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Investigation Report on the Implementation of Integrated Teaching, Learning, and Assessment (ITLA) in High School Chemistry Instruction

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Abstract

This study aims to investigate the current status of the Integrated Teaching, Learning, and Assessment (ITLA) model in high school chemistry classrooms. By employing methods such as questionnaires, classroom observations, and post-lesson interviews, the students and teachers of Hezhou First Senior High School were surveyed as research subjects. The relevant data were collected, organized, and analyzed to reveal the implementation status of the integrated teaching and assessment approach in high school chemistry instruction. The research results indicate several pressing issues in high school chemistry instruction, including teachers' inadequate understanding of the ITLA model, a lack of innovation in designing classroom instructional activities, and insufficient utilization of evaluation methods and tools. Additionally, the study explores students' needs in terms of assessment. This study holds significant importance in improving high school chemistry instruction and enhancing teaching quality. It provides valuable references and insights for educational decision-makers and educators. By addressing the identified challenges, such as enhancing teachers' understanding, fostering innovative classroom activities, and promoting effective evaluation practices, this research contributes to the improvement of high school chemistry education.

Keywords

Chemistry instruction, Integrated Teaching, Learning and Assessment, investigation report

According to the study by Ren (2020), the concept of Integrating Teaching, Learning, and Assessment (ITLA) was proposed in the context of modern educational reform. This represents an innovative approach to teaching and evaluation. Traditional assessment methods often involve administering exams or grading assignments after the completion of learning activities (Zhang Y, 2020). In contrast, Integrated Teaching, Learning, and Assessment emphasize incorporating the evaluation process into classroom instruction and learning, using assessment to determine students' current learning status and the gaps between their current state and learning objectives. During the teaching process, teachers can timely identify students' issues and confusion through observation and assessment of their learning progress and employ corresponding teaching strategies for guidance and support (He J, 2017). Simultaneously, students can adjust and enhance their learning through the guidance and feedback provided by teachers. This integrated approach to teaching, learning, and assessment tightly integrates instruction and evaluation, complementing each other and contributing to improved learning outcomes and teaching effectiveness.

Integrated Teaching, Learning, and Assessment require teachers to not only focus on knowledge transmission but also pay attention to students' learning processes and the cultivation of learning strategies (Ma J, 2018). Teachers should flexibly utilize various assessment methods and tools, such as classroom observations, student discussions, and individual guidance, to gain a comprehensive understanding of students' learning situations and needs. Additionally, teachers should provide timely feedback and guidance to help students overcome difficulties, develop their potential, and guide them in forming the ability for self-directed learning. The ITLA model encourage students to actively participate in the learning process, cultivating their motivation and autonomy in learning, thereby enhancing learning outcomes and quality (Li J, 2023).

1. Investigation Design and Implementation

This study aims to gain a comprehensive understanding of the current status of the ITLA model in high school. To achieve this, data will be collected from students and teachers of Hezhou First Senior High School through the use of questionnaires, interviews, and observations. The research will employ a combination of questionnaires and interviews to gather comprehensive data. Questionnaires will be distributed to students and teachers to assess their awareness, implementation, and challenges related to the ITLA model. Face-to-face interviews will be conducted with students and teachers to further explore their perspectives, experiences, and suggestions. The collected questionnaire and interview data will be organized and analyzed. Through a comprehensive analysis of the data, the study aims to uncover the existing problems in high school chemistry instruction.

1.1 Questionnaire Design and Implementation

This survey targets students and teachers from Hezhou First Senior High School, and two separate questionnaires have been designed. The student questionnaire aims to delve into their characteristics and psychological traits to gain a deeper understanding of their assessment of high school chemistry classrooms. The questionnaire will include questions about students' age, learning motivation, interests, study methods, learning difficulties, and other aspects to explore their perception and experience of the teaching model. The teacher questionnaire will focus on teachers' perspectives on current classroom instruction, their ideas, and measures for teaching improvement, as well as their familiarity with and implementation of the ITLA model. The questionnaire will include questions about teachers' establishment of teaching objectives, utilization of teaching resources, design of instructional activities, and selection of assessment methods to understand their understanding and application of the teaching model.

