There is no doubt that other factors may account for some of the differences we found. Prior course experience by each student was not taken into consideration. We did not correlate each student in the upper level courses with the types of foundations courses they took (for example, Principles of Chemistry I and II rather than General Chemistry) or where these courses were taken (at the University of Wisconsin-Green Bay or at another institution with a subsequent transfer to UW-Green Bay). The survey instructors used to self-report safety topics covered and techniques used to convey information was not detailed. Some laboratory course content (such as a large emphasis on animal dissections) did not provide natural opportunities to discuss safety issues. However, we still believe the way to improve student laboratory safety knowledge is not complicated: teach the material and test students on the material.

Survey results also provided information on specific topic knowledge. We did not establish an "acceptable" mean for overall survey results nor for individual question results. However, poor post-survey results overall for questions on fire extinguishers, emergency response to clothing fire, PELs (Permissible Exposure Limits), and emergency response to a corrosive splash concerned us. We will pay particular attention to topics on which students scored low on the survey when developing the next steps. These results also raised a few questions. Only one instructor reported covering PELs as a safety topic and over all post-survey response rate on the PEL question was only 30%, which follows one of our basic conclusions — a topic needs to be covered to increase knowledge base. Only one instructor reported covering the NFPA (National Fire Protection Association) labeling system as a safety topic and the over all correct response post-survey was 60%. Extensive signage explaining the NFPA labeling system is found in all our labs; no information on PELs is posted. We then asked does signage really make this kind of difference and/or is signage a potential important tool to use in teaching safety knowledge? It may merit further investigation.

Based upon conclusions drawn from our survey results, we plan to implement several changes in our approach to teaching laboratory safety in biology laboratories. Although some campuses may have to deal with instructor resistance to covering safety topics or resistance to accepting suggestions for improving topic coverage, these are not issues at the University of Wisconsin-Green Bay. Therefore, we can focus our efforts on providing instructors with improved tools for use in teaching safety in the lab. We plan to do the following:

1. Provide laboratory instructors with a comprehensive list of topics that should be covered in an introductory lecture.
2. Consider developing a campus-produced video with an emphasis on safety issues in the biology lab to complement the introductory safety lecture. A campus-produced video is currently used extensively in our introductory chemistry courses. We are in the process of assessing the effectiveness of its use to see if it is worth pursuing this idea.
3. Investigate ways to include safety exercises or quizzes into the lab experience.
4. Begin the process of answering the other two questions posed at the beginning of this article: Do students comprehend safety knowledge conveyed and do students apply safety practices in the lab?

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