patterns.** During the collaborative stage, students could discuss questions with anyone in the class. In a typical PQT classroom of 35–40 students, students sat in two sections with four to five students per row. During the collaborative stage, students formed impromptu clusters, usually four to six students, based on proximity (See Figure 1). Primary-level collaborative clusters often began within a row, then expanded to include nearby rows or even across the aisle. Second-level collaboration paths were present, especially with complex questions without an obvious answer choice, necessitating additional consensus-seeking or concept affirmation.

**Figure 1.** Typical classroom seating arrangements and different collaboration clusters



PQT fostered multiple interaction models with seamless fluidity within a short period (Oloyede, Adebawale, and Ojo 2012). Beginning with solo work, it shifted to small-group collaboration and then culminated in a full-class discussion that brought out a shared understanding. PQT fostered cross-class interactions, disrupting the usual pattern where students stay in the same seats and social circles throughout the semester. By allowing open collaboration without formal groupings, PQT encouraged spontaneous knowledge-sharing and consensus-building. Students valued the chance to connect with more peers, contributing to a stronger sense of belonging, as recognized by the following two comments from students.

- “It’s a great way to get to know others while reducing quiz anxiety. It gave me a chance to talk to some people that I most likely wouldn’t have had if we didn’t have the two-stage quiz.”
- “It helped make friends.”

Additionally, considering that 2022 marked the return of students to in-person classes after the COVID-19 pandemic, this approach helped rebuild those personal connections. One student said, “It was nice to be able to group up with students as we are not used to working in person anymore. It helped ease into the idea of meeting new people.”

**Active engagement and the collective voice of students.** One of the most intriguing outcomes of PQT was enhanced collaborative learning (Bruffee 1999). During the collaborations, a heightened state of excitement spread through the class. Instructor observation revealed that the mix of time pressure, grade motivation, and social energy drew even quiet students into active participation. Without access to notes, students relied on collective memory (Barber, Rajaram, and Fox 2012). One student wrote, “Working with the group helped break down the questions, and everyone helped to give their input to eliminate answer choices, making the correct answer easier to find.” Further, explaining and debating questions helped to deepen understanding. Many student comments highlighted how group discussion clarified concepts and enhanced learning:

- “The discussions with the group helped me understand what the questions were asking.”
- “I really enjoyed this quiz format. It allowed me to talk through questions with classmates who thought/understood it differently, which I found really helpful.”
- “It is good because we have to actually discuss it, and I personally think I’ve learnt more this way rather than studying on my own.”

Others shared how the multifaceted interpretations of course concepts supplemented different levels of understanding among group members.

- “Being able to discuss helps me see others’ points of view that otherwise I never would have thought of.”
- “It helps point out some concepts that I may have overlooked or didn’t consider.”

Students also recognized the process as a knowledge-sharing experience with mutual benefits:

- “Format is a good way to share your knowledge with others to fully understand it yourself or help others fully understand the concept.”
- “You discuss with others around you; you can describe why you think the answer you chose was the right one.”

**Fostering an environment of trust and confidence.** While many students can be reluctant to speak in class, the collaboration phase of PQT transformed classroom dynamics. Based on the instructor observation, students became noticeably more vocal and at ease during peer discussions, gaining a boost in confidence. In several instances, students volunteered to lead full-class discussions, standing at the front to facilitate question-by-question analysis. These moments fostered debate, encouraged diverse perspectives, and cultivated a culture of knowledge sharing.

Revisiting the concepts of the learning environment (Abualrub et al. 2013), PQT appears to have created a psychologically safe learning environment where students felt comfortable sharing and learning together. This sense of safety enhanced their self-esteem and self-efficacy regarding concept awareness and willingness to share their views (Bacon and Stewart 2022). One student identified, “I like it because it helps learn the material as you can change the answers and then discussing you see why it was right/wrong. This also helps self-esteem as you don’t fail the quiz.”

In addition, for the instructor, these active discussions provided valuable insights into students’ depth of understanding of critical concepts and revealed areas of misconception, offering timely opportunities to foster deeper learning.

