

An Analysis of Instructor Feedback

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Carless & Boud (2018) capture the definition of feedback best as “a process through which learners make sense of information... use it to enhance their work or learning strategies.” This definition goes beyond feedback solely being the role of teachers and highlights the student component in making sense of the feedback (Carless & Boud, 2018). A more specific type of feedback that will be used in this study involves “actionable feedback” which allows the student more agency to revise their work independently (Hattie & Timperley, 2007).

Research Questions

1. What are the feedback types commonly used by instructors within a student homework sample?
2. Do the feedback types that instructors provide match those that the students prefer/find useful?

Methods, Results, and Benefits

Boise State University instructors were asked to complete an online questionnaire and to grade and leave written feedback on student work samples of the same task. No rubric was provided. A thematic analysis was conducted on their feedback practices and word choice to then classify into groups. The classification of feedback was based on a combination of Wahyuni (2023) and Lyster & Ranta (1997) written feedback clarification. Students' perceptions about feedback were gathered through a questionnaire to gain insight on how they use feedback, how highly they value it, and which feedback type they find most useful.

Results are currently pending, but preliminary results suggest that most instructors use a wide-variety of different feedback types. Most tend to be non-actionable feedback, while there is almost always at least one piece of feedback that provides the student with the agency to help revise their response. Instructors commonly followed a close pattern of feedback across their students.

This study is focused on BSU's Math Department, and as a result, we may be able to identify certain trends within the ways courses are currently taught and provide more awareness to better inform our department's grading practices across our entry level math courses. This information could be especially beneficial to present as training material for new GTAs.

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Opportunities for Reasoning-and-proving with Trigonometric Identities in Precalculus Textbooks

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Keywords: precalculus, trigonometry, proof, reasoning, justification

Outside of geometry, United States high school students have few opportunities to engage with proof (Thompson et al., 2012; Otten et al., 2014). It is therefore likely that for most precalculus students, proving trigonometric identities represents a significant departure from familiar modes of reasoning. As both a thorough understanding of the relationships between trigonometric functions and the ability to reason deductively are critical in undergraduate mathematics, learning trigonometric identities may be an opportune time for students to develop skills at all levels of Stylianides' (2009) taxonomy of reasoning-and-proving (RP) activities.

This poster will summarize a study that examined five precalculus textbooks for the opportunities they afford students to engage in RP activity in the context of trigonometric identities. One textbook was selected from each decade from the 1970s to the 2010s, and each represents a distinct instructional approach (Stylianides, 2008). The research questions were:

1. Across the five textbooks, what opportunities do students have to derive or prove essential trigonometric identities?
2. Across the five textbooks, what types of RP activity, and in what amounts, are expected of students in the context of learning to apply and verify trigonometric identities?

Twenty trigonometric identities were identified as *essential* (defined as necessary in future problems and/or in proofs of other identities). Each textbook's presentation of each identity was assigned one of six author-created codes, capturing the extent to which the text solicited student involvement in deriving it. A modified version of Otten et al.'s (2014) framework for coding RP opportunities in geometry textbooks was used to code justification-based problems in lessons about trigonometric identities. Percentages of items marked with each code were tabulated and trends identified. The poster will report on those trends, of which two were most salient:

1. In nearly all instances of an opportunity to derive an essential identity, the text provided enough guiding detail that a student would not bear the cognitive load of creating a proof.
2. The two 21st century textbooks afforded noticeably more frequent opportunities to make graphical arguments than the three 20th century textbooks.

The second finding is particularly significant in light of Stylianides' (2008) comments on the potential curricular effects of the 2000 NCTM Standards' unified view of reasoning and proof. Because of the small sample of textbooks under analysis, a natural next step would be to repeat the analysis with the precalculus and trigonometry textbooks that have been most popular over time. Significance tests of the differences in proportions of codes could show with greater clarity how responsive trigonometry curricula have been to long-term trends in instructional approaches.

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Using Online Resources to Study Mathematics: Students' Perspectives on Effectiveness and Ethics

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Keywords: Information Literacy, Ethics, Technology

Students in undergraduate mathematics classes are using online resources to support their learning with increasing frequency (Erickson, 2019, 2020). The use of such online resources has not proven to be straightforward for students. Undergraduate students have well-documented difficulties locating, evaluating, and making use of information sources regardless of the topic area in question (Scott & O'Sullivan, 2005; Walraven, Brand-Gruwel, & Boshuizen, 2008). These difficulties may vary depending on a student's familiarity or comfort with the field (Brand-Gruwel, Wopereis, & Vermetten, 2005). Thus, it is important to develop subject-specific models of student information-seeking. This is particularly important for the field of mathematics due to the role that lower-division math classes have often played as a gatekeeper for entry into STEM majors (Martin, Gholson, & Leonard, 2010).

This poster will present findings from a nationwide mixed method research project that has collected surveys from over 300 students across the country and follow-up semi-structured interviews with over 60 students intended to assess how students currently make use of online resources to support their learning in lower-division mathematics classes. These findings specifically address the following questions:

1. From the students' perspective, what does it mean to efficiently use online resources to study mathematics?
2. From the students' perspective, what does it mean to ethically use online resources to study mathematics?

These findings also include a mid-range theory of students' use of online resources based on a grounded theory (Strauss & Corbin, 1994) analysis of the interview transcripts. The poster will present this theoretical model in which we identify triggers for the use of online resources, along with the most common types of resources used and the accompanying goals. For example, students commonly make use of online video lectures if they are having trouble understanding what their instructor is saying in class or look up solutions in an answer engine when they feel that they need to double-check their homework.

We present evidence that students are generally conscientious in their use of such resources, struggling both with how to maximize their efficiency while also expressing concern that their practices are ethical. These two concerns are sometimes balanced against one another as is evidenced by a recurring student suggestion for their peers: start by learning on your own and only make use of online resources when you struggle.

Finally, our poster will present several representative cases in order to better capture the way in which students balance these concerns in different types of mathematics classes. These narratives have the potential to be used in classroom settings in order to help students become more effective and ethical users of online resources.