

Background

Chemistry and the history of it is more important than most people realize and are taught about in college level lectures and labs. It is part of everything we use and consume daily. Scientists put years into their research and work to develop safe ways to use chemicals and make products. The significance of the internationality of chemistry is evident by the international diversity of the Nobel Prize winners in chemistry, numbers of chemists, chemical companies and their sales around the world, numbers of international students and those studying chemistry, and the American Chemical Society's international efforts to find the best information and ways that it can be incorporated into lectures and laboratories. Whereas information on the history and internationality of chemistry is greatly available, there appears to be a disconnect when it comes to awareness of that information in college lectures and laboratories. This proposal examines and presents the history of internationality, figures of chemists and chemical companies, and the international efforts available for students

Research Question

How can internationality be incorporated into college chemistry lectures and laboratories? SciFinder and Journal of Chemical Education were used to search for the words "international" and "teaching chemistry." Then, history, the overall internationality of chemistry today, and teaching was researched.

Methods

The information found from Nobel Prize winners in Chemistry was synthesized into two separate pie charts, Figures 3 and 4. Figure 3 shows the top three countries with prizes awarded to people and shows the "other" category with all the countries that only had a few winners. The percentage of evangelicals from the top three countries was also synthesized into a bar chart, Figure 9. Figure 4 shows the percentage of winners from grouped countries, which helps to better show the distribution of countries more than the first pie chart. The data of chemists, top 10 chemical companies and their sales (Figure 7), and commonly used chemicals was searched to show how prevalent chemistry is in our society today and how the numbers are only going to grow moving forward. Finally, the numbers of international students (Figure 8) and programs related to international efforts from the American Chemical Society (Figure 6) was researched to show the need for international history to be taught more frequently in lectures and laboratories.

Future Work

Practically, this information could be incorporated by having a brief slide every lecture and/or laboratory on a different Nobel Prize winner every week, and the scientist chosen could even be connected to the topic being taught about that day. For example, when introducing the Grignard reagent and reaction in organic chemistry, Francois Grignard could be briefly taught on as an introduction to the lecture. Future research that could be done is the statistics of international knowledge of students that were and were not taught about the history of chemistry in college classes.

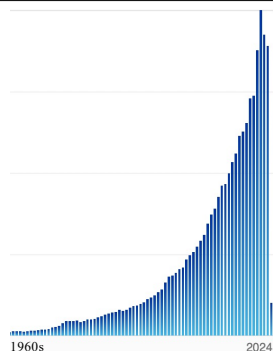


Figure 1. The SciFinder results for articles under the search "international" starting in 1787 but the most growth started in the 1960s to 2024.



Figure 6. The ACS percentage of published articles from different countries found on the ACS website.

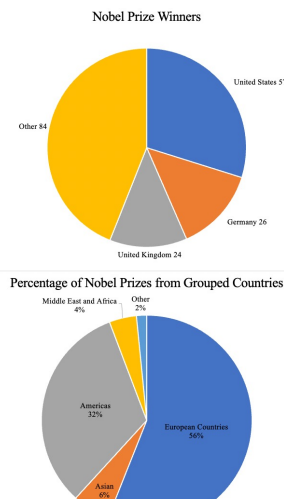


Figure 3. (top) and 4. (bottom) The top 3 countries with winners of Nobel Chemistry Prizes and the grouped countries with prizes.

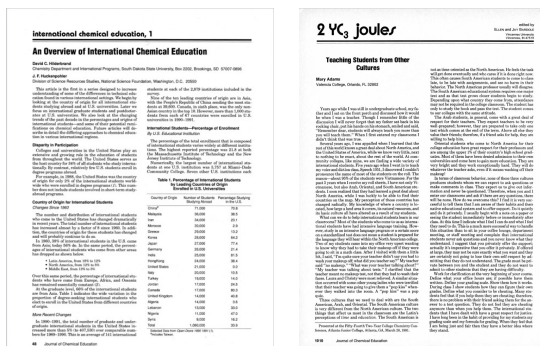


Figure 2. The two articles that informed this search.

