

SOCIAL SCIENCE HREC MINIMAL RISK APPLICATION

Important: Please send an electronic copy of this application (may be unsigned) and all attachments by email to Katherine.Shaw@utas.edu.au. All electronic copies should be submitted as Microsoft Word documents. A signed hard copy must also be sent to: Katherine Shaw, Private Bag 1, Hobart, 7001

If you have any questions, please call: 6226 2763

1. Title of proposed investigation

Please be concise but specific. Titles should be consistent with those used on any external funding application.

Making sense of steepness: Adults applying their learning of high school mathematics to real life situations.

2. Expected commencement date:

May 2012

Expected completion date of project

October 2012

3. Investigators:

A. Chief Investigator (Note: This is the researcher with ultimate responsibility for the project. The CI may not be a student)

Given Name

██████

Surname

██████

Staff Position: Associate Professor

Qualifications: PhD

Staff ID:

██████

School &

Division: Education

Contact

Address: Private Bag 66, Hytten Hall, Hobart

Telephone: [REDACTED]

Email: [REDACTED]

(Required)

B. Co-Investigator(s)

i) Given Name

Surname

Staff Position: Senior Lecturer

Qualifications: PhD

Staff ID:

Contact

Address: Private Bag 66, Hytten Hall, Hobart

Telephone: [REDACTED]

Email: [REDACTED]

(Required)

C. Student Investigator(s):

i) Given Name

Surname

Gender: M

Date of Birth: [REDACTED]

Preferred Title:

Mr

Student Number: [REDACTED]

Level:

Undergraduate / Hons / Masters /

School: Education

Postgraduate Diploma / PhD

Contact Address: Private Bag 66, Hytten Hall, Hobart

Telephone: [REDACTED]

Email: [REDACTED]

(Required)

4. Purpose

What is the main purpose of this project?

Research for Publication Teaching Research for Thesis Quality Assurance/Audit **5. Brief Outline of Proposal**

Aims:

Please give a concise description of the main objectives and/or hypothesis of the study.

The purpose of this investigation is to find out how pre-service teachers measure the slope of the ground. Also:

- How accurately do they compare different slopes?
- How accurately do they measure different slopes?
- What strategies they have for measuring slope.
- Do they use the strategies that are covered in the high school mathematics curriculum?

Justification:

Explain why this particular study is worth doing; and the main advantages to be gained from it.

The measurement of sloping ground is common practice for builders, plumbers and landscape designers. For instance, building regulations determine when a path should include steps, based on the slope of the ground. If a person employed in these trades makes an error in their measurement of slope, the consequences could result in expensive corrections needed in the building or hazardous walkways that have not been built to regulation standard.

The measurement of slope is taught in Australian high schools and also in the technical education institutions that educate builders, plumbers and landscape designers. According to the Australian Curriculum: Mathematics, students in Year 7 are expected to “Recognise and solve problems involving simple ratios” and “Identify angles formed by a transversal through parallel lines.” Both of these skills can apply to the measurement of sloping ground. Further study of functions in Years 8, 9, and 10 provide more opportunities for students to understand the process of measuring slope. However, there is little reference to real-world situations involving slope.

An aim of the *Australian Curriculum: Mathematics* is to “enable students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.” This implies that successful students are able to transfer their mathematical knowledge to solve problems in unfamiliar situations. This study examines how well pre-service teachers are able to apply the mathematics they have experienced in high school to a real world situation.

Pre-service teachers who have enrolled in the Secondary Mathematics teaching method strand of the Master of Teaching course should have good conceptual understanding of the measurement of slope as it applies to functions studied in high school algebra; that is, the study of the relationship between variables and how these relationships are represented in tables, graphs, and equations. Other teachers in this course will not have the same degree of mathematics in their background but all should have met the minimum standard for grade 9 students, which includes the measurement of the slope of a line. Both groups of teachers will be involved in the study.

