

## Chapter 8

# Mathematics Bridging Education Using an Online, Adaptive E–Tutorial: Preparing International Students for Higher Education

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### ABSTRACT

*This contribution describes and evaluates a postsecondary remediation program in mathematics, aiming to ease the transition from high school to university and to improve the success rates in the first year of bachelor studies. The remediation program consists of the administration of an entry test and the organisation of voluntary bridging education in the format of an online summer course, using the adaptive e-tutorial ALEKS. Participants are prospective students of the university programs business and economics of Maastricht University, and are mostly students with an international background. Effect*

DOI: 10.4018/978-1-60960-875-0.ch008

*analysis suggests a strong treatment effect of successful participation in the summer course. However, given the quasi-experimental setup of this study, with non-equivalent groups, selection effects may be responsible for part of that effect. Correction of the treatment effect by applying the propensity score method indicates that indeed a selection effect is present, but that a substantial treatment effect remains, of about 50% the size of the effect of being educated in advanced math versus basic math, in high school.*

## **INTRODUCTION**

This contribution focuses on a type of education that is referred to in different ways: bridging education, developmental education, or remedial education. Whatever the label, the type of education subject of this contribution is education directed to ease the transition from high school to college and to improve the success rates in the first year of bachelor studies. In the Netherlands, the main advising council for educational affairs, the Educational Council of the Netherlands, has stressed the importance of bridging education in a range of studies and recommendations (Onderwijsraad 2006, 2007, 2008). The dating of these advices makes evident that Dutch interest in bridging education beyond the institute of open education is recent. Nation wide projects, supported by SURF, the Dutch collaborative organisation for higher education institutions and research institutes aimed at innovations in ICT, run from 2004 onwards. Some of these Dutch initiatives have acted as pioneer for European projects, indicating that interest in (continental) Europe is also of very recent date. EU projects M.A.S.T.E.R., S.T.E.P. and MathBridge collect experiences with bridging education with a specific European focus: that of internationalisation of European higher education. This internationalization development is going very fast; for example, some Dutch universities located at short distance of country borders, like the case elaborated in this article, the share of international students in the inflow of new bachelor students has risen to 75% (mostly from continental Europe). Although most of these students are not very international in terms of the geographical distance they have to bridge, there is certainly a

huge diversity with respect to high school education they have received. Secondary school systems, even in neighbouring countries as Netherlands, Germany and Belgium, are very different, producing strong heterogeneity in knowledge and skills of prospective students. That heterogeneity brings about a strong need for bridging education in the transfer from secondary to university education, which adds to the more national focused needs for bridging education that have existed for some time: to bridge knowledge and skills deficiencies in areas that are part of the national secondary school program, but are not sufficiently mastered by students transferring to university.

## **US Context**

The longest tradition of bridging education is without doubt to be found in the Anglo-Saxon education system, and specifically, in the US. Developmental education for underprepared students, as it is generally labelled, is in the US quite often organized state-wise, and has achieved an enormous reach: estimates of participation of undergraduate students in developmental education in any format offered by community colleges and universities ranges between 40% and 58% of first year students (Attewell et al., 2006; Bailey, 2009; Kozeracki, 2005). Most recent discussions in the US on the topic of developmental education is focusing on the question if there is any way back: the opinion that too large a share of public funding of education is finding its way into developmental education is shared by many, opening the debate how to improve regular education to diminish the need of developmental education (see e.g. the special edition of *New Directions for Community*

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