Research on Educational Evaluation Paths under the Perspective of Game-based Learning

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Abstract. Game-based learning, as an innovative educational trend, integrates game design elements into the learning environment to enhance learner engagement and motivation. However, traditional educational evaluation systems have not fully adapted to this mode, necessitating the exploration of more suitable evaluation approaches. This study aims to investigate the educational evaluation paths within the context of game-based learning. The current status of educational evaluation in game-based learning is analyzed, revealing inadequacies in student engagement, motivation stimulation, and knowledge and skill assessment. Combining the ideal vision, the study proposes the use of multidimensional assessment methods, such as behavioral observation, outcome feedback, and player mindset evaluation, along with the incorporation of PBL (Problem-Based Learning) model in educational evaluation. It also emphasizes the role transformation of educators in game-based learning environments, advocating for personalized learning paths and immediate feedback mechanisms. This research systematically explores educational evaluation in game-based learning, proposing innovative methods and practical paths. The findings not only aid in enhancing the educational effectiveness of game-based learning but also provide theoretical support and practical guidance for the innovation of educational evaluation systems. This is expected to play a significant role in promoting comprehensive student development and improving educational quality.

Keywords: Game-based learning, Educational Evaluation, Player Mindset, PBL Model, Personalized Learning Path.

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1. Introduction

With the rapid development of information technology and the advent of the digital era, traditional educational methods are facing unprecedented challenges and pressures for reform. Game-based learning, as an innovative teaching method that introduces game elements, design principles, and ways of thinking into the learning process, significantly increases learners' engagement and motivation. It is seen as one of the effective approaches to address current educational challenges. It not only changes learners' behavior patterns but also promotes a deep understanding of knowledge and effective skill cultivation.

Against this backdrop, educational evaluation, as a crucial means of monitoring and promoting the quality of teaching and learning, has undergone fundamental changes in its role and implementation. Traditional educational evaluation methods often focus on the quantitative measurement of learning outcomes, overlooking the monitoring and feedback of the learning process, and thus fail to fully reflect learners' actual learning status and needs. In contrast, educational evaluation within the context of game-based learning places greater emphasis on the observation and analysis of the learning process, highlighting the importance of personalized and dynamic feedback. It aims to comprehensively enhance learners' knowledge levels and learning outcomes through a scientific and rational evaluation system.
2. Current State of Educational Evaluation

Game-based learning, as an emerging teaching method, integrates game design principles and elements into the learning process, effectively enhancing student engagement and motivation. Educational evaluation plays a crucial role in this process, not only helping educators grasp students' learning progress and outcomes but also providing a basis for adjustments in teaching methods. The essence of educational evaluation lies in the systematic, objective, and comprehensive analysis of the learning process and outcomes. Its goal is to gain a deep understanding of students' learning conditions, identify potential issues, and thereby optimize educational practice.

Currently, educational evaluation in game-based learning adopts a variety of methods. Questionnaire surveys, observation records, performance assessments, and feedback mechanisms are common means of evaluation. Questionnaire surveys reveal students' perceptions of game-based learning, while observation records offer direct insights into students' learning behaviors [1]. Performance assessments measure learning outcomes through indicators such as the completion of game tasks, scores, and rankings. Feedback mechanisms provide timely information to students about their learning performance, significantly enhancing learning effectiveness.

Despite certain progress in educational evaluation within the context of game-based learning, this field is still in a phase of continuous exploration and development. Recent studies have pointed out that although game-based learning can significantly improve students' academic performance and motivation, specific methods and standards for evaluating learning outcomes remain to be refined. Meanwhile, assessing learning motivation also faces challenges in accuracy [2]. Additionally, the transformation of teachers' roles in game-based learning into facilitators and supporters of learning presents new requirements for educational evaluation. Therefore, future research needs to focus on the innovation and practice of evaluation methods, aiming to build a more effective evaluation system for game-based learning.

