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Enhancing Students Learning Outcomes with AI-Driven Formative Assessment using ClassPoint

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ABSTRACT

Formative assessment is an essential practice that enables us to monitor student progress and provide timely feedback during the teaching and learning process. In engineering education, where conceptual understanding and problem-solving skills are critical, the use of AI-driven applications such as ClassPoint has revolutionized this process. This paper examines the integration of ClassPoint into classroom activities in an Electrical Engineering course, using its key features such as Word Cloud, Short Answer, Slide Drawing, Image Upload and Quiz Areas to engage students actively and gather meaningful feedback. The implementation involved real-time student participation in problem-solving exercises, concept reviews, and interactive discussions. The results indicate that ClassPoint notably enhanced student engagement and understanding. The data collected through its interactive features provided actionable insights, enabling us to identify misconceptions, personalize instruction, and cultivate meaningful learning. In addition, its straightforward integration into teaching workflows promoted collaboration and active participation among engineering students, fostering a deeper understanding of complex concepts. In conclusion, ClassPoint has demonstrated its potential as an effective formative assessment tool, enhancing both the learning experience and the quality of engineering education. Its ability to provide real-time data analysis and support differentiated instruction makes it an invaluable tool for preparing students to excel academically and professionally.

Keywords: Artificial intelligence; real-time feedback; formative assessment; interactive quizzes; student engagement

INTRODUCTION

Formative assessment plays an integral role in Outcome-based education. It provides us with the means to monitor student progress, deliver timely and constructive feedback during the learning process and improve students' learning outcomes in due course (Schildkamp et al. 2020; Bernett 2011; Black & William 1998). In engineering classrooms, where conceptual understanding, problem-solving and generic skills are essential, the need for effective formative assessment methods is considered a priority. Most engineering students often struggle with complex concepts and applying their knowledge in various contexts. This makes it necessary to track their progress continuously and adjust teaching strategies accordingly to meet their needs.

Despite its importance, commonly used traditional formative assessment methods, such as paper-based quizzes or manual feedback do have shortcomings. These methods may not capture fully the complete details of student performance in real-time. They lack the immediate action and accuracy required to address the diverse needs of students in technical disciplines where courses are usually fast paced. These limitations have paved the way for the integration of technological advancements into educational practices. As noted by Sanchez-Lopez et al. (2023) in their work, Artificial Intelligence (AI)-driven tools emerged as powerful solutions to enhance formative assessment processes.

The advent of AI-driven applications like ClassPoint has transformed our approach in conducting classroom-based formative assessment. In particular, the applications reshaped the way we interact with students and in evaluating their learning progress (Smith & Lee 2022). ClassPoint stands out for its set of versatile tools designed to promote active engagement and provide meaningful feedback instantaneously. Features such as Word Cloud and Short Answer encourage collaborative brainstorming and deeper reflections. While tools like Slide Drawing and Image Upload initiate creativity and problem-solving by enabling students to visualize and share their ideas. The Quiz Areas feature reinforces the learning experience further by changing assessments into interactive, real-time activities. In this way, the features not only evaluate knowledge but also maintain student interest and motivation continuously (ClassPoint 2025).

This article examines the implementation of ClassPoint in an Electrical Engineering course and highlights the broader impact of ClassPoint on important learning outcomes that focus on student engagement, comprehension of challenging material and overall learning success. The integration of AI-driven technology marks a significant step forward in bridging the gap between traditional assessment methods and the growing demands of current engineering classrooms.

LITERATURE REVIEW

The integration of artificial intelligence (AI) in education has transformed traditional teaching and assessment practices. AI-driven formative assessment tools, such as ClassPoint, have emerged as innovative solutions to enhance student learning outcomes. This review critically examines the existing literature on the effectiveness of AI-driven formative assessment, with a focus on ClassPoint, to evaluate its impact on student engagement, understanding, and academic performance.

THE ROLE OF FORMATIVE ASSESSMENT IN ENGINEERING EDUCATION

Formative assessment lay emphasis on course improvement rather than on assigning grades. It is particularly important in engineering education, where students are expected to master complicated theories, complex mathematical models, and practical applications. According to Black & William (1998) effective formative assessment provides students with timely feedback, enabling them to identify and address learning gaps while fostering critical thinking and problem-solving skills. They emphasize the constructivist approach, which posits that learners construct knowledge actively rather than passively receiving it.

However, traditional formative assessment methods, such as paper-based quizzes and manual grading, often fall short in several crucial areas. Mainly these methods lack immediate delivery of feedback where the time lag between assessment and feedback can hinder students' ability to promptly correct mistakes and misconceptions. Bernett (2011) suggests that in the dynamic and complex field of engineering, where concepts are built on each other, delayed feedback can result in escalating errors and misunderstandings. In addition, traditional assessments often do not capture the full range of student performance. Engineering problems are multifaceted and require a deep understanding of principles that may not be adequately tested through standardized tests. Another significant limitation is the scalability of traditional formative assessment. Large class sizes and diverse student cohorts make it difficult for instructors to provide personalized and detailed feedback within a reasonable timeframe. The manual nature of these assessments can be overwhelming for instructors, thus reducing the quality and frequency of feedback provided to students (Sanchez-Lopez et al. 2023).