Research in the US (Stump 2001) suggests that students who perform well on function-based tasks do not exhibit full understanding of slope with models or diagrams of physical situations. This study aims to provide further clarification of students’ ability to transfer this understanding, specifically to real world applications. A study by Lobato & Thanheiser (2002) suggests that, given sufficient scaffolding, students are able to derive the appropriate technique for measuring slope by their own reasoning. A gap exists between these studies in the examination of participants’ ability to apply their mathematical understanding to real world, physical situations; that is, between what students can do on paper and what they are able to do in real life. Several difficulties occur when transferring understanding of this measurement technique from the paper-based examples used in the classroom to real life situations. For instance, slope is calculated as a ratio; this requires the combination of two measurements (a height and a length). These two measurements are not always visually apparent in real-life situations. Also, when slope is referred to in common contexts, such as the steepness of a hill or the gentle slope of a pathway, it may be expressed in a number of different forms including as a percentage, an angle or as a ratio (e.g. one in fifty). Without

addressing these difficulties explicitly in teaching the measurement of slope, teachers are not providing adequate opportunity for students to “employ” the mathematical strategies they learn in the context of functions to the solving of problems in real-world contexts.

This study will work with pre-service teachers with varying backgrounds in Mathematics. It will probe their conceptualisation of slope, and assess their ability to accurately and appropriately measure the slope of the ground. By considering the accuracy of their measurements, the techniques they employ, and the mathematical knowledge of the participants it is possible to ascertain the degree to which this knowledge is being applied in practice and, therefore, the degree to which the aims of the Australian curriculum are being met. The findings of this study will have implications for the teaching of mathematics in high school. By assessing the ability of this sample of educated adults to transfer their high school mathematics to real world situations, insights can be gained into how well the stated aims of the curriculum are being met.

6. Review of Ethical Considerations

Research is only considered to be Minimal Risk if you answer “No” to all the following questions. If you answer “Yes”, you must complete a full application using the Social Sciences Full Application Form

Does your research involve the collection of human tissue samples?
Human tissue samples include blood and other bodily fluids.

Yes No

Does your research involve the deception of participants, including concealing the purposes of research, covert observation and/or audio or visual recording without consent?

Yes No

Does your research involve the participation of people without their prior consent?

Yes No

Does your research involve withholding from one group specific treatments or methods of learning from which they may benefit?

Yes No

Does your research involve the access or use of medical records where participants can be identified or linked to their records in some way?

Yes No

Does your research involve the use of ionising radiation?

Yes No

Does your research involve the use of personal data obtained from a Commonwealth or State Government Department/Agency without the consent of the participants e.g. getting a list of addresses from the Australian Electoral Commission?

Yes No

Does your research **specifically target** any of the following groups of people; (specifically target means they are the central group of participants, as opposed to potentially being incidentally recruited as part of the general population)

Yes No

- Women who are pregnant and the human foetus
- Children and young people
- Those highly dependent on medical care who are unable to give consent
- People with a cognitive impairment, intellectual disability or mental illness
- People who may be involved in illegal activities or residents of custodial institutions
- Aboriginal and Torres Strait Islander Peoples
- People in other countries
- People who are unable to give informed consent because of difficulties in understanding an information sheet (i.e. non English speakers etc)

Does your research pose any risks for participants under medical care beyond those of their routine care? (Risks include not only physical risks but also psychological, spiritual and social harm or distress eg stigmatisation or discrimination)

Yes No

Does your research involve the in depth discussion of any of the following topics whether by interview or as part of a questionnaire or survey;

- Parenting practices,
- Sensitive personal issues,
- Sensitive cultural issues,
- Grief death or serious traumatic loss,
- Depression mood states or anxiety,
- Gambling,
- Eating disorders,
- Illicit drug taking or substance abuse,
- Psychological disorders,
- Suicide,
- Gender identity and/or sexuality,
- Race and/or ethnic identity,
- Fertility and/or termination of pregnancy

Yes No

Does your research involve the potential disclosure of illegal activities or criminal behaviour?

Yes No

Are there any specific risks to the researcher (e.g., will the research involve the use of hazardous materials or be undertaken in a politically unstable area)?

Yes No

If your research will take place in an overseas setting do any of the following apply: is the research to be undertaken in a politically unstable area? Does it involve sensitive cultural issues? And/or: will the research take place in a country in which criticism of the government and institutions might put participants and/or researchers at risk?

Yes No

Does your research explore potentially confidential business practices or seek to elicit potentially confidential commercial information from participants?

Yes No

Does your research explore potentially divergent political views or involve the collection of politically sensitive information?

