Investigating the Impact of Different Learning Assessments on Students' Adoption of Learning Strategies Through Explore-Exploit Tensions

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Abstract. In the current educational reform, learning assessment activities demonstrate diversity and integration. students can actively engage in the evaluation process and monitor their learning performance across different aspects over time. However, limited research conducted on students' psychological acceptance and utilization of diverse types of learning assessments. This study examines the psychological changes in young students' learning assessment activities from the perspective of their trade-off between information exploration and exploitation. Regarding participation, students tend to rely more on teachers' intuitive quantitative evaluations rather than placing trust in results obtained through interactions with their teachers and peers. Regarding the use of evaluation results, grade-related assessments are easier for students to utilize, while assessments involving strategies, attitudes, and emotions are often perceived as less valuable. In terms of self-regulation and knowledge application, students encounter challenges when attempting to acquire useful information independently and adjust their future learning strategies. Adjusting future learning strategies based on quantifiable results such as grades is relatively straightforward for students. Based on these findings, this study proposes three pedagogical recommendations. Firstly, the teacher should establish an appropriate assessment environment. Secondly, the cultivation of students' self-regulation skills should be emphasized throughout the evaluation process. Finally, the teacher should set short-term learning goals for enhancing student abilities while fostering long-term goals aimed at developing personal adaptability skills.

Keywords: learning assessments, learning strategies, explore-exploit dilemma.

1. Introduction

The goal of instructional activities is to cultivate individuals with overall development. Assessment for Learning, as a crucial component of these activities, entails the process of assessing, analyzing, and measuring students' learning progress and outcomes. With the advancement in educational theories and evaluation practices, there have been significant transformations in both the theory and practice of learning evaluation. In China, assessment for learning is progressively shifting towards a process-oriented approach that emphasizes developmental aspects and in-depth assessment. This shift aims to move away from solely relying on examinations that prioritize knowledge acquisition while undervaluing practical application. The reform of assessments not only seeks to scientifically and effectively evaluate students' knowledge and skills but also plays a guiding role in their individual development as intended by assessment for learning.

Despite the widespread recognition of the significance of assessment for learning in educational activities, there exist divergent interpretations regarding its definition. At its core, assessment for learning entails a process that involves gathering, analyzing, and processing pertinent information to further evaluate students' developments and achievements in their learning progress [1]. Consequently, the primary functions of assessment for learning can be delineated as follows: firstly, it enables appropriate control and regulation for subsequent teaching and learning activities. Secondly, it facilitates the provision of clear objectives and guidance for students. Thirdly, it fosters students' motivation to learn and cultivates their drive toward autonomous development [1,2].

It is undeniable that different types of learning evaluation possess their advantages. For instance, diagnostic evaluation can provide a more intuitive representation of students' learning achievements

through scores at specific stages, while consultative evaluation emphasizes students' self-management ability in one aspect of their development. The integration of these two evaluations can yield complementary effects, enabling both teachers and students to continuously focus on the efficacy of cultivating specific abilities during the teaching process, whether it be reflected in grades or students' emotions. Consequently, exploring how to integrate these assessments for learning to guide further education has become a primary direction for numerous current studies on assessment for learning. However, few studies have addressed the impact of diverse evaluations from the perspective of students' cognitive development and habits. This study aims to analyze the characteristics of different ways of evaluations and examine their influence on students' cognitive development and habits with an endeavor to identify improved strategies for learning assessment based on students' cognitive development.

2. Features and Issues on Current Learning Assessment Approaches

There are diverse evaluation approaches implemented across different educational stages in contemporary China. Particularly, with the endorsement of educational reform and the integration of intelligent tutoring systems based on large-scale language models, the modes of assessment have gradually shifted from quantitative and summative evaluations to process-oriented, development-focused computer-assisted assessments. Categorized accordingly, learning evaluation has primarily undergone three phases: teacher-led learning assessments, interactive assessments involving teachers and students, and computer-supported assessments empowered by digital technologies.