Other studies (see example Brooks et al. 2019) show that instructors often struggle to provide timely, high-quality feedback due to constraints like limited time and resources. Formative assessment theory advocates peer feedback to alleviate this burden (Wiliam 2011). However, managing peer assessment in classrooms remains challenging for instructors, even in well-resourced contexts, as the workload associated with implementing such practices continues to pose significant barriers (Halai et al. 2022).

AI-DRIVEN FORMATIVE ASSESSMENT: A PARADIGM SHIFT

The emergence of AI-driven tools has transformed formative assessment in engineering education by addressing the limitations of traditional methods. AI-driven platforms offer real-time analytics, personalized feedback, and interactive features that cater to the unique needs of engineering students. According to Hopfenbeck et al. (2023), these tools enable instructors to monitor student progress in a dynamic manner and adapt their teaching strategies to enhance learning outcomes. On rethinking assessment and how AI is changing the way we measure student progress, Joseph (2025) supports ideas that AI-driven assessments can analyze student responses more accurately and swiftly than traditional methods, besides identifying areas of strength and pinpointing weaknesses that need addressing. Main functionalities include adaptive learning paths tailored to individual student needs, interactive elements that engage students more deeply, and comprehensive analytics that inform instructors about student progress. These applications not only foster a more dynamic and responsive classroom environment but also boost student engagement and motivation significantly, leading to improved learning outcomes and overall academic performance.

AI-driven applications like ClassPoint deal with these challenges by offering interactive and real-time assessment features that enhance student engagement and provide insights that bring actions into their learning progress (ClassPoint 2025). Through versatile tools, instructors can bridge the gap between traditional assessment methods and the growing demands of current engineering classrooms. Reports indicate the use of such tools gradually improved educational outcomes and student success (Smith & Lee, 2022). While other applications like Intelligent Assessment Systems (Brightwood et al. 2024) and EdTech AI (Hopfenbeck et al. 2023) offer adaptive learning environments and predictive insights. Most AI-driven tools such as ClassPoint and Intelligent Assessment Systems provide scaffolding through personalized feedback and adaptive learning paths, helping students progress within their zone of proximal development (ZPD). This approach ensures that students are consistently challenged while receiving the support they need to succeed. It appears that these innovations empower instructors to monitor progress, refine teaching strategies, and enhance outcomes in the classrooms, as well as fostering critical thinking and problem-solving skills in the students.

CLASSPOINT IN ENHANCING STUDENT LEARNING OUTCOMES

The ClassPoint website features various case studies, including examples of its application in higher education. While not specific to engineering, these studies provide insights into how ClassPoint transforms traditional teaching methods into interactive and engaging experiences (ClassPoint, 2025). Furthermore, the interactive features of ClassPoint can be adapted for formative assessment across different educational levels. Ramadhanya (2024) shows how tools like word clouds and quizzes can make assessments engaging and insightful even among young learners. A study by Arshad et al. (2023) demonstrated that the use of ClassPoint in Electrical and Electronics Engineering courses significantly improved student engagement and participation. Features like word clouds and quizzes encouraged active learning and facilitated a deeper understanding of complex topics. The findings indicate that ClassPoint is particularly beneficial in engineering education, where visualizing concepts and solving problems collaboratively are required.

Engineering students often struggle with applying theoretical knowledge to practical problems. ClassPoint addresses this challenge by providing real-time feedback, allowing students to refine their problem-solving approaches immediately. The importance of timely and actionable feedback, as highlighted by Wiliam (2011), is central to formative assessment. AI tools like ClassPoint create efficient feedback loops by delivering real-time insights into student performance. This immediate feedback enables both students and instructors to make informed adjustments, enhancing the learning process. Research by Sanchez-Lopez et al. (2023) has shown that such timely feedback enhances students' confidence and academic performance, particularly in technical disciplines. The researchers emphasize the role of AI tools in promoting self-regulated learning (SRL). By providing immediate feedback and tracking progress, tools like ClassPoint empower students to take ownership of their learning. This aligns with SRL principles, which focus on goal setting, self-monitoring, and reflection as critical components of effective learning.

In addition, a rather straightforward integration with existing teaching workflows makes ClassPoint a highly adaptable and scalable solution for engineering classrooms. Its user-friendly interface and compatibility with various devices ranging from laptops to tablets and smartphones ensure accessibility for lecturers and students alike. This accessibility allows for the use of ClassPoint across diverse educational contexts, from well-equipped university lecture halls to resource-constrained settings.

