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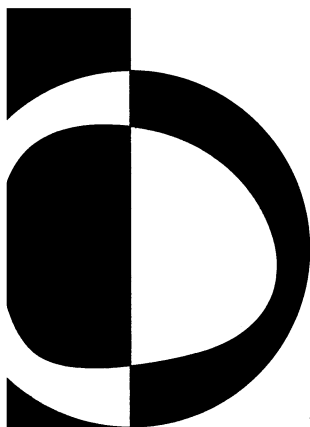
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Design and Pitch: Introducing Multiliteracies Through Scientific Research Posters

ABSTRACT

While literature on research posters continues to grow in the sciences, writing center scholarship has yet to fully engage in exploring the pedagogy of research posters, let alone the facets of its multimodal components. Over the last few decades, research poster sessions in major academic conferences have grown in number, requiring the research in the poster to not only be presented clearly and succinctly but also be designed in a memorable way. As a significant communication genre that embraces multimodal design, research posters and sessions may provide exceptional occasions for students in the sciences and the humanities to learn multimodal design. For multiliteracy centers, the research poster itself could become the cross-disciplinary anchor for multiliteracies pedagogy. This article explores how research posters, as a ubiquitous and important genre in the STEM fields, can help make multiliteracy work visible, increasing students' awareness of their everyday engagement in multimodal communication.

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Part pitching, visual storytelling, and dialogue—the scientific research poster session is like no other academic performance. A popular genre in science, technology, engineering, and mathematics (STEM) fields, research posters are a major feature in most professional scientific conferences. For instance, the Society for Neuroscience’s annual meeting in 2013 displayed nearly 15,000 posters to an audience of over 25,000 people during the course of five-day meetings. Because publishing or even presenting research has become increasingly difficult, research posters are not only “one of the most common ways of presenting research” but also one of the most important ways novice and experienced professionals in social science and science fields learn, network, and collaborate in their research communities (Silvia, Delaney, & Marcovitch, 2009, p. 117).

Consequently, a growing amount of literature on research poster presentations across disciplines has been published in the last 20 years (Brownlie, 2007), but most focus on offering technical guidelines for the visual design of research posters (for example, Sherbinski & Stroup, 1992; Murray, Thow, & Strachan, 1998; Shelledy, 2004). While literature on research poster presentations has been on the rise, writing center journals and blogs rarely (if at all) address scientific research posters, even though many centers provide support through research poster workshops or links to websites (Welhausen, 2013). With the emergence of multiliteracy centers and scholarly interest in oral, visual, and multimodal literacies in higher education (Sheppard, 2009; Sheridan & Inman, 2010; Balester, Grimm, Grutsch McKinney, Lee, Sheridan, & Silver, 2012; Lee & Carpenter, 2014), writing and multiliteracy centers have a rare opportunity to not only introduce writing center pedagogy but also reframe multimodal discussions with faculty and students through the genre of the research poster. The unique genre and rhetorical situation of the professional science poster session (with its international crowds, number of poster displays, and diverse range of audience members from academic field specialists to government agencies) may help multiliteracy centers initiate compelling conversations on multiliteracy and introduce STEM students to the range of ways researchers make meaning through visual, linguistic, gestural, spatial, and auditory designs.

For this article, the term “multiliteracy centers” will be used when discussing writing centers or studios that provide workshops and tutorials on visual or multimodal assignments. Multiliteracies, as the New London Group (1996/2014) explains, describe more than multimodal composing (the use of various combinations of visual, linguistic, gestural, spatial, and auditory modes to convey expression and/or make meaning). Multiliteracies are pedagogical approaches

to literacy education that ask us to prepare students for the various affordances of communication possibilities and to encourage them to apply dynamic meaning-making strategies that are shaped by socio-cultural purposes, experiences, identities, and discourse contexts (New London Group, 1996/2014). Multiliteracy center scholars also build on the work of composition scholars in new and visual literacies, such as Jay Bolter, Cynthia Selfe, Andrea Lunsford, Kathleen Blake Yancey, Jody Shipka, Jason Palmeri, and others, who advocate for developing students' capacities to negotiate, participate, collaborate, and create beyond written text. While research posters are classic genres in the science field, multiliteracies pedagogy introduces a useful critical lens by which research poster sessions can be understood and approached. This article first describes the scientific research poster presentation in professional conferences to help multiliteracy centers better articulate strategies for faculty, graduate students, or undergraduate students. Next this article presents some data findings of 10 research poster articles, which may help multiliteracy centers identify needs in research poster pedagogy. The remaining half of this article considers how the New London Group's (1996/2014) theory of multiliteracies pedagogy might help us develop robust conversations on research posters and promote strategies through which students become "meaning-makers" across varying modalities and discourses (New London Group, 1996/2014, p. 35). As an example, we discuss the design of a research poster workshop initially created for Stanford University's Hume Center for Writing and Speaking and review examples of sample student posters. There are practical reasons why writing centers and multiliteracy centers should develop approaches to research poster pedagogy that attend to a fuller range of the genre's multimodal affordances: Students may deliver better research poster pitches and design more effective, memorable posters; multiliteracy and writing centers may attract students who do not traditionally visit; and research posters may provide a platform for discussing ways multimodality is involved in communication and writing across fields. More importantly, we hope that an exploration of multiliteracies pedagogy through research posters may help centers frame discussions of multimodality on their campuses.