3. The Ideal Vision of Educational Evaluation

3.1 Purpose of Evaluation

Incorporating game elements into the teaching process, game-based learning aims to enhance learners' participation and learning outcomes. Within this context, educational evaluation bears the responsibility of accurately assessing learners' achievements in knowledge acquisition, skill application, and cognitive abilities. This assessment not only reveals learners' performance in a gamified environment but also provides a quantified reference for their learning effectiveness.

Another crucial function of educational evaluation is to identify the problems and challenges learners face during the learning process. By observing learners' interactions and feedback within the game, teachers can grasp students' learning progress and difficulties, thereby adjusting teaching strategies and providing personalized support to maximize learning efficiency [3].

Moreover, educational evaluation aids in optimizing teaching methods by offering feedback on teaching effectiveness. Teachers can identify and improve shortcomings in their teaching based on learners' performance and feedback, thereby continuously enhancing teaching quality. For learners, the results of the evaluation serve as positive motivation, enhancing their learning drive, boosting confidence, and fostering an interest in learning. In summary, educational evaluation plays a pivotal role in game-based learning, not only assessing and promoting learning outcomes but also facilitating comprehensive development of learners through continuous feedback and motivational mechanisms.
3.2 Evaluation Standards

In game-based learning, educational evaluation standards are key to measuring the effectiveness of learning outcomes and processes. These standards encompass multidimensional assessments of students' knowledge mastery, skill development, and problem-solving abilities, while also considering engagement, collaboration, and self-directed learning capabilities. Educators gain a deeper understanding of students' learning processes by observing their interactive behaviors in games and recording their participation levels. Moreover, the quality assessment of game design is crucial, including the clarity of educational objectives, the appropriateness of challenges, and the attractiveness of interactions, ensuring the educational effectiveness of learning tools [4]. The applicability of teaching methods and teachers' facilitation skills are also focal points of evaluation, reflecting the contribution of educational strategies to enhancing learning. Assessments of learning motivation and attitudes, obtained through questionnaires and interviews, provide data to understand students' perspectives on game-based learning experiences. The scientificity, objectivity, and reliability of these evaluation standards are vital for accurately reflecting students' actual learning situations, offering educators effective feedback and improvement suggestions, while ensuring fairness in the evaluation process and protecting students' rights.

3.3 Methods of Evaluation

Educational evaluation methods in a game-based learning environment, by integrating game elements and mechanisms into the evaluation system, not only increase learners' engagement but also effectively monitor and promote learning processes and outcomes. The core of these evaluation methods lies in their ability to comprehensively capture learners' behaviors, strategies, and outcomes, while providing timely, personalized feedback [5]. Compared to traditional evaluation methods, gamified evaluation emphasizes learners' active participation and real-time progress feedback, more accurately reflecting learners' actual learning states. Furthermore, evaluation methods in game-based learning focus on stimulating learners' intrinsic motivation. By setting challenging tasks and reward mechanisms, they encourage learners to continually enhance their learning capabilities and problem-solving skills while pursuing achievements [6].

Table 1. Comparison of Evaluation Methods in Game-based learning

<table>
<thead>
<tr>
<th>Evaluation Dimension</th>
<th>Traditional Evaluation Methods</th>
<th>Gamified Evaluation Methods</th>
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<tbody>
<tr>
<td>Engagement</td>
<td>Low, often passively received</td>
<td>High, active participation in the game-based learning process</td>
</tr>
<tr>
<td>Feedback Timeliness</td>
<td>Delayed, usually after testing</td>
<td>Immediate, real-time feedback during the game</td>
</tr>
<tr>
<td>Personalization</td>
<td>Limited, uniform standard evaluation</td>
<td>Strong, feedback customized based on learner performance</td>
</tr>
<tr>
<td>Motivation</td>
<td>Weaker, relies on external rewards</td>
<td>Strong, combination of intrinsic motivation and game rewards</td>
</tr>
<tr>
<td>Skill Development</td>
<td>Singular, focused on knowledge memorization</td>
<td>Comprehensive, promotes problem-solving and collaboration skills</td>
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</table>