**The whole is greater than the sum of its parts.** PQT’s collaborative phase allowed students to tap into their group’s collective memory (Barber et al. 2012; Bloome, Beierle, Grigorenko, and Goldman 2009). Collaboration often led to complete and accurate responses, even when individuals couldn’t recall all elements of an answer. This resulted in higher grades for everyone and greater group cohesion, as the following student comments expressed:

- “I like how it gives you a better chance of getting a higher grade on the quiz.”
- “Good format. Good chance for us to share, help us understand the differences among us, and motivate. Can kinda boost our grade!”
- “I think it gives people a fair chance to earn a better grade while learning the material. Since individuals like myself learn better while talking out loud.”

Students shared how the multifaceted explanations from peers helped them fill in the missing elements in their concept awareness and understanding:

- “This allows me to see what I have missed during lectures and what others have picked up on.”
- “I like engaging with a team. Usually, they have good explanations as to why they chose what they did that I have never thought of.”

On the other hand, a rare student felt that this format did not give them an advantage, as a student who expected an A in the class. “As someone who is already expecting to get an A in the class, I didn’t really benefit from the group format of the quizzes, and it didn’t improve my grade much or at all.” It may be that the students did not see the overarching pedagogical rationale of PQT (e.g., explaining the concept to others is a great way to reinforce knowledge) and focused only on grade improvement.

**Consensus, overruling, and standing ground.** PQT allowed students to retain individual control over their final answers after group discussions. While collaboration often helped students arrive at correct responses, disagreements sometimes led to second-guessing. Although the students welcomed the opportunity to change their original answers, the stress created by second-guessing stressed some:

- “A negative aspect would be that we can doubt our original answer and the chance of getting it wrong.”
- “I like how it gives you a better chance of getting a higher grade on the quiz. But don’t like how you have to do it twice, and it makes you second-guess yourself.”

Sometimes students changed their initially correct answers after group discussions: “Although my answer is correct, I have changed my answer to conform to others’ opinions.” These moments often sparked vocal frustration during grading. While the process fostered learning, individual traits such as assertiveness (Smith-Jentsch, Salas, and Baker 1996), self-efficacy (Bandura 2010), and personality may have shaped students’ final choices. Exploring how these characteristics influence students’ decision-making in collaborative assessment contexts presents a promising avenue for future research.

**Student grading and implications.** Immediately after completing both stages of the PQT, students graded the quiz (self- or peer-grading), while the instructor facilitated a class-wide discussion of each question. This allowed students to experience the grading process and provided guidance for high-stakes exams, such as the midterm and finals.

With multiple iterations of correcting answers, quizzes had many answers scribbled or circled, making it difficult to verify accuracy during self-grading. Peer grading added a layer of accountability and offered valuable practice in critically assessing another’s response, an important yet often overlooked academic skill. Since each quiz contributed only 5–10% to the final grade, the risk of over-reporting was low, while the trust-building and learning benefits were high.

Grading also became a mechanism to reinforce learning. During grading, students had to evaluate the completeness and accuracy of answers. With MCQs, typically with one correct answer, students rarely get to discuss the nuances of why one answer is the most suitable choice. With PQT,

students got the opportunity to distinguish between seemingly similar responses during the grading discussions by questioning and validating with the instructor as to why a particular option was not the correct choice. In addition, students took notes on the questions they got wrong for future reference. This active engagement in grading intentionally connected learning goals with learning activities (Bacon and Stewart 2022).

**Immediate reinforcement of correct concepts.** Feedback is an essential component of effective teaching and learning. A substantial body of research confirms that high-quality, timely feedback is among the most powerful influences on student achievement (Butler and Roediger III 2008; Hattie 1987; Hattie and Timperley 2007; Wisniewski et al. 2020). In particular, students value dialogic feedback, where students and instructors engage in a real-time, two-way, interactive process, as a system of guidance rather than a one-way transmission of information (Beaumont et al. 2011). PQT integrates this dialogic approach by offering instantaneous, relevant, and timely conversational quality feedback, as identified by the following student comments.

- “I like it a lot because when someone gets different answers, we are able to discuss it right away. There is no wait, and the learning is instant.”
- “I enjoy it because it allows us to see what we did wrong and to learn what we didn’t know immediately to pinpoint what we didn’t know.”

