

Teachers' Knowledge and Skills in Utilizing AI for Formative Assessment Practices: The Students' Perspectives

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ABSTRACT

This study investigates how formative assessment practices are impacted by teacher's artificial intelligence (AI) skills from the perspective of the students. This study aims to identify opportunities and challenges associated with integrating AI in formative assessment examine how teachers AI proficiency impacts students learning experiences and outcomes and provide recommendations for enhancing teachers AI proficiency. According to the study's qualitative analysis of student interviews teachers AI proficiency significantly boosts personalized learning provides timely and focused feedback and raises overall student engagement. The necessity for a balanced human-AI interaction as well as obstacles like potential biases and technical difficulties were noted. According to the findings educators must take comprehensive AI training programs that focus on technical proficiency ethical considerations and pedagogical integration. Ultimately the study's suggestions will support teachers in incorporating AI into formative assessments which will help them create a more adaptable and supportive learning environment. Future studies should examine the long-term effects of AI on student outcomes efficient AI training strategies for teachers and ethical issues surrounding AI in education.

Keywords: Artificial Intelligence (AI), Teacher's Knowledge, Skills, Assessment, Formative Assessment practices

Introduction

Artificial Intelligence (AI) has become a critical component of the contemporary world, and in today's world, computers are able to make decisions about various aspects of human life processes. With the help of massive open online courses and online educational resources billions of people can now learn anytime anywhere. The formal and in particular informal learning systems in education have grown quickly. Furthermore, artificial intelligence's advancements in this area is gaining much attention because of their potential as tools to refine the efficiency and of assessment in education. (Gardner et al., 2021).

Formative assessment began the process of training and improvement and is the indication of acquired knowledge. The assessment and feedback are viewed as the elements of focus in

educational setting because it affects all the participants of educational process (students, teachers, principals). Despite the fact that teachers invest a considerable amount of time for the assessment and feedback process, there is little advancement regarding the ways to approach the assessment, about how to provide credible feedback as well as about analyzing the effects of both in the higher learning environment. The aspects of assessment in the context of education enhance their grading abilities, motivation values, performance, and learning advancement. Regarding the role of assessment, several researchers have explained the significance and influence of assessment on students learning in education. Lately, the concept of assessment and feedback has expanded through covering not only the students' accomplishments but also the curricula, teachers' explanations, and administrators' configurations. There is significant evidence that shows that assessment plays a positive role in enhancing the learning of students and serves as a mediator of their future accomplishment. It can now be stated that AI will prove to be one of the most beneficial technologies of the coming years (Hooda et al., 2022).

The effective integration of high level technologies such as artificial intelligence (AI) in learning environment may likely have positive and negative effects on the usage of formative assessment as taught by educations in learning institutions. It is recognized that formative assessment has an important value in imparting useful information not only to the teachers but with the students also in enhancing teaching and learning to enhance the student achievement (Hopfenbeck et al., 2023).

In addition, assessment puts more expectations on the teachers in that they should possess high level of proficiency in a number of areas and knowledge and skills. Therefore, for such professional development, it must approach the entire spectrum of knowledge of pedagogy domain and instructional content, information, assessment and measurement basics. Nevertheless, there could be new challenges to face as well for formative assessment practices of teachers and their unawareness and incompetency in terms of AI techniques through the implementation of artificial intelligence, including applicational, moral issues (Hopfenbeck et al., 2023).

Statement of the Problem

AI in formative assessment practices bring opportunities as well as challenges. One of the first sensitization gaps and need that must be satisfied before educators can use AI in formative evaluation is a lack of understanding and proficiency with AI-related technologies. Consequently, although automating certain formative assessment tasks like tracking student learning progress and automating scoring may lessen the workload of educator's artificial intelligence also adds a burden by requiring professional development for its application. In order to address teacher's skill gaps, further professional development is needed, although artificial intelligence can facilitate assessment processes such as evaluation and progress tracking. In order to take full advantage of the benefits of artificial intelligence in formative assessment, while at the same time reducing the burden on teachers, there is an urgent need for addressing these problems (Hopfenbeck et al., 2023).