Situating the Practice of Scientific Research Poster Sessions

In the summer of 2013, the Hume Writing Center merged with the Oral Communication Program. The new Hume Center for Writing and Speaking joined writing and oral communication support to become a multiliteracy hub on campus. At the time, the Hume Center was

home to 51 appointment-based tutors, of which 31 were lecturers in the Program in Writing and Rhetoric. In addition, the center had 30 drop-in undergraduate peer tutors and 57 oral communication tutors consisting of both undergraduate and graduate students. Our university serves a large population of STEM students: More than a quarter of undergraduate students, for instance, study engineering. Not surprisingly, for writing services alone, 49% of students visiting our center came from STEM fields during the academic year of 2013 to 2014 and 37% during the academic year of 2014 to 2015. To better serve STEM students, we created a research poster workshop to help students practice designing and pitching their own research. The authors' collaboration in 2013 combined specialized knowledge of visual design and scientific oral presentations; however, this collaboration led to a better understanding of the need for contextualizing the history and purpose of research poster sessions and resulted in a deeper appreciation of how research poster sessions apply design elements across modalities.

When introducing workshops to faculty and students, we found it necessary to explain the scale and scope of professional scientific research poster sessions (on which undergraduate research poster sessions are modeled) and the professional stakes of these sessions. These explanations not only informed students about the rhetorical decisions they would make in designing their poster-accompanying pitch but also helped them understand and practice the ways they might communicate in research poster sessions. The theory of situated practice presented by the New London Group (1996/2014) emphasizes the importance of connecting learning, such as oral and visual strategies used in research poster sessions, with the context in which learning is actually practiced and applied. "There is ample evidence," the New London Group (1996/2014) argues, "that people do not learn anything well unless they are both motivated to learn and believe that they will be able to use and function with what they are learning in some way that is in their interest" (p. 50).

To begin, the academic poster session involves three components: the visual display of a research poster, the short presentation or pitch, and the informal discussion of the content after the pitch. In the sciences, the poster session has always been a popular way of presenting information, but, as we mentioned earlier, poster sessions at major academic conferences have increased dramatically in the past few decades. David C. Shelledey (2004) with Linda A. Sherbinski & Dennis R. Stroup (1992) note that research posters are increasing because poster sessions represent a "step toward publishing" and provide networking potential. According to Paul J. Silvia, Peter F. Delaney, & Stuart Marcovitch (2009), publi-

cation in top-tier scientific academic journals is increasingly difficult; thus, the scientific poster session has become a legitimate alternative for academics not only to formally publish scientific abstracts but also to widely disseminate their research. The growth and scale of research poster sessions signify the importance of poster sessions in research—especially as advancement of computer technology and software aids how we visualize information and graphically design data.

The main objective of the poster presentation, to share recent research, is well known to most scientists, but due to the growing crowds and the range (as well as limited time) of audiences, research poster sessions have extended well beyond the goal of simply presenting scientific information. Thus, it is helpful for multiliteracy center workshop facilitators to articulate both the primary and corollary objectives of research poster sessions. Primarily, the active research poster session serves as a vehicle for presenting one's current/recent research to others in similar or related fields of study or to industry representatives and funding agents who may also attend poster sessions. Therefore, an engaging and memorable presentation of the research may not only lead to effective dissemination of the work and generative feedback but also provide opportunities for professional collaborations, offers for post-doctoral positions, or job interviews. Although presenting "research" is the primary aim of a poster session, students should understand that the design and delivery of effective scientific research posters have much broader implications when professional stakes are so much higher.

Furthermore, the environment of poster events at professional conferences might be best described as crowded marketplaces, where showcased posters change daily (often twice daily) and are arranged in long rows in large conference halls. Presenters compete for attention with each other and nearby vendors as audience members make their way through the aisles. In fact, presenters may discover that theirs are not always the "destination poster," that is, the specific posters that attendees have targeted to visit. Attendees generally make their way to specific posters because accepted abstracts are arranged by theme and then made web searchable from weeks to months in advance. However, as topics and themes are generally clustered in the same area, attendees browse posters nearby the ones they have pre-identified to visit. This browsing opens up opportunities for presenters to gain more eyes and ears of accidental audiences. Aware of the perusing habits of conference attendees, Jane E. Miller (2007) recommends, "The title will be potential readers' first glimpse of your poster, so make it inviting and easy to read from a distance" (p. 324). Thus, even before the conference begins, the size and scope of these research poster sessions in scientific confer-

ences have made a stimulating title and abstract even more important to presenters; more importantly, effective presenters need to prepare a visually appealing poster and oral “pitch” in order to actively draw, engage, and keep audience attention during packed sessions.

While the crowds at research poster sessions point to the need for making the research poster and presentation appealing and clear, workshop developers should also understand the variable nature of live presentation requirements of research poster sessions. Conferences can range from requiring speakers to introduce their posters some of the time to requiring poster presenters to always stand next to their posters. Consequently, the amount of content and text in a research poster depends on whether (and to what degree) the speaker(s) must be present with the poster. Because research poster information can supplement the presenter’s talk or stand alone, research posters may be designed to do “all the talking” or “some of the talking.” In our experience, this is rarely considered in the design stage of poster creation.

In summary, over the last few decades, research poster sessions in major academic conferences have grown in number, requiring the research in the poster to not only be presented clearly and succinctly but also be designed in a memorable way. While the experience of the research poster session as described in the last few pages is well known to many STEM academic professionals, this experience is often not translated in research poster or writing center literature. As we will explain in the ensuing pages, communication strategies students apply will depend on how they think about communication during their poster sessions and tell their research story to audiences ranging in diverse academic, cultural, and linguistic backgrounds.

