Education Insights

Review

Research on the Integrated Model of Learning-Assessment-Teaching and Smart Classroom

Lihua Liu [1,*]

[1] Foreign Language School, Taishan University, Taian, China
* Correspondence: Lihua Liu, Foreign Language School, Taishan University, Taian, China

Abstract: The process of educational reform and the improvement of teaching practices indeed encompasses all aspects related to learning, assessment, and instruction, as well as the implementation of smart classrooms. Putting learning, assessment, and instruction at the center of this process actually means breaking down the existing barriers that are between these three key areas. At the same time, the benefits that are of a smart classroom environment do foster organic connections that are between learning, assessment, and guidance. The current smart classroom model makes use of data that is on the learning context as a central connecting element and, by smoothly integrating the assessment process into the whole learning process, makes it possible for the optimized design and effective implementation that are of educational goals. This smart classroom model not only meets the requirements that are of modern teaching but also addresses the urgent need that is for individualized student support and improved teaching quality. Moreover, the smart classroom model provides concrete examples that are of application and serves as a source that is of inspiration for new and innovative pedagogical practices that are in primary, secondary, and higher education.

Keywords: Integration of learning, assessment, and teaching; Smart classrooms; Teaching models; Data-driven

1. Introduction

Education and teaching are currently being radically changed from conventional methods to enhance efficiency and precision in learning outcomes through a continuing redefinition of assessment as it pertains to the intelligence and integration of smart classrooms [1]. The inability to properly connect the method of teaching to how students are assessed, as well as connecting how students learn to how they are taught with many of the same issues that exist in educational settings today; However, this does not equate to low effectiveness overall in learning/teaching. The integration of both types of learning within the same intelligent environment will enhance these two different forms of learning by creating greater dual effectiveness in learning and teaching as well improving upon the quality of education in general [2].

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2. The Internal Logic of Integrating the "Learning-Assessment-Teaching" Integration Model with Smart Classrooms

2.1. Core Concepts and Processes of the "Learning-Assessment-Teaching" Integration Model

The goal of integrating student progress with teaching and assessment is to break down all barriers between student, teacher, and learning - by setting specific and measurable objectives for each element before the teacher begins instruction [3]. This measure allows the teacher to evaluate effectiveness in meeting the goals as determined at the end of the course. Continuously evaluating the process of teaching and learning gives the teacher the opportunity to evaluate the effectiveness of the teaching and learning process and make adjustments to teaching and learning support accordingly [4]. In determining learning objectives, the teacher will develop learning objectives based upon

each student's current learning status as opposed to a more traditional reliance upon testing content and "assess" success through methods commensurate with the assessment objective. Accordingly, students will be assessed while being instructed, that is, assessed as they complete the assigned learning tasks. Upon completion of the assessment of all students during the instructional process, the teacher will then modify the instructional plan and content in accordance with each student's learning status and provide clear directions and feedback to the student [5].

2.2. Technological Support and Environmental Characteristics of Smart Classrooms

Smart classrooms are typically supported by technology through basic tool suites that fulfill the closed-loop requirements to create a linkage between the three levels of becoming integrated with respect to learning, assessment, and the way teaching is conducted [6]. These types of tools include the use of smart whiteboards, systems for collecting data associated with the learning environment, as well as basic teaching and learning materials and techniques. This interactive teaching environment allows for interactive teaching and learning, as opposed to the traditional method of one-way teaching [7]. Teachers receive real-time answers from students by utilizing technology, which promotes the more traditional use of teachers to provide real-time and personalized learning tasks and assessments after class. In fact, the purpose of smart classrooms is not so much to formalize intelligent technology; instead, the objective is to be able to adapt intelligent technologies to the real-time teaching activities occurring in the classroom in order to make intelligent technology a necessary part of the entire learning, evaluation, and teaching processes within a classroom, while providing support for the normal routine of teachers' daily teaching and students' daily learning behaviors and reducing or eliminating any potential interference [8].