2.1. Teacher-Led Learning Assessments

Teacher-led evaluation is characterized by the teacher's decision-making power over the evaluation content and their dominant role throughout the assessment process. Students, as recipients of evaluation, can only passively accept the teacher's judgment [2]. This approach encompasses summative, diagnostic, and even some kinds of formative evaluations where teachers act as primary evaluators. These kinds of assessments also have a name called "Assessment of Learning", aimed to record students' achievement [3]. Due to the teacher's authoritative position and professional authority in the classroom, these evaluation methods ensure students' trust in the reliability of assessment results. Consequently, when students receive evaluations dominated by teachers, they simply need to assess whether their abilities meet the goals that may mainly be set by their teachers and the examination and adjust their further learning direction accordingly.

Despite this, such a straightforward and intuitive evaluation method also possesses evident limitations. Even for a process-oriented evaluation that emphasizes student development and change, teacher-led learning assessment methods imply that the teacher has complete control over the evaluation content, approach, and criteria. Students have no agency in this process, rendering them passive recipients throughout the learning process. Consequently, it is prone to situations where the assessment content and format appear overly simplistic in actual teaching [2]. In the evaluation process, there is an excessive emphasis on examining students' knowledge retention, with a focus on changes in scores [4]. As a result, the humanistic qualities of students' development are often overlooked [1]. This type of learning evaluation exhibits a clear "utilitarian tendency" that integrates the goal of "only scores" into every step of the learning process. Consequently, these knowledge points are disconnected and counted as "gainable" score points by students during teaching [5]. Under such an evaluation system, it is evident that students' cognitive processes tend to proceed incrementally like "1+1=2", rather than constructing knowledge as a whole structure.

2.2. Interactive Assessments Involving Teachers and Students

The distinguishing features of enhanced student engagement in evaluation lie in the facilitation of communication between students and teachers or peers, which propels the evaluation process forward. The content of evaluation is not confined to mandatory requirements imposed by instructors; rather,

it can be based on students' autonomous selection of crucial course components or serve as a reflection of their comprehensive efforts and learning accomplishments. These assessments serve a consistent purpose, primarily derived from student engagement in assessment activities, which yield valuable learning information necessary for students to develop effective learning strategies and plans [3]. In light of these characteristics, teacher-student negotiation evaluation, peer evaluation, and self-evaluation emerge as exemplary instances. Unlike teacher-led feedback that facilitates students' understanding of the disparity between their current performance and desired learning objectives, this form of interaction among students and their teacher, as well as their peers, can stimulate students' introspection regarding the evaluations they receive and foster an impetus for enhancing their learning strategies.

Despite many studies showings that interactive assessments for learning are more beneficial for students' cognitive development, such not only consumes time but is also challenging for teachers and students to accept in actual teaching. Under the pressure of various exams, many teachers and students insist that achieving higher exam scores is the ultimate goal of learning, so such assessments are no different from wasting "valuable" instructional time. Moreover, both teachers and students are psychologically reluctant to accept this type of evaluation. Teachers are reluctant to give up their authoritative roles in the classroom, while students are unwilling to assume the responsibility of providing feedback to their peers. Furthermore, the evaluation results can only help adjust teaching goals and students' learning state, but cannot truly measure their competence levels.

2.3. Computer-Supported Assessments

Most evaluations of computer-supported learning are designed based on online course platforms, such as MOOCs, and Intelligent Tutoring Systems (ITS). The learning evaluation model primarily encompasses three aspects: First, test-based evaluation, which includes pre-class, in-class, and post-class tests to assess students' knowledge. Second, interactive evaluation, involves the establishment of an online communication platform for teachers and students to evaluate creative achievements or practical abilities while providing opportunities for students to further refine their learning products [6]. Third, process tracking through recording students' learning progress, and facilitate self-awareness of their academic performance [3,7,8]. In short, computer-aided learning evaluation can be viewed as an integrated assessment encompassing diagnostic evaluation, communication evaluation, and self-evaluation facilitated by an online platform.

The main advantage of computer-based, particularly AI-assisted, assessment in classroom teaching is the real-time collection and tracking of diverse data changes. This includes students' mastery of knowledge and skills, interaction during learning, resource utilization, and emotional attitude changes. Unlike assessments that focus on knowledge retention, the assessment model based on digital techniques shifts its focus from tracking knowledge retention to monitoring thinking changes during the application of knowledge and problem-solving processes [7]. Analyzing performance evaluation datasets at different stages, can reveal growth patterns and provide a reference for evaluating individual heterogeneity scientifically and objectively [8]. This type of assessment not only focuses on student's final academic achievements but also highlights their genuine progress over time. It reflects an intrinsic educational development perspective that values effort rather than solely comparing basic abilities [6, 7].

