

SHORT COMMUNICATION

Undergraduate Education

Designing and presenting an oral poster presentation for undergraduate students' research

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Abstract

Designing and delivering an oral poster presentation is becoming very common for undergraduate students to showcase their research, whether it be in conferences, symposiums, and/or poster sessions; however, there is limited published evidence on how to successfully develop and make a presentation. This article demonstrates how undergraduate students can prepare, and eventually present, their research by effectively engaging their audience, and it also provides qualitative evidence of how successfully undergraduate students have achieved these goals. Among the advice provided to undergraduate students, as outlined in this paper, 10 easy steps are recommended to help undergraduate students present their research in a novel and engaging way to enhance the impact of their oral presentation. Steps 1–5 focus on preparing undergraduate students to design their posters, and steps 6–10 focus on presenting their posters.

Plain Language Summary

Oral presentations at a conference, symposium, poster session, or even among colleagues have become ubiquitous in academia and in the field of Science, Technology, Engineering, and Mathematics (STEM). Many undergraduate students lack the skills, strategies, and experience necessary to prepare and present their research effectively. Although presenting one's research may be challenging, the importance of practicing and presenting not only promotes one's research but it also enhances communication skills and strategies, and dissemination of content knowledge, while also improving skill in communicating research findings.

1 | INTRODUCTION

Scientific oral presentations to a group of people with similar backgrounds can be traced back to the ancient Greek philosophical schools (Farrell et al., 2017). Oral presentations at a conference, symposium, poster session, or even among colleagues have become ubiquitous in academia and in the

field of science, technology, engineering, and mathematics (STEM) (Adebisi, 2022; Dillon et al., 2024). Many undergraduate students lack the skills, strategies, and experience necessary to prepare and present their research effectively (Algouzi et al., 2023). Although presenting one's research may be challenging, the importance of practicing and presenting not only promotes one's research, it also enhances

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communication skills, strategies, and research findings, and dissemination of content knowledge (Corwin et al., 2018).

While there is a myriad of books, online articles, and videos that provide guidelines and advice on how to design and deliver a presentation (Leo et al., 2023), the best available research indicates that consistent practice and constructive feedback are highly effective methods to improve one's presentation skills and strategies (Curran-Everett, 2019; Vogel & Viale, 2018).

In view of this potential for undergraduate students to broaden their educational experiences and improve their ability to communicate more effectively in a formal setting, it raises the question of why most colleges/universities do not include a scientific writing and oral presentation course for undergraduate students (Brownell et al., 2013). Given that many undergraduate students in the field of STEM are engaged with some level of research and need to share their findings by orally reporting to their colleagues and advisors, some formal education in oral presentation of research findings would be appropriate to help students master best practices.

While there is a myriad of online templates for poster presentations and peer-reviewed articles, including how to make a poster (Gundogan et al., 2016; Shelledy, 2004), steps to create a poster (Barker & Phillips, 2021), rules of an academic poster (Erren & Bourne, 2007), and general guides and guidelines to make a poster, the approach of preparing a poster, emphasized here, involved a collaborative effort between the presenter and their colleagues/mentor to properly prepare the poster, particularly emphasizing the use of consistent best practices when presenting the poster.

Based on the previously published recommendations mentioned above, particularly Barker and Phillips (2021), the following recommended steps (listed below) were composed to help undergraduate students with the preparation and presentation of their posters.

Before the undergraduate students begin preparing their poster presentation, they should submit a proposal to the teacher if it is in an educational setting. Moreover, students should also understand the appropriateness of presenting at a poster presentation or a formal oral presentation. If the poster is presented at a conference, students should identify the physical location of where the poster boards are and set up the poster at the earliest possible time. If students are presenting at a later time slot, they should take the opportunity to attend other presentations. They may even take the initiative to invite people to their posters.

Below is a list of steps undergraduate students can utilize to enhance the oral presentation of their research.

Step 1: Abstract: Your abstract for an oral poster presentation should be 100 words or less to highlight the most relevant information from your research. What

I tell undergraduate students is to think of the coming attractions to a movie; it is generally short and provides you a brief overview. Your abstract should be engaging, but make sure that there is not too much jargon or humor, as this can be distracting to the viewer. It is important to note that there are no citations in abstract and spell out acronyms used for the first time. However, as described in **Step 5**, the Introduction, Methods, Results, and Discussion (IMRaD) Structure is used in organizing the format of the poster.

