

Everyday mathematics of university students

Marc Bonne¹, Sheila Webber² and Paul Clough³

¹ Information School, The University of Sheffield, Regent Court, 211 Portobello, Sheffield S1 4DP, UK
mabonne1@sheffield.ac.uk

Abstract. In this poster abstract we highlight the preliminary results of an exploratory study investigating the ways in which university students use mathematics in their everyday lives. The study is part of wider research investigating the impact of mathematics computer games on mathematics anxiety in university students. A survey was distributed to 125 students across the University of Sheffield asking participants about the most common activities they take part in that involves mathematics, as well as any mathematics concepts involved. Responses predominantly came from undergraduates (49.6%). The most common activities included counting, measuring, and predicting. Future work would require the inclusion of students across different universities to increase the generalisability of the results

Keywords: everyday mathematics, university students, game-based learning, real world application, mathematics education, STEM

1 Introduction

This study is part of a wider thesis investigating the impact of online mathematics games on mathematics anxiety in university students. The aim of the wider study is to create a model for a game that reduces mathematics anxiety. A recurring theme in the literature on mathematics education is the need to improve learning of abstract mathematics concepts using interactive real-world application [1] [2] [3].

In conducting a pre-pilot study comparing the usability of three browser based mathematics games as well as their features that affect anxiety levels, interview data revealed that participants preferred storylines that were related to their everyday lives over more abstract or fantasy based themes. Only two examples were provided, namely shopping and calculating change at a restaurant. As such, an exploratory study was conducted to find further potential stories and activities that students can identify with to be incorporated into a model for a game.

2 Literature review

The literature on everyday mathematics has been studied extensively in the past, encompassing a variety of countries and cultures [4] [5]. Bishop's [4] literature review identified six types of everyday mathematics activity across numerous age groups, countries and cultures. These included counting, locating, measuring, designing, playing and explaining.

However few studies, have examined the everyday mathematics of university students, an important demographic due to high attrition rates [6] as well as failure rates on mathematics heavy university courses [7]. Furthermore, concerns from employers about STEM (Science, Technology, Engineering, Mathematics) skills shortages has since led to numerous interventions encouraging students to enroll on courses involving mathematics [8] [9].

Educational psychologists have called for more real-world application of mathematics in the classroom to aid learning. Studies found that students' understanding of mathematical concepts improves when applied to scenarios students believe reflect the real world [1] [2] [3] [5].

2.1 Aims of the study

This study has three main aims:

1. To discover what everyday activities students, perceive as involving mathematics everyday lives of students.
2. Discover what mathematical concepts students recognize in their everyday lives.
3. Compare identified mathematics activity amongst students with Bishop's [4] typology of everyday mathematics.

3 Methodology

In January 2017, a Google forms based questionnaire was distributed via email to a student volunteer list at the University of Sheffield (ethics approval was acquired before the research began). Demographic data was collected in the form of closed-ended questions, including the participants' age and gender, attendance status (e.g. full time/part time/distance learning), as well as accommodation status (e.g. student accommodation/living at home). This is so the researcher could identify any trends between student demographics and mathematics activity. For the everyday mathematics section of the questionnaire, participants were queried using open-ended questions on the last time

they used mathematics outside of their course or job, and to write about their experience. These responses were exported from Google forms to Excel and imported into NVivo to be coded and themed, focusing on the activity undertaken by the participant and the mathematics involved.

4 Preliminary Results

4.1 Demographics

126 students responded to the survey into total; though one record was later omitted, due to being purely inflammatory in nature. 60% of participants were found to be in the 18-24 age group. The next largest age group were between 25-34 at 30.4%. Across all age groups, 67.2% of participants were female, except for the 55 or older demographic which had an equal number of males and females. 84.8% of students were full time on campus.

4.2 Everyday mathematics

25 categories of activities were identified. The table below shows the most frequently occurring activities and what students identified as mathematics:

Table 1. Fig 1. Activities involving mathematics and the mathematics concepts

Activity	Frequency	Mathematics concepts
Shopping	25%	Arithmetic, percentages, counting, fractions
Managing personal finances	20%	Arithmetic
Planning events	9%	Arithmetic, currency conversion, time/distance measurements
Cooking	7%	Arithmetic, ratios
Splitting the bill	5%	Arithmetic

4.3 Comparison with previous literature

The results were also compared to Bishop's [4] more abstract typology of everyday mathematics with the more common mathematics concepts being counting and measuring. While the results agreed with the wider demographic used for Bishop's typology, an additional category was formed identified as "Predicting". This involved the use of percentages, fractions and general number estimates to anticipate future events (e.g. planning events, online gambling, gaming (computer games), cooking as well as estimating distances/prices). Other common activities involving mathematics took the form of locating, designing and explaining.

5 Conclusion

The everyday mathematics experienced by university students appears to be similar to those reported by the general population in previous studies. However, it was found students additionally engage in “Predicting”, encompassing some newly discovered technology-focused activities such as online gambling and computer gaming. The final results will use more sophisticated statistical methods (such as cross tabulation) to identify trends between specific participant attributes (e.g. age and study status) and activities involving mathematics. Furthermore, data from a wider range of universities would help improve the generalisability of the results.

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