Visual and Oral Literacies in Research Poster Literature

While the number of research posters has grown in professional conferences, there is a perceptible gap between how research posters and sessions are delivered and how disciplinary literature discusses research posters. Since 1985, research posters have become such an important opportunity for exchange that at least 29 articles or chapters on the topic have been published in professional journals and books across fields of education, biomedicine, nursing, rheumatology, neuroscience, medicine, aquaculture, physiotherapy, psychology, and health research. We sampled 10 of these articles from disciplines mostly in STEM fields, where research posters literature appeared to be most concentrated.

Table 1. Surveyed Research Poster Literature Listed by Publication Year and Field

Field	Research Poster Literature
Dermatology/ Leprosy	Kaimal, S., & Thappa, D. M. (2010). The art and science of medical poster presentation. <i>Indian Journal of Dermatology, Venereology, and Leprosy</i> , 76(6), 718–720.
Disease	Forsyth, R., & Waller, A. (1995). Making your point. <i>Archives of Disease in Childhood</i> , 72, 80–84.
Education	Miller, J. E. (2007). Preparing and presenting effective research posters. <i>Health Services Research</i> , 42(1), 311–328.
Marketing	Brownlie, D. (2007). Towards effective poster presentations: An annotated bibliography. <i>European Journal of Marketing</i> , 41(11/12), 1245–1283.
Medicine	Shelledy, D. C. (2004). How to make an effective poster. <i>Respiratory Care</i> , 49(10), 1213–1216.
Nursing	Moore, L. W., Augspurger, P., King, M. O., & Proffitt, C. (2001). Insights on the poster preparation and presentation process. <i>Applied Nursing Research</i> , 14(2), 100–104.
Nursing	Sherbinski, L. A., & Stroup, D. R. (1992). Developing a poster for disseminating research findings. <i>Journal of the American Association of Nurse Anesthetists</i> , 60(6), 567–572.
Psychology	Silvia, P. J., Delaney, P. F., & Marcovitch, S. (2009). <i>What psychology majors could (and should) be doing: An informal guide to research experience and professional skills</i> . American Psychological Association.
Rheumatology	Wright, V., & Moll, J. M. H. (1987). Proper poster presentation: A visual and verbal ABC. <i>Rheumatology</i> , 26(4), 292–294.

Some aspects of inquiry we examined were how scholars discuss and recommended visuals and oral skills: How did research poster literature discuss visual design? Did they discuss visuals mostly in terms of how posters clearly conveyed technical information? Did they discuss design beyond clarity in terms of how it might appeal to audiences? In addition, did research poster literature discuss oral communication skills and techniques for how presenters might apply them? Taking a closer look at research poster literature in light of these questions, we discovered two interesting trends: First, the literature provides very little advice or no advice on oral presentation skills in a poster session,

despite that oral communication is a major feature in research poster sessions. Second, visual design of research posters is discussed in terms of both visual clarity and visual appeal to audiences.

Table 2. Discussions of Content in Surveyed Literature: Visual Appeal, Visual Clarity, and Oral Presentations

	Visual Appeal	Visual Clarity	Brief Discussion on Oral Presentation Skills	No Discussion on Oral Presentation Skills
Total Number of Articles	5 (50%)	6 (60%)	5 (50%)	5 (50%)

Beginning with how the surveyed literature discusses oral skills, we found that half of the literature does not discuss oral presentation skills; those that do tend to under-emphasize oral presentation skills as a part of research poster sessions. A typical example of how an article addresses oral skills in research poster sessions can be read in Verna Wright & John M. H. Moll’s (1987) “Proper Poster Presentation: A Visual and Verbal ABC,” published in *Rheumatology*. While the title promises a discussion on both visual and verbal, the “verbal” part of the discussion is allotted one line under “Recommendations”: “Give a short introduction” (p. 293). Despite this, Wright & Moll’s (1987) article is one of the earliest pieces to highlight the importance of visual aesthetics in posters by including a study of how conference attendees interacted with conference posters. Their study points to a need for posters to be visually designed to 1. “get the viewers to look at it”; and 2. “make it easy to digest” (p. 292).

While oral presentations for research posters are only briefly touched upon, visual design is identified, described, and prescribed: In fact, research poster literature shows a growing awareness and interest in the rhetorical elements of visual design. In a survey study of poster design and audience interaction, Linda Weaver Moore, Phyllis Augspurger, Margaret O’Brien King, & Charlotte Proffitt (2001) discover the following findings of audiences attending two professional nursing conferences: The perception of research poster effectiveness depends on the visuals and design of the research poster as much as its content. While research poster literature in the sciences emphasizes clarity and data transparency in visual design, half of the research poster literature

distinguishes and stresses the importance of visual appeal. For instance, 6 of the 10 papers on research posters describe the cognitive value of visualizing information effectively: the function of the design of research posters is to be transparent, to clearly and efficiently illustrate research findings. Rob Forsyth & Alan Waller (1995) argue that illustrations and graphs help convey challenging theoretical concepts and note that visuals should “inform” rather than impress. In contrast, 5 of 10 articles on research posters raise the argument that poster design should present effective and appealing design as well as research content. Rowena Murray, Morag Thow, & Rosanne Strachan (1998) stress that posters should be designed to “generat[e] interest” and “sell” the research work (p. 319, 320). Likewise, Sherbinski & Stroup (1992) assert the importance of the initial visual appeal of research posters and data visualizations: “[V]iewers are generally drawn to a poster by its appearance” (p. 571). Moreover, they argue, “Visually appealing content is preferred to narrative whenever possible” because “showing versus telling” helps to relay information more clearly and quickly (p. 569). Together with the observation raised by Wright & Moll (1987) about the need to “get viewers to look” at posters, studies presented by Moore, Augspurger, King, & Proffitt (2001) and Sherbinski & Stroup (1992) demonstrate the developing interest in and importance of visual design rhetoric, a topic that might be overlooked if multiliteracy center administrators focus only on technical discussions of font size and color choices.