Step 2: Keywords: The keywords (most significant identifying words that characterize your research) should be composed on your poster board in the following format: **Keywords:** (Bold and italicized, followed by a colon, preceding the list of keywords, each separated by a comma).

For example:

Keywords: Ecology, food webs, primary producers, species diversity, succession of species

The use of keywords enhances discoverability of your research. A useful resource to help you compose keywords is an online resource, "The Medical Subject Headings (MeSH)." This site will provide a list of appropriate keywords for you to consider based on the content of your poster abstract. When using this online resource, a response screen will appear as shown in Figure 1.

Step 3: Formatting your poster presentation: When creating your poster presentation, use the font Times New Roman, size 12, for the entire poster, and use a larger size font that is appropriate for major headings such as the *title, abstract, keywords, introduction, methods, results, and discussion*. Use the same size, type, and color of font for each section of the poster.

The title of the presentation should be centered, bold, and the first letter of each word written in uppercase, excluding words that have three or less letters. The presentation title should be doubled spaced from the rest of the heading (Figure 2).

Use a graphic platform such as PowerPoint, Canva, Prezi, or any other graphic platform that you are familiar with. Use the landscape format to type your content information; and save it as a PDF; then print it out at the college/university technical center or printing center with a size of 36 × 48 in. The poster itself can be rolled up and secured with a rubber band, and then you can post it using pins on a poster board.

Undergraduate students should consult presentation guidelines of the conference or those of the department where they are presenting the poster (such as use of a standard institute template with proper color theme and institutional images/icon, etc.), and funding agents, if any. Undergraduate

FIGURE 1 MeSH online text field where you paste in your poster abstract. *Source:* National Institute of Health: National Library of Medicine: <https://meshb.nlm.nih.gov/MeSHonDemand>.

FIGURE 2 Example of a poster template including the presentation title, authors' name, authors' affiliation, and date of presentation. If you are presenting on consecutive days, then include a hyphen for the date range, for example, January 2–4.

students should also review past posters, where available, to learn the best practice of poster formatting (color, placement, etc.)

Step 4: Poster content: A very standardized structure in the 21st century for publishing a research article and a poster presentation should include the title. The title is particularly important to focus on because it is a major part of the header that people will look at while traversing through the poster session. A complete header of a poster should include the following information.

1. A title (centered and bold)
2. Name of the authors (centered)
3. Affiliated institution (centered)
4. Date (centered)

Step 5: The IMRaD structure: Prior to the late 1960s, research articles were organized to resemble a book chapter rather than a research paper (Divecha et al., 2023). A research paper and an oral presentation should be organized using the following format that is presented subsequent to the header containing the title, abstract, and keywords: IMRaD. These are the major headings for the content of the text of the

poster that comes after the header at the top of the poster. The IMRaD structure encourages authors to organize and structure their work in a logical manner. This structure is considered the standard outline for scientific writing.

Step 6: Practice, practice, and then, practice with a colleague: It is essential that you practice your oral presentation 7 days a week, before the day of the presentation, for 15 min a day. An oral presentation of a poster is usually 5–8 min and then 1–3 min to answer questions. Continued practice will prevent you from not going past the 5–8-min mark. You should take an opportunity to practice by presenting to your family, friends, colleagues, and/or advisors and encourage them to ask you questions that someone may ask you at the time of the oral presentation. It is useful for undergraduate students to keep in mind that when preparing for an oral presentation, it is also wise to rehearse and practice.

Step 7: Presenting suggestions: There is a myriad of presenting techniques that will inform and engage your audience. Engage with your audience and/or individuals while they look at your poster. After a brief time, do not wait for them to ask you a question. If you see someone looking at your poster, say, Hi, my name is _____, would you like to learn about

my research titled “Designing and Delivering an Oral Poster Presentation for Undergraduate Students Research?” If they say “No, just looking,” let them know that you are happy to provide more information and then give your audience the opportunity to browse at their own pace. If they say “Yes,” then begin explaining your research. Additional suggestions for making a presentation include

1. smiling and maintaining eye contact;
2. speak at a moderate pace, not too slow and not too fast;
3. be cognizant of possible overuse of verbal cues such as um, uh, and so on;
4. maintain an upright posture, do not slouch.