3.4 Evaluation Outcomes

Educational evaluation within the realm of game-based learning, through its innovative evaluation methods, has significantly increased learners' engagement and motivation while enhancing learning effectiveness. The combination of qualitative and quantitative evaluation methods not only captures learners' intuitive performances but also reveals specific improvements in learning outcomes through data analysis. Furthermore, the game-based learning environment has promoted the development of self-directed and collaborative learning. The effective integration of
these teaching strategies has provided learners with a richer and more dynamic learning experience [7]. Research findings further validate the effectiveness of game-based learning in educational evaluation, demonstrating its positive impact on increasing learning motivation, enhancing learning outcomes, and encouraging learners’ active participation in the learning process.

<table>
<thead>
<tr>
<th>Effectiveness Indicator</th>
<th>Description</th>
<th>Research Support</th>
</tr>
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<tbody>
<tr>
<td>Learner Engagement and Motivation</td>
<td>Significantly increased, learners are more actively involved in the learning process</td>
<td>Studies show that student engagement and motivation are significantly enhanced in a game-based learning environment</td>
</tr>
<tr>
<td>Learning Outcomes</td>
<td>Learners perform better in knowledge acquisition and skill development</td>
<td>Surveys indicate noticeable improvement in students' learning achievements within game-based learning settings</td>
</tr>
<tr>
<td>Self-directed and Collaborative Learning</td>
<td>Promotes learners' capabilities in self-directed and collaborative learning</td>
<td>Research finds that game-based learning strengthens students' self-directed and collaborative learning</td>
</tr>
<tr>
<td>Learner Evaluation</td>
<td>Students' evaluations of game-based learning methods are generally positive</td>
<td>Questionnaire results show that students find game-based learning more interesting and motivating for learning</td>
</tr>
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</table>

4. Pathways to Implementing Educational Evaluation

4.1 Cultivating a Gamer's Mindset

Game-based learning, a significant part of educational innovation, centers on cultivating students' gamer mindset through the introduction of game mechanics. This mindset emphasizes the enhancement of problem-solving, strategic planning, and teamwork skills. To achieve this goal, educators need to set specific, quantifiable learning objectives combined with challenging tasks to stimulate students' intrinsic motivation and improve their problem-solving abilities. The establishment of real-time feedback and reward systems allows students to understand their performance promptly and adjust their learning strategies while maintaining enthusiasm and participation [8]. Additionally, educators should encourage learning through cooperation and competition, not only fostering team spirit but also stimulating competitive awareness and self-drive. Providing personalized learning paths based on students' unique needs and interests ensures personalized matching of teaching content and tasks, thus promoting the formation of a gamer's mindset. Finally, a diverse design of game-based learning activities, such as problem-solving, role-playing, and simulations, can effectively stimulate different cognitive abilities of students, promoting their comprehensive development. The comprehensive application of these strategies provides a solid foundation for cultivating students' gamer mindset, thereby enhancing their learning and thinking abilities comprehensively.

4.2 Application of the PBL Model

The integration of game-based learning with the Problem-Based Learning (PBL) model offers a novel perspective for educational evaluation. In this model, students engage in the resolution of real or hypothetical problems through game activities, promoting the internalization of knowledge and the development of critical thinking and collaborative skills. The implementation of educational evaluation needs to focus on students' learning outcomes, including their understanding of chemical concepts and principles, application of problem-solving strategies, and demonstration of innovative thinking during the learning process [9]. Furthermore, the evaluation of teamwork should not be overlooked, involving students' communication, collaboration, and leadership within group interactions. Additionally, evaluating the game experience is essential, reflecting the attractiveness
of learning activities and the effectiveness of instructional design through students' engagement and satisfaction. The comprehensive application of these evaluation methods helps to fully grasp students' learning effects, providing references for improving teaching activities and enhancing educational quality. In summary, the PBL model in game-based learning presents new requirements and challenges for educational evaluation, necessitating the design of a reasonable evaluation system to promote comprehensive development of students' abilities\cite{10}.

