

Interactive posters: A valuable means of enhancing communication and learning about productive paths toward sustainable bioenergy

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Interactive posters that require audience engagement are an effective means of communicating and exchanging information. Virginia Dale and Keith Kline discuss how they can be used to actively solicit opinions and visualize progress toward bioenergy sustainability

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The goal of poster presentations at scientific meetings is to provide a snapshot of the research, to engage colleagues in a face-to-face discussion, and to deliver enough information to entice the reader to learn more.¹ Unfortunately, poster sessions are too-often passive and non-interactive events with limited exchange between the poster presenter and the audience. Communication is constrained by what can be effectively displayed in a 0.9 to 1.2 meter space. Many posters are poorly organized and provide too much detailed and unorganized information.

While contributed posters are often intended to be as prestigious as contributed talks at scientific meetings, that is not the general interpretation. One survey found that only 64% of participants thought that posters were a good medium for knowledge transfer.² In another study of national and international meetings, very few (< 5%)

of the meeting participants visited posters, few read them, and even fewer asked useful questions.³ The subsequent recall of poster material was abysmal.³ Furthermore, most original posters do not result in a journal publication. For example, Von Helm *et al.*⁴ found that only 27% of posters resulted in a publication two years after an international conference.

An effective poster provides information, begins a conversation, serves as an advertisement of the work, and provides a summary of the research. Guidance provided to designers of poster presentations includes making the poster more attractive and engaging by limiting the text to about one-fourth of the poster space and using visuals (graphs, photographs, schematics, and maps) to convey the story.¹ Lucid and visually evocative posters are most effective in engaging an audience.⁴ In addition, presenters should be ready to

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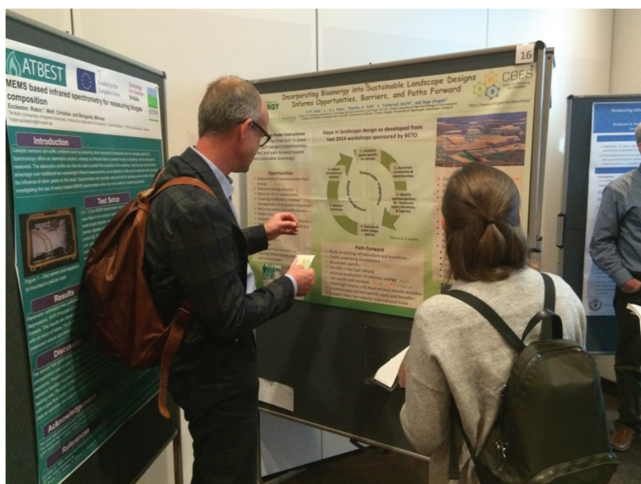


Figure 1. Displays of the interactive poster showing dots being placed on the poster at the IEA Bioenergy conference.

provide a brief verbal summary for attendees who want a quick overview of the poster.

Although posters can stimulate conversations, that is not always the case. Often posters are unmanned, and it is then up to the viewer to interpret the material. Other times the presenter hovers nearby waiting for someone to visit the poster.⁵ Student poster competitions are a welcome exception as judges circulate, read, and ask presenters questions about the poster. In the best of circumstances, a small group may engage with the presenter and each other in discussing the issues raised by a poster.

Posters can be designed to better meet the objectives of scientific communication. We recently developed and deployed interactive posters that required audience engagement. We did this by structuring provocative questions and asking attendees to indicate the choice of their favored response by placing dots on the poster (Fig. 1). The number of dots provides a gauge of the group's opinions. The dots are then removed and the poster is redeployed at other meetings, providing insights into how attendees at different meetings viewed the issues discussed in the poster.

Using an interactive poster to solicit opinions about ways to make progress toward bioenergy sustainability

The first interactive poster we developed provided information and asked attendees about the most important opportunities, barriers, and paths forward to make progress

toward sustainable bioenergy (as discussed by a recent IEA Bioenergy report⁶ generated by an international bioenergy collaboration under the auspices of the International Energy Agency). This poster was shown at four meetings that differed in geographic scope, the number of attendees, and breadth of familiarity with the science and policy related to bioenergy. The meetings were (i) the US Department of Energy Bioenergy 2015 meeting in Washington, DC⁷ that was attended by more than 600 professionals in bioenergy development and deployment; (ii) the Women in Science colloquium held at Oak Ridge National Laboratory (ORNL) that was attended by scientists and engineers from a wide variety of disciplines; (iii) the IEA Bioenergy conference in Berlin, attended by more than 300 global stakeholders from industry, academia, and policy who have insights into recent research and market developments in bioenergy,⁸ and (iv) a Bioenergy Study Tour that highlighted innovations and was attended by 70 scientists from 9 countries coming from the Department of Energy (DOE) and its national labs, IEA Bioenergy, universities, and industry as well as regional stakeholders.⁹ The collective responses to the questions on the poster indicate some agreement on (i) the importance of the opportunity to replace nonrenewable fossil energy and (ii) the key barrier to progress toward sustainable bioenergy being easy access to relatively cheap fossil fuels.

Highly ranked opportunities for progress toward sustainable bioenergy include replacement of non-renewable fossil energy, improving environmental conditions, and reducing wastes and inefficiencies (which garnered 37%, 25%, and 12% of the votes, respectively). The most important barriers identified were ready access to inexpensive fossil fuels, uncertainty about future demand and price structure, public perceptions, and sustainability concerns (which acquired 22%, 15%, 13%, and 13% of all votes, respectively).