The most informative article on research poster design and presentation is Jane E. Miller’s (2007) “Preparing and Presenting Effective Research Posters.” Although writing in the health field, Miller (2007) calls attention to elements of rhetoric and argues that research poster design can only be effective if it considers how it conveys information to “varied professional audiences” (p. 311). She points to the need for “focused storyline” through “dialogue” between speaker and audience (p. 313), the “hybrid” model of research posters (combination of “published paper and oral presentation”), and the visualization and planning of the poster design as part of the visual dialogue to audience. While Miller (2007) argues that research poster presentations should be considered a visual and vocal “hybrid” mode of communication, oral presentation strategies are not explored in detail. Nonetheless, her emphasis on “dialogue” and planning of oral narrative is valuable and points to a growing interest in the sciences for learning and applying oral strategies in communication.

Trends in research poster literature in the sciences and social sciences suggest an increased interest in effective visual design and oral presentation of the research poster. However, the majority of literature

offers templates and technical specifications such as font size, poster dimensions, and color suggestions. Very few research poster articles frame poster presentations in terms of rhetorical concepts or offer concrete strategies that encourage composers to adapt these “communication” skills to variable situations and media, even as they recognize the research poster session as requiring a multimodal approach.

Research poster scholars’ interest in visual design rhetoric and their oversight of oral communication has helped us highlight the unique value of the multiliteracies approach—it is an approach that integrates visual, oral, and other modalities used in research poster sessions. More broadly, though, our insight in the gap between practice and literature has also led us to note the absence of significant writing center discussions on scientific research posters. While literature on research posters continues to grow in the sciences, writing center scholarship has yet to fully engage in exploring the pedagogy of research posters, let alone the facets of its multimodal components.

Rhetorical Thinking in Design Models

An early writing center response to the New London Group (1996/2014), John Trimbur’s (2000) “Multiliteracies, Social Futures, and Writing Centers” notes that writing center work has been supporting—at least at his own polytechnic institution—composition beyond writing. Even so, Trimbur (2000) insists on the significance of “multiliteracies” as a concept: “Multiliteracies” gives a name to important changes and developments in literacy practices of which his center is already actively a part; and he predicts the emergence of writing centers that actively promote their support of “essays and project reports to PowerPoint presentations to web page and poster design” (p. 30). In discussing future multiliteracy centers, Trimbur (2000) distills the New London Group’s (1996/2014) rich concepts of multimodality and relates them in terms of three major modal categories: “oral, written, and visual communication” (p. 29). Almost a decade after Trimbur’s (2000) observation, Jackie Grutsch McKinney (2009) points out that many more writing centers have been working with a “variety of texts” (p. 29). For all that, multiliteracy center scholarship tends to focus almost exclusively on the visual mode. Grutsch McKinney’s (2009) “New Media Matters,” for instance, examines how visual design of new media texts might be supported in tutorial sessions. Exploring material processes of multimodal work, David M. Sheridan & James A. Inman (2010) also provide extensive examples of tutors working with visual design issues, although they do refer to the use of music in oral presentations, website,

and video. The discursive leaning toward visual design in multiliteracy center studies is understandable as visibility is central to multimodal communication. Nonetheless, in revisiting the New London Group's (1996/2014) multiliteracies pedagogy and considering it in light of research poster sessions, we discovered opportunities for exploring a fuller range of multimodality.

As we worked to develop research poster session workshops for the Hume Center, it became clear that our workshops needed to be different from standard research poster workshops that usually focus on visual design recommendations. This is because research poster sessions embody a range of design elements and multimodal communication practices delineated by the New London Group (1996/2014). Based on a theory of discourse that treats any semiotic activity as a matter of purposive "design," the pedagogy of multiliteracies introduced by the New London Group (1996/2014) considers creative application of five semiotic systems or modes of meaning: linguistic design, visual design, gestural design, spatial design, and audio design (see Table 3). The New London Group's (1996/2014) definition of "linguistic design" refers to words or text used for rhetorical effect. In our case, we argue that linguistic design applies to words chosen to be read on research posters as well as words spoken orally during the live pitch. In addition, "spatial design" is expanded to discuss the conscious staging and use of the triangulated space between presenter, poster, and audience—an area analogous to Landon Berry & Brandy Dieterle's (2016) concept of "interstitial space" in tutorial sessions. Describing interstitial space in terms of the social space between tutor and tutee, Berry & Dieterle (2016) argue how interstitial space, when strategically inhabited, improves conversations and interactions. This notion of interstitial space works well with the situation of poster presenters who work to engage transient audiences with gestures, body language, and voice within a small working stage space. We also adapted the New London Group's (1996/2014) concept of "audio design" (that is, sound effects impacting reception) to take into account "auditory design," an important feature of oral communication. For us, auditory design considers how voice (through intonation, pitch, rate of speaking, articulation, volume) is used to shape words that people hear and how people respond to it.