The scalability of ClassPoint is particularly advantageous in large engineering classes, where individualized attention is often difficult to provide due to high student-to-teacher ratios. Resaba (2025) illustrates that features like real-time analytics and interactive quizzes allow instructors to monitor the progress of entire classes while identifying individual learning gaps. By offering these insights, ClassPoint enables instructors to adjust their teaching strategies in real time. Even when faced with logistical challenges, instructors can respond with confidence, knowing that every learner is supported and ensure no student falls behind.

The interactive tools of ClassPoint, such as Slide Drawing and Word Cloud, foster collaborative learning experiences that are critical in engineering education. Besides, AI-driven tools help manage cognitive load by breaking down complex tasks into manageable components and providing visual aids or interactive elements. For example, the Slide Drawing feature in ClassPoint allows students to visualize and simplify complicated engineering concepts, reducing cognitive strain. Smith & Lee (2022) emphasize that these features allow students to visualize and share ideas, transforming passive lectures into dynamic and engaging sessions. This collaborative aspect not only enhances learning outcomes but also cultivates a supportive environment where students actively participate in their educational journey. Moreover, the ability of the platform to integrate easily with commonly used applications, such as PowerPoint, ensures that educators can adopt it with minimal disruption to existing workflows. This ease of implementation as observed by Hopfenbeck et al. (2023) makes ClassPoint a practical and efficient choice for lecturers seeking to enhance formative assessment processes without overhauling their teaching methods.

CHALLENGES AND LIMITATIONS IN ENGINEERING CONTEXTS

While ClassPoint offers numerous benefits, its implementation in engineering education is not without challenges. One major issue is the need for specialized training for instructors. Many instructors are unfamiliar with AI-powered tools, and this requires professional development to fully make use of the capabilities of ClassPoint. Smith & Lee (2022) caution that without sufficient training, the potential of the platform to enhance formative assessment may remain underutilized. Moreover, transitioning from traditional methods to AI-driven solutions can be overwhelming for instructors accustomed to conventional teaching practices (Hopfenbeck et al. 2023).

Another challenge is the potential for over-reliance on technology. While the features of AI applications such as ClassPoint are powerful, excessive dependence on AI tools may detract from important human elements in teaching, such as mentorship and personalized guidance, which are vital in engineering education (Resaba 2025). Striking a balance between using AI tools and maintaining human-centered instruction is therefore necessary to maximize the benefits of both approaches.

Data privacy and security concerns also pose significant challenges. AI-driven platforms often rely on data collection to provide feedback and analytics, raising questions about how student data is stored and used. As pointed out by Hopfenbeck et al. (2023), ensuring compliance with data protection regulations and safeguarding sensitive information are crucial to maintaining trust and security.

On another note, work by Sanchez-Lopez et al. (2023) emphasized that the effectiveness of ClassPoint can vary based on the specific engineering discipline and subject complexity. While its interactive tools may excel in disciplines like mechanical or civil engineering, their applicability in fields like computer engineering or microelectronics, which involve abstract simulations or programming tasks, may require additional customization.

The integration of AI-driven tools like ClassPoint represents a significant advancement in formative assessment, particularly in engineering education. Theories and principles such as constructivist learning theory, ZPD, SRL and cognitive load theory collectively underpin the design and implementation of AI-driven formative assessment tools, demonstrating their alignment with evidence-based educational practices. By fostering active engagement, providing real-time feedback, and addressing individual learning needs, ClassPoint has the potential to transform traditional teaching methods. Despite the promising benefits of ClassPoint in engineering education, there remains a clear gap in the literature regarding its effectiveness and adaptability in different engineering disciplines. Further research is needed to explore its long-term impact on student learning outcomes and to address the challenges associated with its implementation.

It is apparent that AI-driven tools like ClassPoint can transform formative assessment in engineering education by providing active engagement, real-time feedback, and addressing individual learning needs. As lecturers, we observed low engagement and performance due to complex concepts. This is of concern and led us to develop the best practices for incorporating ClassPoint in engineering courses.

DESIGN, PLAN AND IMPLEMENTATION

EDUCATIONAL PRINCIPLES

The integration of ClassPoint into classroom instruction is guided by basic educational principles outlined in the *How People Learn* framework by Bransford et al. (2000), which emphasizes four key lenses: learner-centered, knowledge-centered, assessment-centered, and community-centered learning environments.

From a learner-centered perspective, ClassPoint supports the recognition and accommodation of students' preconceptions and diverse learning needs by offering interactive tools such as Short Answer, Word Cloud, and Multiple Choice. These features actively engage students, allowing them to express their thinking and understanding in various ways. Lecturers can also enable anonymous participation, which promotes inclusivity and encourages greater student participation.