Despite the advantages, the technical limitations of existing MOOCs and ITS result in the primary evaluation of actual teaching being based on assignment completion and final exams [9]. This type of evaluation primarily provides a final grade through fixed-answer assignments and exams. Moreover, due to the large student population in online courses, particularly in humanities and social sciences subjects, teachers are unable to assign assessments such as essays and writing tasks for evaluating students' knowledge acquisition due to impractical one-on-one evaluations [8, 10]. Additionally, the singular mode of learning assessment leads to low student engagement in online courses. Although students can complete the course, they may neglect communication opportunities

with teachers and peers on the platform due to asynchronous communication, and lack of interest in learning, resulting in underutilization of learning resources.

3. The Exploration-Exploitation Reasons Behind the Issues

Regarding the current Chinese educational reality, the issues associated with the first three types of learning assessments primarily stem from an overemphasis on examinations. On one hand, students tend to prioritize direct assessment by teachers as a means to achieve higher grades and gain admission into superior schools, subsequently adjusting their further learning strategies based on these grade-based evaluations. On the other hand, to optimize knowledge transmission efficiency and standardize classroom discipline, teachers tend to directly observe, evaluate, and control students' engagement in classroom learning activities. However, considering the cognitive aspects related to teenagers' exploration and utilization of knowledge, it appears that there are underlying psychological reasons influencing students' adoption of different types of learning assessments.

3.1. Psychological Traits Involved in the Evaluation Process

The exploration-exploitation dilemma can be understood as the choices made by learners during knowledge acquisition, between exploring new knowledge and exploiting existing knowledge to efficiently obtain the required information [11]. In a stable learning environment, individuals typically engage in observation and exploration at the outset of an activity. Once they perceive that the newly acquired information fulfills their needs, they cease exploration and commence utilization of this acquired knowledge [12]. When applied to students' participation in learning evaluations, teacher-led assessments create a stable environment where students passively receive feedback from their teachers. Initially, upon receiving feedback, students may imitate and reflect on their learning based on the evaluations provided by teachers. This represents exploratory behavior for self-reflection. However, young learners who lack efficient judgment of effective strategies or finding alternative methods may eventually rely solely on teacher-provided feedback. This is because excessive energy consumption or failure to achieve the desired learning outcomes prompts students to reassess the cost of this exploratory self-assessment process, thereby avoiding further losses. In other words, particularly among young learners, there is a tendency towards adopting more "energy-saving" and "risk-avoiding" assessments for learning characterized by excessive dependence on teacher-led feedback.

On the other hand, communicative-based assessment among teachers and peers can create an uncertain learning environment. This uncertainty refers to students' challenges in predicting whether they will receive valuable assessments from sources other than their teachers during interactions, as well as whether non-graded diagnostic assessments can help improve their academic performance. In such uncertain environments, exploration offers potential for new information and opportunities but is more prone to failure. While individuals alternate between exploring for new information and exploiting known options, it becomes clear that relying on established options can lead to stable outcomes [12]. During actual learning processes, individuals prioritize acquiring relative knowledge by minimizing losses when they cannot determine which methods would yield maximum benefits [13]. Therefore, while young learners have the opportunity to acquire broader knowledge through communication activities with teachers, peers, and themselves, they may be inclined towards intuitive information that supports their learning goals [11]. Consequently, when faced with immense examination pressure, learners may overlook evaluations that assist them in adjusting study strategies or emotional attitudes. Instead, they tend to seek evaluations that bridge the gap between knowledge acquisition and desired scores.

3.2. Cognitive State During the Utilization of Learning Materials

In theory, the integration of diverse learning assessments can offer a more comprehensive evaluation of students' knowledge acquisition. For instance, teachers adopt diagnostic assessments

before class to understand students' prior experiences and learning levels. Throughout teaching activities, formative assessment can focus on various aspects of student performance, including engagement, cooperation awareness, inquiry consciousness, and learning methods. After teaching activities conclude, summative assessment can be utilized to determine whether students have attained the anticipated knowledge and accomplished predetermined objectives [5]. By integrating these three evaluation methods, it becomes possible to achieve timely tracking and analysis of students' learning status and changes in their abilities, thereby facilitating more effective development for their future growth. Nevertheless, numerous studies have discovered that providing intuitive feedback from learning assessments may not influence students' utilization of strategies or their reflection on their learning. In particular, communication-based evaluations like peer assessment may yield substandard feedback, characterized by excessive information, lack of focus, or irrelevance to the student's existing knowledge or learning outcomes, thereby failing to facilitate students' learning and assessment process.

