A Comparison of Tutors', Students', and Researchers' Perceptions of College Algebra Mistakes

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Experiences in first year mathematics classes predict persistence in a STEM major (Seymour & Weston, 2019). Retention becomes increasingly difficult when students need to develop foundational skills in prerequisite courses such as College Algebra. The development of study skills, including metacognitive skills, are often used to improve low success rates. As part of a study on the impact of metacognitive instruction for College Algebra students, we found that when reflecting on the reason for their errors, students often attributed exam errors to "simple mistakes." Researchers identified many of these mistakes as "not simple." Classifications of "simple" or "not simple" mistakes by undergraduate peer tutors, who provide support in campus learning centers, did not consistently align with either the views of students or researchers. We discuss student, tutor, and researcher views of mistakes and how they compare with each other.

Methods

For this IRB approved study, data was obtained from students in a College Algebra support course at a large, Western, public, Hispanic-Serving Institution. In semi-structured interviews, students classified recent errors on an exam as either simple or not simple and provided justification for their classifications. Transcripts of these interviews along with student work on the exams were analyzed to determine students' reasoning for classifying mistakes as "simple or "not simple." Data was later gathered from 11 undergraduate peer tutors at two institutions through an online questionnaire which presented five mistakes from the first college algebra exam. Iterative coding was used to analyze the tutors' reasoning for the mistakes.

Discussion and Conclusion

Researchers defined simple mistakes as ones that "could be made accidentally, would likely not be repeated, or violated a mathematical convention rather than a rule" (Authors, 2020b). Sometimes, tutors' classifications aligned with students' or researchers' classifications of simple and not simple; other times, the tutors were divided. Students sometimes distinguished between simple and not simple by the difficulty level of the problem or by how quickly they could see how to do the problem correctly when reviewing the exam. Student RG stated, "I think that a simple mistake is something that can be fixed without … a large amount of time" Tutors were similar to researchers in that they distinguished between simple and not simple mistakes by noticing if the student had demonstrated understanding previously. Different from both researchers and students, some tutors considered the amount of work it would take to correct the student's misconceptions. Tutor X stated, "A simple mistake is one that can be corrected (and the student would understand where they went wrong), with just a quick clarification. If the mistake requires a more in-depth discussion, then it is not simple." By comparing different views of mistakes between student, tutor, and teacher, we build a deeper understanding of how both tutors and instructors might better address student's misconceptions and misunderstandings.

References

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Seymour, E., Hunter, A. B., & Weston, T. J. (2019). Why we are still talking about leaving. *Talking about leaving revisited: Persistence, relocation, and loss in undergraduate STEM education*, 1-53.

Is the mistake simple or not simple?

Researchers say…
Students say…
Tutors say…

What do you say?

Mistake	A	B	C	D	E
Student	S	S	NS	NS	S
Researcher	S	S	NS	NS	NS
Tutors (S/NS)	10/1	3/8	1/10	7/3	7/3

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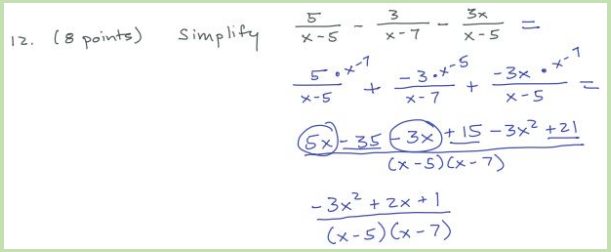
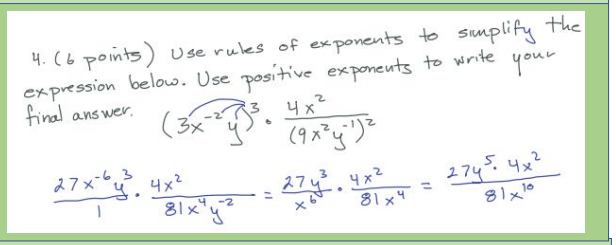
Mistake A

The student correctly began getting a common denominator for each term. The student did not correctly multiply the last numerator, which should have been $-3x^2+21x$.



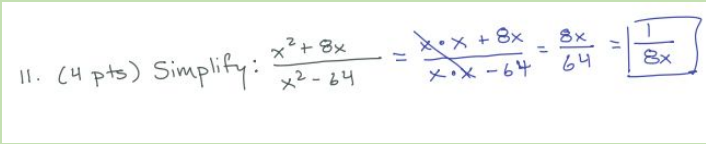
Mistake B

The student initially correctly combined exponents for the y-terms, but did not for the x-terms and the student did not reduce the coefficients.



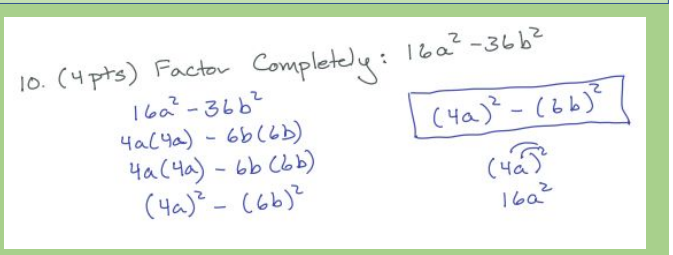
Mistake C

The student incorrectly canceled the x^2 terms in the numerator and denominator, which led to subsequent incorrect steps. Consider the first error of canceling the x^2 terms.



Mistake D

The student recognized the squared terms, but did not factor as a difference of squares to get (4a-6b)(4a+6b)



Mistake E

The student incorrectly factored the numerator as (x+8)(x+1). The student should have factored the numerator as x(x+8).