This questionnaire targets students and teachers from Hezhou First Senior High School. The teacher questionnaire was distributed to all chemistry teachers within the school, totaling 33 questionnaires, and all 33 questionnaires were collected. The student questionnaire was distributed to students in grades 10, 11, and 12, with a total distribution of 2,602 questionnaires and 2,528 questionnaires collected. Specifically, 1,071 questionnaires were collected from grade 10 students, 964 questionnaires from grade 11 students, and 493 questionnaires from grade 12 students. By distributing questionnaires to students and teachers and collecting feedback data, we have obtained relevant information. The data will be organized and analyzed to explore students' assessment of high school chemistry classrooms, their learning motivation, and learning difficulties. Additionally, we aim to understand teachers' perspectives on current classroom instruction, and improvement measures, as well as their familiarity with and implementation of the ITLA model.

1.2 Classroom Observation and Interviews

In addition to the questionnaire survey, methods such as daily observation of students and recording relevant facts are employed to provide more comprehensive data support. By observing students' performance, participation, and interaction in the classroom, and recording information about their learning status, problems, and difficulties, more intuitive and objective data on students' classroom learning can be obtained.

In addition to the teacher questionnaire survey, interviews with teachers are conducted to gain in-depth insights into their perspectives and experiences regarding current classroom instruction and the ITLA model. Through face-to-face communication with teachers, their voices can be heard, and their understanding and implementation of the teaching model can be understood, further enhancing the promotion and support of Integrated Teaching, Learning, and assessment.

By conducting a comprehensive analysis of the data from the questionnaire survey, student observation, and teacher interviews, a more comprehensive understanding of students' classroom learning and teachers' feedback on the teaching model can be achieved. Through the integration and analysis of data, correlations and trends between different data sources can be discovered, further revealing problems and challenges in the teaching situation, and providing a scientific

basis for developing targeted teaching improvement measures.

2. Survey Results Compilation and Analysis

2.1 Survey Statistics of Student Questionnaires

Table 1. Survey Results on the Impact of Teacher Evaluation on Students

Does teacher evaluation motivate you?	Percentage Distribution
A. It has a significant motivating effect.	38.3%
B. It has some motivating effect.	49.5%
C. It does not have a motivating effect.	12.2%

Based on classroom observations and post-class discussions, the majority of students believe that teacher evaluation has a motivating effect on them. Students express that teacher evaluations not only affirm their thought processes but also accurately identify their weaknesses in learning, which provides them with significant encouragement and motivation. However, some students also mentioned that at times their mistakes are due to carelessness, and teacher evaluations do not immediately have a motivating effect. For these students, teachers can provide more explicit and targeted feedback to help them recognize their areas of improvement and ignite their motivation to make progress.

Table 2. Survey Results on Preferred Methods of Evaluation by Students

What is your favorite method of evaluation in the classroom?	Percentage Distribution
A. Teacher evaluation.	12.8%
B. Peer evaluation.	6.5%
C. Self-evaluation.	6.3%
D. Teacher evaluation + peer evaluation.	27.6%
E. Teacher evaluation + self-evaluation.	19.4%
F. Peer evaluation + self-evaluation.	6.7%
G. Teacher evaluation + peer evaluation + self-evaluation.	20.7%

The survey results indicate that students tend to prefer a combination of evaluation methods in the classroom. Through classroom observations and post-class discussions, students expressed that a combination of evaluation types provides more comprehensive and objective feedback. They believe that teacher evaluation has scientific rigor and reliability, making teacher evaluation alone or in combination with other evaluation methods more preferred. As professional educators, teachers are capable of assessing students' learning processes and outcomes from multiple perspectives, which enhances the scientific nature and reliability of teacher evaluation in the eyes of students. Teacher evaluation helps students recognize their strengths and weaknesses while providing specific improvement suggestions. Additionally, other evaluation methods such as peer evaluation and self-evaluation involve students in the evaluation process, enhancing their awareness and reflective abilities regarding their own learning.