Yes No

7. FUNDING

Under the National Statement (2.2.6) a researcher must disclose:

- *the amount and sources or potential sources of funding for the research; and*
- *financial or other relevant declarations of interest of researchers, sponsors or institutions*

Is this research being funded? Yes No

If yes, please detail amount and source of funds (NS 5.2.7)

If this application relates to Grant(s) and/or Consultancies, please indicate the Title and Grant Number relating to it

If no external funding has been obtained, please indicate how any costs of research will be met:

The UTas School of Education provides a budget allocation for honours research which will cover the costs of this project.

Do the investigators have any financial interest in this project? Yes No

If yes, please provide details

8. Participants

Selection of Participants

Clearly describe the experimental and, where relevant, control groups. Include details of number of subjects, sex, age range, and any special characteristics. Give a justification for your choice of participant group(s).

Data collection will occur via two processes. Participants are selected differently for each process. In both cases participants' consent to participate will be sought. The participant pool forms a convenience sample that is reasonably representative of well-educated adults, and allows for a variety of mathematical backgrounds.

1) Survey activity: Participants for the survey activity will be all the first year Master of Teaching students (adults) enrolled in the unit EMT520 Personal and Professional Numeracy and studying via the face to face mode who attend the tutorial sessions in which the survey activity takes place, (around 60). None of the researchers are involved in teaching this group. The unit coordinator and tutor of this group have given verbal approval for the survey activity to take place during the time allocated to these tutorials.

2) Interview: Twelve participants who completed the survey will be purposefully selected for the follow up interview, based on their level of mathematics education, their intended teaching specialisation, and their responses to the survey activity. The survey group will be comprised of students who have suitable combinations of the following criteria:

- studied basic high school mathematics only
- studied tertiary level mathematics
- selected secondary mathematics as their teaching specialisation
- not selected secondary mathematics as their teaching specialisation
- recorded accurate estimations of the slope of the ground
- not recorded accurate estimations of the slope of the ground.

Recruitment of Participants

Give specific details about how participants will be recruited. Some questions to consider include:

- *Are you recruiting through advertisements? If so, indicate where they will be placed and append a copy*
- *Are you recruiting through 3rd parties like associations, schools or clubs? If so, detail how you will approach the organisations and the process that the stakeholders will use to pass on information to potential participants. Please attach copies of letters of introduction, emails, and telephone preambles if appropriate*
- *Are the participants University or DHHS staff, or regular patients in a particular clinic? If so, detail how they will be approached i.e. through personal invitation, email etc*

Recruitment of participants will be different for the two processes.

1) Survey activity: Participants for the survey activity will be recruited from the students attending the face to face tutorial groups on the particular day of the survey activity. (The date will be determined once ethics approval has been granted). A presentation will be given to the tutorial group explaining the nature and purpose of the survey activity. The survey activity will immediately follow the presentation. All tutorial attendees will be invited to participate unless they have reduced mobility such as requiring crutches or a wheelchair. This activity will be undertaken by all participants as part of their tutorial, but only data from those giving consent will be used for the study.

2) Interview: All participants in the survey activity will be invited to indicate their willingness to participate in a follow up interview. Those participants who accept this invitation will provide their contact details on the data collection forms used in the survey activity. Participants who are selected for the follow up interview will be contacted and a mutually suitable time for the interview will be determined.

9. Data Identifiability

Which of the following best describes the identifiability of the data (including tissues) collected?

- a) **Non-identifiable data** is data which have never been labelled with individual identifiers or from which identifiers have been permanently removed, and by means of which no specific individual can be identified. A subset of non-identifiable data are those that can be linked with other data so it can be know that they are about the same data subject, but the person's identity remains unknown.
- b) **Re-Identifiable data** is data from which identifiers have been removed and replaced by a code, but it remains possible to re-identify a specific individual by, for example, using the code or linking different data sets
- c) **Identifiable data** is data where the identity of a specific individual can reasonable be ascertained. Examples of identifiers include the individuals name, image, date of birth or address, positions in some companies.