In terms of knowledge-centered lens, ClassPoint helps facilitate the development of deep conceptual understanding in engineering concepts by integrating real-time analytics by AI-driven tools. This feature enables lecturers to tailor content delivery based on individual learning progress and provide immediate clarification and misconceptions that emerge.

Being assessment-centered, the interactive activities and instant feedback mechanisms of ClassPoint allow for continuous formative assessment. This not only keeps students informed of their performance but also enables lecturers to make timely, data-informed adjustments to their instructional strategies.

Lastly the community-centered lens is reflected in the capacity of ClassPoint to support a connected learning environment through active student-lecturer interaction either in physical or online classrooms. While it does not facilitate direct peer-to-peer interaction, its easy integration with Microsoft PowerPoint encourages participation and creates a supportive classroom culture. This promotes a sense of belonging and shared learning goals among students.

In summary, ClassPoint aligns closely with the *How People Learn* framework, making it an effective tool for enhancing student engagement, improving learning outcomes, and enhancing instructional responsiveness in engineering education context.

PLANNING FOR IMPLEMENTATION

Recent work by Ghazali (2023) indicates that effective integration of AI-driven tools like ClassPoint into engineering education requires careful planning and alignment with course outcomes. This section discusses the key components involved in preparing for successful implementation.

The first step involves identifying the purpose of integrating ClassPoint into engineering courses. Mainly the purpose is to promote class engagement and strengthen formative assessment. Subsequently the course content should be reviewed to determine whether it is technical, theoretical, or programming-based to ensure the appropriate ClassPoint features as in Figure 1 are selected accordingly. Following this, the lesson content should be structured to align with the allocated class hours, incorporating suitable ClassPoint activities at appropriate instants throughout the class section.

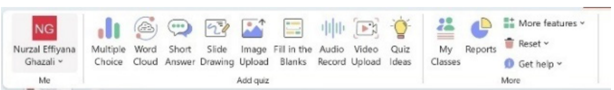


FIGURE 1. ClassPoint features

It is important that the use of ClassPoint in each class session is aligned with the specific learning outcomes targeted for that session. The selected activity should serve as a tool both to engage students as well as to assess whether the intended learning outcomes have been achieved. In addition, careful instructional design is needed to determine the most effective moments during the lesson for implementing ClassPoint features, to ensure they support learning and assessment goals without disrupting the flow of the class.

Successful implementation depends on the lecturer's knowledge in integrating technology into classroom and competency in using ClassPoint. For lecturers to have this capacity, it is suggested that they should attend relevant training sessions and professional development programs focused on Technological Pedagogical Content Knowledge (TPACK). Such support program will help engineering lecturers understand the features, instructional design considerations, and the best practices for fostering engagement and meaningful learning through technology.

The integration of ClassPoint should be implemented in phases to build lecturer's confidence and nurture student trust in the learning activities. In the initial phase, ClassPoint can be used at the beginning and end of each class. Feedback from the students should be gathered to assess their engagement and satisfaction with using ClassPoint. If issues arise, they must be identified and addressed promptly to ensure a smooth transition before scaling up to full implementation of ClassPoint.

IMPLEMENTATION STRATEGY

ClassPoint has been implemented in Network Programming, Electrical Technology, and Data Communications & Networks courses using the Book-End approach, as illustrated in Figure 2. The implementation has taken place in both physical and online classroom settings.

As can be seen in Figure 2, the Book-End approach consists of four elements: Advanced Organizing (AO), lecture, discussion, and summary. The AO stage is used to understand students' preconceptions about the topic content. ClassPoint features such as Multiple Choice, Word Cloud, and Short Answer can be utilized during this stage. The responses from this activity help lecturer to identify early misconceptions before going deeper into the content or topic. This activity typically lasts around five minutes: approximately three minutes are allocated for students to submit their responses, followed by two minutes for the lecturer to provide a brief explanation. This ensures that all students begin the lecture with a shared understanding.

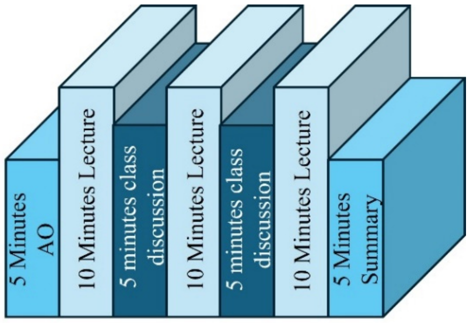


FIGURE 2. Book-End approach

Then, the class continues with a ten-minute activity using ClassPoint to ensure that students are engaged and understand the content covered in the preceding lecture session. ClassPoint features such as Image Upload and Slide Drawing are particularly suitable for courses like Network Programming and Electrical Technology, where visual representation and interaction can enhance conceptual understanding. The lecture-activity cycle can be repeated throughout the class before concluding with a summary, reinforcing key concepts and maintaining student engagement.