However, a small number of students hold reservations about self-evaluation. They may worry that self-evaluation could be influenced by subjective factors, making it difficult to accurately assess their own learning performance. This highlights the importance of providing clear standards and guidance in self-evaluation to help students accurately evaluate their learning outcomes.

Table 3. Survey Results on Desired Content of Evaluation by Students

What aspects do you hope the teacher will evaluate your chemistry learning performance from?	Percentage Distribution
A. Test and exam scores.	5.3%
B. Attitude towards chemistry learning in daily life.	23.6%
C. Methods of learning chemistry.	29.3%
D. Time dedicated to learning chemistry.	28.7%
E. Other aspects.	13.1%

The survey results indicate that the majority of students do not want teachers to solely rely on "test and exam scores" as the basis for evaluating their chemistry learning performance. Instead, they believe that attitude, methods, and time dedicated to learning chemistry can provide a more objective evaluation of their learning. This viewpoint reflects their need for comprehensive evaluation. Chemistry learning is not just about knowledge acquisition; it also involves students' understanding of the subject, application of experimental skills, problem-solving abilities, and application of chemical concepts.

Through communication with students, it is understood that students expect teachers to conduct comprehensive evaluations. In terms of attitude, they hope to be evaluated on their positive attitude towards chemistry learning, goal setting, classroom participation, and autonomy in learning. These aspects can reflect their level of engagement and motivation in chemistry learning. Regarding learning methods, students want teachers to assess whether their learning methods are scientifically reasonable and effective in improving learning outcomes. This includes evaluating their understanding of chemical concepts, logical problem-solving approaches, and utilization of learning resources. In terms of learning time, students hope that teachers can evaluate the time and effort they invest in learning chemistry. This reflects their level of commitment to learning and their ability to manage their time effectively for chemistry studies.

2.2 Survey Statistics of Teacher Questionnaires

Table 4. Survey Results on the Main Teaching Methods Used by Teachers in the Classroom

What forms do you primarily use in your regular classroom teaching process?	Percentage Distribution
A. Teacher-led lectures.	9.8%
B. Teacher-led instruction with student engagement and reflection.	36.8%
C. Student-centered self-study with teacher guidance for addressing difficulties.	26.6%
D. Combination of teacher-led instruction and student group discussions.	26.8%

According to the results, a small portion of teachers tend to prioritize lectures in their teaching process. They conduct more explanatory sessions during problem-solving classes and review sessions to help students address difficulties and organize their knowledge structure. However, due to limited class time, most teachers are unable to allocate more time for student thinking and discussion. Through interviews, it was found that teachers would be very willing to hand over the classroom to students and let them construct knowledge networks autonomously if conditions allow.

This phenomenon reflects a bias among teachers, where the primary goal is to impart knowledge. This bias may stem from teachers facing limited classroom time and wanting to ensure that students acquire essential knowledge and skills. However, for students, mere knowledge transmission is not sufficient to promote deep understanding and learning. In the teaching process, teachers play the roles of knowledge guides and organizers of learning. While lectures play an important role in teaching, over-reliance on lectures can restrict students' active learning and development of critical thinking skills.

Table 5. Survey Results on Teachers' Understanding of "Integrated Teaching, Learning and Assessment"

Do you have an understanding of "Integrated Teaching, Learning, and Assessment" in instructional design?	Percentage Distribution
A. Yes, I have a strong understanding of it, and I design every lesson according to this model of ITLA.	21.8%
B. I have a moderate understanding of it, and I design lessons according to this model for competitions or public presentations.	57.7%
C. I have a limited understanding and I am not familiar with the ITLA model.	15.3%
D. I haven't heard of it before.	5.2%

According to the survey results, 15.3% of teachers have limited understanding or are unfamiliar with the ITLA model, with 5.2% of teachers even stating that they have never heard of it. This reflects a lack of sufficient theoretical knowledge in the field of education among some teachers, as well as a lack of awareness of cutting-edge educational theories, which can limit the guidance for practical teaching.