If the information is Re-Identifiable or Identifiable, please give details of the information that will be collected. Also indicate how the confidentiality and anonymity of the participants will be protected:

1) Survey activity. Data from the survey activity will be collected on forms at the completion of the activity. Each form will be given a reference number for identification. Participants who are willing to undertake a follow up interview will also write their email address on their form. These forms will be processed differently, according to the following participant responses:

- Participants who indicate that they are not willing to have their data used will have their surveys destroyed.
- Participants who consent to their survey data being used but do not consent to the interview will have their survey data identified by code only and stored securely.
- Participants who are willing to be involved in a follow up interview will be asked to provide their UTas email address. This identification is needed to link their survey responses to the interview. These survey responses will be stored securely and de-identified after the interviews have been conducted.

2) Interview. Interviews will be video recorded and stored digitally.

- Interview recordings will have their audio component transcribed and de-identified using a code that allows links to the survey data to be maintained.
- Video data will be analysed without modification, but if video data are to be used in publications or similar then those sections of the video footage containing relevant gestures will be converted to still frames and facial features blurred to prevent identification. The video data files will be coded to allow links to survey data and stored securely.
- Pseudonyms will be used where individual responses are referred to in reporting this project.

10. Relevant Literature References

Please list the most relevant and recent literature references, both by the investigator and/or by others, that support the justification for the study.

ACARA. (2012). The Australian Curriculum: Mathematics. <http://www.australiancurriculum.edu.au/Mathematics/>

Lobato, J. & Thanheiser, E. (2002). Developing understanding of ratio and measure as a foundation for slope. In B. Litwiller, (Ed.) *Making sense of fractions, ratios and proportions. 2002 Yearbook.* (pp. 162-175). Reston, VA: National Council of Teachers of Mathematics.

Sabinin, P. D. (2011). *Reasoning about steepness. Strategies of fifth through eighth grade students when solving steepness tasks.* (Ed D dissertation). Boston University, Boston, MA.

Stump, S. L. (2001). High school precalculus students' understanding of slope as measure. *School Science and Mathematics, 101*(2), 81-89.

11. Procedures

Researchers should explain how the investigators intend to conduct the study including the methodological approach, the specific procedures employed and the methods of analysis of data. This should be consistent with the aims of the project.

Please provide detailed procedures (describe exactly what you are going to do):

This study has two parts. In the first part, I am going to ask participants to carry out a survey activity which involves walking around a path, judging the degree of steepness at various places, and recording their judgements. Participants will complete this survey activity in their tutorial class and I am anticipating the whole activity will take no more than 30 minutes.

I will explain the different ways in which participants may record their judgement on the record sheet and allow them ample opportunity to complete the exercise. I will emphasise that, while I am investigating the accuracy of participants' judgements, there are no consequences to the participants as a result of their participation or judgements. See "Making sense of steepness: Survey activity" in the Appendix.

The second part of this study involves an interview about the methods that individual participants used to judge steepness. While all participants in the survey activity will be invited to also participate in the interviews, I will select 12 participants only for the interviews, based on their responses to the survey and their history of study in mathematics. The interviews are semi-structured; they can be varied according to participants' responses, but are expected to take around 15 minutes. Interviews will be recorded, with participants' permission, on digital video in order to collect images of gestures that may be made as a part of their description of the method used to measure steepness. They may view the recording after the interview if they wish but I will not rerecord any aspects of the interview based on their viewing. These recordings will be analysed and the analysis stored using only a coded reference that allows data to be linked with the survey responses. The original video recording will be deleted after analysis. See "Steepness interview" in the appendix for a draft interview schedule.

Where is this project to be conducted? Researchers should attach a letter of agreement/support to participate from any organisation or department whose resources will be accessed as part of

this project.

The path I have chosen for this activity is located in and around the barbecue area, adjacent to the School of Education building, Hytten Hall. The interviews will be conducted in [REDACTED]

12. Monitoring

What mechanisms do you intend to implement to monitor the conduct and progress of the research project? (NS 5.5)

The student researcher will meet fortnightly with the supervisors, and conduct and progress will always be an item on the agenda for these discussions.

In compliance with section 5.5 of the National Statement, the investigators will report to HREC any adverse events arising from this study upon becoming aware of them.

13. Data Storage

All raw data (including blood and/or tissue) must be held by the responsible institution (i.e. UTas, DHHS, AMC) for a period of at least five (5) years from the date of the first publication (this includes publication of the thesis). The data may be kept for longer than five (5) years but must eventually be destroyed, unless explicit consent is obtained from the participants to archive their data.