In many traditional assessments, feedback often arrives days or weeks later. By then, students could have forgotten the challenges with the questions and their reasoning behind a particular answer. This disconnect does not help student learning, even when there is an in-depth explanation of the correct answer (Ferguson 2011; Mulliner and Tucker 2017). The immediate feedback following a multi-level examination of a problem (through individual and group discussions) reinforces the correct concepts and promotes active learning (Gibbs 1999).

**Enhanced knowledge retention.** Research shows that learning is deepened when students engage with multiple representations of concepts (Dolin 2001; Prain and Waldrup 2006). Multiple experiences of the same concept (Nuthall 1999) and collaborative learning (Cortright et al. 2003) enhance long-term knowledge retention. PQT integrates these elements with individual and collaborative attempts, student grading, and immediate instructor feedback, operationalizing multiple learning models. Students recognized these benefits:

- “Working with classmates afterward was a good learning experience as it was hands-on and vocal so it would allow me to remember more information. Then the immediate feedback was good as the quiz is still fresh in our mind.”
- “I like that we get a chance to discuss questions and answers with each other right after the quiz and see what the correct answer is right away. This helps me to remember why I thought the answer was a different one at first and to remember the correct one in the future.”

Butler and colleagues argued that repeated retrieval through assessments, especially when followed by feedback, enhances long-term retention more than repeated studying (Butler, Karpicke, and Roediger III 2008; Roediger III and Butler 2011). They also argued that the feedback after a retrieval attempt, regardless of whether the attempt is successful or unsuccessful, helps with more successful

retrieval in the future (Roediger III and Butler 2011). PQT offered such retrieval opportunities with low stakes and high engagement. Students reflected:

- “I like it when we correct it and discuss, it makes me remember my mistakes so I don’t make them again.”
- “The discussion of the group on why the answer is wrong makes the answer store more to your head than just receiving the wrong mark and marks on it.”
- “By doing the quiz twice and then going over WHY I was right or wrong allowed me to fully understand and retain the information much easier.”
- “Loved this format! I also found myself remembering some course discussions we had during the quiz during the final, so it’s a great study technique.”

In PQT, instructor-facilitated instant clarification followed immediate grading. This reinforces the concepts by revisiting them multiple times within a short time frame via multiple avenues. These PQT features fall within the realm of elaboration and practice, which is recommended for active learning, content retention, and recall (Bacon and Stewart 2022).

**Impact on student anxiety and stress.** Exams and quizzes often heighten students’ anxiety and stress, which can affect academic performance negatively (Khanna 2015; Rana and Mahmood 2010). Even low-stakes assessments can increase stress (Stöber 2004), and high-stakes formats exacerbate it further (Tse and Pu 2012). In contrast, PQT appeared to reduce in-class tension, particularly during the transition from the individual to collaborative stage. Students expressed appreciation for PQT’s calming effect:

- “Tests in general cause a lot of anxiety, but I like the format of how you do it. so, thank you!”
- “I think this quiz format is the most ideal way of doing a quiz because it reduces test anxiety and allows for interaction with other individuals.”
- “This is the only class I am taking this year that uses this format, and it is a major thumbs up as it definitely reduces the stress involved with taking quizzes and tests in this format.”
- “I wish these types of quizzes were in more classes because it reduces a lot of anxiety for students.”

Considering that student stress is closely associated with their mental health and wellbeing (Epstein et al. 2019), PQT’s ability to reduce assessment stress would be quite valuable. On the other hand, a few students identified PQT’s potential to add to their anxiety. First, as a pop quiz, PQT dates are not announced in advance in order to encourage class attendance. Although students knew this all along, some still did not like it:

- “The bad thing is that the quizzes are always a surprise so students don’t know when it is taken in the class.”
- “The date is not set for quizzes, so I rarely know when/ what I should be studying.”

Second, with three short quizzes, some students felt that covering several chapters in a short quiz added pressure rather than easing it. “I find it ridiculous for a small quiz to contain three to four chapters for only 15 questions. It adds more pressure rather than easing the anxiety of the course

load.” Future research should examine the overall variation in student anxiety under PQT and weigh these trade-offs against its broader goals of fostering attendance, engagement, and deep learning.

