

Teaching undergraduate mathematics in the United States and the United Kingdom: Four comparative observations

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Increased global mobility has given students and faculty unprecedented opportunities to study and work in different countries, which leads to new challenges for faculty in adapting to classrooms that are more international than ever before. This paper looks at the author's experience in teaching mathematics in the United States and the United Kingdom, and to students with very different cultural and academic traditions. Four broad themes are used as the basis for comparison, chosen on the basis of their relevance to contemporary issues, with previous literature blended with personal observations, along with qualitative data gained through individual interviews.

Keywords: United States; United Kingdom; undergraduate teaching; student engagement; textbooks; technology; assessment

Introduction

The *Global Student Mobility 2025* report (Böhm et al., 2002) predicted that the demand for international education will increase to 7.2 million students by 2025, while many perceive internationalization as the most revolutionary development in higher education in the twenty-first century (Seddoh, 2001). Even in cases where no travel is involved, classrooms are predicted to become more international given the projected rise of transnational education, with technology enabling students to access programmes from anywhere in the world (Stewart, 2008). Many believe it is therefore necessary that teacher training include international experiences, competence with regard to foreign languages, and an ability to incorporate a global dimension into their teaching to meet the needs of a diverse classroom (Heyl & McCarthy, 2003).

This paper describes the author's experience in teaching mathematics in the United States and the United Kingdom. While there are many directions that this paper could have taken, the four briefly described topics were chosen primarily due to their relevance to contemporary issues in tertiary education in the two countries, with both textbook usage and student assessment among those noted by Biza et al. (2016) as being among those most worthy of focus in a summary publication written to coincide with the 13th International Congress on Mathematical Education (ICME-13) in Hamburg. Along with a review of previous studies to contextualise the four topics, personal observations are provided, along with qualitative data gained through individual interviews with twelve former exchange students who have studied in both countries. The interview protocol was approved by the relevant ethical review committees, and all the names have been changed.

Student Engagement

It has been documented that students in American classrooms are more inclined to question their instructor, even in a lecture format, versus those in Europe and Asia

(Sisco & Reinhart, 2007). Huizenga (n.d.) noted that “Americans are used to participatory classrooms with plenty of teacher-student dialogue. Elsewhere, students are often trained to be silent, good listeners, and memorizers.” While my observations confirm that this is true, it is noteworthy that in classes I have taught it is the composition of the students rather than local norms that had the greatest effect. When teaching students raised in Asia on an American campus, there is very little interruption for questions (sometimes accentuated by reduced English proficiency); however, when teaching American students overseas, the number of questions asked is consistently high. This goes against the contention of Cheng (2000) that the causes of classroom behavior are situation specific rather than culturally pre-set.

In the United Kingdom, although questions were regularly encouraged, I found that students were still reluctant to ask them, with a sense of annoyance sometimes prevalent among the majority towards those who raised their hand most often. While many of those interviewed noted that the number of questions asked in the United Kingdom was far lower when compared with the United States, this was perceived as a cultural difference rather than a result of academic staff in the United Kingdom being unwilling to seek input from students. Eric commented somewhat sarcastically that “It seems like it’s taboo to ask questions [in the UK], which I think is weird.” Lee also noted that “People don’t ask questions in [the UK]. Over here [in the US] they want you to interact, and I’m not used to interacting, which has been quite bad, because there’s participation marks, and I don’t want to say something, even though I might know it, but there are always Americans who are willing to shout out. But I think that’s just the culture difference, British people are more reserved.”

Textbook Usage

The College Board (2016) estimated that students in the United States spend an average of \$1298 per year on books and supplies. While the Canadian government (FCAC, 2014) also recommends budgeting \$800-\$1000 each year for books, it seems that outside North America the median amount spent by students is much less (Bookboon, 2012). However, even in the United States, the rising cost of textbooks seems to be impacting the decision of students as to whether or not to make a purchase, with it being more likely when the perceived benefits outweigh the cost (Skinner & Howes, 2013).