Step 8: Know your audience prior to your oral poster presentation: Your audience will have varying levels of interest and knowledge of your topic. For example, if your poster is presented at a meeting related to microbiology, then you should avoid lecturing them on too much detail, because most of your audience will know the basic principles of microbiology. Rather, you should spark their interests by highlighting what you have done differently from other researchers and what would be of valuable to them. This is a good time to emphasize how your research is educational, modern, relevant in society, and related to STEM. You will usually state this information at the end of your oral presentation.

Step 9: Delivering the oral poster presentation: Since you practiced your oral presentation prior to the conference, symposium, and/or poster session, try to stay calm and carry on with your oral presentation. Effective delivery of your oral presentation involves careful preparation to ensure proper pronunciation of words and terms, pacing of speech, and other verbal cues. This is a skill that is enhanced with practice and constructive feedback.

Avoid using hand lotion, because your hands may become sweaty. Also, avoid drinking coffee or any caffeinated drink the day of the oral presentation; believe me, your heart rate will be racing, in a positive way, not in a nervous state. Also, keep a travel-size bottle of mouthwash with you for obvious reasons.

Step 10: Finalization: You should slow down toward the end of your oral presentation to summarize your main points. Your audience wants to hear you, the presenter, reflect on your research. At the end, use terms such as “In summary” or “Lastly” or “In conclusion.”

Finally, describe what you accomplished with your research. It is at this point you may want to provide a per-

sonal perspective, detailing your interest and passion for your research.

There is limited time between presentations when people come to view your poster, and it is impolite and, to some extent, unprofessional to be engaged with your cellular phone when the presenter should be alert and attentive to the viewers of the poster. Once you are done presenting, you may have a minute or less before the next audience group approaches you. Avoid using a cellular phone, as this may give the impression that you are text messaging.

Additional suggestions after finalizing your oral presentation include the following:

1. Ask the audience if they have any questions, with a smile.
2. Keep a piece of paper and a pen to write down any mishaps that you need to correct in the future.
3. It would be beneficial to have a colleague, mentor, and/or faculty member attend and observe you, provide comments, or pose a question to promote more discussion.
4. Contact anyone who requested information or wanted to collaborate with your research.
5. Prior to your poster presentation, have your colleague, mentor, and/or faculty member contact their colleagues in the field and ask them to come by your poster to support you.
6. Describe real-world implications with your research.

2 | MATERIALS AND METHODS

A review of existing literature related to oral presentations and poster design was used to identify and demonstrate important considerations for designing and presenting an oral poster presentation. Based on the review of the literature and an analysis of prior undergraduate students’ poster preparation and presentation, some critical evidence was collected on the limitations and quality of the students’ oral poster presentation as described hereafter.

2.1 | Study design

Qualitative evidence was obtained using a rubric (Table 1) to analyze 50 undergraduate students’ majoring in a field of STEM and their posters collected during 2024–2025.

2.2 | Participants

Fifty undergraduate students were participants in a Research Scholars Program in the College of Science and Technology at Temple University. The purpose of the Research Scholars Program is to pair each of the undergraduate students with an appropriate academic mentor/primary investigator (either

TABLE 1 Rubric for evaluating undergraduate students' posters.

