Education Insights

Article

A Study on Formative Assessment Management for Undergraduates Based on Digital Platforms

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Abstract: With the rapid development of information technology, the application of digital platforms in higher education has become increasingly widespread, particularly in the teaching and assessment processes at the undergraduate level, where their role has become increasingly prominent. This paper takes a class from Major A at a certain university as the research subject and uses a 36-hour course as a case study to systematically explore the effectiveness of applying digital platforms in the formative assessment management of undergraduates. The study analyzes from three dimensions: formative assessment, improvement of final grades, and teaching management by instructors. A quasi-experimental method was adopted, comparing learning data between 128 students in the experimental group and 169 students in the control group. The results show that digital platforms significantly improve students' learning initiative, enhance process assessment scores, improve final exam performance, and reduce teachers' management workload. Based on these findings, the paper proposes recommendations for promoting the use of digital platforms in undergraduate education, aiming to provide a reference for educational informatization reform.

Keywords: digital platform; undergraduate education; formative assessment; teaching management

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1. Introduction

In today's society, which is undergoing rapid digitalization and intelligent transformation, the field of education is also experiencing profound changes. Particularly in undergraduate education, how to leverage information technology to improve teaching efficiency, optimize assessment methods, and promote students' holistic development has become an important topic in higher education research. Formative assessment, which focuses on the learning process and emphasizes continuous feedback and improvement, is highly aligned with the current student-centered educational philosophy.

In recent years, both domestic and international scholars have carried out extensive and in-depth investigations into the integration of formative assessment with digital platforms. On the international front, the seminal concept of Assessment for Learning marked a significant shift in assessment theory and practice [1]. This framework highlights that assessment should not be confined to the summative measurement of students' final learning outcomes, but should also serve as a dynamic and ongoing process that actively supports and advances learning. Central to this idea is the continuous and systematic collection of evidence regarding students' progress during the teaching process. Such evidence may take the form of classroom observations, learning analytics, peer assessments, or student self-reflections. The timely analysis of this information enables educators to make informed and responsive adjustments to their instructional strategies, thereby addressing students' individual needs, fostering deeper cognitive engagement, and encouraging autonomous learning.

However, in undergraduate teaching, formative assessment still faces challenges such as high implementation costs, difficulty in data collection, and delays in feedback. The introduction of digital platforms has the potential to address these bottlenecks effectively.

However, with the advancement of information technology, digital platforms have provided powerful tools to operationalize this approach. Features such as real-time feedback, adaptive learning pathways, and interactive learning environments not only facilitate the efficient collection and analysis of learning evidence, but also create opportunities for students to actively participate in the assessment process [2]. As a result, the integration of formative assessment principles with digital technologies is increasingly recognized as a key driver for enhancing both teaching quality and student learning outcomes in higher education. With the advancement of information technology, universities abroad have widely embedded formative assessment functions into online course management systems (e.g., Moodle, Blackboard, Canvas) to enable instant feedback and personalized instruction. In China, research has mainly focused on the functional exploration of digital platforms in classroom interaction, assignment management, and learning data analysis. It has been suggested that digital platforms can provide diversified and visualized formative assessment results, thereby enhancing student engagement and self-regulated learning ability [3,4].

Therefore, an in-depth analysis of the specific role and implementation effects of digital platforms in formative assessment management for undergraduates is of great significance for promoting the improvement of higher education quality [5].

2. Research Subjects

To ensure the representativeness and scientific validity of the study, this research selected Major A at a certain university as the subject. The major has 297 students, divided into three-year groups with 41, 44, and 43 students respectively. Among them, 128 students were assigned to the experimental group (where digital platforms were applied in teaching and assessment management), and 169 students were assigned to the control group (using traditional teaching and assessment methods) [6].

The selected course was a core professional course with a total of 36 contact hours, combining theoretical and practical components. Students were required not only to master a solid knowledge framework but also to develop strong practical skills. These characteristics made it an ideal case for observing the impact of digital platforms on formative assessment management.

3. Research Methods

This study adopted a combination of quasi-experiment, questionnaire survey, and statistical analysis. The specific steps were as follows:

Assessment method design: The experimental group implemented formative assessment throughout the course via the digital platform, including online check-in, real-time interaction statistics, online quizzes, assignment submission and grading, and learning data analysis [7]. The control group used traditional methods, including manual roll calls, paper-based assignments and quizzes, and offline oral feedback.

Data collection and analysis: SPSS 21.0 software was used to perform independent-samples t-tests on the data from the experimental and control groups, with $P < 0.05$ as the threshold for statistical significance [8]. Data included process assessment scores (attendance, interaction frequency, quiz results, assignment quality), final exam scores (objective and subjective items), student experience questionnaire results, and teacher workload evaluations.

Questionnaire design: Questionnaires were designed for both students and teachers, covering ease of platform use, learning efficiency, interaction quality, and enhancement

of self-directed learning. All questionnaires underwent reliability and validity testing, with Cronbach's α coefficients greater than 0.85, indicating high reliability.