Therefore, students prioritize reviewing subject knowledge that they struggle to grasp during exams and then memorize the missing knowledge to improve their scores in subsequent exams. This issue can be identified based on test scores. In contrast, the outcomes of formative assessments that focus on emotions, learning status, habits, etc., are challenging to summarize as direct causes influencing academic performance. Additionally, a significant concern arises from the limited cognitive abilities of students which may hinder their effective utilization of learning assessment results. Especially for adolescent students, may not smoothly derive relevant learning strategies from their learning outcomes or progress, guiding their subsequent learning activities [3]. Consequently, this aspect tends to be overlooked by students.

3.3. Psychological Mechanisms Behind Learning Strategy Selection

Particularly after accomplishing a learning task, learners should be capable of reflecting on the attainment of their predetermined objectives. Ideal learners can adapt their current learning strategies based on evaluations they received, thus establishing a virtuous cycle from evaluation to self-regulation [14]. From various perspectives on content learning strategies, it is widely acknowledged that deep-level learning strategies aimed at knowledge comprehension and application contribute to higher-quality learning compared to those solely focused on rote memorization. However, in social content where emphasis is placed more heavily on learning outcomes and scores, knowledge memorization and recitation prove more effective than deep understanding and application of knowledge [3].

Assessment for learning can be perceived as a steady return at the end of the learning activities, as students can receive evaluations and improvement methods from others within a specific time frame, regardless of the quality of the feedback. This receiving of feedback can be viewed as an effective exploration of acquiring information self-regulatory during the learning process and providing additional insights for future development and decision-making. Unlike receiving assessment results from diverse sources, adjusting future learning strategies through evaluation results represents a behavior that seeks uncertain outcomes. This emphasis on uncertainty-seeking for the future pertains more to variable outcomes rather than their potential value [13]. In other words, intuitional feedback and evaluation offer valuable information in proportion to the time horizon, since accumulated information over an extended period becomes increasingly valuable. However, prolonged time may not necessarily benefit learners to a greater extent when it comes to uncertain outcomes like the efficacy of adjusting learning strategies. The reason is the potential failure of students to effectively adapt their future learning strategies based on assessment results, and even worse, they may spend a lot of time adapting to new learning methods without achieving better improvement in abilities or obtaining higher scores. Perhaps this is why teachers provide less feedback on students' learning strategies changing during the evaluation process. Similarly, students also exhibit less concern towards changes in their learning strategies but instead prioritize outcome-oriented focus.

4. Suggestions

4.1. Creating an Appropriate Evaluation Environment

The essence of education lies in guiding children to gradually acquire cultural concepts, methods, tools, and resources accumulated by humanity--from concluding personal experiences and interacting with others to developing a rational awareness of and participating in society [7]. From this perspective, evaluation not only serves as a judgment of students' learning outcomes but also facilitates the construction of structured knowledge skills, thinking patterns, and inquiry modes [8]. Therefore, teachers should create an appropriate evaluation environment that is open-ended and encourages students to further explore through evaluations. In other words, an environment suitable for evaluation should also foster students' curiosity and security that is not afraid of failure, while respecting their autonomy in taking the next steps [15].

Furthermore, the assessment environment should be regarded as an ongoing process rather than a mere final judgment of learning outcomes. Teachers should consistently provide timely feedback that not only focuses on superficial learning outcomes, such as knowledge retention, but also emphasizes students' utilization of acquired understanding to analyze, evaluate, and create performance. The latter aspect establishes the groundwork for students to cultivate their ability to employ diverse learning strategies. By encouraging students to scrutinize how they can apply acquired knowledge and assess their learning process, they can acquire proficiency in determining when specific learning strategies should be employed.

