

Scientists were also asked to indicate whether they thought SemMed would be a good tool for others in research (see Figure 13). All 17 respondents indicated SemMed would be a good tool for other academic scientists, graduate students, physicians and librarians (100%). Most respondents also indicated that SemMed would be useful for industry scientists, medical students and other health care professionals (82.35%). Undergraduate students were rated the least to find SemMed useful (*Yes* 52.94% and *Maybe* 47.06%). None of the scientists indicated *No* in any category, suggesting SemMed could be useful to most people interested in biomedical research and knowledge.

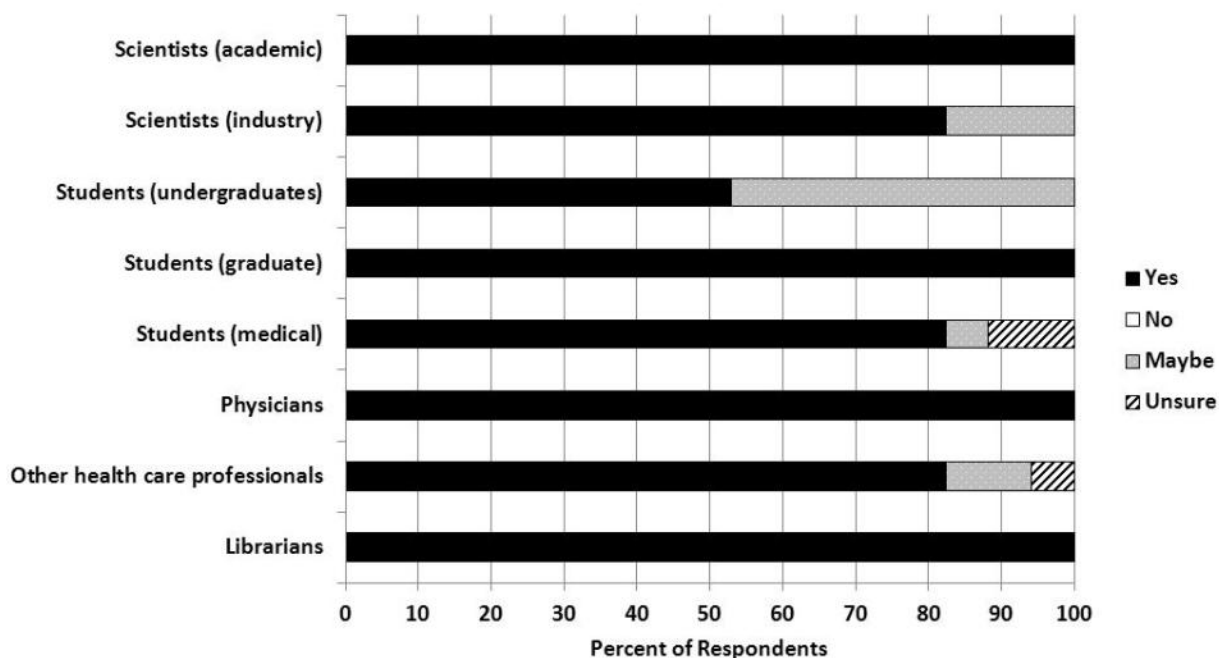


Figure 13. Survey respondents were asked to indicate *Yes*, *No*, *Maybe* or *Unsure* as to whether they thought SemMed would be a useful resource for Scientists (academic or industry), Students (undergraduates, graduates or medical), Physicians, Other Health care professionals or for Librarians.

