

Crickets to Collaboration: A Group Discussion Model that Builds Confidence and Ownership in the STEM Classroom

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Author Biography

Dr. Kimberly Hays is an Associate Professor of Biology at Dalton State College. She received the Felton Jenkins, Jr. Hall of Fame Faculty Award for Excellence in Teaching in 2021 and the Dalton State College Foundation Awards for Excellent in Teaching and Service in 2015 and 2017, respectively. Dr. Hays teaches both introductory and upper level biology courses. Her interests include ecotoxicology and wildlife biology.

Introduction

Many of us have experienced that awkward moment of silence and averted eyes from students after we open a course for discussion on peer-reviewed articles. But we all know group discussions are well-established as a successful method of student learning (Hamann et al., 2012). These discussions of peer-reviewed literature give students the opportunity to engage with recent research with their peers, but the silence often becomes more deafening as the size of the class increases (Yazedjian & Kolkhorst, 2010). This phenomenon worried me early in my career, and I began to prod students about their hesitancy to discuss the papers in class when they were often willing to ask questions or verbally participate during other activities. The most common responses I received were:

*I didn't understand ALL of it, so I can't say anything.
I don't know what I should say.
What if I am wrong?*

With this student feedback, I sought to focus on building student confidence, establishing an environment of true learning rather than fear of being wrong, and teaching the skills of discussion and critical reading. I revised my plans for discussion of peer-reviewed literature and began to utilize a three-step assignment in *Field Biology Techniques*, *Ecotoxicology*, and *Senior Seminar in Biology* that includes prompted written response, small group discussion, and whole group discussion.

The Three-Step Process

1 - Prompted Written Response

Prior to an in-class discussion of a peer-reviewed paper, students are presented with a prompt to guide them through reading the paper (see box). These prompts often ask standard questions and then ask students to look at specific parts of the paper. This activity is uploaded to the learning management system (LMS) the night prior to the in-class discussion. These responses are a small stakes formative assessment that allow me to gauge how well students understand the material, where common questions are occurring, and promotes student accountability. The above box includes a written response prompt used in BIOL 4600 Ecotoxicology.

Rodayan et al. (2016) Response

Please note, I know you are not going to understand this paper perfectly! This is why we ask questions and why we follow up with discussion. Do your best. Slog through it. Look up works. Doodle notes in the margin. Look at the figures and tables. Really take the time to do this right!

- What is the objective of this study?
- What are five (you can totally have more) questions you have when reading this study? Questions could be able experimental design, methodology, statistics, figures, methodology, etc.
- Did the authors meet their objective?
- If you were the researcher (and you had unlimited funds) what would you have done differently?
- Would you consider this to be an ecotoxicology study? Why or why not?
- The results indicate the levels of these drugs in the water are very, very low. Should we actually be concerned for human health? Wildlife?
- What other fields of science might find the data in this paper useful? How could it help?

2 - Small Group Discussion

Students are encouraged to bring written responses with them to serve as prompts during the small group discussion. They are divided into small groups of three to four students (in person or using the breakout feature in the LMS) with a designated leader to keep the group on track. I allow them to agree or disagree with their peers, puzzle over disagreements, and explain items a classmate may not have understood. During this time, I “eavesdrop” on the groups but do not engage in their discussion unless invited with a specific question. After 15-20 minutes of discussion, I often add an additional question or two for the small groups to discuss.

3 - Whole Group Discussion

Following the small group discussion (~30-45 minutes), I facilitate a class discussion. Because students have had a chance to bounce ideas off of their classmates in the small group format, they are much more likely to engage in the large group discussion. They are now acting as the voice of a group rather than a solo voice in the course. We use this time to clarify misconceptions and tie the paper back to other material covered in the course.

Reflection

While all of the classes I implement this method in are small ($n < 25$), the majority of students on our campus commute and work full-time which reduces their opportunities to engage with classmates. By incorporating small group discussions, students in these classes have become more engaged with each other, build relationships that promote accountability and move into study groups, peer support, or carry on into other classes. The implementation of this three-step discussion process yielded feedback similar to those of other studies. Like Yazedjian and Kolkhorst (2010), discussion has “enhanced comprehension of course material, reduced anonymity associated with large lecture classes, and promote student accountability” (p. 164). Hamann et al. (2012) found similar results when comparing student perceptions of small, large, and online group discussions. They reported that students in small group discussions were most likely to report understanding of the topic, a high likelihood of raising questions, high stimulation of interest, and high overall satisfaction.

As we have explored alternate teaching methods during the pandemic, I find that this discussion format lends itself well to use in a synchronous online classroom. Because social distancing requirements can make small group discussion a challenge, I have shifted these discussions online using the CollaborateUltra software embedded in the LMS. In this format, I use breakout rooms to divide students into small groups, pop into small groups to observe their discussion, use the chat function to communicate new questions to students, and bring the class back together at the touch of a button. This method does make it difficult to observe group participation and engagement of students, but has served as an ideal way to continue this discussion format with current limitations

Student Feedback

The paper activities are one of the most commonly addressed by students in teaching evaluations and solicited comments. Representative comments include:

- *Doing the scientific papers helped so much! It got easier to read through and pick out items I needed.*
- *Scientific articles can contain a lot of information to sort through by yourself, but by starting alone and moving through the larger group settings, a much wider perspective is slowly revealed. It gives the student a much more thorough understanding of the literature.*
- *...elevated my collaboration skills by requiring group discussions after we had individually read assignments. The method used in class allowed me to identify my confirmation biases while also developing active listening skills and focus on collaboration over compromise.*

References

Hamann, K., Pollock, P.H., & Wilson, B.M. (2012). Assessing student perceptions of the benefits of discussions in small-group, large-class, and online learning contexts. *College Teaching*, 60(2), 66-75. Retrieved from <https://doi.org/10.1080/87567555.2011.633407>

Yazedjian, A. & Kolkhorst B.B. (2010). Implementing small-group activities in large lecture classes. *College Teaching*, 55(4), 164-169. Retrieved from <https://doi.org/10.3200/CTCH.55.4.164-169>