QUANTUM®
INTELLIGENT TUTORING ENGINES

Research Results: Quantum Assessment Advisors
Artificial Intelligence Formative Assessment Software Proven Effective and Reliable for Grading Student Work

"This study is the first of its kind and demonstrates that the Quantum AI software can quickly and consistently assess student work, freeing teachers to use their time and talents more effectively."

— **Benny Johnson, Ph.D.**
President and CEO
Quantum Simulations, Inc.

Research Objective

Compare the reliability and effectiveness of the Quantum Assessment Advisors with human graders for evaluating and grading student work on the chemistry topic of Oxidation Numbers.

Methodology

- To compare the Quantum Assessment Advisors with actual teacher grading, identical copies of student papers (250 problem attempts on the topic of oxidation numbers) from the University of Kentucky were given to teachers to grade.

- The teachers were instructed to not only determine whether a solution was right or wrong, but to assign partial credit for correct problem-solving steps.

- Because the student's own work rather than a multiple-choice answer was graded, Quantum's patented *consistency rules* technology was used to handle unanticipated student errors. This is an important feature of Quantum's formative assessment tool since many student errors cannot be diagnosed by multiple-choice tests, which may force the student to pick an answer having nothing to do with their own solution attempt or thought process.

Note: This comparison study is not intended as a criticism of the teachers' competency in grading. As most teachers agree, the grading process is prone to error and inconsistency because of the tedious conditions and short timeframe under which it must be done.

Key Findings

- The mean grading score for the Quantum Assessment Advisors was in agreement with those scores assigned by teachers.

- The Advisors were more accurate in identifying correct solutions and accurately assigning partial credit.

- One teacher failed to identify correct solutions 47% of the time because of an inaccurate answer key the teacher developed — a good example of potential errors with human grading.

- Quantum was more consistent, eliminating any inconsistencies in grading (i.e. assigning different scores for the same answer given by different students). Quantum also graded more consistently across all student work and problems.

- Quantum's graded all student work and provided feedback for every problem, for every student within 3 to 5 seconds. Teachers took over one hour to grade student work which did not include any student feedback.

Conclusion

Quantum's assessment software can significantly reduce or eliminate teacher grading time and are more accurate and consistent than human graders. By analyzing the student's actual work, a much more accurate and detailed evaluation of their knowledge and problem-solving skills is assessed at classroom level with drill-down detail to an individual student's work and problem.

Inspiring students to learn *why*