Research Objectives

1. To examine the perceived effect of teachers' AI knowledge and skills on students' learning experiences and results.
2. To identify from the perspective of learners challenges and opportunities associated with AI integration in formative assessment.
3. To provide recommendations based on student feedback to enhance teachers' ability to use artificial intelligence in formative assessment.

Research Questions

1. What's the effect of teachers' ability to use artificial intelligence on student learning outcomes and outcomes?
2. What challenges are faced by students when teachers utilize AI for formative assessment?
3. How do teacher's ability to use artificial intelligence in practice assessments can be improved to better meet the needs and expectations of pupils?

Literature Review

Impact

It is clear from the various articles and studies reviewed that artificial intelligence, which has spread to different sectors of society as well as could have a significant impact on other sectors where it is being applied, was encouraged by technological innovations and advances in computer technology and related fields. One area where artificial intelligence has been used is the education sector, resulting in significant impact (Chen et al., 2020).

Challenges

Artificial intelligence has brought forth expectations as well as worries in the area of educational assessment, in particular with regard to the dynamics of artificial intelligence and the practice of formative assessment in the classroom. Additionally because assessment calls for teachers to possess a high level of competency in a variety of knowledge and skill areas (e. g. G. knowledge of measurement principles assessment and data literacy pedagogical content knowledge, domain content knowledge) such professional development must have a broad focus. This means that the essential interactive dialogue in assessment between educators, students and peers can be sensitive to cultural and contextual differences. This makes it difficult to use a one-size-fits-all method of assessment in a variety of contexts. Research has indicated that instructors find it difficult to provide students with enough feedback particularly at pivotal moments in the learning process and at the caliber of feedback required to enhance each student's learning because of time and other resource constraints. With the widespread application of AI in conventional procedures however there may also be new difficulties which can be both ethical and practical. (Hopfenbeck et al., 2023).

Before teachers can incorporate AI into their assessment procedures one of the main issues that must be resolved is their lack of expertise in AI-related fields. Thus, while AI may be able to reduce teacher's workload by automating certain formative assessment processes (tracking students' academic progress and automating scoring) it increases workload by requiring professional development. Instructors who are reviewing the assessment results must be aware of the limitations of the AI techniques. Only after examining the validity and interpretability of the assessments should conclusions regarding the integration of AI techniques be drawn from their results (Hopfenbeck et al., 2023).

Opportunities

Teachers content and pedagogical knowledge are undoubtedly required by formative assessment a dynamic process that involves the elicitation analysis and application of evidence. Teachers need to apply both pedagogical and content knowledge in order to effectively guide teaching and learning. This is what Shulman and others have defined as educational content expertise. Content-pedagogical knowledge encompasses the knowledge of how to help students grasp specific subject areas the difficulties and misconceptions that they might face along the way and the specific teaching and assessment techniques that educators need to adapt to meet the needs of their students. Along with comprehending the essential concepts and structural representation of specific subject matter domains this knowledge is also present. It is evident how instructors content pedagogical and assessment knowledge affects how well they implement formative assessment by setting learning objectives gathering and analyzing student learning data and giving focused targeted feedback. The instructor's knowledge base shapes and limits each of these activities. (Herman et al., 2015).

Research Design

This qualitative research employed a phenomenological approach to explore how students viewed the impact of teachers' proficiency in utilizing artificial intelligence (AI) in formative assessment methods. Grasping how students perceive and interpret teachers' AI competence during formative assessment is facilitated by phenomenology's effectiveness in exploring individuals' lived experiences and viewpoints. In order to understand the significance and context of peoples (research participants) lived experiences Husserl (1931) first conceptualized and theorized phenomenology as a qualitative research approach (Alase, 2017).

Interview Process

The primary method for collecting data for the study was semi-structured interviews. By employing this technique the researcher was able to ask participants open-ended questions concerning their opinions and experiences regarding the use of AI by teachers in formative evaluation. The semi-structured format allowed for both the exploration of predetermined areas of interest and the freedom to delve into new topics that emerged during the interviews. Depending on the participants preference and availability each interview was conducted either in-person or online.