Poster characteristics	Meets expectations	Partially meets expectations	Does not meet expectations
Title accuracy Title formatting Title affiliation(s)	Title contains accurate information and clearly represents the content of research reported in the poster. Title is bold and centered with authors' names appear one single-spaced line below the title. Authors' affiliations after their names.	Title contains partially accurate information and clearly represents the content of research reported in the poster. Title is bold and not centered, with authors' names appearing one double-spaced line below the title. Authors' name is present, but the affiliations are not complete.	Title contains inaccurate information and/or does not clearly represent the content of research reported in the poster. Title is not bold and not centered, with authors' names appearing one double-spaced line below the title. Authors' name are present, but not the affiliations.
Abstract formatting Abstract accuracy	The word Abstract is aligned to the left and bold below the title, and the main paragraph of the abstract should not be indented and should not have any citations of other works. The abstract is accurate, highlighting the most relevant information from the research.	The word abstract is either aligned to the left or bolded, but not both, and has no citations. The abstract contains partially accurate information, highlighting the most relevant aspects of the research.	The word abstract is either aligned to the left or bolded, but not both, and has a citation. The abstract does not fully contain accurate information and does not fully highlight the most relevant aspects of the research.
Keywords formatting Keywords accuracy	The term <i>keywords</i> is italicized, aligned to the left followed by a colon, and the keywords are written in lowercase. Keywords accurately represent the research reported in the poster.	The term <i>keywords</i> is italicized but not aligned to the left, followed by a colon, and the keywords are written in lowercase. Keywords partially represent the research reported in the poster.	The term <i>keywords</i> is not italicized or not aligned to the left or not followed by a colon, and the keywords are written in upper and/or lowercase. Keywords inadequately represent the research reported in the poster.
Introduction: Topic identification Introduction: Problem identification	Clearly introduces the topic. Clearly identifies a problem.	Partially introduces the topic. Partially identifies a problem.	Does not clearly introduce the topic. Does not identify a problem.
Methods formatting	Methods are clearly organized and well-detailed, and methods and materials are explained.	Methods is partially clearly organized, but some aspects of the methods and materials are not clearly explained.	Does not clearly explain the methods and materials.
Methods accuracy	Methods are accurately designed and fully explained.	Methods are partially accurate but may not be fully explained.	Methods are not accurately designed and/or are not fully explained.
Results formatting Results accuracy	The results are detailed clearly. The data is accurate.	Results are partially detailed clearly. The data are partially accurate.	The results are not clear. The data is not accurate.
Discussion	The discussion has an adequate report of the conclusions.	The discussion partially addresses the conclusions.	The discussion does not adequately address the conclusions.
References	References are fully consistent with APA format.	References are partially consistent with APA format.	References are not consistent with APA format.
APA formatting	Poster is consistent with APA order, structure, and format.	Some aspects of the poster are consistent with APA formatting.	Poster is not consistent with APA order, structure, and format.
Visual formatting	Visuals are easy to interpret and visualize and are labeled and formatted correctly.	Visuals are labeled but are difficult to interpret, or are too small, or are not formatted correctly.	There are no visuals.
Visual accuracy	The content of the visuals is accurate and properly represents the research findings.	The content of the visuals is partially accurate and/or only partially represents the research findings.	The content of the visuals is not accurate and/or does not properly represent the research findings.

TABLE 2 Results are based on percentages of applying the rubric to the sample of 50 undergraduate student posters.

Poster characteristics	Meets expectations (percentages)	Partially meets expectations (percentages)	Does not meet expectations (percentages)
Title accuracy	100		
Title formatting	100		
Title affiliation(s)	100		
Abstract formatting	84	16	
Abstract accuracy	100		
Keywords formatting	76	24	
Keywords accuracy	94	6	
Introduction: topic identification	100		
Introduction problem identification	100		
Methods formatting	82	18	
Methods accuracy	86	14	
Results formatting	94	6	
Results accuracy	94	6	
Discussion	62	24	14
References	56	30	14
APA formatting	40	22	38
Visual formatting	96	4	
Visual accuracy	76	24	

a faculty member, researcher, or practitioner) for two academic semesters, who provides guidance and encouragement to develop the skills and strategies needed to accomplish the undergraduate students' research goals.

2.3 | Instruments

Using a rubric with the following categories shown in Table 1, each of the 50 posters was analyzed and evaluated by the author.

Each of the 50 posters was analyzed by applying the rubric and was evaluated for each of the three column criteria and each of the row characteristics.

3 | RESULTS

The data based on the rubric analysis is presented in Table 2.