### **Evaluation of the research questions**

#### *Is PQT an effective tool for learning assessment?*

In summarizing the assessment literature, Black and Wiliam (2018) distinguish among three purposes of assessment: assessment of learning, assessment for learning, and the more recent addition of assessment as learning. Traditional quizzes typically address the first two, helping instructors gauge whether students have met learning outcomes (assessment of learning) and using those results to adjust teaching strategies (assessment for learning). The PQT model distinguishes itself by the ability to fulfill the assessment as learning criterion, which is the “role of students in monitoring and directing their own learning” (Black and Wiliam 2018, 553; Hayward 2015). Through its collaborative and discussion-oriented approach, the quiz format enables students to actively engage in the learning process, as reflected by the following student comments:

- “I personally like it as it often reminds me of what I need to go back and review. It provides immediate feedback and very clearly points out areas that I may have overlooked.”
- “I think it is a good format that lets the individual see where their knowledge is at by completing the quiz first by themselves. Then it is good to talk about the questions with classmates and discuss why we chose the answers we did and then have it thoroughly explained by the professor right after writing the quiz provides clarity about the questions—very effective.”
- “It gives me the ability to see how well I know the material as well as see where I am relative to my class.”

With the PQT approach, students gained insight into their level of understanding of concepts and solidified their content awareness through multiple touchpoints during the quiz process. They used PQT to assess their learning in relation to what they should know and to their peers’ knowledge. Thus, the PQT model’s ability to create this self-awareness in students aligns with the “assessment as learning” criteria (Black and Wiliam 2018, 553).

As demonstrated in the previous section, PQT facilitated a deeper understanding of course concepts and improved students’ retention of course content. PQT’s built-in, iterative mechanisms for feedback and low-stakes grading transform the traditional summative pop quizzes into a robust formative assessment. In summary, the results show strong support for PQT as an effective assessment tool that delivers multiple benefits, including better content retention, deeper understanding of concepts, and greater student ownership of learning.

#### *Does PQT enhance the learning environment?*

The study’s qualitative findings suggest that PQT positively influenced several dimensions of the classroom learning environment (Abualrub et al. 2013). Chickering and Gamson (1987; 1999) identified seven principles of good practice in undergraduate education. As elaborated in the previous section, PQT strongly aligns with all seven dimensions. Specifically, it 1) promotes student-faculty contact through real-time grading discussions and clarifications, 2) increases cooperation among students via collaborative quiz stages, 3) enhances active learning through peer explanation and reasoning, 4) delivers prompt feedback through the grading and discussion process, 5) provides multiple learning mechanisms via individual, collaborative, verbal, and written modes, 6) emphasizes

time on task through repeated retrieval and clarification cycles, and 7) communicates high expectations by encouraging preparation and participation, even in unannounced assessments (Chickering and Gamson 1987; 1999). Taken together, these features suggest that PQT is not merely a quiz format but a pedagogical approach that cultivates a positive, engaging, student-centred learning environment (Abualrub et al. 2013).

## CHALLENGES WITH PQT IMPLEMENTATION AND OPPORTUNITIES FOR FUTURE RESEARCH

### **Managing academic accommodations**

While PQT offers multiple pedagogical benefits, it presents challenges in providing standard academic accommodations, such as extended time or alternative testing environments. First, as a pop quiz with unannounced dates, coordinating accommodations in advance with accessibility services proved difficult. Second, since PQT quizzes occupy only a portion of class time, booking additional time outside class was often impractical. Third, providing extended time in class for the individual phase of PQT made it impossible for students to participate in the collaborative discussion and feedback phases, missing out on the core benefits of PQT. Fourth, the unannounced nature created a problem for students absent for legitimate reasons, such as illness.

To make PQT fair and equitable without losing its overall benefits, I adopted a few measures. First, only two of the three quizzes counted toward a small portion (five percent) of the final grade, offering flexibility for absences or accommodations. Students who missed multiple quizzes for legitimate reasons could retake them individually.

Second, the instructor met with students seeking accommodation at the beginning of the semester to examine options without giving away details of the PQT format. The instructor often suggests that students try the first quiz to understand the conditions before deciding. Quizzes contained 10–15 multiple-choice questions, and with a slightly extended time in class, all students typically completed the individual attempt. This was a possible accommodation within the classroom setting. Unfamiliarity with the process before the first quiz could still stress some students. After experiencing the first quiz, all such students chose to complete the quizzes in a typical classroom setting, even when they experienced high stress levels, as the following comment reflects:

I enjoy being able to talk with peers after. I believe it is a good learning tool. But as a student with accommodation, it can be stressful and does not feel fair to me as I usually write quizzes/ tests in the accommodation room.