At the end of the class, a five-minute summary activity is conducted. The choice of ClassPoint features for this session should align with the targeted learning outcomes. If the focus is on design and calculation, Image Upload and Slide Drawing are recommended. However, if the goal is to assess students' understanding or analytical thinking, the Short Answer feature is more appropriate. The five-minute activity typically consists of approximately three minutes for students to submit their responses, followed by two minutes for the lecturer to provide a brief explanation. Providing feedback at the end of the class is crucial to preventing students from carrying misconceptions or misunderstandings into the next class, which could negatively impact their future learning.

RESULTS AND DISCUSSION

The implementation of ClassPoint within the electrical engineering classroom was characterized by active student participation in problem-solving exercises, concept reviews, and interactive discussions. Its diverse features enabled engagement in real time that enhanced the learning experiences. Data-driven insights provided instant feedback to the lecturers, such as illustrated in Figure 3 are valuable and could be used to improve instruction.

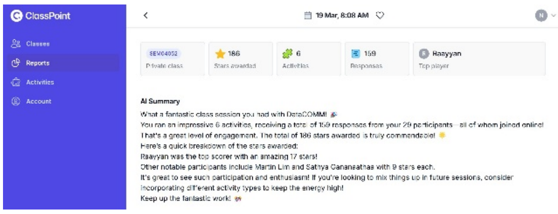


FIGURE 3. AI summary of class activity in ClassPoint

Figure 4 shows a Microsoft PowerPoint slide that consists of ClassPoint activity using the Short Answer feature.

FIGURE 4. ClassPoint activity in Microsoft PowerPoint

The settings for this class activity can be seen on the right column in Figure 4. The activity is configured for anonymous responses to create a safe learning environment where students feel comfortable making mistakes without fear of embarrassment or being intimidated by their peers. This aligns with the fourth lens of the *How People Learn* framework that focuses on community-centered learning. Students are allowed to submit up to three responses, encouraging greater participation and engagement with concepts learned. As depicted in Figure 5, the student responses showed active involvement with many offering their ideas on the task. The input also directly revealed their thinking and what they focused on when considering the concept.

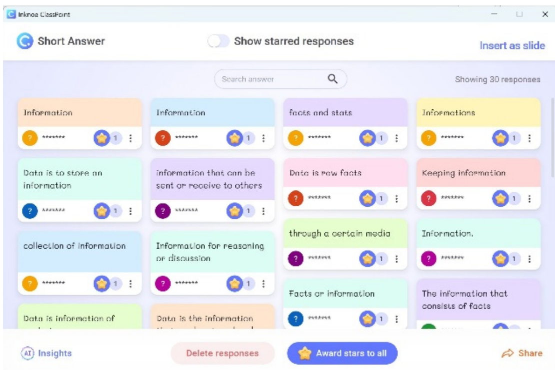


FIGURE 5. Responds from students

ClassPoint offers AI Insights to analyze students' responses with a single click using the AI Insight feature located at the bottom left, as shown in Figure 5. This feature helps lecturers to quickly gauge students' understanding without going through student submission manually, refine lessons for better results and adjust teaching approaches. Figure 6 displays prompts or questions that the lecturers can ask ClassPoint AI to review the data swiftly and determine students' grasps of concepts being discussed.

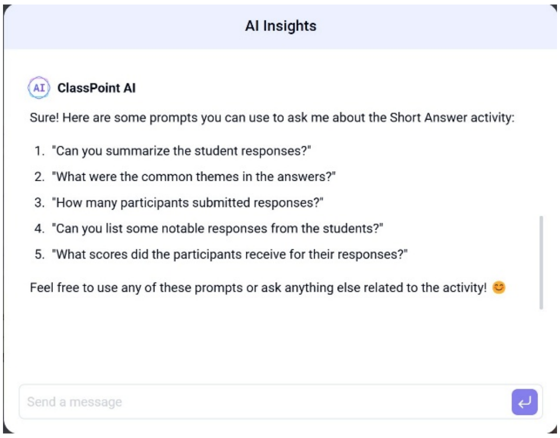


FIGURE 6. AI Insights in ClassPoint

Depending on the prompts posed by instructors, this feature can be used to provide an overview of student responses, session performance as well as suggestions for instructors to improve their class session. A sample of the summary generated by ClassPoint AI based on the prompts offered is shown in Figure 7.

