



Research Results: Oxidation Numbers Students Improve Problem-Solving Ability by 45% with Quantum Artificial Intelligence Tutors

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Research Objective

Evaluate the effectiveness of the Quantum Tutor for Oxidation Numbers on performance of university science majors.

Methodology

The study randomly divided 14 sections from Duquesne University's general chemistry course into two groups:

- Treatment group (97 students) used the Quantum Tutors for at-home study.
- Control group (138 students) received the same course instruction as the Treatment group but did not use the Quantum Tutors.
- Both groups received the usual course lecture discussing how to assign oxidation numbers and were given a pre-test to assess baseline performance.
- Both groups were given identical homework assignments on oxidation numbers to ensure that a comparable amount of study time was spent preparing for the post-test.

To measure student mastery and comprehension accurately, students were required to write all steps in solving each problem rather than simply selecting answers from multiple-choice lists. Only completely correct solutions were accepted.

Results

	Tutor Group	Control Group
Students Solving 80% or More Post-Test Problems Correctly	41.2%	15.9%
Improvement in Correct Solutions Reached from Pre-Test to Post-Test	+45.0%	+28.0%

Key Findings

- The Tutor group improved by 45.0% in number of correct solutions reached, outperforming the control group by an average of 20.8% more problems solved correctly on the post-test.
- 41.2% of students in the Tutor group solved 80% or more of the post-test problems correctly (compared to only 15.9% of students in the control group) demonstrating the Tutor's ability to help more students gain full mastery of the concepts and skills required to assign oxidation numbers.

Conclusion

The Quantum Tutors are proven to significantly improve test scores and help students (K-12 and higher education) achieve a deeper understanding and appreciation of the subject matter.

"Our students have found these Tutors to be extremely helpful in developing critical thinking and problem-solving skills. They show the students how to solve the problem rather than provide an answer."

— Jeffrey Madura
Professor and Chair
Department of Chemistry
& Biochemistry
Duquesne University

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