

## Underlying Reasons for Different Learning Approaches in Statistics in an Australian University

Ayse Aysin BILGIN\*

Department of Statistics, Macquarie University, Australia  
[ayse.bilgin@mq.edu.au](mailto:ayse.bilgin@mq.edu.au)

### Abstract

Learning approaches of students has been investigated by many researchers since Marton and Saljo wrote their papers on learning approaches in 1976. However, in many of these studies, the cohorts of students were studying towards a degree which was closely related to the unit of learning approaches study (i.e. accounting for Bachelor of Accounting). In this research, we are investigating learning approaches of students who are studying towards a degree other than statistics but studying statistics as a required unit of their degree. We found some statistically significant relationships between students' demographics and their learning approaches in statistics in Australia.

**Keywords:** Deep approach to learning, statistics education; service teaching;

### 1. Introduction

During the last couple of decades, technological improvements have enabled easier and faster data collection in many areas. The silos of data brought about the necessity of more widespread use of statistical analysis. The realisation of the importance of statistical analysis and understanding research outputs in peer reviewed articles has led to the inclusion of statistics units into many different degree programs: from Biology and the Health Sciences, to Marketing and Human Resources. However, inclusion of statistics units into curricula does not guarantee an in-depth understanding of statistics even after completion of the unit, especially if students use a surface approach to their learning.

Learning approaches have been investigated in the context of various subjects and areas of study, such as arts, social science, psychology, economics, health disciplines, and science (Entwistle, 1991; Cooper, 2004; Elias, 2005; Leung et al, 2006). Although teaching approaches and learning theories in statistics education has been researched (Garfield, 1995; Keeler & Steinhorst, 1995 & 2001; Hubbard 1997); to date there is only a few empirical studies on statistics learning approaches, usually in one unit and/or in one country. Certainly, there are no existing studies with students studying statistics but are progressing towards a degree other than statistics. Therefore, the aim of this study was to investigate students' learning approaches in statistics units, especially in the service statistics units, and relate these to background variables such as country of origin, age, gender and work commitments.

This paper will present the preliminary findings of the Australian arm of a multinational project. The bigger project brought together educators from Italy, Argentina, and Turkey and recently we also gained a researcher into our project from Vietnam.

### 2. Data Collection

The conception of the multinational project has begun in 2010 and ethics approval has been received from Macquarie University Human Ethics Committee in 2011. A demographic survey (Bilgin et al 2013) and the Approaches and Study Skills Inventory for Students (ASSIST) survey tool (1998) are used for data collection. The ASSIST is used to identify learning approaches of students. The relationship(s) between the learning approaches and the student demographics are investigated.

We surveyed students in a metropolitan Sydney university in Australia who was enrolled into various statistics units, specifically first year statistics units in 2011 semester 2 and 2012 semesters 1 & 2. We are aiming to survey more students in 2013 and in the future via an online survey instead of paper based surveys.

In total, we had 137 responses in 2011 semester 2 and 255 responses in 2012 semester 1. These 392 responses came from seven different statistics units in Australia and used for analysis.

### 3. Results

The sample was reasonably split between male (51.2%) and female (48.8%) participants. The average age of students was 22 (SD=4.8) years. 91% of the students were aged 26 years or younger. Half of the sample consisted of students who identified themselves as an international student. These students were mainly from China (66% of international students were from this country) and other Asian countries (31% of international students). Although only half of the students were international students, 66% of students indicated that they spoke a language other than English at home and only 33% of the students had English as their first language. One third of the students completed secondary education through a private or independent high school, while nearly 58% graduated from a government high school (including selective high school). More than one-third of the students attended coaching for more than 30 hours in a year prior to starting university. Forty percent of students did not have a parent with a university degree, while one-third had both parents with university degree, 16% only father and 7% only mother with a university degree. More than one-third of the students lived with their parents and another one-third lived in shared accommodation, the remaining lived alone (17.7%), with partner/husband/wife (7.9%), residential college (2.1%) or in other accommodation (5.3%). 52% of the students had a job during their studies where they worked from 2 hours per week to 60 hours per week. On average they worked 17.5 (SD=11.2) hours each week.

Two-thirds of students indicated that they liked studying in general and they also liked studying mathematics in their high school years. The percentage of students who considered statistics to be useful for their future work (70%) and the percentage of students who intended to enrol in a higher degree after completing their current degree (68.5%) were very high.

Their self-identified learning approaches were quite evenly distributed for deep, surface and strategic approaches, 36%, 34% and 30% respectively. Two-thirds of the students provided an explanation for why they had chosen a certain learning approach to study their current statistics units.

Deep and surface approaches consist of four subscales each with four statements; therefore if a student chooses the highest possible value for each statement, the highest possible score for deep and surface approaches are 80. The strategic approach consists of five subscales each with four statements; therefore if a student chooses the highest possible value for each statement, the highest possible score for the strategic approach is 100. The mean deep, surface and strategic approach scores for the 392 students were 57.2 (SD=9.9), 53.5 (SD=11.1) and 72.1 (SD= 12.8), respectively.

The preliminary results of our analyses showed that there were statistically significant positive correlations between age and using a deep approach to learning, age and strategic approach to learning, deep and strategic approaches to learning, years at university and deep approach to learning, years at university and strategic approach to learning, the number of units studied and surface approach to learning and negative correlations between age and strategic approach to learning.

The analysis also showed that when students stated that they liked studying mathematics at high school, their deep and strategic approach scores were higher compared with those who did not like studying mathematics at high school. Finally, students' expected grade for their statistics unit was highly related to the learning

approaches they utilised; higher expected grades were associated with higher deep and strategic approach scores and lower surface approach scores.

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