An evaluation of the data in Table 2 indicates that the undergraduate students had a good understanding of how to design and present an oral poster. One hundred percent of the undergraduate students were categorized as *fully meets expectations* for the following attributes: *title accuracy*, *title formatting*, *title affiliation(s)*, *abstract accuracy*, and *introduction: topic identification and problem identification*. This exceptionally good performance on these rubric attributes may have been a result of the close working relationship between the undergraduate students and their

research mentor/primary investigator. However, for the more detailed attributes such as *abstract formatting*, *discussion*, and *visual accuracy*, the percentages categorized as *partially meets expectations* were substantially less and are as follows: *keywords formatting* (76%), *discussion* (62%), *references* (56%), *APA formatting* (40%), and *visual accuracy* (76%). Very few of the undergraduate students' posters were categorized as *Does Not Meet Expectations*, namely, for the following attributes: *discussion* (14%), *references* (14%), and *APA formatting* (38%).

Some of the challenges that were encountered among the undergraduate students, such as the poor performance on preparing the *Discussion*, may be attributed to the lack of experience integrating and reflectively analyzing data obtained in their results. When citing and/or listing *References*, undergraduate students may not have had enough experience in properly composing the details required for reference citations. Proper *APA Formatting* requires careful attention to details related to the sources used throughout the poster, and some students may have difficulty meeting the requirements.

4 | DISCUSSION

Designing and presenting an oral poster is truly an art and a skill that will complement, rather than conflict with, a students' education. One of the primary goals of encouraging

undergraduate student's to present their posters is to educate them on how to develop necessary skills that can be applied outside of the academic setting.

Poster presentations for undergraduate students are not unique. Numerous studies have been conducted on various aspects of poster presentations (Rowe & Ilic, 2009), focusing on the levels of the poster itself, from formatting, academic content, and visuals to the interaction between presenter and the audience, including engagement with the audience and dialogue (Miller, 2007). However, designing and presenting an oral poster presentation at professional conferences or among colleagues is often a daunting and challenging task for many novice undergraduate students and inexperienced people in general.

The steps and rubric presented above addressed the challenges and achievements of undergraduate students' initial design and presentation of a poster when they were guided by a more mature mentor or adviser and contributed additional evidence for the efficacy of this approach in introducing undergraduate students to the task of developing and presenting a poster orally in a semi-formal setting among their peers.

Dillon et al. (2024) suggest face-to-face interactions are more effective than merely practicing alone. Their research consisted of designing a workshop that exposed undergraduate students to the realities of research poster presentations by participating in a role-playing activity in "which half of the class acts as different poster session attendees or audience members, while the other half practices presenting their poster to these audience members." By using this format, undergraduate students are challenged to observe poster presentations as a more flexible "poster conversation" that encourages them to adapt their talk to the listener and immerses students in the dynamic, fast-paced environment of a poster session.

Rowe and Ilic (2009) explored the perceptions of academic poster presentation for transferring content knowledge to the public and for academic publication. The authors identified the visual appeal of one's poster as a "first impression," which, at times, may be more influential than the poster content itself. "Posters are designed to give a visual representation of an issue that first attracts attention and then conveys an intended message. Therefore, much of the poster's success as an educational tool relies upon the design of the poster" (p. 5), consistent with the overall findings reported in this study of undergraduates' first introduction to the design and oral presentation of a research-based poster.

5 | CONCLUSIONS

The major steps described in this paper to enhance novice learners' first experience in designing and presenting a poster in large measure were successful based on the evidence

obtained using the evaluation rubric. However, it is notable that some aspects of the quality of the students' posters, such as details in proper formatting of citations to published sources and quality of the discussion of the findings reported in the posters, were more challenging for this sample of undergraduate students. While much of the success of the approach used here can be attributed to the role of the professional mentor(s) in providing individualized guidance to the students, additional attention by the mentors in reviewing details of the poster prior to presentation may be necessary to alleviate some of the shortcomings noted in the rubric evaluations. Overall, this article emphasizes the importance of giving students an opportunity to present their research in a way that may empower their self-confidence and proficiency. By developing and orally presenting one's research in a supportive and informative feedback environment, the experience encourages a sense of enjoyment rather than fear or an aversive sense of apprehension in making oral presentations. This experience for undergraduate students can greatly benefit both presenters and their peers who participate as members of the audience.

AUTHOR CONTRIBUTIONS

Adam Stefanile: Writing—original draft.

CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest.

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