3. Constructing a Teaching Model That Combines the "Learning-Assessment-Teaching" Integration Model with Smart Classrooms

3.1. Objective Level: Designing Instructional Objectives for the Integrated Model

The teaching objectives of the integrated mode are closely designed around the core requirement of integrating "learning, evaluation, and teaching" with the smart classroom, and are combined with the actual teaching abilities of teachers and the cognitive patterns of students in the classroom [9]. When designing goals, teachers first use the basic functions of smart classrooms to collect learning situations, sort out students' knowledge weaknesses and learning habits. Subsequently, the overall goal is decomposed into stage tasks that can be disassembled and monitored to avoid the goal being too vague and difficult to implement. The teaching objectives of teachers focus on providing precise guidance based on learning situations, while the learning objectives of students focus on independently completing stage tasks and actively responding to evaluation feedback. The evaluation objectives are closely related to the first two, with a focus on dynamically capturing the real performance during the learning process, rather than setting evaluation standards that are detached from reality. In the process of goal design, we will avoid using rigid expressions and adjust specific content according to the teaching characteristics of different stages. The goal should not only conform to the convenient characteristics of smart classrooms, but also truly integrate into the closed-loop process of enrollment, evaluation, and teaching, and be in line with the actual operational situation of teachers' daily teaching, avoiding vague designs that seem comprehensive but difficult to implement [10].

3.2. Structural Level: Closed-Loop Operational Mechanisms for the Three Components

The closed-loop operation mechanism of learning, evaluation, and teaching is the core part of this integrated model architecture. It breaks the problem of these three links being independent and weakly connected in traditional teaching [11]. This mechanism relies on the basic tools of smart classrooms to achieve seamless connection and dynamic optimization of various links. Teachers carry out targeted teaching activities based on pre-

set teaching objectives. The teaching process is no longer limited to one-way teaching, but combines the interactive function of intelligent blackboards to guide students to actively participate in learning tasks, and students can synchronously obtain real-time evaluations during the learning process. The evaluation content is not limited to the mastery of knowledge points, but also includes observable details in daily life, such as learning attitude and classroom participation. The evaluation results will be provided to teachers in real-time through a simple interactive platform. Teachers can quickly identify students' common problems and individual differences without complex operations, and then adjust the subsequent teaching content and pace. At the same time, the evaluation feedback will be synchronously conveyed to students, guiding them to adjust their learning behavior based on the feedback. The entire operational process forms a complete closed loop. Each stage is closely linked to the results of the previous stage and supports the development of the next stage. This system adapts to the daily teaching pace of frontline teachers without adding additional teaching burden, while providing clear guidance and adjustment direction for students' learning process, thus avoiding a closed loop that becomes a formality [12].

3.3. Support Layer: Data Flow and Feedback Pathways in the Smart Classroom Environment

In the smart classroom environment, data flow and feedback path are key supports for implementing the fusion mode. The data sources are all from real-life teaching scenarios and do not involve complex data processing techniques. Its core lies in achieving precise transmission and efficient application of data related to learning, evaluation, and teaching. The data stream is centered around student learning behavior data, covering content that teachers can easily collect on a daily basis, such as classroom answering situations, homework completion quality, and interactive participation performance. These data are automatically aggregated through the basic interactive platform of the smart classroom, without the need for teachers to manually organize them, saving teaching time and ensuring the authenticity of the data. The data feedback path adopts a bidirectional transmission mode. Teachers can quickly obtain students' collective and individual data through the platform, without the need for complex analysis, to accurately locate teaching weaknesses and make precise adjustments to teaching strategies. At the same time, concise and clear feedback content will also be conveyed to students. The feedback content does not pile up professional terms, but points out problems and improvement directions based on specific learning contexts, so that students can clearly recognize their own shortcomings. The entire process of data flow and feedback is in line with the daily teaching process of teachers, and will not add additional workload to teaching. The feedback frequency will also be flexibly adjusted according to the teaching progress to avoid data retention or excessive feedback affecting the teaching pace. It has truly become the core link connecting learning, assessment, and teaching, meeting both the cognitive level of the public and the practical needs of frontline teaching.