The ITLA model is an educational approach that combines teaching and assessment in an organic manner. It aims to promote comprehensive student development and effective learning by seamlessly integrating teaching and assessment. In this model, teaching and assessment are no longer isolated components but rather mutually supportive and enhancing. Teachers guide students' learning through instructional activities, while assessment goals, content, and methods are

integrated throughout the teaching process, providing students with timely feedback and guidance. For teachers who have limited understanding or are unfamiliar with the ITLA model, it is important for them to strengthen their knowledge of educational theories and continuously stay updated with cutting-edge research in the field of education. Teachers can enhance their education and teaching knowledge by participating in professional training, academic seminars, and educational research forums, as well as engaging in exchanges and collaborations with other educators.

Table 6. Survey Results on Factors Teachers Consider in Evaluating Teaching Effectiveness

What factors do you believe should be considered when evaluating the effectiveness of a teaching session? (Multiple choices)	Percentage Distribution
A. The alignment of instructional objectives with curriculum standards and the students' actual needs.	77.3%
B. The ability to regulate the classroom atmosphere and effectively select examples to explain and teach the content.	68.4%
C. Effective management of the teaching process and providing learning guidance.	70.2%
D. Creating a learning environment that encourages active student participation.	75.9%

According to the survey results, the majority of teachers believe that multiple factors should be considered when evaluating the effectiveness of a teaching session. This comprehensive approach ensures a more objective, comprehensive, and holistic evaluation of the classroom. Considering various factors helps to accurately assess teaching quality. Evaluating the effectiveness of a teaching session is a complex process that requires the integration of multiple factors. Through interviews, teachers also mentioned the following factors that should be taken into consideration, such as: student performance, achievement of instructional objectives, design of instructional activities and resources, application of teaching methods and strategies, teaching competence, and performance. By considering these factors comprehensively, it is possible to evaluate the teaching effectiveness of a session more holistically.

3. Discussion

Based on the current investigation of the implementation of integrated assessment in high school chemistry teaching, we conducted a questionnaire survey from both students and teachers' perspectives. Additionally, we utilized supplementary methods such as classroom observations and post-lesson discussions to enhance the reliability of data analysis.

At the student level, we found that there is generally low interest in learning chemistry, and students lack confidence in their abilities. They perceive their self-assessment accuracy as low. As a result, during the learning and assessment process, students tend to rely more on objective factors from teachers and external sources. To improve this situation, teachers should focus on nurturing students' self-confidence and helping them clarify their learning goals, encouraging them to overcome confusion and apathy towards learning. Additionally, students desire evaluations that go beyond mere scores. Teachers should consider a comprehensive and objective assessment that encompasses students' practical laboratory skills, problem-solving abilities, and other aspects.

At the teacher level, with the progress of time and the advent of the intelligent era, teachers should first adhere to the concept of lifelong learning. They need to continuously acquire new theoretical knowledge and apply it to guide their teaching practices. Meanwhile, teachers should emphasize the role of students as "masters" and ensure their active participation in the teaching process. Although the ITLA model has not been fully adopted, some teachers may still be hesitant. However, we encourage teachers to engage in in-depth research, and daring experimentation, and promptly explore Integrated Teaching, Learning, and Assessment models that suit the actual needs of students. Only by doing so can students truly experience the charm of chemistry and develop a genuine passion for the subject.

4. Conclusion

In summary, the above survey results indicate that there are still challenges and room for improvement in the implementation of Integrated Teaching, Learning, and Assessment in high school chemistry teaching. Students' interests and confidence need to be nurtured, and teachers should consider multiple evaluation criteria to promote students' comprehensive development. Teachers should embrace lifelong learning as a foundation and actively explore models that suit the actual needs of students. They should also prioritize student engagement to enhance students' understanding of and passion for chemistry.

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