

# Immigrant Students in the U.S. Chemistry Classroom: An Educational Opportunity and Challenge

Donald J. Wink\*

Department of Chemistry, University of Illinois at Chicago, Chicago, Illinois 60607, United States

**ABSTRACT:** Close to one-quarter of the U.S. population is an immigrant or the child of an immigrant. This editorial outlines how chemistry educators have the opportunity to address this new group in four important ways: (i) by considering pedagogical, systematic, and content responses to working with immigrant students; (ii) educating for international connections; (iii) including new countries and cultures in educational content; and (iv) working with undocumented students.

**KEYWORDS:** *General Public, Elementary/Middle School Science, High School/Introductory Chemistry, First-Year Undergraduate/General, Public Understanding/Outreach*

The field of science education, and chemistry education in particular, is critical to the success of a huge number of students, ranging from future chemistry Ph.D.s to those who will enter the workforce right out of high school and assume important positions in technical settings. There is also a fundamental economic component to our work, because of chemistry's status as the "central science", affecting disciplines such as health, energy, the environment, and engineering. Although many of our discussions are rightly centered on the "what" and "how" questions of content and process in developing a deep understanding of chemistry, chemistry education also needs to concern itself in basic ways with addressing questions of "who" in chemical education.

One place where questions of "who" appear is at the intersection of teaching with the demographics of students. For good reason, then, the American Chemical Society has long supported discussions about diversity<sup>1</sup> and has engaged its members in discussions on increasing participation of women,<sup>2</sup> African American, Hispanic, and Native American students,<sup>3</sup> and students with disabilities.<sup>4</sup>

Some of these discussions include what to do in response to students who are recent immigrants or children of immigrants to the United States. Over the last 50 years, since a significant change in U.S. immigration policy, the country has experienced large-scale immigration, with nearly 45 million immigrants from a post-1965 wave now living in the United States.<sup>5</sup> When their children are also considered, the post-1965 wave accounts for close to one-quarter of the total U.S. population. This editorial suggests that the chemistry education community should begin to discuss more directly the opportunities and challenges of working with this population, including some of the estimated 11 million immigrants (almost 800,000 of them children) who are undocumented.<sup>5</sup>

It is worth considering why this question may be important to the chemistry education community. There are four reasons that are apparent. The first is the challenge of simply serving the students in schools, colleges, and universities. Immigrants have long been a major component of the U.S. educational system, yet until the mid-1960s, they were almost all from Europe, just as was the case for the faculty. Today, immigrants are much more likely to be from Latin America, Asia, and Africa

and are dissimilar from the demographics of the faculty. This presents questions of how to engage students across cultures and languages.

The second concern relates to the international economic system and the potential for our students to participate in unprecedented ways with individuals in other countries. Students from other countries have always been an important part of the connection to those locations. Economic globalization creates opportunities for U.S. educational institutions and industries that rely on chemistry to make rapid use of students who are both well trained in a technical field and are also ready to bridge cultures from the United States to their countries of origin.

Third, students from cultures that were not a strong part of the development of current scientific knowledge have the potential to drive new thinking about the teaching of chemistry. As students from other, generally non-European, backgrounds become the norm in U.S. classrooms,<sup>6</sup> chemical educators have the potential to learn how chemistry matters in those settings, and also how other scientific cultures' encounters with chemistry can change the scientific enterprise—something especially clear in a year when the Nobel Prize for medicine has, for the first time, been awarded in part for work that relied on traditional medicinal chemistry (in this case, from China).<sup>7</sup>

These three areas are all clearly important with all immigrant students and, arguably, represent extensions of good, inclusive chemistry education. But I want to also highlight that the current situation in the United States includes students who are also negatively affected by their immigration status. Recent actions by the federal government (through the "Deferred Action for Childhood Arrivals", or DACA program) now make it possible for some of the hundreds of thousands of undocumented students in the K–16 system to participate in educational and economic programs, albeit in ways that are very much dependent on state and local regulations. All students, regardless of status, are eligible for public K–12 education and many states have begun to extend in-state tuition benefits and, less commonly, financial support to these students.<sup>8</sup>

The emergent group of DACA students therefore creates a fourth area of potential discussion. These students, who represent a potentially large source of excellent workers for technical fields, come disproportionately from families with very limited economic resources. They create a specific challenge for providing efficient, low-cost educational opportunities even as they finally begin to engage more openly with the educational and economic system.