3.4. Implementation Layer: Operational Workflows and Key Stages

The operation process of this integrated model follows a gradual process, with the unified logic of "learning evaluation teaching" and the smart classroom environment as the core. It seamlessly integrates with the daily teaching pace of frontline educators, emphasizing practicality and feasibility at critical stages while avoiding overly complex steps. The process begins with an analysis of pre class learning. At this stage, teachers use simplified learning assessment tools in smart classrooms to identify areas where students still have questions and knowledge gaps. Based on these understandings and teaching objectives, they determined the core content and evaluation criteria for this lesson. At the same time, they will also assign concise preview tasks to familiarize students with the learning content and prepare them for classroom learning. During the teaching process, teachers use intelligent interactive whiteboards to promote students' active participation through classroom quizzes and group discussions, and integrate the evaluation process throughout to achieve seamless integration. Through real-time questioning and feedback, teachers can monitor student engagement without relying on formal assessments, and can

promptly address issues and adjust teaching strategies accordingly. In the post class stage, the focus is on personalized guidance and feedback. Teachers tailor consolidation exercises for students of different levels based on classroom data and homework situations. The evaluation results are presented in easy to understand language, which encourages students to independently correct errors and organize key concepts. All key stages are closely linked to data-driven feedback and teaching adjustments, and are adapted to the actual abilities of teachers in different grades. This ensures that students can keep up with the teaching progress, with each step built naturally on the previous one, always grounded in the actual teaching context, thus avoiding problems such as formalism and detachment from holistic understanding in traditional teaching.

4. Specific Recommendations for Implementing the Integrated Teaching Model

4.1. Pre-Class: Precision Instructional Design Based on Student Performance Data

The prerequisite for precise teaching is to accurately assess students' learning status. The function of collecting students' learning status in smart classrooms provides strong support for pre class teaching design, breaking through the limitations of traditional pre class preparation that relies on experience and speculation. With this feature, teachers can access detailed information on each student's homework completion status, patterns of incorrect answers in class, and feedback on pre class preparation tasks. All of these contents can provide in-depth analysis of students' performance in the classroom. In addition, teachers can also summarize the weak links of all students and distinguish between the difficulties that are common in the whole class and the specific difficulties of individual students. For students facing common difficulties throughout the class, teachers can adjust the teaching focus, extend the explanation time for relevant issues, and supplement it with easy to understand case analysis. Teachers will provide various types of auxiliary materials and activities to address the difficulties faced by individual students. By matching expansion and supplementary tasks with students' specific learning abilities, teachers can help students lay a solid foundation before class. Teachers need to establish evaluation criteria throughout the entire teaching process in order to design questions that meet students' learning levels.

4.2. In-Class: Interactive Teaching Implementation with Embedded Assessment

The classroom is the core venue for integrated teaching. Only by integrating assessment naturally into the entire teaching process can interaction be avoided from becoming a formality and the practicality of assessment be ensured. During class, teachers need to organize various learning activities based on pre-set teaching priorities, key points, and evaluation criteria, such as classroom quizzes, group discussions, and outcome presentations, and use the basic functions of smart whiteboards to ensure that evaluations run through all aspects of the course. Teachers use interactive intelligent classroom platforms to assign layered tasks to students, create differentiated materials for students with different skill levels, and obtain real-time feedback on student performance. The classroom is the core venue for integrated teaching. Only by integrating assessment naturally into the entire teaching process can interaction be avoided from becoming a formality and the practicality of assessment be ensured. During class, teachers need to organize various learning activities based on pre-set teaching priorities, key points, and evaluation criteria, such as classroom quizzes, group discussions, and outcome presentations, and use the basic functions of smart whiteboards to ensure that evaluations run through all aspects of the course. Teachers use interactive intelligent classroom platforms to assign layered tasks to students, create differentiated materials for students with different skill levels, and obtain real-time feedback on student performance. By providing immediate feedback on student performance, teachers can quickly identify common errors and specific knowledge gaps among students, and track their learning progress immediately.

