

Game- Based Pedagogy and VARK Model: Students' Achievement Across Learning Styles towards Guide in Adapting Games for Teaching Chemistry Concepts

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Abstract

This study investigated the impact of game-based learning (GBL) strategies on Grade 10 students' academic achievement across varying learning styles, specifically focusing on the Visual, Auditory, Reading/ Writing, and Kinesthetic (VARK) model. Employing a quasi-experimental research design, the study sampled 74 students from an international school in Taif, Saudi Arabia, divided into an experimental group (n=37) receiving GBL interventions and a control group (n=37) following traditional instruction. Data collection involved researcher-developed standardized pre-tests and post-tests, the VARK questionnaire, and a perception survey. Statistical analysis via paired t-tests revealed no significant difference in initial knowledge between groups; however, the experimental group demonstrated significantly higher post-test performance ($M=39.16$) compared to the control group ($M=30.38$, $p < 0.05$). Furthermore, one-way ANOVA indicated significant differences in achievement among learning styles within the GBL environment ($F=16.9998$, $p < 0.05$), with auditory and kinesthetic learners outperforming visual learners. Qualitative data confirmed that students perceived GBL as highly effective, with composite means ranging from 3.98 to 4.49. The study concludes that GBL significantly enhances chemistry achievement by catering to individual preferences. It is recommended that educators adopt a multi-modal GBL framework — incorporating virtual modelling, interactive diagrams, and collaborative quizzes to foster an inclusive environment. School administrators should prioritize professional development and technological resource allocation to support the sustainable integration of these pedagogical innovations.

Keywords: Game-based learning, VARK model, chemistry education, student achievement, learning styles, interactive teaching, academic performance

