Chapter 9

How Is Mathematics Humanistic, Culturally Rich, Relevant, and Interesting? Seeking Answers Through the Redesign of an Undergraduate Mathematics Course

Priya Shilpa Boindala
Georgia Gwinnett College, USA

Ramakrishnan Menon
Georgia Gwinnett College, USA

Angela Lively
Georgia Gwinnett College, USA

ABSTRACT

This chapter focuses on the redesign of a traditional History of Mathematics course as an internationalized course and its early implementation. This redesign of the course incorporates significant learning experiences and includes the learning goals of both the college and the discipline. The design of these learning experiences using the backwards design model, the framework based on a blended taxonomy of Bloom and Fink, are elaborated on. How these learning experiences are supported by active learning strategies and forward assessments is also presented. The pilot implementation by an author not involved in the design process provides for an objective perspective of this redesign. The chapter elaborates on the learning experiences within the initial implementation and concludes with ideas for future iterations of the course.

INTRODUCTION

In this chapter, the authors describe the redesign of a STEM course, namely the History of Mathematics course, as part of their institution’s internationalization initiative. They begin with a discussion of relevant literature related to internationalization of curriculum: the assessment of intercultural and global learning outcomes, the emerging paradigm of student-centered learning outcomes as a means to student

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engagement and achievement and the challenges in teaching and learning mathematics. They describe the theoretical framework used to redesign the course, namely, the Backwards Design model with a blend of Bloom’s Taxonomy and Fink’s model of creating significant learning experiences and elaborate on the various phases of the framework in the context of the History of Mathematics course. The authors further illustrate how the course goals and institutional learning outcomes were used to develop the learning activities for the internationalized course with the goal of making mathematics less static and more humanistic. The human element is emphasized by examining how the study of math was used to solve real world problems, exploring how scholars grappled with academic challenges that were demanding to solve, and finally by exploring the very human qualities of the lives that notable mathematicians lived. The chapter further summarizes the pilot implementation of the internationalized course for the first semester including synopses of student work. It concludes with a reflection upon how the course may evolve, including additional assessment strategies for future implementation.

BACKGROUND

Internationalization of Curriculum and Assessment of Intercultural and Global Learning Outcomes

Given the increased and varied challenges in the world including a growing number of mobile employees as well as the trend of global employability, it is no surprise that institutions of higher learning are placing more emphasis on internationalization of the curriculum and initiating appropriate assessment measures of intercultural competence. On examining a plethora of studies on the concept of intercultural competence, it was found that there have been as many as 20 different definitions and frameworks (Spitzberg & Changnon, 2009), such as Cross’s cross-cultural continuum, Bennett’s Developmental Model of Intercultural Sensitivity, and King and Baxter Magolda’s intercultural maturity model (Cross, 1988; Bennett, 1993; King, 2005). While a few of these models were not strictly research-based, Deardorff was one of the first to have a research-based definition of intercultural competence (Deardorff, 2006), and that was followed by a synthesis of related work published in the Sage Handbook of Intercultural Competence (2009). Subsequently, there were many publications all over the world on this topic, not only in the United States but also in many other countries around the world.

These intercultural competence models identify characteristics of intercultural competence for use by institutions of higher learning to translate into measurable student learning objectives. There are two means by which postsecondary education internationalizes the campus in order to bring an intercultural and global dimension to students’ educational experiences: through the curriculum, and through co-curricular activities (Deardorff, 2011). According to Bok (2006), fewer than 10 percent of undergraduates take a course in international relations, and fewer than 20 percent of four-year colleges require more than two years of foreign language study. He further suggests that postsecondary institutions can maximize the intercultural competence by integrating intercultural experience throughout the undergraduate course work (Bok, 2006). Deardorff continues this theme by suggesting that an infusion of intercultural competence and global learning into courses is more than just an inclusion of some international readings, or taking a single course in international studies. To ensure the development of intercultural competence, this process must span many undergraduate courses, including the STEM (science, technology, engineering, and mathematics) fields, with faculty invested in the efforts of internationalization. Such infusion
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