Hence, it seems that the time is ripe for the chemistry education community to begin an open dialogue about the opportunities and challenges of educating immigrant students. For this reason, I am proposing symposia for two conferences in 2016, to serve as venues for such a dialogue. One will be at the Biennial Conference for Chemical Education to be held in July 2016 at the University of Northern Colorado.<sup>9</sup> The other will be at the Fall 2016 ACS National Meeting in Philadelphia, fitting well with its meeting theme of "Chemistry of the People, by the People, and for the People".<sup>10</sup> I hope that the symposia will have individuals who address all four areas of discussion: (i) working with immigrant students; (ii) educating for international connections; (iii) including new countries and cultures in educational content; and (iv) working with undocumented students. The symposia will focus on what is happening in U.S. classrooms, but I hope what we hear will also impact international discussions.

## AUTHOR INFORMATION

### Corresponding Author

\*E-mail: [dwink@uic.edu](mailto:dwink@uic.edu).

### Notes

Views expressed in this editorial are those of the author and not necessarily the views of the ACS.

Donald J. Wink teaches at the University of Illinois at Chicago Department of Chemistry and the University of Illinois at Chicago Learning Sciences Research Institute. His research in chemical education and learning sciences focuses on the use of interdisciplinary teams to improve student understanding of chemistry, including work with mathematics, other natural science departments, and with teacher preparation programs. His K–12 work includes extensive outreach and professional development efforts in conjunction with the Chicago Public Schools. Wink also collaborates with molecular researchers through X-ray diffraction studies of small molecule structures. He is Immediate Past Chair of the American Chemical Society (ACS) Division of Chemical Education and currently serves on the ACS Society Committee on Education.

## REFERENCES

- (1) American Chemical Society. Diversity Resources. <http://www.acs.org/content/acs/en/membership-and-networks/acs/welcoming/diversity/diversity-resources.html> (accessed Oct 2015).
- (2) These reports were coordinated by the ACS Committee on Minority Affairs in conjunction with the ACS Committee on Professional Training (CPT). These reports can be found at the CPT Web site: <http://www.acs.org/content/acs/en/about/governance/committees/training.html> (accessed Oct 2015).
- (3) See the Women's Chemist Committee for further information: <http://www.womenchemists.sites.acs.org/> (accessed Oct 2015).
- (4) See the Committee on Chemists with Disabilities for further information: <http://www.acs.org/content/acs/en/about/governance/committees/cwd.html> (accessed Oct 2015).
- (5) The largest source of data on immigration is available from the Pew Research Center. See, for example: Modern Immigration Wave

Brings 59 Million to U.S., Driving Population Growth and Change Through 2065: Views of Immigration's Impact on U.S. Society Mixed; Pew Research Center: Washington, DC, 2015; <http://www.pewhispanic.org/2015/09/28/modern-immigration-wave-brings-59-million-to-u-s-driving-population-growth-and-change-through-2065/> (accessed Oct 2015).

(6) Fernandez, M. A. D.; Middlecamp, C. H. From San Juan to Madison: Cultural Perspectives on Teaching General Chemistry. *J. Chem. Educ.* **1999**, 76, 388–391.

(7) Nobelprize.org. The Nobel Prize in Physiology or Medicine 2015: William C. Campbell, Satoshi Ōmura, Youyou Tu. Youyou Tu—Facts. [http://www.nobelprize.org/nobel\\_prizes/medicine/laureates/2015/tu-facts.html](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2015/tu-facts.html) (accessed Oct 2015).

(8) Tuition Benefits for Immigrants, 2015. National Conference of State Legislatures: Washington, DC. [http://www.ncsl.org/documents/immig/InStateTuition\\_july212015.pdf](http://www.ncsl.org/documents/immig/InStateTuition_july212015.pdf) (accessed Oct 2015).

(9) 2016 Biennial Conference on Chemical Education (BCCE). <http://www.unco.edu/bcce2016/index.html> (accessed Oct 2015).

(10) American Chemical Society. Upcoming Meetings (252nd ACS National Meeting & Exposition, Philadelphia, Pennsylvania). <http://www.acs.org/content/acs/en/meetings/nationalmeetings/meetings.html> (accessed Oct 2015).