Where will the data be kept?

1) Survey activity. Survey response sheets will be stored within a locked filing cabinet in a locked office within the School of Education at the University of Tasmania

2) Interview. Digital video recordings, still-frame excerpts and transcripts will be kept in electronic files accessed via a password-protected computer. All electronic files will be de-identified.

How will the data be kept secure?

Paper documents will be stored within a locked filing cabinet in a locked office within the school of education. Electronic files will be accessed only via a password-protected computer.

How and when will the data be destroyed?

Electronic files will be deleted from computer hard-drives and servers, and electronic "rubbish bins" emptied and paper documents will be securely shredded. All files (electronic and paper based) will be held securely for a minimum of 5 years following the publication of reports or articles resulting from data generation and then securely destroyed.

Will any personal information be collected from sources other than the subjects themselves (Please refer to Privacy Legislation Section 95A - National Privacy Principles)?

No Yes

If yes, please detail including a declaration of the sources of the Information i.e. medical records, databases, registries, lists of members from Associations, clubs etc:

Will data on individual subjects be obtained from any Commonwealth Government agency without seeking the consent of the individuals?

No Yes

If yes, please detail including a declaration concerning which agency and what information is being sought. If you wish to obtain data containing personal information from any Commonwealth Government agency state the names of these agencies, describe the nature of this data and explain the justification for obtaining this information. At the Commonwealth level the collection, storage, use and disclosure of personal information by Commonwealth agencies is regulated by the Privacy Act 1988. The NHMRC requires the HREC to provide information on the cases in which it has approved access to, and use of, data held by Commonwealth Government agencies.

14. Information Sheet

With few exceptions, it is essential that subjects are provided with an information sheet about the study in which they are being asked to participate. The Chair of the HREC will pay close attention to the information that is given.

A copy of the proposed information sheet must be attached to your application form.

(Information Sheet Pro forma is available on our website at:

http://www.research.utas.edu.au/human_ethics/social_science_forms.htm)

Is your proposed Information sheet attached to this application?

Yes No (please provide an explanation as to why)

15. Consent Form

Written evidence of consent is usually required for research involving human subjects. If written consent is to be obtained a copy of the actual consent form that you propose to use. In certain circumstances, the HREC may give approval for consent to be waived (see Chapter 2.3 of the

National Statement). While written consent is the norm, there are various kinds of studies for which other procedures for obtaining consent are more appropriate (See Chapter 2.2 of *National Statement*).

If you consider that written consent is inappropriate for this project please state your reasons clearly referring to the appropriate sections of the National Statement.

(Consent Form Pro forma is available on our website at:

http://www.research.utas.edu.au/human_ethics/social_science_forms.htm)

Is a proposed consent form attached to this application?

Yes No

If no, please explain.

16. Approvals from other Departments / Institutions

Does this project need the approval of any institution other than the University of Tasmania and/or the Department of Health and Human Services (e.g., Department of Education, particular wards in hospitals, prisons, government institutions, or businesses)?

No Yes

If yes, Please indicate below the Institutions involved and the status of the Approval.

Name of Other Institution(s):

Status:

Does this project need the approval of any other HREC?

If yes, Please indicate below which HREC and the status of the application.

No Yes (please detail):

Other HREC(s):

Status:

17. Declarations

The Head of School or the Head of Department is required to sign the following statement of scientific merit:

“This proposal has been considered and is sound with regard to its merit and methodology.”

The Head of School or Head of Department’s signature on the application form indicates that he/she has read the application and confirms that it is sound with regard to:

(i) educational and/or scientific merit and

(ii) research design and methodology.

This does not preclude the Committee from questioning the research merit or methodology of

any proposed project.

If the Head of School/Department is one of the investigators, this statement must be signed by an appropriate person. This may be the Head of School/Department in a related area or the Dean. The certification of scientific merit may not be given by an investigator on the project.

Name	
Position	
Signature	
Date	

Conformity with NHMRC Guidelines

The *Chief Investigator* is required to sign the following statement:

I have read and understood the *National Statement on Ethical Conduct in Human Research 2007 and the Australian Code of Conduct for Responsible Research 2007*. I accept that I, as Chief Investigator, am responsible for ensuring that the investigation proposed in this form is conducted fully within the conditions laid down in the *National Statement* and any other conditions specified by the HREC.