Table 3. Short Definition of Individual “Modes of Meaning” Adapted from the New London Group’s (1996/2014) Discussion in “A Pedagogy of Multiliteracies: Designing Social Futures”

<p>Multimodal Design includes various combinations of “Modes of Meaning” <i>Research posters provide an opportunity for writing centers to explore the ways they can engage students in different modes of meaning in various contexts (academic, professional, international, etc.)</i></p>	<p>Linguistic Design</p>	<p>Words, Vocabulary, Information structure, Metaphor/analogy, Local and global coherence <i>For research poster sessions, use of words refer to text meant to be read (on posters or other visual screens) and text meant to be spoken (oral speech).</i></p>
	<p>Visual Design</p>	<p>Color, Perspectives, Vectors, Foreground and background, etc.</p>
	<p>Gestural Design</p>	<p>Body language, Affective behavior, Gesture, Feeling and affect, Kinesics, Proxemics <i>For research poster sessions, using gestural design may be determined by cultural contexts and a person’s abilities to perform physical acts or movements.</i></p>
	<p>Spatial Design</p>	<p>Architectonic meanings, Ecosystemic and geographic meaning, Interstitial space <i>For research poster sessions, using interstitial space meaningfully—body/objects in space.</i></p>
	<p>Audio or Auditory Design</p>	<p>Sound effects, Sound or voice reception <i>For research poster sessions, use of voice for sound effects such as intonation, emphasis, pitch, speech rate, articulation, volume.</i></p>

Multimodal design is the deliberate combination of modes described in Table 3 (linguistic, visual, gestural, spatial, auditory). These modes are heuristic tools rather than rules, supplying students with “infinite” ways to engage in “different forms of meaning-making in relation to cultures, subcultures, or the layers of an individual’s identity” (New London Group, 1996/2014, p. 53). For us, the research poster genre offers presenters with occasions to apply combinations of almost all the design modalities the New London Group (1996/2014) describes.

In our research poster workshops, we attempt to bridge the gap between actual poster session practice and research poster literature by discussing the balance and interplay between different modes of meaning-making, emphasizing how visual design works with oral communication strategies that include aspects of linguistic, auditory, gestural, and spatial design. While we cover these modalities in our workshops, we begin with visual design, because the “poster” is the first thing students usually consider when preparing for a research poster session. However, our workshops draw students’ attention to higher-order concerns in visual design, rather than addressing lower-order concerns of type size, color, or contrast. Analogous to higher order concerns (HOCs) in writing, an approach many writing centers use to guide tutorial conversations around big-picture elements of argument (Gillespie & Lerner, 2004; Purdue Online Writing Lab, 2013), higher order concerns in visual design mean focusing on the big picture of the research poster, exploring how research concepts or results are visually represented and prioritized on the poster in an efficient and appealing way: for us, this means inviting students to explore different layout options to tell the data or research story of purpose, methods, and results. Rather than discussing font choice or dimensions of the poster board (these are usually pre-set by the conference organization), our workshops prioritize information design of the research poster, keeping in mind, of course, that visuals convey sets of meaning that can be explicated orally and enhanced gesturally by the presenter.

Our approach to promoting critical engagement of research poster design is to introduce sketching activities involving two types of layout for data storytelling: Newspaper Column model and Visualization model (see Table 4).

Table 4. Comparison of the Newspaper Column and Visualization Models for Research Poster Layout Design

Newspaper Column Model	Visualization Model
<p>Content: IMRaD sections (Introduction, Methods, Results, Discussion)</p>	<p>Content: IMRaD sections (Introduction, Methods, Results, Discussion)</p>
<p>Data visualization: Charts, graphs, images, etc., with different sets of results and measures. Visualizations illustrate or supplement written text.</p>	<p>Data visualization: Charts, graphs, images, etc., are interconnected to represent different kinds of relationships amongst data (spatial, hierarchical, temporal, componential, etc.). Written text support and supplement visualizations.</p>
<p>Advantages: Design is commonplace, template driven. Layout is predictable. Poster is easy to produce.</p>	<p>Advantages: Layout is unique and visually large. Visualizations convey research findings memorably and reveals relationships between data.</p>
<p>Drawbacks: Poster is often text heavy. Ready-made “template” design might be visually uniform and boring. Cognitive style may limit more effective representation of data.</p>	<p>Drawbacks: Visualizations take time and skill to conceptualize and/or produce. Visualizations are data dependent; this style is not for every research poster.</p>

The Newspaper Column model. The most common layout of scientific research posters is what we call the “Newspaper Column” model. The Newspaper Column model includes IMRaD sections (Introduction, Methods, Results, and Discussion or Conclusion) in vertical columns (see Figure 1 for a student sample). Data visualized in

this model tend to be charts, graphs, and images that might represent different sets of methodological approaches or results. There are three main advantages of this layout: First, the structure is commonplace and familiar. Second, the layout is predictable, thus making it easy for viewers to go to specific areas of interest (such as the results and discussion sections). Finally, the poster is easier for the presenter to produce since it is a common template.

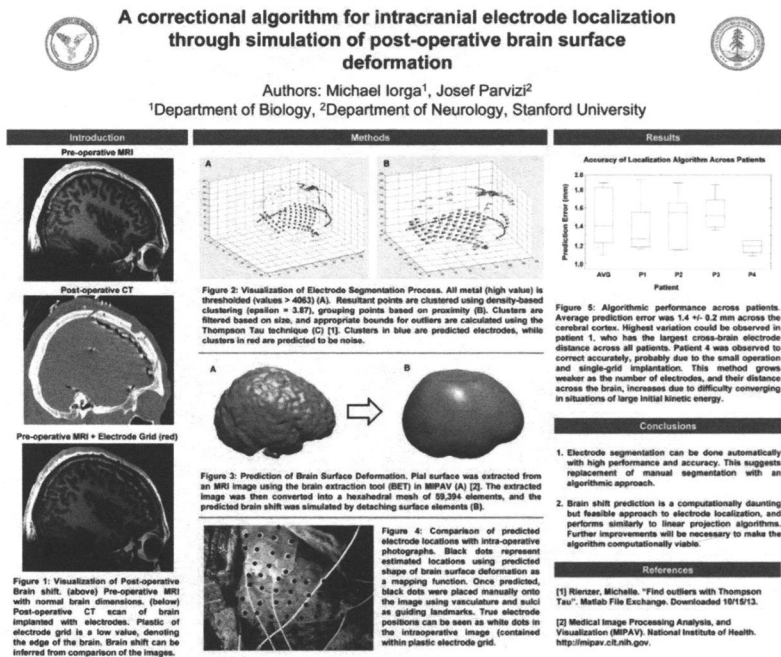


Figure 1. Newspaper Column Model by Michael Iorga and Josef Parvizi (obtained with permission). This sample with three columns was created by a student after the workshop. The information and data are presented in typical IMRaD sections. However, note that visuals are large and the text provide supplementary description of the visuals. This poster was designed to augment the spoken narrative of the presenter (versus standing alone without a presenter).