Given that college course materials account for \$13.9 billion annually in the United States (Silber & Chien, 2015), and how technology now makes it possible to generate high quality scans directly from a hard copy of a textbook, it is perhaps not surprising that there is an increasing prevalence of online pirated textbooks (Cusker, 2016). While a rise in the use of online homework systems has shifted the cost from physical books to electronic access codes (which generally include an e-book), the fact remains that the laws of supply and demand are not adhered to (the price of a new textbook should decrease over time) due to a virtual oligopoly that exists among the major publishing companies.

My observation has been that the majority of students in the United Kingdom will take the assigned textbooks merely as recommendations, which can be found in the library (and often online for free) by those feeling particularly inquisitive or diligent, whereas students in the United States are more inclined to purchase the textbook given that a higher weight is accorded to homework in the calculation of final grades, with the questions usually assigned from the book. This came as a surprise to American students in the United Kingdom, with Beth saying “I never

heard anything about textbooks the whole time I was there! People would only ever buy a textbook if they wanted to know more about the subject. They wouldn't just go out and buy one." Colin remarked that "No one buys textbooks in the UK. It's unbelievable! The lecturers don't even assume that you're going to buy one. It is nice that all the books are in the library – that's really awesome."

Lecturers in the United Kingdom tend not to follow the recommended textbooks as closely as those in the United States, and are often encouraged to provide printed and digital course materials to students free of charge. This was seen as being positive by students from both countries. Allison described how "[Lecturers in the UK] didn't really want you to buy textbooks. They would give recommended textbooks, and I looked at a few at the library. Little bits of each book would go with what we were doing, but they didn't have one book that did it all." Eric noted that "In the States people rely more on textbooks. Here [in the UK] I haven't looked at one. It's good because I don't have to waste all that money."

The Role of Technology

An assertion by McCabe and Meuter (2011) is that "Today's students assume technology will be integral to their college experience" (p. 155). However, there seems to be a distinction between the United States and the United Kingdom when it comes to what "using technology" means. Based on the student interviews described below, it is fair to suggest that there is little if any difference in how technology is used *in the classroom* between the two countries, as in both it generally amounts to just using PowerPoint slides, overhead projectors, or discipline specific software programmes. However, there does seem to be a difference in the way that technology is used outside the classroom, with faculty members in the United Kingdom being more likely to upload lecture notes and homework solutions to a class website, and faculty members in the United States being more likely to utilise online homework programs. Jessica commented that "The US is very dependent on online computer programs for study methods, lectures using computers, and using clickers to answer questions. In the UK it was all just PowerPoint in lectures, so that was pretty much all they used as far as computer technology."

The role of online and distance learning is mostly confined to the United States at this stage, with students from both countries being wary of courses taught completely online. Jessica said "I know that at some of the large state schools there are entire courses that are online, and I would hate that! I think that would be very negative to my education." This sentiment was echoed by Lee, who when asked about online learning said "No, I'm more old school. I'm just not a technology person myself, so I like things nice and simple, on paper. I hate it when you have to submit something online. It's a lot easier, hand written, hand it in, but I find it's becoming uniform, across the board, everything's going more with technology." This confirms the assertion of White et al. (2007) that "educational technology in [UK] universities has not managed to match the ubiquity of technology in everyday life" (p. 840).

It may be that a tipping point will be reached, and that technology usage in the United States will experience a law of diminishing returns (Griffiths, 2015), which leads to a global equilibrium whereby institutions in developed countries use technology in a moderated manner. This sentiment was borne out by the students interviewed, most of whom concurred with Hazel, who said "I like technology, but not for all of the course."

Assessment and Evaluation

There is a clear and profound difference between the system of continuous assessment in the United States, with midterms, homework, quizzes, and sometimes even attendance forming the majority of a student's overall mark, versus the British approach with its emphasis on the final exam. Proponents of the American system say that students are able to communicate their knowledge more often, and have a better sense of how well they understand the material, while the traditional British system of lectures and tutorials gives students more time to learn and digest the material in ways that utilise formative assessment. Opinion was mixed when students were asked which system was preferable. Michael stated that he "preferred the English system – the mostly final based system – as it gave me the chance to study and prepare how I want to prepare, and I don't have to prepare in a way that's formalised for everyone." However, Nadine said "I didn't feel as if I learned the material as well as if I'd been tested more often and been required to perform more frequently."