Name of chief investigator	████████████████████
Signature	
Date	

Signatures of Other Investigators

I acknowledge my involvement in the project and I accept the role of the above researcher as chief investigator of this study.

(Name) ████████████████	(Signature)	(Date)
(Name) ████████████████	(Signature)	(Date)

CHECKLIST

Please ensure that the following documents are included with your application:

Information sheet/s (if not attached ensure you have explained why in Section 14)	<input checked="" type="checkbox"/>
Consent form/s (if not attached ensure you have explained why in Section 15)	<input checked="" type="checkbox"/>
Questionnaires (if applicable)	<input checked="" type="checkbox"/>
Interview schedules (if applicable)	<input checked="" type="checkbox"/>

A copy of any permissions obtained i.e. Other HREC, Other Institutions (if applicable)	<input type="checkbox"/>
All documents relevant to the study, including all information provided to subjects.	<input checked="" type="checkbox"/>
Telephone Preambles (if applicable)	<input type="checkbox"/>
Recruitment Advertisements (if applicable)	<input type="checkbox"/>
Email Contents (if applicable)	<input type="checkbox"/>

TO SUBMIT THIS APPLICATION:

1. You must email an electronic copy of this application form (may be unsigned) and all study documents to Katherine.Shaw@utas.edu.au (please submit all forms as Microsoft Word documents).
2. You must also send a signed hard copy of this application form and all study documents to Katherine Shaw, Private Bag 1, Hobart, 7001

Has the Head of School/Department signed the form?

Have all investigators signed the form?

Making sense of steepness: Adults applying their learning of high school mathematics to real life situations

Information for participants

Invitation

I, [REDACTED], would like to invite you to be involved in this research study "Making sense of steepness: Adults applying their learning of high school mathematics to real life situations." When people walk across sloping ground they develop a perception of steepness and the means to judge a slope as being very steep or not very steep. This study examines how well people do this and collects information about the techniques people use to measure steepness. This study has been designed, and will be conducted, by the following team:

[REDACTED]
[REDACTED]
[REDACTED]

This study is being conducted in partial fulfilment of an Honours degree for [REDACTED]
[REDACTED]

The purpose of this investigation is to find out what people understand by, and what strategies they have for measuring, the slope of the ground; that is, how they judge, compare, and quantify the way in which the ground varies from being flat. Specifically, this study will examine the accuracy with which different slopes are estimated and compared. It will also examine the methods by which people make these judgements and compare these methods with those covered in the high school Mathematics curriculum for measuring slope. The data from this study will indicate whether adults use their high school mathematics in this application and may lead to recommendations for the teaching of these concepts in high schools.

Why have I been invited to participate?

You have been invited to participate in this study as a sample of high school graduates with a range of experiences studying mathematics. All students enrolled in the first year of the Master of Teaching program in 2012 and undertaking the unit EMT520 as an on campus student have been invited to be involved.

Please be assured that your involvement is voluntary, that there are no consequences if you decide not to participate, and that this will not affect, for example, your relationship with the University.

What will I be asked to do?

This study has two parts. In the first part, I am going to ask you to carry out a survey activity which involves walking around a path, judging the degree of steepness at various places and recording your judgements. The path I have chosen for this activity is located in

and around the barbecue area, adjacent to the School of Education building, Hytten Hall. You may complete the survey activity in your own time but I am anticipating the whole activity to take no more than 30 minutes.

I will explain the different ways in which you may record your judgement on the record sheet and allow you ample opportunity to complete the exercise. I must emphasise that, while I will be assessing the accuracy of your judgements, I am simply collecting information and will not be placing any value on your accuracy. This is a survey, not a test; that is, there are no consequences to you for your participation.

The second part of this study involves an interview about the methods you use to judge steepness. While all participants in the survey activity will be invited to also participate in the interview, I will select 12 participants only for the interviews, based on your responses to the survey and your history of study in mathematics. You don't have to agree to both: You can do the survey but choose not to be available for interview. The interview is semi-structured, depending on your responses, and is expected to take around 15 minutes. Your responses will be recorded, with your permission, on digital video. You may view the recording after the interview if you wish but I will not rerecord any aspects of the interview based on your viewing. These recordings will be analysed and the analysis stored without any connection to your identity. The original video recording will be deleted after analysis.