Data Saturation

When no fresh themes or revelations emerged from the interviews data saturation was reached signifying that a wide variety of experiences and opinions had been fully captured during the data collection process. Data saturation was reached when the researcher noticed that after interviewing nine participants the responses started to repeat themselves and no new information was being found.

Population

All individuals who fit the specific requirements listed for a research study are considered to be part of the target population (Mohsin 2021). Students from the public universities in Lahore made up the study's population.

Sampling

A sample is a subset of a population chosen for research purposes from a larger population. Participants are the people who make up the sample (Mohsin 2021). To guarantee data saturation and information richness a total of 9 participants were chosen. In order to guarantee information richness and data saturation nine participants were decided upon. Depth is prioritized over breadth in qualitative research particularly in phenomenological studies. Nine participants was an adequate sample size to capture a range of experiences and perspectives resulting in a strong dataset suitable for thematic analysis. This sample size is in line with suggestions from the literature on qualitative research which contends that narrowly focused samples can provide profound understanding of the phenomena being studied.

Sampling Strategy

Researcher used convenient sampling to choose study participants looking for students with a range of experiences and backgrounds. My objective was to gather a range of viewpoints and insights pertaining to the research subject. It is also known as chance or unintentional sampling. The researcher includes people who are approachable or readily available. Because it made it easy for the researcher to find and interact with students who met the inclusion criteria and were eager to share their experiences this method was appropriate for this particular study. When a very vast category adequately describes the target population the method performs well. Every member of the intended audience who is available at that time is made contact with. Participants are invited to take part in the study. The investigation is completed if the subject gives consent (Mohsin, 2021).

Data Collection

For this study semi-structured interviews were the primary method of data collection employed by the researcher. Researcher was able to have open-ended conversations with participants regarding their experiences and opinions of teachers AI expertise in formative assessment through semi-structured interviews. Student's viewpoints experiences and attitudes could be thoroughly explored thanks to these techniques. A semi-structured interview consists of

several key questions that help define the areas to be examined while also allowing the interviewer or interviewee to stray to explore an idea or response in more detail. (Gill et al., 2008)

Data Analysis

Interview transcripts underwent thematic analysis as part of data analysis process. This allowed researcher to uncover patterns themes and categories in the data through thematic analysis technique. This helped me learn more about how students saw the AI proficiency of their teachers in formative assessments and made it easier to explore important discoveries that were connected to the goals and questions of the study. All qualitative designs frequently employ the data analysis technique known as thematic analysis (TA). When TA is utilized in research projects it is categorized as qualitative research. One way to identify analyze and report themes within data is through use of Thematic Analysis. It is described as a descriptive technique that reduces the data in a flexible way and easily integrates with other data analysis techniques. TAs can delve deeper into the context of teaching and learning than cannot be achieved with quantitative analysis by allowing flexibility and interpretation when analyzing the data through open-ended survey responses or transcribed interview questions. However extra care and attention to method transparency are required to ensure confidence in the findings. (Castleberry & Nolen, 2018).

As part of this study's data analysis procedure interview transcripts were subjected to thematic analysis. Through the application of thematic analysis researcher was able to identify themes patterns and categories within the data. This made it easier for the researcher to investigate significant findings that were related to the objectives and questions of the study and helped in understanding more about how students perceived the AI proficiency of their teachers in formative assessments.

Inter-code Reliability

To enhance the reliability of the thematic analysis, inter-coder reliability was established through the following

Codebook development

A comprehensive deductive codebook was produced. To maintain coding consistency this codebook provided definitions, sub-codes, the description of sub-codes and examples for every code.

Table of Data Analysis

Codes	Sub-codes	Frequency	Example from findings
AI_EDU	AI_Education_Positive	6	Participant 3: "AI has improved feedback quality, with some teachers providing automatic feedback."