In our workshops, students typically start by sketching their research poster in the Newspaper Column style and are quick to recognize the advantages of this model due to their familiarity with the IMRaD

format. When asked, very few students admit that they reflected on the disadvantages. One potential disadvantage is that the Newspaper Column layout may invite text-driven posters and over-predictability. However, its greatest weakness may be best understood in light of Edward R. Tufte's (2003) argument against templates in *The Cognitive Style of PowerPoint*. Although speaking of PowerPoint templates, Tufte's (2003) most powerful argument about PowerPoint layout can apply to the Newspaper Column. Tufte (2003) draws connections between layout templates and the tendency to cultivate non-rhetorical thinking: Layout templates and bulleted lists often preclude alternative and possibly better presentation of research because presenters simply fill in information to fit an existing ready-made format. Like PowerPoint templates, there is a tendency to have the Newspaper Column layout prompt the content, rather than the reverse: allowing for the content to prompt the layout strategy. In this way, the template format may limit creative and insightful ways that students could represent data relationships and/or research results.

The Visualization model. Like the Newspaper Column model, the Visualization model also includes the IMRaD format; however, the design of the research poster usually works around visualization(s) of the results section. In the Newspaper Column model, the graphic and visual elements (fonts, lines, shapes, images) support the written text, and the written text is the primary means of conveying the research. However, in the Visualization model, the relationship between graphics and written text may be reversed: The graphic and visual components of the research poster convey the bulk of the research findings (with the text supporting by explanation). In the results section, the Visualization model usually illustrates the relationship amongst various sets of data (spatial, hierarchical, temporal, relational, componential, etc.). Through discussions, students learn about the advantages of this layout-approach style: The most obvious is that data visualizations are larger. Moreover, layout is unusual and visually appealing. At its best, Visualization models convey the complexity of research results quickly and memorably. As one student at a workshop put it, "Visuals are cool." However, students should also consider drawbacks of this model. It takes time and skill to conceptualize and/or produce visualizations. Also, this poster style is not appropriate for every research poster topic. The Visualization model works best when components of the research results can be mapped, diagrammed, compared, or related to each other (see Figure 2 for an example).

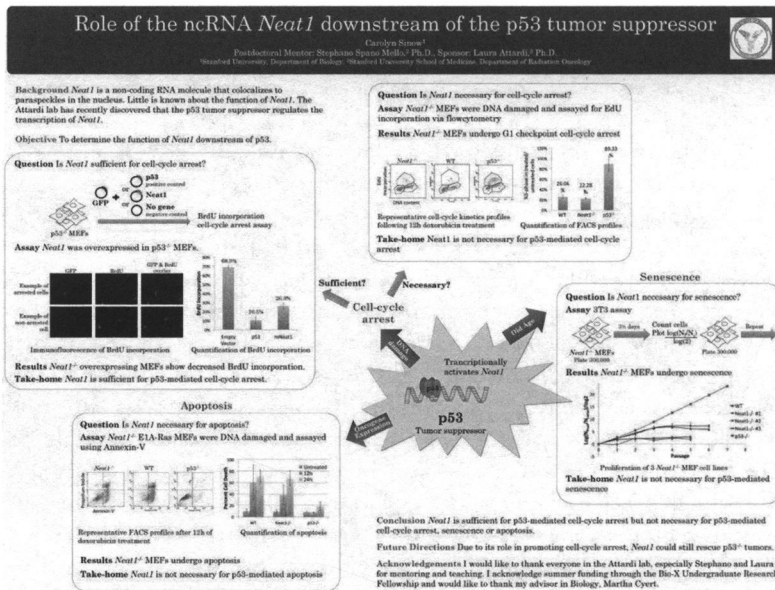


Figure 2. Visualization model by Caroline Sinow (obtained with permission). The student created this sample after taking our research poster workshop. A diagram in the center of the poster connects the different questions and results of the research. Like in Figure 1, this poster was designed to augment the spoken narrative of the presenter, hence the minimal text.

The first quarter of our research poster workshops involves discussions on layout and application of the two research poster models. We provide students with a worksheet in which they sketch a Newspaper Column and Visualization poster within a short period of time (usually 10 to 15 minutes) and then discuss the advantages and disadvantages of these models through the exploration of their sketches. Many in composition and writing center work support visual mapping as a means of brainstorming or aiding the writing process. Eric H. Hobson (2002), for instance, notes the value of visual-based activities to help visual and kinesthetic learners break down abstract ideas and become more critical aware of the composition process. In addition to supporting visual learners in thinking critically, Sohui Lee & Russell Carpenter (2016) argue that sketching encourages creative thinking and the exploration of different design possibilities with minimal risk and time. Used in the fields of art and engineering to encourage creativity, rapid sketching can help students brainstorm how their research posters might appear

and even take conceptual risks without the constraint of commitment or worry about font size or written language. Second, because students in the sciences tend to select the Newspaper Column model by default, sketching encourages students to consider alternative ways to conceptualize the research results of their data and imagine how images and design impact the communication of their research.