4. Results and Analysis

4.1. Impact of Digital Platforms on Formative Assessment

Students in the experimental group, supported by the digital platform, could identify weaknesses in their learning through functions such as online self-tests and instant classroom feedback. For example, the platform's error analysis function allowed students to review high-error-rate topics after class, significantly improving the focus and efficiency of learning. Teachers, through data analysis features, could quickly identify learning difficulties at both the class and individual levels, enabling timely instructional adjustments.

4.2. Impact on Process Assessment

Data showed that the experimental group's average classroom interaction frequency was 23.5 ± 5.42 times, compared to only 6.7 ± 1.32 times in the control group, a significant difference ($P < 0.01$). This indicates that instant interaction tools (e.g., bullet comments, polls, online Q&A) effectively stimulated student participation. In terms of assignment submission, the on-time submission rate in the experimental group reached 98%, compared to 87% in the control group.

4.3. Impact on Final Grades

Final exam results revealed that the experimental group outperformed the control group in both objective and subjective questions, with an average total score increase of approximately 23%. Particularly in higher-order thinking tasks such as analytical and integrative questions, the experimental group demonstrated stronger logical reasoning and organization, which were closely related to the continuous feedback and targeted guidance of formative assessment.

4.4. Impact on Teacher Management

Questionnaire results indicated that over 90% of students found the platform easy to operate, 91% believed it facilitated self-study and review, 90% felt it improved learning efficiency, and 88% reported enhanced teacher-student interaction [9]. Teachers noted that the platform automatically tracked attendance, assignment completion, and quiz results, significantly reducing manual workload and allowing more focus on instructional design and personalized guidance.

5. Discussion and Recommendations

5.1. Optimization of Formative Assessment Implementation

In traditional classroom settings, the effectiveness of formative assessment is often constrained by structural and cognitive limitations, including restricted instructional time, high teacher workload, and the mental effort required to simultaneously deliver instruction and evaluate student performance. Such constraints frequently result in delayed or generalized feedback, diminishing its immediacy and, consequently, its effectiveness in guiding learning [10].

Digital platforms fundamentally address these limitations by leveraging technological affordances to enable real-time data collection, automated analysis, and instantaneous feedback delivery. Tools such as online quizzes, live polling, adaptive questioning, and embedded micro-assessments allow educators to track students' understanding on a continuous basis. The immediate identification of misconceptions enables timely instructional interventions, ensuring that learning gaps are addressed before they widen [11].

Moreover, personalization features supported by machine learning algorithms and learning analytics make it possible to tailor assessment tasks to individual learning profiles, interests, and proficiency levels. Such adaptive assessment not only enhances the accuracy of feedback but also aligns it closely with each student's current learning trajectory, thereby increasing its relevance and impact.

From a pedagogical perspective, these advances reinforce the feedback loop central to effective formative assessment [1]. By providing actionable, targeted, and context-specific feedback during the learning process, digital platforms support the development of self-regulated learning skills and promote sustained academic improvement [6]. In addition, the automation of routine assessment tasks reduces the administrative burden on educators, freeing cognitive and temporal resources for deeper instructional design and individualized student support.

In sum, optimizing formative assessment through digital platforms not only improves efficiency but also fundamentally transforms its pedagogical value—from a periodic evaluative measure to a continuous, responsive, and personalized learning support system.

5.2. Positive Changes in Student Learning Behavior

The experimental results reveal that students in the platform-supported formative assessment group demonstrated significantly higher levels of engagement compared with their peers in traditional classroom settings. This heightened engagement can be attributed in part to the interactive, personalized, and gamified elements integrated into digital learning platforms. Features such as quizzes with instant feedback, collaborative discussion boards, and challenge-based activities have been shown to enhance learner motivation and persistence [7]. These design elements tap into intrinsic motivation by creating a sense of autonomy, competence, and relatedness—core psychological needs identified in self-determination theory.

Furthermore, the incorporation of visualized learning analytics—such as progress dashboards, achievement badges, and longitudinal performance charts—provides students with a transparent and accessible representation of their learning trajectory. Such transparency is essential for fostering formative feedback literacy, allowing students to interpret feedback effectively and take ownership of their learning [9]. By making performance trends visible, learners are better equipped to engage in metacognitive monitoring, a process in which they evaluate their current understanding, identify gaps, and adapt strategies accordingly [12].

The cumulative impact of these features extends beyond immediate academic performance. Over time, the development of metacognitive awareness and self-regulated learning strategies cultivates the ability to set realistic and adaptive learning goals, maintain persistence in the face of challenges, and transfer learning strategies to new contexts. These are foundational skills for independent and lifelong learning—qualities that have been widely recognized as critical for success in the 21st-century knowledge economy. By embedding these practices into regular coursework through digital platforms, educators can not only improve short-term engagement but also lay the groundwork for sustainable learning habits that endure well beyond formal education.

