

STEP BY STEP: BUILDING POSITIVE ATTITUDES TOWARD CHEMISTRY WITH IBL

Vanda Peto

University of Debrecen, Faculty of Humanities, undergraduate, Hungary
Supervisor

Magdolna Chrappan

University of Debrecen, Dr., Hungary

Chemistry, like other STEM subjects, is often perceived by students as challenging and less engaging. Our research aimed to identify teaching strategies that can positively influence learners' attitudes towards this subject. Inquiry-based learning (IBL) has been recognized as an effective approach for skill development and attitude improvement [1, 2]. IBL is characterized by active learning, thought-provoking situations and questions, increased student responsibility, and a teacher taking up the role of facilitator. It is centered around seeking knowledge and developing new understanding [3].

The empirical phase of our research focused on examining the frequency of IBL-related factors in Hungarian high school chemistry lessons and their impact on students' attitudes. Quantitative data were collected via an online survey among teacher trainees ($N=273$) at the University of Debrecen during the 2022-2023 academic year. Participants responded retrospectively to questions regarding their experiences. The prevalence of IBL elements was assessed using frequency scales, with means and standard deviations calculated using SPSS. Multiple regression analysis was employed to explore factors influencing attitudes (assessed using 4-point Likert scales and semantic differential scales) toward chemistry.

The study revealed a limited presence of IBL in Hungarian chemistry classrooms, though certain components, such as open-ended questions, opportunities for students to explain their ideas, and real-life-based tasks, were generally at least sometimes present. In terms of shaping attitudes, IBL can have both positive and negative effects. Significant positive contributors to favorable attitudes included the teacher's role as a facilitator ($B=0.273$, $p<0.001$), the incorporation of problem-solving tasks related to everyday life ($B=0.260$, $p=0.007$), and emphasizing the societal relevance of chemistry ($B=0.205$, $p<0.001$). Conversely, the frequency of experiments and the use of open-ended questions did not significantly influence attitudes. Furthermore, we found that increased responsibility and the increased frequency for student decision-making, which are typical features of IBL, were not considered desirable by students. To conclude, IBL holds the potential to enhance students' attitudes toward chemistry but requires step-by-step and consistent implementation. Rapid or unstructured introduction of IBL elements can overwhelm students, increase cognitive load and stress, and ultimately counteract the benefits. Our findings highlight the importance of strategic, student-centered teaching methods to foster engagement and reshape perceptions in chemistry education, providing valuable insights into both the challenges and opportunities of IBL.

References

1. Korom, E., & Csiszár, I., A természettudományos gondolkodás és kutatás készségeinek fejlesztése kisiskoláskorban (Developing Scientific Reasoning and Inquiry Skills in Early Childhood). *Magyar Tudomány*, 183(11). 2022.
2. Reid, N., & Ali, A. A., Making Sense of Learning: A Research-Based Approach, Springer, 2020.
3. Spronken-Smith, R., Angelo, T., Matthews, H., O'Steen, B., & Robertson, J., How Effective is Inquiry-Based Learning in Linking Teaching and Research? Paper prepared for An International Colloquium on International Policies and Practices for Academic Enquiry, Marwell, Wichester, UK, April 19–21. 2007.