After providing an opportunity to create sketches, we lead student discussions on these two models as viable design approaches. In a workshop delivered to undergraduate students in electrical engineering, for instance, students echoed many of our points made in this article. They described three characteristics of the Newspaper Column model: a “classic” layout, a recognizable “flow in sequence” of the research, and layout that is easy to read. By contrast, they described the Visualization model as engaging visually and requiring more time and thought to create. Through the discussion, students seemed to understand that layout which is recognizable and “easy” to read may not always be the best way to represent one’s research story. However, students also worried that unconventional layout may not be perceived by the professor or fellow researchers as “professional.” Making a choice between the two models, we argue, should be carefully reflected upon, if students are to understand that design involves consideration of audience, situational needs, ethos, and data visualization requirements. The objective, then, of this portion of the workshop on higher-order visual design strategies is to facilitate more awareness of rhetorical choices students have when applying these two layout models and, finally, to help students understand that design choices impact how readers comprehend, engage with, and remember the research.

As we mentioned earlier, multimodality involves the dynamic interplay between the different modes of meaning. During our workshop, we remind students that the research poster session joins the visuality of the poster with the spatial, gestural, and linguistic design that comprise effective oral arguments. What this means for poster design, then, is careful consideration of what needs to be written and displayed on the poster versus what can and should be spoken and gestured during the pitch. The two samples we provided (Figures 1 and 2) illustrate how students designed a Newspaper Column model and Visualization model with the pitch in mind, minimizing the amount of text so that the majority of the poster’s real estate is devoted to a visual narrative of the research that could be referenced by the speaker. Students who worry about having a stand-alone poster (a poster meant to explain the research without a speaker present) can create a more detailed, text-heavy version as a handout. Students are also reminded that they can incorporate quick

response (QR) codes on the poster to direct the audience to web pages that offer longer technical reports on the research as well as additional figures.

Oral Pitch of the Research Poster

Like the visual design of the research poster, the oral presentation of the research during a poster session requires careful planning and thought because presenters interact with a range of audiences and their role as presenter must shift accordingly. Unlike research papers, in which authors are expected to deliver field-specific academic language and style, the oral presentation or pitch of the research poster allows for more nuanced engagement, where the presenter's ability to respond to audiences through differentiated language and style is central for their success. The goals of oral pitch include grabbing the attention of different audiences and then concisely conveying the research and its significance through key take-home points. Although it may be the most efficient way of communicating with scientists in one's field, the formal and intentional use of academese "jargon" (the term often used to describe highly specialized scientific language) may be ineffective with audiences outside the field. For our workshops, we have developed some specific strategies, focusing on higher order thinking in linguistic design to help students attend to the rhetorical choices. This includes the following:

1. Crafting a research "story" or narrative thread
2. Developing structural elements of the presentation (hook, problems and solutions, take-home messages)
3. Modulating the research "pitch" based on specific audience types

In communication studies and memory research, it is well established that developing and presenting information in the form of a story, rather than in an expository form, enhances memory recall and comprehension (Cahill & McGaugh, 1995; Glonek & King, 2014). Storytelling of the research is rhetorically important because stories improve comprehension and recollection by leveraging people's semantic memory process. Hence, students find that developing a data story—that is, relating the meaning of various results or discoveries as a narrative rather than segments of a lab report—helps them craft easily translatable and memorable take-home messages for their audience. In the research

poster marketplace of ideas, a concise and narrative presentation of data improves the chances that students' research will become more memorable, thus promoting wider dissemination of, and perhaps greater interest in, students' work.

While data stories are important, we also teach students techniques in modulating stories and word choice for different audience types, categorized primarily (for the sake of simplicity) by level of expertise. At professional conferences, developing a one-size-fits-all story is not the best approach for presenters, whose day will likely involve interacting with a large and diverse audience. In longer workshop sessions for graduate students, students spend more time thinking about and practicing multiple versions of the oral research "pitch" that might help them connect with three common audiences representing a range of field knowledge:

1. Field expert: individuals with specialized knowledge in the field
2. Individuals in the discipline: individuals who study related fields in the discipline; individuals with general knowledge in the discipline
3. Non-scientist: individuals with no field or discipline-specific knowledge; "lay audience"

Audience demographics are shaped by the poster venue; for instance, there are more experts and general discipline audience members at a field-specific conference. By contrast, there are more non-scientists and non-specialists at events on university campuses. In either scenario, planning for these three most common audience types gives the presenter a range of practice. The ways that one speaks about their work, then, should be flexibly tailored to their understanding of the audience's needs and expectations.

Depending on the length of the workshop, students may practice one or two versions of "technical elevator pitches," each tailored to a specific audience type, in small groups. When identifying an audience with expert or specialized knowledge, we recommend students craft a pitch using less background and applying specialized terms, as well as articulating nuanced methods and results. We encourage students to convey specific ideas about future research directions and even discuss problems/setbacks to facilitate a dialogue, as a conversation with an expert in the field is potentially a rich vein to mine. When engaging an audience with general knowledge in the discipline (perhaps a scientist in

a related area), students practice crafting their pitch with general terms, less jargon, and more background about the research than they would to an expert. Students speaking to individuals in related disciplines are asked to discuss basic ideas of the research and results and articulate the relevance of their research to the broader scientific discipline. Finally, to the audience with no scientific background, we suggest that students generate a pitch using general terminology and plain language. In terms of content for general audiences, students provide more background information to help explain the need for research, discuss the basic results without diving too far into specifics and nuanced interpretations, and explain the relevance of the research broadly. In this way, we remind students that the poster presentation, much like the classic “elevator pitch,” is about creating customized dialogue with the audience, which can lead to rich conversational opportunities.

