

Mentoring and Judging at the Undergraduate Poster Session of the Joint Mathematics Meetings

Angel R. Pineda^{1,2} and James P. Solazzo^{1,3}

¹ Mathematical Association of America Subcommittee on Research by Undergraduates

² Department of Mathematics, California State University, Fullerton, CA

³ Department of Applied Mathematics and Statistics, Coastal Carolina University, SC

Introduction

If you are reading this article, chances are you plan on being a judge for the upcoming undergraduate poster session at the Joint Mathematics Meeting (JMM). It's an exciting experience to take an active role in mentoring the next generation of mathematicians. Being a judge at the JMM poster session is beneficial to both the students presenting their research and to you. The students will benefit from having a professional mathematician interact with them and provide feedback on their work. By volunteering to be a judge you will be exposed to a myriad of undergraduate research projects occurring at institutions across the nation and improve your ability to assess the quality of undergraduate research. You will be able to share this experience with your colleagues and offer guidance on their student's future JMM posters.

In this article we will discuss what to expect as a judge and provide guidelines for being an effective and successful mentor. The over arching goal of this article is to make judging a positive experience for you and for the students you will be mentoring and whose work you will be evaluating.

What to expect?

The undergraduate poster session at the JMM will be full of extremely enthusiastic undergraduate students presenting their research. The excitement and energy in the room is palpable. Often, this is their first national meeting and perhaps the first time presenting their work outside of their home institution. Students are nervous, excited, and may feel vulnerable about having their work judged by a professional mathematician they have never met before.

When you arrive at the poster session you will be provided with a judging form for each poster to which you are assigned. This form has two parts: a mentoring component and an evaluation component. The mentoring component is the formative evaluation of the student's work and is eventually shared with the student. The evaluation component is used to rank the posters for an official award certificate from the Mathematical Association of America (MAA); it's a summative evaluation and is not shared with the student. In what follows we will discuss both of these important, yet different, aspects of judging at the undergraduate poster session.

How to Mentor?

When evaluating a person's work, a rule of thumb is to start with the positive attributes of their work. Also, it's essential to be conscientious about how you phrase your constructive criticisms. This is best illustrated by comparing two examples.

Mentor 1: Your formatting made it impossible to read your work, and everyone knows that you don't include long tedious computations in a poster.

Mentor 2: Your introduction provided a nice summary of your work, and the example in the second column of your poster gave me more insight into your main result. However, in terms of formatting, a larger font would make it easier for someone standing three feet away from your poster to read it. Also, the computation you included could have been omitted, and it would have been good to let the reader know that this result is not obvious. With regard to proofs, consider using a heuristic argument versus a rigorous proof. A heuristic argument allows you to highlight the key points of your result without getting bogged down in details. You can include the details in the paper. Thank you for sharing your work!

The second example gives the student concrete ways to improve their poster presentation, and also lets them know what components of the poster were valuable to the reader. As an experienced mathematician, you can help the students improve their presentation skills, understand why what they are doing is exciting, and explore the broader context of their work.

Finally, mentoring the students can extend beyond written comments on a form. Take a moment to talk with students about their background and future plans. For many, this is their first exposure to the larger mathematical community. Remember, this is a critical time in these students' education and your comments may help them make a difficult decision about their future, e.g., pursuing a graduate degree in mathematics.

Variability of the Posters

The MAA website (<http://www.maa.org/students/undergrad/jmmposterindex.html>) describes appropriate poster topics as including “a new result, a new proof of a known result a new mathematical model, an innovative solution to a Putnam problem, a method of solution for an applied problem” and states “Purely expository topics are not appropriate for this session.”

Even among posters which satisfy these criteria for originality, you can expect a large variability in their mathematical level. Here we present two examples to illustrate what you might see:

Poster 1: The content presented was easily graduate level work and required some understanding of functional analysis, which is not typical undergraduate coursework. The work was impressive and the student understood her work extremely well. She was able to answer questions as well as elaborate on how her work was a special case of a more general problem that her advisor was working on.

Poster 2: This student presented several interesting new examples associated with a well-known theorem in linear algebra. He used his programming abilities to generate the examples. The examples were new and interesting, but they could have been a final project for a linear algebra class.

The level of novelty of the work presented by students is largely determined by research advisors at home institutions. There are posters presented, which were produced after multi-year, externally funded research projects, and posters from a one semester independent study. In both cases, the results are new to the students, and viewing this variability as a natural consequence of the inclusiveness of the poster session will help you support all of the students.

How to Evaluate?

There are three areas to consider when evaluating a poster: the content, the presentation, and the ranking. Below we discuss guidelines that we have found useful in each area.

Evaluating the Content

The specific mathematical content for posters from different mathematical disciplines is difficult to evaluate. We have tried to identify aspects of undergraduate research that cross mathematical topics and allow for comparison of poster content.

- **Problem Statement and Motivation:** Because of the breadth of mathematics, it is unlikely that judges will be intimately familiar with the topics students are studying. It's important that they clearly communicate their problem and why it is important.
- **Methods:** In undergraduate research, more so than in graduate research, a substantial component of a student's work may be learning mathematical techniques outside of that covered in courses. It is critical that they understand their methods and are able to clearly explain them.
- **Results:** In order to evaluate results across disciplines, we try to evaluate whether the result is new to the student or new to mathematics in general. Might this result have an impact beyond the student's work?

Evaluating the Presentation

- **Poster Design:** The design of a poster needs to be professional, well-suited for the topic and appropriate for a poster presentation. As there is typically not enough time to go over the details of the work, the poster design should give a clear visual presentation of the problem, methods, and results.
- **Verbal Presentation:** There should be versions of the presentation which are 2 minutes for a broad overview or 5 minutes including more detail. The ability to identify the essential aspects of the work and communicate these ideas clearly is very important.
- **Answering Questions:** This is perhaps the best way to assess a poster presentation. The way a student answers questions demonstrates how much they understand both the depth and the broader scope of their work.

Ranking the Posters

- **Not necessarily a numerical score:** One aspect of a poster may be extraordinary beyond what is evaluated in the form. Results may not just be new to mathematics and important, but truly innovative. The student's understanding of the methods implemented may not only be proficient but at a level far beyond what one would expect from an undergraduate. In each case, the score would be 5 but could warrant a higher value if such were allowed. This section allows for such considerations and is also used for tie-breakers in choosing the top posters.
- **Comments:** This section is helpful in describing those posters with an extraordinary aspect. Along with the ranking,

it may also be used for tie-breakers.

Summary

By volunteering to be a judge you are supporting the next generation of mathematicians and will be exposed to a variety of undergraduate research projects from across the nation. This exposure will improve your ability to assess the quality of undergraduate research and to mentor your own research students.