There was some divergence in perspectives evident among the different stakeholder groups. The European-dominated, Berlin group put the highest priority on public perceptions, which was ranked fourth among responses at the US meetings. Berlin attendees also ranked 'improving conditions for biodiversity' and 'increased food security' among their top-three opportunities and barriers, while these were less popular among US meeting attendees who ranked food security near the bottom. Furthermore, while the second most important barrier at the US meetings was market uncertainty, that topic was not among the top five barriers for attendees in Berlin. Interestingly, an opportunity (improving soil conditions) that was ranked near the bottom in the four poster presentation meetings was the top priority in a Landscape Design project meeting in Ames, Iowa, that comprised predominately government

researchers and farmers (Unpublished work by VH Dale, KL Kline, TL Richards, and KL Karlen in review).

Regarding a path forward, there was strong agreement about using wastes and residues to develop a sustainable bioeconomy (37% of the votes). The next most-important aspect of the path forward for Berlin participants was to ‘increase production of cellulosic energy’ (17% of respondents) while for the US participants, ‘building on existing infrastructure’ came next (whereas this topic was ranked fifth in Berlin).

Another interesting aspect about the interactive poster results involves categories for which there were few responses. For example, opportunities to reduce risks; provide stable jobs; and use existing infrastructure, know-how, and technologies were given low priority in the four meetings where most participants were researchers. We expect these aspects would be more important to other stakeholders employed in bioenergy-related industries. Similarly, the barriers that ranked low included being too optimistic about costs and timetables, lack of infrastructure, and the need for new investments. Again, these are barriers faced by those on the front lines of deployment of new technology and are not necessarily encountered by the academic community.

Displaying the same poster at multiple meetings gave us a way to gauge the responses of different interest groups. The poster attracted attention and instigated thoughtful debate among attendees at all four of these meetings.

Using an interactive poster to ask about visualization

We also developed and presented an interactive poster on “Visualizing progress toward bioenergy sustainability” at the Bioenergy 2016 conference: <http://www.energy.gov/eere/bioenergy/bioenergy2016>. The poster conveyed information about indicators of progress towards sustainability encompassing diverse environmental, social, and economic characteristics of a system and multiple measures being needed to provide a comprehensive description of the system. In addition, it pointed out that analysis of sustainability indicator measurements is complicated not only by the variety of potential indicators but also due to variation in measurements found in different data sets, the need to convey contextually relevant results, and the variety of ways to display the results. The visualization poster then asked viewers to rank different approaches to data visualizations and graphics. Several options to display multivariate information about sustainability were displayed as shown in Fig. 1 of Kanter *et al.*¹⁰ Based on those options, participants identified their top two choices.

Although many were surprised at the request to participate, almost everyone was willing to collaborate because it merely required placing a few dots on a poster. Of the display options offered, most participants selected spatially explicit maps and bar charts (37% and 18% of the votes, respectively). However, all of options were identified by some participants as being useful. The matrix of scatter-plots was the least preferred option, and, to our surprise, 9% of the participants chose the tabular list of raw data.

During the meeting, people kept returning to the poster to see the accumulating distribution of responses. One person declared that he would definitely be using more maps and more color in displaying results. Another person proclaimed that the interactive poster was the ‘best part of the meeting.’ The feedback from the poster is helping our team improve communication and develop a tool to visualize progress toward sustainability goals.

Benefits of interactive posters

Interactive posters offer one means of generating greater attention – a clear need¹¹ – and motivate the presenter to be proactive in calling on passers-by to collaborate with their opinions. Because participants were requested to respond to the questions on the poster, it required each participant to think about the question, evaluate potential responses, and make a selection. This process often induced a discussion with the presenters as well as among other people who gathered around the poster. These exchanges were fruitful. As attendees conveyed their perceptions around each question, we were able to gain a more nuanced understanding of how participants interpreted issues and presentation options. Interactive posters provide insights about the relative importance of different research questions, barriers, or opportunities in a particular field. Engaging attendees directly increases poster impact and helps identify improved ways to communicate complex information (as demonstrated by our visualization poster).

In line with rules for good presentations (e.g. Erren and Bourne¹), interactive posters tend to attract a crowd and allow the presenter to address the entire audience at once. Simplicity is vital so that attendees are not waiting for directions. In addition, in asking visitors to provide responses to questions, an interactive poster provides a reason for the presenter to make eye contact (another ‘rule’ of Erren and Bourne¹).

Posters are most effective in transferring knowledge when integrated with other educational tools.¹² For example, posters presented from a laptop can allow viewers

to interact and access linked documents and images.¹¹ However, electronic presentations require more equipment and a different set-up than is available for most meetings hosting poster displays. Our interactive poster containing simple queries proved to be a useful means of exchanging information and promoting debate.

By stimulating focused discussions about bioenergy sustainability, the posters helped attendees refine and compare their understanding of bioenergy with those of other participants. The broad consensus that emerged regarding the most productive paths forward for bioenergy was aligned with the conclusions reached by scientists collaborating under the IEA Bioenergy framework.⁶ Whereas the poster results could be further tested in formal surveys, the interactions were productive and provided quick insights into perceived opportunities and barriers. The success of our interactive poster was acknowledged by the organizers of the annual event where this format was introduced, and that meeting now requires all posters to be interactive.

Conclusion

Interactive posters are an effective means of engaging, communicating, and exchanging information with scientists who attend conferences. Using an interactive poster to consider ways to make progress toward bioenergy sustainability revealed broad agreement about the need to confront barriers of public perception and replace fossil fuels with renewable energy starting with better utilization of wastes and residues. Furthermore, spatially explicit maps were a favored way of displaying context-specific information. We thank the interactive poster participants whose contributions enriched our understanding and improved our plans for future research.

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