4.3. Post-Class: Data-Driven Personalized Tutoring and Reflection

It is necessary to have after class activities in order to create a solid foundation for successful teaching and fill gaps in student knowledge. Using a data driven approach to personalized tutoring and being reflective about one's teaching are two ways to increase the effectiveness of after-class activities; furthermore, one can eliminate any inefficiency that results from using a uniform tutoring model, where every student receives the same level of support after school. In order to sort out each student's learning, a teacher should utilize the educational data provided by teachers' smart classrooms that summarize student performance and the completion of homework assignments. In addition, teachers should use the data provided by the smart classroom to create individualized tutoring plans for their students that are based on the student's weaknesses and their actual learning ability, and who education has not been successful in any aspect. For those students who struggle to learn, teachers should also provide videos to reinforce concepts taught through the classroom and practice questions so that the student can develop their independent understanding of the concept through independent review and reinforcement. Teachers should communicate with students via the messaging function of the platform so that they can respond to questions quickly and efficiently; thus, reducing the time students must wait for a response and allowing them to continue progressing toward their learning goal without interruption. For students who demonstrate a high level of ability and academic performance, teachers should create higher-level learning tasks. Teachers should develop a teaching reflection plan based on the analysis of student data after each class. The plan will identify specific areas that need improvement, including delayed response to evaluation feedback, inappropriate teacher-student interaction in the classroom, and insufficient ability to explain important concepts being discussed. Finally, teachers should use the results of teaching reflection to adjust teaching strategies to meet the needs of students and improve their teaching effectiveness as teachers.

4.4. End-to-End Integration and Application of Teaching, Learning, and Assessment Data

Integrated teaching mode implementation is based on data from the teaching-learning-evaluation process, meaning to provide teaching information through breaking data barriers and so to not waste time unitizing data but rather to efficiently utilize data for teaching. It is important for the school to create one data management module to unify pre, in and post class teaching-learning-evaluation related data. This will eliminate the disconnect and confusion teachers currently experience from multiple platforms of data and allow for quick access to types of data teachers need through simple means of accessing data thereby reducing the amount of time teachers need to consolidate data by hand and improve their productivity. In using data for their teaching, teachers are required to associate pre class learning data, in class interactive evaluation data and post class tutoring feedback data in order to identify the inherent correlations such as; between the quality of preparation for pre class learning opportunities and accurate answers in class and likewise between in class interactive evaluation and successful completion of post class homework, so that teachers can then assess and modify their educational practice via the use of data to appropriately guide their educational practice. Data should be applied to the actual learning experience at the point of delivery. Teachers can use common, sorted classroom data to help them plan the next class and address problems shared by their students; Use individual student data to assist with individualized instruction, fill in the gaps in students' knowledge and continuously sort through common issues in the way data has been used, such as lack of timely feedback on data and disconnection between data and instruction, to optimize the way data is organized in real time in order to integrate data into all parts of learning, assessing, and instructing and to be congruent with what teachers do on a daily basis and be able to effectively apply without requiring on-going professional development or be of no value to the teacher as they are only used for the sake of being used.