The final question in the follow-up survey asked scientists whether they thought they might need additional assistance with the use of SemMed (see Figure 14). Most (53%) scientists indicated *No*, they did not need any additional assistance. Another 29% said *Maybe*, 12% said they were *Unsure*, and 1% said *Yes*, they would like additional assistance with SemMed. After completion of the online tutorial sessions, additional follow-up with the scientists via phone calls, emails, Twitter and/or Skype conversations was completed. All contacted scientists welcomed the opportunity to talk about their current research and strategizing how SemMed and PubMed searches could assist in furthering discovery. Additionally, since the tutorials one scientist has

contacted the Associate Fellow regularly for assistance on query strategizing and another two scientists are in the process of writing (different) book chapters. Both have indicated they would like assistance with using SemMed to generate new research topics and ideas for their book chapters. Another scientist was writing a grant and wanted assistance in exploring the literature using SemMed for hypothesis and specific aim ideas. Overall these follow-up efforts have proven beneficial and refute the suggestion that scientists do not want additional assistance. These results show that while many scientists do not regularly seek out librarian assistance, they are not opposed to the service when approached.

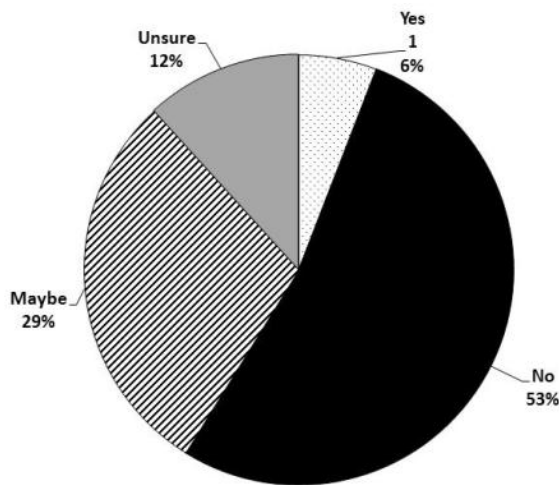


Figure 14. Scientist response to the question: Will you need additional assistance with the use of Semantic MEDLINE?

Discussion

Here we report on a project where tutorials were created and conducted to show how librarians could use SemMed for outreach to scientists. We aimed to teach scientists about SemMed and analyze their thoughts about using the tool for research. The project results suggest that the scientists who participated in the tutorial were able to easily learn about SemMed and were interested in using the tool for research. Many of the participants requested, or indicated they planned to request, login information to use the application for research. Overall these results show that teaching scientists about SemMed is a feasible undertaking, and these results are promising for librarians in providing outreach to scientists.

Scientists, especially those in the basic and integrated fields, are an important target group because they tend to be heavy users of library resources (2-3, 5-6). Many libraries offer in-

context informationists or subject-specific library liaisons to serve the basic sciences and yet there are still limited connections to basic research groups. One possible reason for the disconnect could be because many scientists tend to believe they are self-sufficient in finding their own information resources (3). Our follow-up survey results show similar findings to what others have reported in regards to basic and academic scientists information assistance needs. 53% of our survey respondents indicated they did not think they would need additional assistance with SemMed searching. However we found that when contacted, our scientist participants were willing to converse about current research and possible SemMed use. The Associate Fellow was blind to the respondents of the survey, so it is unknown who indicated they would not need additional librarian assistance with SemMed. The survey respondents who indicated they did not need additional assistance might or might not be the same scientists contacted in follow-up communication. However for those scientists that have been contacted post-tutorial, it is apparent that additional assistance has been necessary, helpful, or appreciated.

The results also reveal scientists' interest in utilizing SemMed as a tool for research and discovery. All scientists surveyed indicated they would likely use SemMed in some way for their own research. This enthusiasm is reflective of recent work where biologists were identified as a group in need of additional tools for mining literature for discovery (7). Many areas of scholarly research have been rapidly changing due to the advances in technology where the boundaries between the sciences have become increasingly blurred and are more interdisciplinary, integrated and comparative. And the increased numbers of available published articles and journals in biomedicine have only added to this rapid change in research. Academic science research is one area that has been greatly affected by these changes, and the rapid advances in technology and information can elude even the most esteemed scientist. However, after teaching scientists about the biomedical application SemMed, it was apparent that the scientist could easily use the resource. The novelty of this system in providing access to not just biomedical citations, but also meaning through visualized semantic relationships was impressive to many of the scientists. Many of the scientists' commented on the usability of SemMed as a tool to assist in keeping up-to-date on published research and trends. And tutorial participants were surprised how easy the Web-based program was to use for searching and extracting biomedical facts. These results support the idea of librarians and scientists using SemMed for exploiting discovery.