Realistically, though, research poster pitches are not solely shaped by levels of expertise in a topic. When viewed through the lens of multiliteracies pedagogy, strategies of delivery might take on an additional layer of purpose, especially when one considers the international scope of professional conferences. The speaker’s range of language choices not only marks rhetorically responsive strategies to expertise but also indicates an understanding of varied linguistic practices and gestural relationships that may be possible (or restricted) in public and professional spaces and different cultural contexts. Although workshop time limits generally do not allow for in-depth discussion of other linguistic, sociocultural affordances that can leverage the pitch, multiliteracy center practitioners might do more to acknowledge and support pitch styles different from expected academic standard English. For instance, a graduate student from China might switch to their native language when presenting to a professor from a Chinese university, or a researcher might speak informally about struggles with a technique to a like-minded attendee. The key to unlocking this multiliteracies approach in the pitch lies in providing students with the time and space to explore variable communication strategies for research poster sessions at regional, national, or international conferences.

In addition to addressing modulation skills, we facilitate short discussions on the effects of spatial dynamics and nonverbal/gestural design (see Table 3). Although students may have thought about what they want to say during the research poster session, they usually do not consider the rhetorical impact of nonverbal communication in terms of body language or the ways in which presenters position themselves in the poster session space. Many scholars in communication and behavioral psychology, however, have explored the persuasive role of

nonverbal communication in face-to-face interactions. According to social psychologists Larissa Z. Tiedens & Alison R. Fragale (2003), audiences identify speakers as being confident and trustworthy when they intentionally use simple but powerful nonverbal communication techniques. If there is time in the workshop, we relate best practices and ask students to model behaviors of nonverbal communication. Students incorporate intentional nonverbal elements into their pitches, including what communication scholars call the “high power” pose, which involves standing tall with shoulders pulled back, being balanced on both feet, and looking confident. When asked about additional body language and nonverbal communication that appeal to audiences, students were usually quick to note what works well: friendly, engaging smiles; eye contact with those walking by; enthusiasm for one’s research; good articulation; appearance of preparedness. In terms of spatial design, we discuss how speakers might ideally position themselves so that they can face audiences while gesturing to the poster behind them. However, unlike a traditional slideware-based presentation, presenters must deal with the ebb and flow of audience traffic; this requires constant assessment of their body position in interstitial space to welcome the interests and questions of audiences who stop to talk—sometimes appearing during an ongoing pitch. These simple nonverbal behaviors and dynamic use of space can facilitate students’ objective to present themselves as active, memorable communicators.

Expanding Multiliteracies

An understanding of the gap between actual practice of research poster sessions involving visual and oral engagement and disciplinary literature has led to improving our workshops and multiliteracy pedagogy: By relating the goals and practice of research poster sessions, we are able to situate our multiliteracy center conversations so that they are in closer dialogue with active disciplinary practices. Students, postdocs, and faculty will always make posters to present their research broadly. Thus, communication skills help our attendees not only reflect on and clarify the purpose and results of their research, but may also, through visualizations and critical engagement with material and various re-articulations, provide them with improved insight into their research.

The value of a pedagogy of multiliteracies, we believe, may extend beyond assignments like the research poster session. More specifically, the skills developed through multiliteracies pedagogy provides an opportunity for real advancement of an individual’s research ideas within the field and of the ways they speak about them to varied audiences.

In fact, the stakes become even higher for students pursuing academic careers in STEM. For example, the directed work in visualizing information is becoming increasingly crucial to young researchers as universities and academic institutions place more emphasis on visual communication across disciplines. Recently, several of the major publishing groups of top-tier scientific journals (Elsevier, Nature Publishing Group) have required authors to create a “Graphical Abstract,” a visual representation of their written abstract that illustrates the most significant findings in their paper. In addition, the ability to modulate pitches and effectively use nonverbal communication will help students as they develop presentations of their research for formal talks, job interviews, and even classroom teaching. By engaging with visual and oral exercises in our workshop and providing a space to experiment with visual and multimodal skills, multiliteracy centers can provide valuable exposure to future tasks.

For newly formed multiliteracy centers, we recommend the following ways in which the scientific research poster may be presented through workshops or consultations with faculty and students:

- *Facilitate a discussion of research poster sessions (poster and pitch) in light of the New London Group’s (1996/2014) theory of multimodal design:* This may involve, for instance, asking students to conduct mock research pitches with each other and asking them to discuss how their partners apply linguistic, visual, gestural, spatial, and/or auditory design in their research poster session. Students might also watch video recordings of dynamic research presentations and discuss how strategies they’ve seen may be effectively applied.
- *Recommend that students take time to study and be creative with a range of layout styles of actual posters in their field:* For instance, students might be provided with samples of a variety of layout styles (both conventional layouts and nonconventional visualizations). Students should be encouraged to explore different layout styles, no matter how unlikely they are to apply them, to their own data set or research.
- *Ask students to craft framing or filtering questions to better identify audiences and then modulate the research pitch appropriately:* Students could practice asking audience questions to determine their level of knowledge or interest on the subject, then develop a concise “pitch” for three likely types—general, field, and expert audiences.

As a significant communication genre that embraces multimodal design, research posters and sessions may provide exceptional occasions for students in the sciences and the humanities to learn multimodal design. For multiliteracy centers, the research poster itself could become the cross-disciplinary anchor for multiliteracies pedagogy: Research posters, as a ubiquitous and important genre in the STEM fields, can help make multiliteracy work visible, increasing students' awareness of their everyday engagement in multimodal communication.

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