The marking systems in the two countries are also very different, with the 70-60-50 scale used in the United Kingdom and the 90-80-70 scale in the United States both being aggregated to provide qualitative measures of attainment. While there has been considerable criticism of summative assessment, particularly in the United Kingdom, it is acknowledged that the greater range of scores typically awarded to work in the hard sciences allows mathematics students to gain more first-class honours degrees than in any other subject (Yorke et al., 2000). This was acknowledged by Michael, who stated that "It was shocking to see a lot of faculty in some departments – not in maths – really did not want to give you above a 69 unless you were spectacular."

Having created several exchange programs for mathematics students, including between the United States and United Kingdom, a recurring observation has been that even though the courses taken by the students look comparable on paper, the number of American students gaining first-class marks in the United Kingdom has been much higher than the number of British students gaining A-grades in the United States. While in theory the scale should not matter, as relative performance should lead to comparable results, British students sometimes struggle to adapt to a system where continual assessment is the norm, with frequent testing and assignments, and a pass mark that numerically seems more daunting. Nadine explained that "The first year [in the UK] didn't count for anything, and the second year didn't count for much either, so British students had a bit of a devil may care attitude sometimes. On the social side, they went out a lot more. I think UK students would have a difficult time adjusting to the constant flow of homework, quizzes, and two or three midterms in the US, which is completely the opposite of the testing style over there." This backs up the claim by Gu et al. (2010) that the challenges of adapting to a different academic culture appeared to be more acute than adapting to a different cultural and social environment, and that the choice of aggregation methods is likely to affect individual students' grades (Dalziel, 1998; Tinkelman, 2013).

Conclusion

Cushner and Mahon (2002) state that "the fact that most current teachers have had relatively few, if any, significant intercultural experiences, and are relatively inexperienced with regard to global affairs, leaves a tremendous gap that must be filled" (p. 45). This paper briefly considers some of the issues that the author has

experienced by teaching in different countries, and adds perspective to topics that are prevalent in contemporary mathematics education.

Issues of textbook usage and the role of technology speak to the role of content, which the advent of digital technology and social media are leading in a very different direction to the purely lecture based delivery of the past. However, it is worth noting that the way in which students prefer technology to be integrated is simply through the use of PowerPoint slides during lectures and the subsequent uploading of lecture notes to the internet, rather than moving entire courses online. In this respect, the statement by Gregorian (2005) that “Technology will supplement education, but will never replace the need for the residential university” (p. 94) is validated. It is also striking that in the United Kingdom faculty often utilise technology in ways that (at least in the short run), will increase their workload, for example by uploading class notes, or writing their own questions for online assessments, whereas in large American state universities the push is towards online and hybrid, classes coupled with computerised assignments that satisfies a “do more with less” approach.

Finally, the issues of evaluation and assessment have long been debated at a national level, but the increasing number of students studying overseas, and the consequences of the Bologna Process in Europe, mean that future decisions must be made with regard to the international implications. Boud (1995) notes that “there is probably more bad practice and ignorance of significant issues in the area of assessment than in any other aspect of higher education. This would not be so bad if it were not for the fact that the effects of bad practice are far more potent than they are for any aspect of teaching” (p. 35).

Clearly, the brief coverage of the topics raised in this paper leaves considerable scope for expanded discussion, and there are many other aspects of undergraduate education that can be better understood by spending time overseas. There is little doubt that international experience leads to a greater understanding of differences within the student body, and underscores the importance of preparing for and reacting to increasingly heterogeneous classrooms.

