

STUDENT INQUIRY IN INTERESTING LESSONS

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What impact, if any, do interesting lessons have on the types of questions students ask? To explore this question, we used lesson observations of six teachers from three high schools in the Northeast who were part of a larger study. Lessons come from a range of courses, spanning Algebra through Calculus. After each lesson, students reported interest on a Likert scale via lesson experience surveys (Riling et al., 2019). The average interest measures were then used to identify each teachers' highest and lowest rated interest lessons. The two lessons per teacher allows us to compare across the same set of students per teacher.

We compiled 145 student questions and identified whether questions were asked within a group work setting or part of a whole class discussion. Two coders coded 10% of data to improve the rubric for type of students' questions (what, why, how, and if) and perceived intent (factual, procedural, reasoning, and exploratory). Factual questions asked for definitions or explicit answers. Procedural questions were raised when students looked for algorithms or a solving process. Reasoning questions asked why procedures worked, or if facts were true. Exploratory questions expanded beyond the topic of focus, such as asking about changing the parameters to make sense of a problem. The remaining 90% of data were coded independently to determine interrater reliability (see Landis & Koch, 1977). A Cohen's Kappa statistic ($K=0.87$, $p<0.001$) indicates excellent reliability. Both coders then reconciled codes before continuing with data analysis.

Initial results showed differences between high- and low-interest lessons. Although students raised fewer mathematical questions in high-interest lessons (59) when compared with low-interest lessons (86), high-interest lessons contained more "exploratory" questions (10 versus 6). A chi-square test of independence shows a significant difference, $\chi^2(3, N = 145) = 12.99$, $p = .005$ for types of students' questions asked in high- and low-interest lessons. The high-interest lessons had more student questions arise during whole class discussions, whereas low-interest lessons had more student questions during group work. By partitioning each lesson into acts at points where the mathematical content shifted, we were able to examine through how many acts questions remained open. The average number of acts the students' questions remained unanswered for high-interest lessons (2.66) was higher than that of low-interest lessons (1.68). Paired samples t-tests suggest that this difference is significant $t(5)=2.58$, $p = 0.049$.

Therefore, student interest in the lesson did appear to impact the type of questions students ask. One possible reason for the differences in student questions is the nature of the lessons students found interesting, which may allow for student freedom to wonder and chase their mathematical ideas. There may be more overall student questions in low-interest lessons because of confusion, but more research is needed to unpack the reasoning behind student questions.

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References

- Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33, 159-174.
- Riling, M., Dietiker, L., & Gates, M. (2019). How do students experience mathematics? Designing and testing a lesson specific tool to measure student perceptions. *American Educational Research Association (AERA)*, Toronto, Ontario, Canada.