This research project is being conducted to improve understanding about the processes and outcomes of teaching mathematics. While it takes place during your regular tutorial time for the unit EMT520, this study is independent of your work in this unit. Your choice to be involved in this study, and the results of your survey and interview have no bearing on your results in the unit, EMT520.

Are there any possible benefits from participation in this study?

While there are no intended benefits to the participants in this study, there is a likelihood that your understanding of the measurement of steepness may improve as a result of your involvement in the exercises. The wider benefits of this study extend to the understanding of people's perceptions and judgements of slope. This understanding, while not being comprehensive at this stage, may result in recommendations for improvements in the processes of teaching high school mathematics.

Are there any possible risks from participation in this study?

The physical activity involved in the survey is low risk. You will be asked to walk around a public path that is well serviced and accommodates frequent use.

The interview is not expected to pose any risk or threat to you. Questions and activities are all based around your observations and judgements of slope.

What if I change my mind during or after the study?

You are free to withdraw at any time, and can do so without providing an explanation. If you choose to withdraw from this study, I will ask your permission to retain any data that has been collected so far. You are free to decline this request. Data that have already been processed will not be able to be withdrawn.

What will happen to the information when this study is over?

The data from this study that is kept will not bear participants' names or be identifiable after the completion of the project. Sufficient information will be needed to cross check survey results with interviews but, once all data are collected, names and means of identifying participants will be removed from the data and stored separately. The interview videos will be transcribed and, if needed for my thesis or publication, visual images will be altered to remove any means of identifying participants. In accordance with the research requirements, research data will be kept for 5 years from the date of completion of the study.

How will the results of the study be published?

The study forms a part of the requirements for an Honours degree and, as such, findings will be presented at a number of forums for educational research. The dissertation may or may not be published. Any participant who would like to learn of the results of the study can contact [REDACTED] for copies of any reports. No participant will be identifiable in the final report. Pseudonyms will be used in cases where a participant is referred to specifically.

What if I have questions about this study?

If you have any questions about this study you may contact the following people.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Contact details for the Ethics Committee:

"This study has been approved by the Tasmanian Social Sciences Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study, please contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. Please quote ethics reference number [Hxxxxx]."

This information sheet is for you to keep. Your consent to be involved in the survey activity is implied by your completion of the survey form. Should you also wish to give your consent to be involved in the interview, complete the appropriate section on the survey form. A written consent form will also need to be signed after you have been invited to participate in the interview.

Making sense of steepness: Adults applying their learning of high school mathematics to real life situations

Consent Form for EMT 520 Personal and Professional Numeracy students (Interviews)

1. I agree to take part in the research study named above.
2. I have read and understood the Information Sheet for this study.
3. The nature and possible effects of the study have been explained to me.
4. I understand that the study involves me participating in a one-on-one interview with the researcher for approximately 15 minutes, which will be video-taped and transcribed. I also understand that my participation in this research will have no effect on my grade in EMT 520.
5. I understand that participation involves no foreseeable risk.
6. I understand that all research data will be securely stored on the University of Tasmania premises for five years from the publication of the study results, and will then be destroyed.
7. Any questions that I have asked have been answered to my satisfaction.
8. I understand that the researcher(s) will maintain confidentiality and that any information I supply to the researcher(s) will be used only for the purposes of the research.
9. I understand that the results of the study will be published so that I cannot be identified as a participant.
10. I understand that my participation is voluntary and that I may withdraw at any time without any effect.

I understand that I will be able to withdraw any unprocessed data.

Participant's name: _____

Participant's signature: _____

Date: _____

Statement by Investigator

I have explained the project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Investigator's name: ██████████

Investigator's signature: _____

Date: _____

Making sense of steepness: Adults applying their learning of high school mathematics to real life situations

Consent for use of Survey data

1. I agree to take part in the research study named above.
2. I have read and understood the Information Sheet for this study.
3. The nature and possible effects of the study have been explained to me.
4. I understand that the study involves me participating in a survey activity for approximately 30 minutes. I also understand that my participation in this research will have no effect on my grade in EMT 520.
5. I understand that participation involves no foreseeable risk.
6. I understand that all research data will be securely stored on the University of Tasmania premises for five years from the publication of the study results, and will then be destroyed.
7. Any questions that I have asked have been answered to my satisfaction.
8. I understand that the researcher(s) will maintain confidentiality and that any information I supply to the researcher(s) will be used only for the purposes of the research.
9. I understand that the results of the study will be published so that I cannot be identified as a participant.
10. I understand that my participation is voluntary and that I may withdraw at any time without any effect.
11. I understand that I will be able to withdraw any unprocessed data.