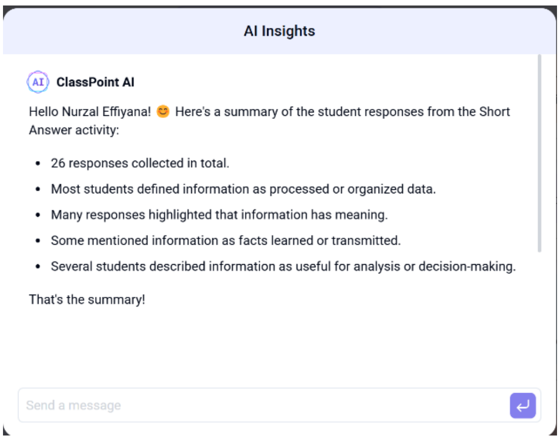


FIGURE 7. Activity summary by ClassPoint AI

Additional questions can be put forth to ClassPoint AI as illustrated in Figure 8, to get a clearer picture of how many students have misconceptions or knowledge gaps, and to identify those students specifically.

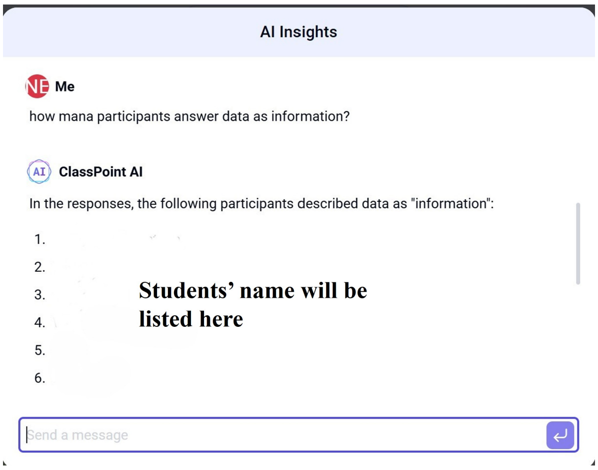


FIGURE 8. Further questions posed to identify the knowledge gap

This activity serves as a formative assessment that allows lecturers to gain immediate insights and greater awareness into students' thinking and to identify which students may be struggling with the material and have cognitive difficulties. This knowledge obtained enables lecturers to modify their teaching strategies for better instruction, to strengthen student grasp of a topic and help prevent any misconceptions or misunderstandings carried forward into subsequent lessons.

The straightforward integration of ClassPoint into the teaching workflow helps in promoting a collaborative learning environment as pointed out by Bong & Chatterjee (2022). Real-time interactions and discussions encouraged students to engage deeply with complex engineering concepts, resulting in a more solid comprehension of the subject matter. At the end of the class session, ClassPoint will send a report to email as in Figure 9, usually displaying overall and individual student responses and participation levels.

FIGURE 9. Report sent by ClassPoint

These reports help lecturers to identify areas where students require additional support, make instructional follow-ups based on student weak performance, and track their progress over time systematically.

By offering feedback in real time and nurturing active involvement, ClassPoint has contributed to increasing lecturer awareness of student thinking, meaningful learning experiences and enhance student learning outcomes. Students demonstrated greater confidence in their communication and problem-solving abilities and have been more willing to clarify important ideas. Figure 10 shows responses of the second question, "What is information" where based on the given responses, it reveals the students' thinking processes. Upon analysis of the responses, it can be identified whether the students attempt to think or try to find meaning before answering the question. Compared to the previous responses, it can be observed majority of students just gave superficial answers, suggesting that there is limited engagement with the concept.

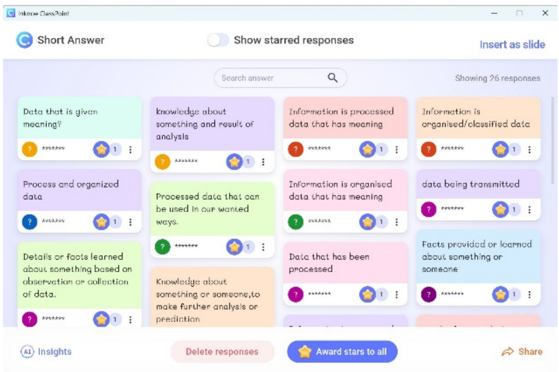
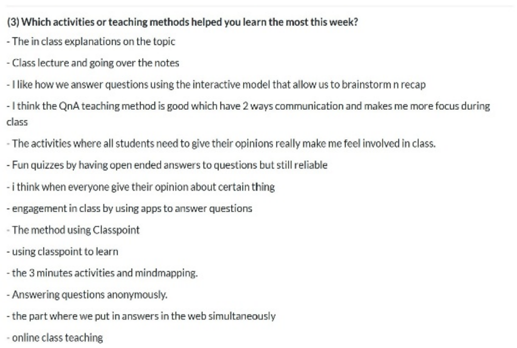


FIGURE 10. Improvement in students' thinking

The use of ClassPoint throughout the course has received positive feedback from the students as can be seen in Figure 11.



(3) Which activities or teaching methods helped you learn the most this week?