Future exploration could consider administering PQT purely as a formative tool without grade association (Khanna 2015), especially in cases where assessment-related anxiety is a significant concern.

### **Managing attempts to manipulate the system**

After experiencing PQT, some students appeared to put less effort into the individual component and relied on group discussions to find answers. Some students recognized this as a drawback of PQT. One student reflected, “The downside is that there is a possibility of students not understanding any of the concepts and just copying someone else.” Another said, “It is successful as long as students are actually discussing their answers and not just copying others.” Considering the importance of individual accountability toward learning, instructors can easily address this by assigning a higher weight to the individual attempt. Future research could examine if there is an optimal grade weight to achieve better learning outcomes and balance individual

accountability against social loafing. Instructors could also use PQT as part of the participation mark rather than a quiz score toward the final grade.

### **Managing class time requirements for PQT**

A typical PQT session takes approximately 45 minutes. Therefore, three quizzes per semester provide a good balance between instructional time and reaping the benefits of PQT. Each quiz, thus, would cover multiple chapters. The unannounced nature of the quiz increased stress for some students, but it also encouraged consistent attendance and preparation. The minimal grade weight and the emphasis on the formative nature of the quiz helped students manage their expectations. Timing the quizzes as learning opportunities before high-stakes exams (i.e., midterm and final exams) helped students clarify course concepts and gauge and improve their preparedness for high-stakes exams.

### **Adapting PQT to online classrooms**

Post-pandemic, many universities continue to offer courses online or in a hybrid format. Instructors can adopt core elements of PQT (i.e., two-stage assessment, immediate grading, and full-class discussions) to hybrid or online classes. Breakout rooms can facilitate group discussions, and auto-graded MCQs with instant feedback provide an accessible format. However, virtual spaces may not hold the richness of in-person discussions. Different learning management software systems could allow for better utilization of self- and peer-grading opportunities, an area for future exploration. Moreover, online breakout rooms could limit interaction levels compared to in-person live discussions. This could be due to technological challenges (e.g., camera or microphone not working), individual preferences and personality (e.g., not wanting to turn on the camera or talk), problems with the environment (e.g., external noise or distractions), or simply not having that in-person connection with other classmates. Considering PQT design's impact on the learning environment, other future studies might explore strategies to adopt PQTs effectively in an online setting.

## **CONCLUSION**

This paper critically examines the effectiveness of an enhanced form of pop quizzes, PQT, implemented in an undergraduate learning environment. The PQT model includes low-stakes pop quizzes administered as a two-stage assessment, combined with student grading and immediate feedback from the instructor. While it shares similarities with TBM (Michaelsen and Sweet 2008; Michaelsen et al. 1994), PQT distinguishes itself through its less structured, impromptu groups and whole-class collaborative format, as well as its reduced emphasis on grades.

Drawing from a rigorous qualitative analysis of student reflections and instructor observations, the study demonstrates that PQT is an assessment tool that can significantly enrich the learning experience. Specifically, it enhances motivation for learning, reinforces learning through multi-model iteration, improves retention, reduces test anxiety, and promotes collaboration and engagement in the classroom. The paper also presents the challenges of PQT implementation and future research directions.

Pop quizzes are a common tool used by many instructors. With a few alterations to traditional pop quizzes, the PQT approach can significantly enhance the learning environment, increase student engagement, and bring joy to quiz-taking. There is definite support for PQT from students, as captured by the student comment, "I would love if more classes implemented this approach."

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## DISCLOSURE OF AI USE

The authors used Grammarly and ChatGPT as proofreading and editing tools to improve the clarity and readability of this manuscript. The ideas, analyses, and conclusions presented remain the author's original work. The authors take full responsibility for the content and integrity of the manuscript.

The introductory image showcases a conceptual illustration of the Pop Quiz with a Twist (PQT) assessment approach, showing a transition from traditional quizzing to collaborative learning. The author generated the image using OpenAI's DALL-E via ChatGPT.

## ETHICS CLEARANCE

The Human Research Ethics Board of Mount Royal University, Calgary, Canada provided ethics clearance for this study.

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