Teaching Mathematics for Business Administration Students in Vietnam: A Curriculum Analysis

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Abstract. Mathematics is among the foundation subjects in the curriculum of business administration (BA) undergraduate programs in universities around the world. However, at many Vietnamese universities, mathematics is not adequately included in BA programs; and there has not been extensive research on the issue. This research aims to fill this void by exploring how mathematics is taught to Vietnamese business students. To address the research purpose, data was collected from the curricula and syllabi of 80 undergraduate BA programs in Vietnam, alongside semi-structured interviews with eight university managers and curricula designers. The findings reveal that having been granted greater autonomy in curriculum design since 2014, Vietnamese universities have made several attempts to innovate mathematics teaching for their business students. Regarding institutional types (multidisciplinary vs. business-oriented universities and public vs. private universities), this study identifies different strategies used by various types of universities to integrate mathematics into their BA curricula.

1. Introduction

The role of mathematics in disciplines related to the social sciences, including BA, is indisputable. As a foundation science subject, mathematics strongly impacts other research and application-oriented majors alike (Dzator & Dzator 2018; National Research Council 2013). In the beginning, the role of mathematics was only counted in natural sciences-related majors, such as astronomy or physics (National Research Council 2013). Subsequently, with the advent of computers and the use of statistical methodology, the use of mathematics has been extended to social sciences disciplines (Ioannides & Nielsen 2007), including sociology, anthropology and particularly economics and business administration (BA) (Wilder 1973). Mathematics acts as a fundamental tool to examine the economic trends and relationships using various tools and techniques, most prominently statistics. In addition, economic theories and models are also developed and tested with the help of mathematics (Bradley 2013).

In recent years, multiple attempts have been made worldwide to explore the effectiveness and improvement of mathematics in other disciplines (Carpenter & Kirk 2017). Stoloff *et al.* (2010) highlighted the fact that students of a psychology undergraduate program, whom they surveyed, were required to take statistics as part of their curriculum. Stoloff and his colleagues also described statistics as the "mathematics of social sciences" (p. 14). However, prior studies have also shown that social science students are prone to having difficulties with mathematics (Johnson & Kuennen 2006; Mulhern & Wylie 2004), which is an obvious barrier to the development of their statistical skills (Greer & Semrau 1984; Mulhern & Wylie 2004). To address the issue, Carpenter and Kirk (2017) suggested the use of the cell means model for the analysis of influencing factors in the study of student statistics of students and provide relevant recommendations. Green and Emerson (2007) proposed the intensive application of technology in the teaching of this subject, including the use of spreadsheets and business memos. Weir *et al.* (2021) suggested a model for the implementation of online testing (e-assessment) of statistics in a Business Decision Making course, taken by Business School students. The model takes advantage of Dewis, a fully algorithmic open-source e-assessment system capable of generating random datasets with statistical properties for testing purposes.

In Vietnam, mathematics is widely regarded as one of the most important subjects in all levels of the basic education system, along with the two other subjects, i.e. literature and foreign language (Le Thanh 2021). The latest revision of the National General Education Curriculum, announced by Vietnam's Ministry of Education and Training in 2018, continued to classify mathematics as a compulsory subject for students from grades 1 to 12 (Education Media Center

2018). However, at higher education levels, anecdotal evidence has shown numerous universities in Vietnam have removed fundamental mathematics courses or reduced the number of credit hours of mathematics-related courses, especially in non-mathematics majors (Dieu Hien 2014). While the issue has somewhat been acknowledged by educators and managers, there has been little systematic research on the teaching of mathematics within the scope of a BA major in Vietnamese universities, inorder to examine the situation thoroughly.

As such, to fill the gap between the prior literature and the aforementioned problem, this study seeks to explore how mathematics is currently taught for BA students in Vietnam. To address the research purpose, a curriculum analysis was conducted with data collected from 80 BA undergraduate programs from 80 Vietnamese universities, along with in-depth interviews with eight university managers and lecturers who have been involved in or had extensive knowledge of the development, application, and revision of BA undergraduate training programs.

2.   The Role of Mathematics in BA Programs

Mathematics has been known to have a profound connection with the performance of a BA major. Green *et al.* (2009) explored the relationship between the grade in foundation-level mathematics classes and their corresponding performance in subsequent business statistics courses. The authors based their research on the prerequisite mathematics courses that students are required to take prior to the main business statistics classes, since statistical analysis requires students to have a basic understanding and ability to utilize math. It has been proven that students who have taken prerequisite mathematics classes containing more credit hours, covering a wider range of mathematical knowledge and having an accentuation on calculus can, in a statistically significant manner, earn higher grades in Business Statistics. Furthermore, institutions that require their students to score a minimum acceptable grade in basic mathematics before enrolling in the main courses, also observe an upward trend in their learners in Business Statistics courses.

Asian-Chaves *et al.* (2021) explored the possibility that there is a statistically significant relationship between mathematical knowledge, together with the corresponding practical skills that students possess, and their academic performance in business-related professions in general and BA in particular. The authors concluded that the lack of mathematical knowledge had negative impacts on upper secondary school students. Meanwhile, the inclusion of advanced mathematics courses in university curricula provided students with the necessary skills to achieve better results in BA undergraduate programs. It can also be inferred that students who have taken advanced mathematics classes have a

higher probability of passing most of the subjects of the first year of business and management skills.

Several universities around the world have acknowledged the relationship between mathematical knowledge and expertise, thus starting to offer various double degree programs that combine the two majors. One of the well-known double degrees at undergraduate level is offered by the Canadian University of Waterloo's Faculty of Mathematics and Wilfrid Laurier University's Lazaridis School of Business and Economics (Wilfrid Laurier University, n.d.) as early as 2013. The University of Waterloo suggested that the analytical skills that students gain from the double degree program would allow them to deal with the rising issues of an ever-changing world of technology. It also mentions that the combination of mathematics and BA courses provides students with advanced quantitative and technical skills to an extent beyond any other previous traditional business programs and promises students with future careers as an analyst, information specialist, trader, and/or many other options (University of Waterloo, 2021). Other institutions, including Northeastern University (n.d.), U.K.-based Aberystwyth University (2020), U.K.'s (University of Birmingham, n.d.), Australia's University of Queensland (n.d.), U.S.-based Whittier College (n.d.), and Australia's Queensland University of Technology (n.d.), provide the combination of mathematics and BA or mathematics and business management in different forms, such as double degrees or combined majors programs.

3.   The Innovations of Mathematics Teaching in BA Programs Around the World

BA has had a long history of popularity among undergraduate students and has been a prominent choice for high school students seeking their future career paths (Gupta *et al.* 2007). To some extent, a degree in BA has been regarded as "a passport into managerial roles" (Baruch & Peiperl 2001, p. 69), or a guarantee for bright career prospects for its learners (Luker *et al.* 1989). The professions in BA-related jobs are expected to bring about boosts in future salaries (Purcell 2005), as well as a promising future career advancement to a degree that several students even prefer to choose BA over any other management major (Gupta *et al.* 2007). Previous authors even suggested a tendency in which students considered the BA major as a tool for their job placement rather than a tool for knowledge perception (Gupta *et al.* 2007; Hunt & Speck 1986). Thus, it can be seen that a degree in BA is essential for individuals who intend to improve their professional skills and competency in numerous fields of work, including management, finance, strategic planning, and marketing, to name but a few (Menez 2014).

However, prior research has concluded that universities and lecturers have yet to push the teaching and studying of mathematics to the maximum extent of efficiency. This happens despite the fact that educators are fully aware of the