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## **Study - How Students' Understanding of Calculus Changes Having Studied Preliminary Courses in Undergraduate Mathematics**

### **PARTICIPANT INFORMATION SHEET**

Central University Research Ethics Committee Approval Reference: C1B-24TT-Educ-048

#### **1. Introductory paragraph**

You are being invited to take part in a research project. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please ask me (Ella) if there is anything that is not clear or if you would like more information. Take time to decide whether you wish to take part.

#### **2. Why is this research being conducted?**

I am carrying out this research as part of my undergraduate dissertation, where I am investigating students' understanding of calculus. I want to see if studying undergraduate courses in analysis and calculus affects students' understanding and/or approach to calculus problems by interviewing students who have and have not studied these courses, but who all have a baseline knowledge of calculus from school.

#### **3. Why have I been invited to take part?**

You are being invited to take part in this study because you are part of one of these groups:

Group A - you are a first-year undergraduate student and took Mathematics at A-Level or equivalent, e.g. IB, AP, etc. and may or may not be studying Mathematics as your degree.

Group B - you are studying undergraduate Mathematics and have taken the Prelims courses in Analysis and Calculus.

I am looking for 3 or 4 participants from each group.

#### **4. Do I have to take part?**

You do not have to take part in this study. If you decide to do so but then wish to withdraw you will face no negative consequences, please just inform me of your withdrawal. If you choose to withdraw after your recorded interview has been transcribed and anonymised your data will still be used for the study but you will not be identifiable in this work.

**5. What will happen to me if I take part in the research?**

- If you agree to participate in this study, you will be invited for an interview where I will be asking you about your understanding of calculus and will ask you to solve some calculus problems.
- I will ask for your consent to audio record the interview so that a transcript can be made for analysis.
- Throughout the interview, including solving the calculus problems, I will request that you talk through all of your thought processes; you will also be given pen and paper to take notes and support with solving the maths problems, if you wish, and these notes will also be collected to be analysed.
- I will ask for consent to record the interview before it begins, and once the recording has started I will ask for consent to record the interview, to collect and store the audio file, transcript of the interview, handwritten notes and any other derivative files on secure, University approved systems for the minimum 3 years term required by the University.
- The interview should take less than 1 hour and can be organised to take place at a time and a location convenient to both parties.
- There may be another person present at the interview to help with recording and as an extra observer, but they will not be asking any of the questions and will not have access to any data outside of the interview.

**6. What are the possible disadvantages and risks in taking part?**

We do not perceive any disadvantages to taking part in this research.

**7. Are there any benefits in taking part?**

There are no direct anticipated benefits to participating in the study, but by taking part in the interview, you may find that your understanding of calculus develops.

**8. Expenses and payments**

You will receive a £20 Amazon voucher [or similar] for your time in taking part in the interview.

**9. What information will be collected and why is the collection of this information relevant for achieving the research objectives?**

I will collect a few pieces of information about your Mathematics education, which may be of interest when comparing different participants' responses. I will collect the audio file and handwritten notes produced during the interview to create transcripts as the major part of the study will be based in analysing these data. Where possible, files will be saved on University-provided OneDrive and otherwise as password protected files on protected personal devices. Once transcripts have been made to an acceptable standard and written work has been copied, the original audio file and hand-written notes should not need to be used and you should not be identifiable. The data will be accessed by me, my supervisor, an assistant for the purposes of

transcription, and other researchers in the Department of Education who work in Mathematics Education Research.

**10. Will the research be published? Could I be identified from any publications or other research outputs?**

The findings from this research will be written up in my undergraduate dissertation, and presented to a small group of academics and students, who may be from the Department of Education and Mathematical Institute.

I would like to request that I be able to use direct quotes from your interview in the write up and presentation, which will be attributed to you via a code, e.g. if you were the second student from Group A to be interviewed, you would be Student A2.

**11. Data Protection**

The University of Oxford is the data controller with respect to your personal data, and as such will determine how your personal data is used in the research. The University will process your personal data for the purpose of the research outlined above. Research is a task that is performed in the public interest. Further information about your rights with respect to your personal data is available from the University's Information Compliance website at <https://compliance.admin.ox.ac.uk/individual-rights>.

**12. Who has reviewed this research?**

This research has received ethical approval; the application was reviewed and approved by my supervisor on behalf of the Department of Education's Research Ethics Committee. The ethics reference is C1B-24TT-Educ-048.

**13. Who do I contact if I have a concern about the research or I wish to complain?**

If you have a concern about any aspect of this research, please contact me, Ella Caulfield, [ella.caulfield@merton.ox.ac.uk](mailto:ella.caulfield@merton.ox.ac.uk), or my supervisor, Prof Jenni Ingram, [jenni.ingram@education.ox.ac.uk](mailto:jenni.ingram@education.ox.ac.uk), and we will do our best to answer your query. We will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the University of Oxford Research Governance, Ethics & Assurance (RGEA) team at [rgea.complaints@admin.ox.ac.uk](mailto:rgea.complaints@admin.ox.ac.uk) or on 01865 616480.

**14. Further Information and Contact Details**

If you would like to discuss the research beforehand or have questions afterwards, please contact  
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Thank you.