- The in class explanations on the topic
- Class lecture and going over the notes
- I like how we answer questions using the interactive model that allow us to brainstorm n recap
- I think the QnA teaching method is good which have 2 ways communication and makes me more focus during class
- The activities where all students need to give their opinions really make me feel involved in class.
- Fun quizzes by having open ended answers to questions but still reliable
- i think when everyone give their opinion about certain thing
- engagement in class by using apps to answer questions
- The method using Classpoint
- using classpoint to learn
- the 3 minutes activities and mindmapping.
- Answering questions anonymously.
- the part where we put in answers in the web simultaneously
- online class teaching

FIGURE 11. Students' feedback on using ClassPoint

The student feedback confirms with the *How People Learn* framework that was used to design the class using ClassPoint. Students appreciate the activities that acknowledged their input, such as open-ended Q&A, opinion sharing, and anonymous submissions. Comments like "*the activities where all students need to give their opinions really make me feel involve*" reflects a strong sense of psychological safety and inclusivity, which are core principles of a leaner-centered approach.

The emphasis on "*in-class explanations*", "*going over the notes*", and "*mindmapping*" shows that students valued structured knowledge building. The interactive methods helped reinforce key concepts, suggesting the activity supported deeper understanding, not just recall. This kind of cognitive engagement aligns strongly with knowledge-centered lens where learning is about constructing meaning.

Students highlighted "*fun quizzes*", "3-*minute activities*", and "*answering questions anonymously*" which are all formative assessments that provided immediate feedback. These techniques appear to not only engage the students but also helped both students and lecturers to identify learning gaps in real time. Such feedback that drives meaningful progress is central to assessment-centered learning.

While ClassPoint does not directly support peer-to-peer (due to the type of licensing subscribed by the author), several students mentioned that the "*simultaneous answering on the web*" and open-ended discussions gave a sense of classroom participation and collective learning, fostering a shared learning experience which is a key component of community-centered lens. This feedback was collected during online class. To incorporate peer interaction, students can be asked to briefly discuss with their neighbours before submitting their responses to ClassPoint. However, this activity should be completed within five minutes instead of the usual three minutes to allow sufficient time for discussion when applied in physical class.

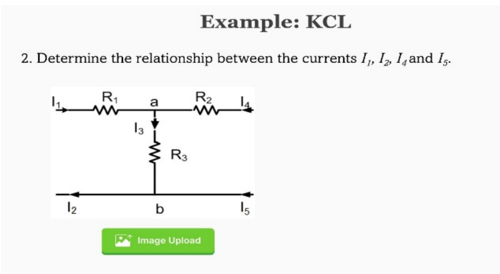
Reflecting on the teaching, the integration of ClassPoint not only enhanced students' engagement but also provided immediate formative insights. For instance, the lecturer could quickly identify misconceptions such as students confusing the concepts of "information" with "knowledge", and this confusion is addressed instantly in real time. The ongoing feedback loop enhances teaching effectiveness and reinforces the lecturer's own understanding of the students build meaning and re-construct knowledge. Such reflective practice contributes to professional development by refining instructional strategies and improving pedagogical awareness.

In general, the use of ClassPoint as a formative assessment tool has demonstrated a great positive impact on student learning outcomes. Insightful knowledge gained from reflections, classroom observations, and student feedback consistently showed that this approach actively motivated students to engage more deeply with concepts learned and tried to build an understanding of the concepts. In addition, the approach also fostered improvements noted in their technical communication skills, nurturing their interactions with both peers and lecturers. These encouraging results indicate the potential of AI-driven tools like ClassPoint, especially when combined with an innovative learning environment, to transform the teaching and learning experience for Electrical Engineering undergraduates.

SIGNIFICANCE AND CONTRIBUTION

The integration of ClassPoint in the electrical engineering classroom has demonstrated significant benefits in promoting student engagement and conceptual understanding. With interactive tools such as Word Cloud and Slide Drawing, students were able to visualize and contribute to discussions readily, fostering an active learning environment. While the use of Quiz Areas provided quick knowledge checks, revealing students' misconceptions and knowledge gaps. These valuable insights allowed us to adjust our instructional strategies in real time, thus making teaching and learning more effective.

In the field of Electrical Engineering, the application of ClassPoint can lead to a deeper understanding of complex concepts such as Kirchoff Current Law (KCL) as in indicated Figure 12.



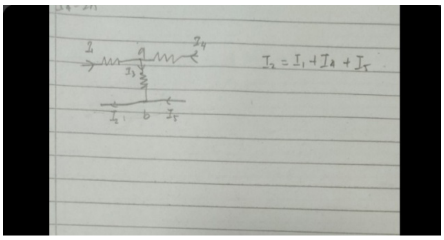


FIGURE 12. Question on KCL and a sample of student's answer

The real-time interaction and data analysis capabilities enable us to identify students' problems in making KCL analysis as in Figure 12. Intervention can be done immediately during that class session. This personalized approach contributes to a stronger grasp of important concepts and improved problem-solving skills, which are crucial in Electrical Engineering.