4.2. Facilitating the Cultivation of Students' Self-Regulatory Abilities

In the continuous research and reform of teaching, it has been observed that employing a teacher-led evaluation method for learning outcomes results in students consistently assuming the role of being evaluated, thereby reducing their active engagement in the evaluation process. Concurrently, students' reliance on teachers as authoritative roles becomes more pronounced, leading them to overlook self-reflection regarding their learning progress and accomplishments. However, it is widely acknowledged that individuals' learning process should be grounded in pre-existing knowledge frameworks and promote the cognitive development of constructing and applying new knowledge to solve problems, rather than relying solely on repetitive drilling and rote memorization. Consequently, an ideal learning process should prioritize the cultivation of self-management and self-regulated learning [3].

Formulating an efficacious new learning strategy necessitates both the capacity to generate alternative solutions to the original approach and the ability to discern and adopt the most viable one from those alternatives [11]. These represent typical exploitative capabilities. Consequently, students need more support from teachers to help them transition from receiving feedback to using the valuable information in feedback to guide their subsequent learning actions. This is an exploration-exploitation tradeoff in the process of learning assessments that learners need to make. On one hand, embracing extensive and multidimensional learning evaluations enables learners to gain a comprehensive understanding of their current level and learning strategies. On the other hand, effectively utilizing their evaluation results to select beneficial strategies for guiding subsequent learning is essential for achieving further learning accomplishments [12].

4.3. Integrating Short and Long-Term Goals for Assessments

In the process of implementing learning assessment, teachers should establish both short-term and long-term goals for evaluating students' learning outcomes. Short-term goals, in conjunction with periodic assessments, can help reduce students' perception of the cost associated with learning and provide them with more information to achieve specific stage-based objectives. Short-term goals should focus on knowledge acquisition and skill improvement, while long-term goals should concentrate on fostering and adjusting students' self-regulation abilities and study strategies. This is because rapid adjustments made by students based on their assessment of their learning status and

strategies are likely to fail. Consequently, students may perceive such strategies as ineffective or consider the development of self-regulation skills too demanding. As a result, they tend to rely on quantified feedback provided by teachers as it enables them to enhance their grades and scores by addressing any knowledge gaps identified through this feedback mechanism, thereby maximizing their efforts and rewards during the learning process. Therefore, expanding the scope of evaluation in this aspect encourages students to recognize longer-term benefits while somewhat alleviating the burden associated with developing self-regulation skills.

5. Conclusion

This study analyzed the current state of learning assessments in China, categorizing them as teacher-led, interactive, and computer-based. The findings reveal that these methods have varying effects on students' adoption of learning strategies. Teacher-led assessment provides professional and authoritative results, saving time for students to analyze their follow-up strategies. However, it may overlook student initiative and excessively prioritize academic performance and grades. On the other hand, interactive assessments consider student initiative by addressing not only academic performance but also emotional adjustment and learning strategies. However, the interactive learning assessment requires teachers and students to put more effort into recording, communicating, and adjusting the assessment content and quality. Lastly, computer-based assessments track real-time data changes to focus on students' thinking processes during knowledge application and problem-solving. Nevertheless, technical limitations in online courses and intelligent teaching systems result in assessments primarily based on assignments and final exams with limited student engagement.

Although different types of learning assessments benefit students, the psychological state of students should also be considered when implementing assessments--specifically, which type they are more receptive to. From attending the evaluation process, students prefer direct evaluations from teachers as they can directly obtain adjustment methods for their further learning strategies. However, this approach may diminish their ability for self-assessment and self-regulation over time. In terms of resource allocations, assessments related to grades are easier for students to utilize. Conversely, evaluations of strategies, attitudes, emotions, and other aspects are often perceived as useless due to limited cognitive abilities. Lastly, when adjusting learning strategies after evaluation, students tend to proactively identify deficiencies based on quantifiable results such as scores; whereas evaluations on self-regulation and application of knowledge make it difficult for them to obtain beneficial information about themselves and independently adjust future learning strategies.

This study focuses on the psychological changes experienced by students in response to different types of evaluation and further explores the advantages and implementation challenges associated with various forms of learning assessment from the perspective of students' acceptance of these changes. However, it is important to note that this study is based on a theoretical analysis of the characteristics underlying psychological transformations during information exploration and exploitation processes, thus requiring additional evidence and research for further elucidation and confirmation.

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