Another promising result from this project was the potential for SemMed outreach to foster collaborations. During follow-up conversations with the scientists, many were open to continued collaborative efforts and receiving assistance with SemMed. These results were not surprising because others have reported that basic scientists are very collegial, but they tend to primarily interact with coworkers in their own laboratories and research colleagues at other institutions (2). Scientists value interdisciplinary research and see it as important for the advancement of knowledge and science (20). For the librarian, these data show the potential in collaborating in integrated research efforts. In fact, studies have reported that librarians found most success and communication with research groups when the librarian was recognized as an "everyday presence" or as part of the research environment (21). The idea of using SemMed to foster collaborations and integrate oneself as the information specialist, or librarian for the research

team, could be crucial in providing outreach to scientists. Here we show that teaching scientists about SemMed has provided avenues to potentially becoming a member of the research group.

Finally, it is important to stress the effectiveness of short and simple tutorials. Previous studies have shown that scientists want short instructional sessions that are offered multiple times and online (4). Studies have also mentioned the difficulties in providing library services to researchers located distantly from the library (3, 6). Here we successfully utilized multiple modes of online tutorial sessions (i.e., Adobe Connect, Skype or G+) and offered these sessions multiple times during a two-month span. We found that offering these tutorial sessions online increased the number of participants at multiple institutions, which in turn, provided opportunities for the scientists to meet virtually and talk about their research to one another.

Conclusions

Here we show how SemMed can be used effectively in providing outreach to basic scientists and how librarians can use the tool to promote LBD collaborative research. Our recommendations to librarians interested in using SemMed or other technology to provide outreach and research collaboration with scientists should consider:

- Identifying the right tools that can be utilized by the researcher.
- Identifying the target research group.
- Creating short, simple tutorials and providing ample opportunities for scientists to participate.
- Communicating often with scientists.
- Being open to new learning and research opportunities.

Overall this project provided excellent opportunities for the Associate Fellow to learn how to teach basic scientists about SemMed and foster potential future research collaborations. With the methodologies and technologies described here, we show how tools such as SemMed can be used by librarians for making connections to scientists with outreach and LBD research potential. Additionally, this project laid the groundwork for continued collaborative efforts with the LHCBC Semantic MEDLINE research group at NLM.

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Appendix A.

Semantic MEDLINE Follow-up Survey for Scientists

1. Were you able to learn about Semantic MEDLINE from the Adobe Connect session?

Yes	Somewhat Yes	Still Unsure	Somewhat No	No
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

2. Did you request a Semantic MEDLINE login following the session?

Yes	Plan to but haven't yet	Don't plan to
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

3. If you don't plan to request a login, could you please say a couple of words on why not?

4. If you did request a login, about how many times have you used Semantic MEDLINE since the Adobe session?

0 times	1-2 times	3-5 times	6+ times
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

5. How likely is it that you will use Semantic MEDLINE for:

	Very Likely	Somewhat Likely	Unsure	Somewhat Unlikely	Very Unlikely
Research	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Facilitating or Finding Collaborations	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Studying/Gaining Knowledge	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Biomedical Literature Exploration	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Hypothesis Generation	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

Other (please specify)

6. Do you think Semantic MEDLINE will be a good resource for:

	Yes	No	Maybe	Unsure
Scientists (academic)	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Scientists (industry)	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Students (undergraduates)	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Students (graduate)	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

	Yes	No	Maybe	Unsure
Students (medical)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Physicians	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other health care professionals	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Librarians	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

7. Will you need additional assistance on the use of Semantic MEDLINE?

Yes	No	Maybe	Unsure
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If yes, what would you like assistance with?

8. Do you have any additional questions or comments about our instructional session?

9. Do you have any additional questions or comments about Semantic MEDLINE?