The positive impact of ClassPoint integration in enhancing conceptual understanding through visual interaction, immediate formative feedback for real-time clarification, and increased student engagement and active participation suggests promising implications for future educational practices. By nurturing active participation and providing real-time feedback, ClassPoint promotes a collaborative learning environment that can be applied to various fields beyond engineering. The detailed data summaries and reports generated by ClassPoint help us identify areas where students need additional support, monitor their progress over time, and make informed adjustments to our teaching strategies. This approach not only benefits students but also helps us as lecturers to reinforce our own understanding and develop our teaching skills using AI.

In general, our experience with ClassPoint highlights its potential as a valuable tool for enhancing student learning and engagement in complex subjects such as Circuit Analysis, Signals & Systems, and Electromagnetic Fields. It transforms the way the course is taught, making learning more interactive, personalized, and effective in fostering conceptual understanding. More importantly, it demonstrates the opportunities provided that enabled us to reflect on our own teaching practice and implement instructional improvements that respond to students' needs based on evidence gathered.

PRACTICAL IMPLICATIONS

Integrating ClassPoint into formative assessment practices in an educational setting can provide valuable advantages. Our experience with ClassPoint reveals several practical implications for lecturers seeking to create a structured and supportive environment for their course that aims to enhance student learning and formative assessment.

The interactive features of the platform like Word Cloud and Slide Drawing can transform conventional lectures into lively student-driven discussions. These tools can prompt students to participate actively and visualize their thinking, thus fostering a more engaging and active learning environment. Regular use of these features can help sustain high levels of student involvement and promote meaningful learning.

The Quiz Areas in ClassPoint are a powerful feature for formative assessment in real time. The function enables quick knowledge checks, allowing lecturers to identify misconceptions and knowledge gaps as they arise. This immediate feedback makes adjustment to teaching methods possible to address students' cognitive struggle in a timely manner. In this way, teaching remains aligned with the intended learning outcomes.

The data analysis capabilities of ClassPoint support a more personalized approach to instruction. The analysis of student responses enables instructors to give specific feedback and create lesson plans that address individual cognitive challenges. This tailored learning experience strengthens students' grasp of complex concepts and nurtures their problem-solving and critical thinking skills.

The reflective opportunities offered by ClassPoint contribute to instructors' own professional growth. By reviewing student data and feedback gathered through ClassPoint, the platform encourages instructors to evaluate critically their own teaching practices, deepen their understanding of the subject matter and improve their teaching strategies.

Therefore, ClassPoint serves not only as a tool for student learning but also as a means for continuous improvement in instructional practices.

RECOMMENDATIONS FOR EFFECTIVE IMPLEMENTATION

Based on our experience, we offer several recommendations for lecturers seeking to implement ClassPoint effectively in similar instructional contexts. First, consistent use of ClassPoint tools across lessons helps establish a habitual culture of interactive learning. Features such as Word Cloud, Slide Drawing, and Quiz Areas can transform passive lectures into dynamic, student-centered experiences that promote active participation and conceptual engagement.

Second, the data summaries generated through ClassPoint can inform adjustments made to instructions and support teaching strategies. This knowledge ensures that the pedagogical decisions are grounded in evidence and allows lecturers to respond more precisely to students' learning needs. Third, collaborative activities facilitated by interactive tools foster teamwork and collective problem-solving which are essential competencies in engineering education.

Fourth, regular reflection on the effectiveness of ClassPoint integration is fundamental to continuous improvement. By analyzing student responses and feedback, lecturers can refine their teaching methods and have a better understanding of how students construct knowledge. Last but not least, providing adequate training for lecturers on using the ClassPoint features effectively and sharing resources and best practices ensures that the tool is used to its full potential across diverse teaching situations.

In retrospect, we found ClassPoint application presents a promising tool for formative assessment that, when implemented systematically, can enhance student engagement, support meaningful learning, and contribute to the continuous development of teaching expertise. By adopting these recommendations, lecturers can go through similar implementation challenges successfully and unlock the full potential of ClassPoint in their classrooms.

CONCLUSION

The integration of ClassPoint into the Electrical Engineering course has demonstrated to be a game-changer for formative assessment. Its ability to collect and analyze real-time data provides invaluable support for differentiated instructions, that enable us to personalize learning experiences. Beyond enhancing student conceptual engagement and understanding, the use of the application has fostered a collaborative and interactive classroom culture, preparing engineering students for both academic and professional success. As a versatile and effective tool, ClassPoint highlights the potential of AI-driven applications to transform engineering education and empower lecturers to deliver impactful teaching.

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DECLARATION OF COMPETING INTEREST

None.

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