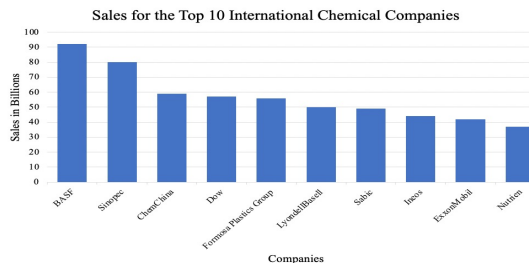


Figure 8. Number of active student accounts in the U.S. and the countries they are from

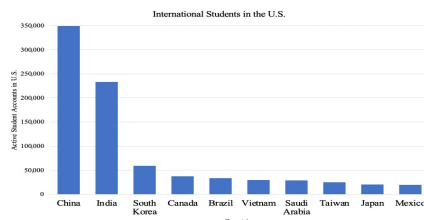


Figure 7. The sales for the top 10 international chemical companies

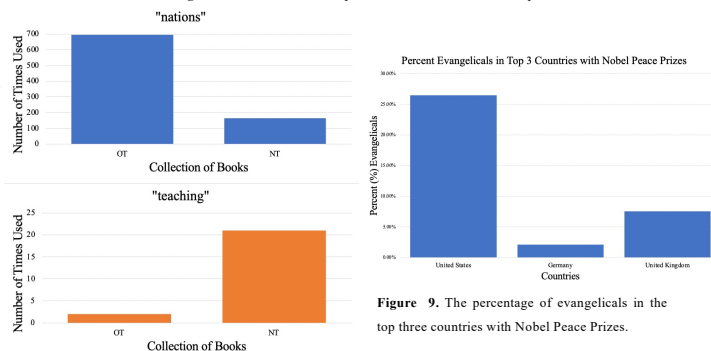


Figure 5. The use of "nations" and "teaching" in the Old and New Testament of the Bible.

Results and Conclusions

From the search for the most Nobel Prize winners, the most came from the United States with 57 people, then Germany with 26 people, and finally, the United Kingdom with 24 people (Figure 3) [2]. The percent of evangelicals from the top countries United States, Germany, and the United Kingdom was found to be 26%, 2%, and 8%, respectively (Figure 9) [3]. Figure 4 shows the percentage of group countries with winners from different countries with the most, 56%, coming from European Countries and then, 32% coming from the Americas [2].

The next set of searches showed that there are over 80,000 chemists around the world and the top chemical company is BASF in Germany [4].

The countries that the most international students come from to study in the United States is China and India. Of over 400,000 international students, about 15,000 of those are general chemistry majors [8]. The American Chemical Society offers a few different international efforts including scholars and study abroad programs and awareness through publications spanning in 75 countries [9].

The words "nation(s)" and "teaching" was searched on Blue Letter Bible to find the amounts of times used in the Old and New Testament. "Nation(s)" was used almost 700 times in the OT and 200 times in the NT. "Teaching" was used just 2 times in the OT and over 20 times in the NT [15].

Genesis 22:18 ESV "...and in your [Abraham's] offspring shall all the nations of the earth be blessed, because you have obeyed my voice." Every nation is blessed and united under God's Covenant with Abraham in the Old Testament. This is important to remember when discussing chemistry history and internationality because those who discovered and invented different types of chemicals, reaction, equipment, etc. were also children of God descended from Adam, whether that was the religion they believed in or not.

Matthew 28:19-20 ESV "Go therefore and make disciples of all nations, baptizing them in the name of the Father and of the Son and of the Holy Spirit, teaching them to observe all that I have commanded you. And behold, I am with you always, to the end of the age." As Christians, we are called to spread the Gospel amongst many different types of people of all nations. Having this kind of worldview in a chemistry course, shows the importance of teaching the internationality and history of chemistry more frequently in college lectures and labs. Students need to learn about the history of chemistry to be able to better connect with other chemists and to share the Gospel through their profession.

References and Acknowledgments

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Figure 9. The percentage of evangelicals in the top three countries with Nobel Peace Prizes.