### 4.3 The Joint Role of Instructor Guidance and Game-Adaptive Push

#### 4.3.1 Instructor Mobilization and Guidance

In a game-based learning environment, the role of instructors transforms into game designers, educators, and, importantly, guides. By designing attractive game-based learning content, instructors stimulate learners' interest and participation. Moreover, providing personalized learning support and immediate feedback, fostering cooperation and competition among learners, are core strategies for instructor mobilization and guidance. Practical examples like Kahoot!, Minecraft, and Duolingo demonstrate the potential for instructors to enhance teaching effectiveness through gamified means.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
<th>Practical Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designing Engaging Learning Content</td>
<td>Utilize game elements to design interesting learning activities</td>
<td>Kahoot!'s quiz games</td>
</tr>
<tr>
<td>Providing Personalized Learning Support</td>
<td>Adjust teaching methods based on learners' needs</td>
<td>Duolingo's personalized language courses</td>
</tr>
<tr>
<td>Promoting Cooperation and Competition</td>
<td>Encourage interaction and competition among learners</td>
<td>Minecraft's team tasks Minecraft</td>
</tr>
<tr>
<td>Offering Instant Feedback and Rewards</td>
<td>Use gamified tools to provide learning feedback</td>
<td>Kahoot!'s real-time ranking</td>
</tr>
</tbody>
</table>

#### 4.3.2 Rationality of Task Gradient

The design of tasks in game-based learning should closely align with learning objectives, ensuring that the difficulty of tasks matches learners' abilities to prevent the emergence of frustration. A rational task gradient design must integrate learners' feedback and assessment results, adjusting the difficulty in a personalized manner to foster self-directed learning and self-regulation abilities. In practice, examples such as progressive exercises in language learning, hierarchical challenges in mathematics problems, and in-depth exploration in scientific experiments all reflect the importance of gradient difficulty design.

### 4.4 Enhancing the Hierarchy of Knowledge

In the study of educational evaluation pathways under game-based learning, enhancing the hierarchy of knowledge is a key link in achieving educational objectives. Game-based learning lays a solid foundation for the elevation of knowledge levels by stimulating motivation and participation. Specifically, game-based learning leverages its unique advantages, such as enhancing memory, fostering creativity and problem-solving abilities, and promoting collaboration and team spirit, all of which create favorable conditions for deepening understanding and applying knowledge. Furthermore, the principles and methods of constructing an educational evaluation system, especially the evaluation indicators for learning processes and environments, provide educators with tools and methods to quantify learning effects \cite{11}. This, in turn, allows for targeted adjustments to teaching strategies, promoting the enhancement of students' knowledge levels. In summary, game-based learning not only transforms the way of learning but also ensures the effectiveness of educational evaluation and continuous improvement of teaching quality through a series of scientifically sound evaluation systems, thereby effectively enhancing students' knowledge hierarchy.
5. Conclusion

In the study of educational evaluation pathways within the context of game-based learning, enhancing the levels of knowledge is a key component in achieving educational goals. Game-based learning lays a solid foundation for the elevation of knowledge levels by stimulating motivation and participation. Specifically, game-based learning utilizes its unique advantages, such as enhancing memory, fostering creativity and problem-solving abilities, and promoting cooperation and team spirit, all of which create favorable conditions for deepening understanding and applying knowledge. Furthermore, the principles and methods of constructing the educational evaluation system, especially the evaluation indicators of the learning process and environment, provide educational practitioners with tools and methods to quantify learning effects. This enables targeted adjustments to teaching strategies, promoting the enhancement of students' knowledge levels. In summary, game-based learning not only changes the way of learning but also ensures the effectiveness of educational evaluation and the continuous improvement of teaching quality through a series of scientific and rational evaluation systems, effectively enhancing students' knowledge levels.

References