	AI_Education_Personalized	6	Participant 8: "AI provides instant feedback and customizes learning experiences."
	AI_Education_Enhancing	3	Participant 4: "AI enhances learning by integrating AI-based technology into projects."
	AI_Education_Multifaceted	2	Participant 6: "AI tailors learning experiences, automates grading, and offers virtual tutoring."
TEACH_COMP	AI_Teaching_Effective	9	Participant 1: "Teachers' AI knowledge and skills enhance learning experiences by providing personalized feedback and tailored instruction."
	AI_Teacher_Competence	9	Participant 2: "Effective use of AI by teachers leads to better learning outcomes with more detailed feedback and improved academic performance."
AI_CHALLENGES	AI_Bias_Challenge	9	Participant 1: "Potential bias in AI algorithms needs to be managed by balancing AI use with personal interaction."
	AI_Bias_Overcome	6	Participant 2: "Students overcome technical difficulties by seeking additional resources and communication with teachers."
Opportunities with AI	AI_Opportunities_Personalized	7	Participant 5: "AI provides personalized learning paths and immediate feedback."
	AI_Opportunities_Effective	7	Participant 7: "AI integration in formative assessment allows for targeted interventions and deeper understanding of progress."
TEACHER_PD	AI_Teacher_Training	9	Participant 3: "Ongoing teacher training and development in AI technologies are essential for improving instructional methods."
	AI_Teacher_Need	9	Participant 4: "Teachers need comprehensive training programs, access to AI tools, and collaboration with peers to improve AI competence."
TEACHER_	AI_Teacher_Data_	9	Participant 6: "Teachers need

KNOW	Literacy		technical proficiency, data literacy, pedagogical expertise, critical thinking, and ethical awareness to effectively utilize AI."
	AI_Teacher_Data_Importance	7	Participant 8: "AI supports teacher professional development and helps in data analysis to enhance teaching and learning."
	AI_Feedback_Instant	3	Participant 8: "AI provides real-time feedback and enhances learning engagement."
	AI_Learning_Engagement	4	Participant 9: "AI-powered tools enhance student engagement through interactive lessons and simulations."
	AI_Administrative_Support	2	Participant 8: "AI streamlines administrative tasks, allowing teachers to focus more on instruction and student engagement."
	AI_Data_Analysis	2	Participant 7: "AI tools provide comprehensive data analysis, helping teachers understand student performance and adjust instruction accordingly."

With reference to the use of artificial intelligence (AI) in education the table provides a thorough examination of the codes, sub-codes, frequencies and instances from participant findings. Positive views of artificial intelligence in education are covered by the AI_EDU code and participants regularly mention sub-codes like AI_Education_Personalized and AI_Education_Positive for their contributions to improving and personalizing learning experiences. Participants observed that the quality of feedback has improved due to AI (e. g. Participant 3) and offered immediate customized feedback (e. g. Participant 8). All participants acknowledge that teachers AI competency is critical to enhancing learning outcomes as demonstrated by the TEACH_COMP code which emphasizes the value of effective teaching methodologies for AI. Participant 1 highlighted for instance, how individualized feedback can improve learning opportunities. As stated by Participant 2 the AI_CHALLENGES code indicates that technical issues and possible biases in AI are prevalent challenges however these can be lessened with teacher assistance and other resources. According to Participant 7 the Opportunities with AI code demonstrates how AI provides tailored learning paths and instant feedback enabling deeper comprehension and focused interventions. The TEACHER_PD and TEACHER_KNOW codes emphasize how important it is for educators to have continual AI training as well as data literacy. In order to increase AI competency participants stressed the necessity of teamwork and thorough training programs (e. g. G. Person 4). Participant 8 highlighted the benefits of both instructional focus and student engagement through AI tools indicating that AI is acknowledged for its ability to provide real-time feedback improve learning

engagement and streamline administrative tasks. This analysis emphasizes the complex effects of AI in education showing students perspectives on both its advantages and disadvantages.

Conclusion

The study concludes that most students perceive YouTube positively as a learning medium. They found it to be effective in simplifying complex concepts, providing diverse perspectives, and enhancing classroom learning. Its flexibility, accessibility, and engaging content made it particularly valuable for knowledge construction. However, concerns about credibility, advertisements, and lack of teacher-student interaction indicate that YouTube is best suited as a supplementary resource rather than a complete replacement for traditional methods. Overall, YouTube plays a significant role in enhancing knowledge among undergraduate students, offering a dynamic and modern approach to learning.

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