References

- Biza, I., Giraldo, V., Hochmuth, R., Khakbaz, A., & Rasmussen, C. (2016). Research on teaching and learning mathematics at the tertiary level: State-of-the-art and looking ahead. Retrieved from <http://link.springer.com/book/10.1007%2F978-3-319-41814-8>
- Böhm, A., Davis, D., Meares, D., & Pearce, D. (2002). *The global student mobility 2025 report: Forecasts of the global demand for international education*. Canberra: IDP.
- Bookboon. (2012). 9 out of 10 students find textbooks too expensive: The big Bookboon textbook survey. Retrieved from <http://bookboon.com/blog/2012/09/the-big-bookboon-textbook-survey-read-the-opinion-of-almost-10-000-students/>
- Boud, D. (1995). Assessment and learning: Contradictory or complementary? In P. Knight (Ed.), *Assessment for Learning in Higher Education* (pp. 33-48). London: Kogan Page.
- Cheng, X. (2000). Asian students’ reticence revisited. *System*, 28, 435-446.
- College Board. (2016). Quick guide: College costs. Retrieved from <https://bigfuture.collegeboard.org/pay-for-college/college-costs/quick-guide-college-costs>

- Cushner, K., & Mahon, J. (2002). Overseas student teaching: affecting personal, professional and global competencies in an age of globalization. *Journal of Studies in International Education*, 6(1), 44-58.
- Cusker, J. (2016). Online textbook piracy: A literature review. *Issues in Science and Technology Librarianship*, 84.
- Dalziel, J. (1998). Using marks to assess student performance. *Assessment and Evaluation in Higher Education*, 23(4), 351-66.
- Financial Consumer Agency of Canada. (2014). Budget for student life – how much will your post-secondary education cost? Retrieved from <http://www.fcac-acfc.gc.ca/Eng/forConsumers/lifeEvents/payingPostSecEd/Pages/Budgetfo-Unbudget.aspx>
- Gregorian, V. (2005). Six challenges to the American university. In R. Hersh & J. Merrow (Eds.), *Declining by degrees* (pp. 77-96). New York: Palgrave MacMillan.
- Griffiths, B. (2015). Perspectives of exchange students on the role of classroom technology: A law of diminishing returns? *International Journal for Infonomics*, 8(1), 974-978.
- Gu, Q., Schweisfurth, M., & Day, C. (2010). Learning and growing in a ‘foreign’ context: Intercultural experiences of international students. *Compare: A Journal of Comparative Education*, 40(1), 7-24.
- Heyl, J., & McCarthy, J. (2003). *International education and teacher preparation in the U.S.* Paper presented at the Global Challenges and U.S. Higher Education: National Needs and Policy Implications, Duke University, Durham, NC.
- Huizenga, J. (n.d.). 10 tips for teachers of English as a foreign language abroad. Retrieved from <http://www.transitionsabroad.com/listings/work/esl/articles/toptentipsforeflteachers.shtml>
- McCabe, D., & Meuter, M. (2011). A student view of technology in the classroom: Does it enhance the seven principles of good practice in undergraduate education? *Journal of Marketing Education* 33(2), 149-159.
- Seddoh, F. (2001). Internationalisation of higher education: What for, how, and at what cost? *International Association of Universities Newsletter*, 7(3), 1-3.
- Silber, J., & Chien, H. (2015). Education and training. Retrieved from [https://cdn2.hubspot.net/hubfs/253501/BMO Edu and Training Report.pdf](https://cdn2.hubspot.net/hubfs/253501/BMO_Edu_and_Training_Report.pdf)
- Sisco, L., & Reinhard, K. (2007). Learning to see what’s invisible: The value of international faculty exchange. *Business Communication Quarterly*, 70(3), 356-363.
- Skinner, D., & Howes, B. (2013). The required textbook – friend or foe? Dealing with dilemma. *Journal of College Teaching & Learning*, 10(2), 133-142.
- Stewart, Y. (2008). Mainstreaming the European dimension into teacher education in England – enabling and disabling factors. Retrieved from <http://www.pef.uni-lj.si/tepe2008/papers/Stewart.pdf>
- Tinkelman, D., Venuti, E., & Schain, L. (2013). Disparate methods of combining test and assignment scores into course grades. *Global Perspectives on Accounting Education*, 10, 61-80.
- White, S., Davis, H., & Eales, S. (2007). Critical success factors for e-learning and institutional change – some organisational perspectives on campus-wide e-learning. *British Journal of Educational Technology*, 38(5), 840-850.
- Yorke, M., Bridges, P., & Woolf, H. (2000). Mark distributions and marking practices in UK higher education. *Active Learning in Higher Education*, 1(1), 7-27.