5.3. Transformation of the Teacher's Role

The integration of digital platforms into formative assessment practices fundamentally redefines the professional identity and responsibilities of teachers. Rather than functioning solely as transmitters of knowledge in a traditional, lecture-centric model, educators are increasingly positioned as facilitators, mentors, and designers of personalized learning experiences. This shift is made possible by digital technologies that give teachers instant access to detailed learning data, such as performance trends, participation levels, and common areas of misunderstanding. With these insights, educators can make timely

adjustments to instruction, offer targeted support to individual students, and design learning activities that address specific needs. This data-informed pedagogy aligns with the principles of precision teaching, wherein instructional interventions are targeted, adaptive, and grounded in empirical evidence [11].

Furthermore, the teacher's role expands beyond diagnosing learning needs to cultivating students' metacognitive and socio-emotional capacities. Guiding learners in interpreting feedback, setting achievable goals, and developing strategies for improvement strengthens their capacity for self-regulated learning [6]. In addition, digital platforms facilitate collaborative environments where teachers can encourage peer feedback, group inquiry, and problem-based learning—approaches known to foster critical thinking and collaborative problem-solving, which are recognized as essential competencies for participation in the 21st-century knowledge economy.

Ultimately, this redefined role positions the teacher as a central orchestrator of a complex, technology-enhanced learning ecosystem—balancing pedagogical judgment, technological tools, and student agency to create a dynamic and responsive learning environment.

5.4. Promotion Suggestions

To fully realize the transformative potential of formative assessment supported by digital platforms, higher education institutions must adopt a systematic, strategic, and evidence-based approach. First and foremost, universities should actively embed platform-based assessment practices into both course-level and program-level curriculum design, ensuring that formative assessment activities are clearly aligned with intended learning outcomes and broader institutional quality assurance frameworks [2]. Such alignment ensures that assessment functions not merely as an adjunct activity but as an integral driver of learning.

Secondly, dedicated and sustained teacher professional development initiatives are essential. Faculty members require training not only in the technical operation of digital platforms but also in the pedagogical principles that underpin their effective use. This includes developing competencies in interpreting learning analytics, diagnosing learning difficulties from data, and translating feedback into actionable instructional adjustments. Teacher capacity-building in these areas directly influences the effectiveness of technology-enhanced formative assessment [5].

Thirdly, collaboration between platform developers, instructional designers, and educators should focus on continuously refining the human–computer interaction (HCI) design. Enhanced usability, intuitive navigation, and accessibility features can reduce cognitive load for both teachers and students, thereby minimizing technical barriers [8]. A well-designed interface not only facilitates adoption but also fosters sustained engagement and trust in the platform's reliability.

Finally, a culture of continuous evaluation and iterative improvement must be embedded in institutional practice. Regular feedback from stakeholders—including students, instructors, and administrators—should inform updates to platform features to ensure that they remain relevant, pedagogically sound, and adaptable to diverse learning contexts. Additionally, inclusivity should be prioritized, ensuring that assessment tools are accessible to students with varying technological proficiencies and learning needs.

By integrating these strategic actions into institutional policy and practice, higher education can leverage digital platforms not only to enhance formative assessment but also to contribute meaningfully to the broader goals of educational innovation, equity, and quality improvement.

6. Conclusion

This study provides clear evidence that the integration of digital platforms into formative assessment management offers substantial benefits for undergraduate education. By

enabling continuous, timely, and personalized feedback, these platforms not only enhance students' academic performance and classroom participation but also contribute to cultivating higher levels of self-directed learning and engagement. The automation of data collection and analysis significantly reduces the administrative and cognitive workload for teachers, allowing them to redirect their efforts toward individualized guidance and pedagogical innovation.

Beyond improving immediate learning outcomes, the findings suggest that digital platforms play a pivotal role in reshaping the assessment culture within higher education—shifting it from a predominantly summative model toward one that values ongoing, process-oriented evaluation. Such a transformation aligns closely with global trends in educational modernization and the demand for graduates equipped with adaptive, lifelong learning capabilities.

Looking ahead, it is recommended that the application of platform-based formative assessment be expanded across a broader range of courses, disciplines, and institutional contexts. Integrating advanced technologies such as artificial intelligence and big data analytics can further enhance the intelligence, adaptability, and precision of assessment systems. For example, AI-driven predictive analytics could identify at-risk students earlier, while data visualization tools could provide deeper insights into learning patterns. These innovations hold the potential to not only improve the effectiveness of teaching and learning but also to support large-scale quality enhancement in undergraduate education.

Ultimately, the sustained development and refinement of digital formative assessment systems will be integral to advancing educational informatization reform. By combining pedagogical theory, technological innovation, and evidence-based practice, higher education institutions can create more inclusive, efficient, and future-oriented learning environments that meet the evolving needs of both students and society.

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