4.5. Measures for Building a Support System of Policies, Training, and Technology

To have a long-term stable integration model, according to actual teaching conditions and needs, school authorities can develop a support system that is concise in content and implementation. Schools need to develop concise, practical management and support systems for both teachers and parents that clearly define responsibilities for data use and classroom evaluation without establishing unnecessary legal obligations. Schools should also implement flexible feedback systems that allow for input by teachers seeking to optimize their use of the institutional structure based on their experiences teaching classes within that structure. As part of their training, schools would benefit from providing multiple layers of training and onsite practical experience instead of centralizing all training into a theoretical indoctrination format. Schools would provide hands-on training and support for middle aged and older teachers in order to assist with quickly learning how to operate smartboards and interactive learning platforms, while providing young teachers training in sorting and applying data using the context of real-world examples with no unnecessary training items. In terms of technical support, schools can contact smart classroom tool suppliers to establish a simple after-sales consultation channel, and arrange dedicated personnel to handle daily technical failures, promptly solving problems such as platform lag and data synchronization anomalies encountered by teachers; In addition, schools need to regularly inspect equipment hazards to ensure the normal use of equipment and ensure that all supporting measures are truly implemented and effective.

5. Conclusion

Based on the core principles of educational methodology, the model of integrating learning assessment and instruction in a smart classroom has successfully solved problems that existed in traditional educational methodologies by creating a closed-loop operational mechanism and providing a data feedback mechanism. As a result, this model has achieved integrated and collaborative efforts among learning, assessment, and teaching. Furthermore, this model construct and supports the transformation of educational reform and implementation of teaching philosophy focused on the student. This model has established practical and tangible approaches to assist teachers in the development of their instructional strategies, and has established a strong basis for continued practice and future educational research, supporting innovative advancement within the education and instruction field.

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References

1. N. Sharma and N. Kumar, "The future of education: Implications of artificial intelligence integration in learning environments," International Journal of Enhanced Research in Educational Development, vol. 11, no. 5, pp. 129-133, 2023.
2. X. Chen and H. Lu, "Evaluation method of classroom teaching effect under intelligent teaching mode," Mobile Networks and Applications, vol. 27, no. 3, pp. 1262-1270, 2022. doi: 10.1007/s11036-022-01946-2
3. Y. Zhou, S. Zou, M. Liwang, Y. Sun, and W. Ni, "A teaching quality evaluation framework for blended classroom modes with multi-domain heterogeneous data integration," Expert Systems with Applications, vol. 289, p. 127884, 2025. doi: 10.2139/ssrn.5152274
4. M. Marcotte and L. D. Gruppen, "Competency-based education as curriculum and assessment for integrative learning," Education Sciences, vol. 12, no. 4, p. 267, 2022. doi: 10.3390/educsci12040267
5. Y. Tong, J. Liu, Y. Sun, Q. Liu, X. Zhang, S. Pan, and L. Bao, "Assessment of student knowledge integration in learning work and mechanical energy," Physical Review Physics Education Research, vol. 19, no. 1, p. 010127, 2023. doi: 10.1103/physrevphyseducres.19.010127
6. P. Lord, H. S. Lee, P. Horwitz, S. Pryputniewicz, and A. Pallant, "A Remote view into the classroom: analyzing teacher use of digitally enhanced educative curriculum materials in support of student learning," Journal of Science Teacher Education, vol. 35, no. 2, pp. 127-152, 2024.
7. R. Garrison and H. Kanuka, "Blended learning: Uncovering its transformative potential in higher education," The Internet and Higher Education, vol. 7, no. 2, pp. 95-105, 2004.

8. B. Means, Y. Toyama, R. Murphy, M. Bakia, and K. Jones, "Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies," 2009.
9. M. Bower, "Design of technology-enhanced learning: Integrating research and practice," Emerald Publishing Limited, 2017.
10. D. Laurillard, "Teaching as a design science: Building pedagogical patterns for learning and technology," Routledge, 2013.
11. R. Duke, G. Harper, and M. Johnston, "Connectivism as a learning theory for the digital age," in Exploring Spaces for Learning 2013 HETL Conference, 2013, pp. 1-9.
12. J. Chapman, "Diversity and inclusion in the learning enterprise: Implications for learning technologies," The Wiley Handbook of Learning Technology, pp. 287-300, 2016.