Participant's name: _____

Participant's signature: _____

Date: _____

Willingness to be interviewed

In addition to the consent given, I agree to participate in a follow-up interview.

Participant's email: _____

OFFICE USE ONLY

ID Code:

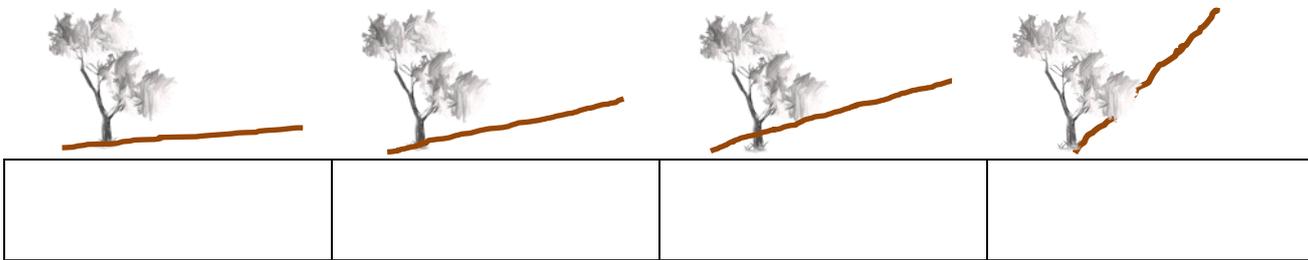
OFFICE USE ONLY

ID Code:

Record sheet: Estimating steepness.

Question 1. There are many different ways to assign a numeral value to the steepness of a slope. Choose the method that you are most comfortable with. So that I can understand the method you use in question 3, I need you to complete this exercise using the same method for measuring steepness.

Assign a numerical value, and include units if appropriate, for the slopes depicted in the following representations of sloping paths.



Question 2. Please indicate:

1. your highest level of successful study in Mathematics

Year 10 Year 11 Year 12 Undergraduate Postgraduate

2. The MTeach education/teaching strand in which you are currently enrolled

Primary Secondary including Mathematics Secondary not including Mathematics

Slope Each slope is marked with a different colour.	Question 3. Line Draw a line that represents each slope. You are given a dark line that represents the horizontal.	Question 4. Number Represent the steepness of each slope with a number. Use the same method you used in question 1.	Question 5. Order Rank these slopes from the least steep (1) to the steepest (4).
RED			
BLUE			
YELLOW			
GREEN			

Steepness Interview

Thank you for agreeing to do this follow up interview, I want to ask you some more questions in relation to the activity you did on measuring steepness as well as some related work with the equipment I have here on the table.

Part 1. You were asked to represent each slope as a line against a horizontal. How did you decide where to draw that line? Where did you stand to judge the steepness?

When you were asked to represent the slope as a number, how did you determine that number?

How did you decide which slope was steepest?

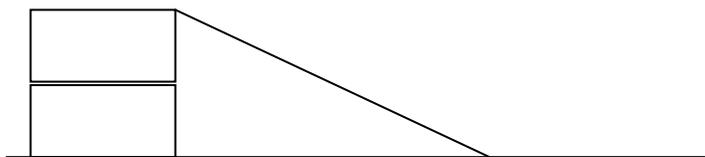
(compare lines? compare numbers? other?)

Part 2. I want to show you some models here of different slopes.

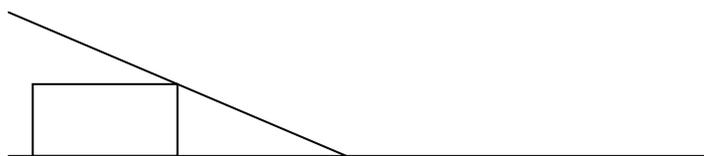
If I place this ruler on this block like this, what number would you give the steepness? How did you make that decision? What things did you consider? How accurate do you think you are as a percentage?



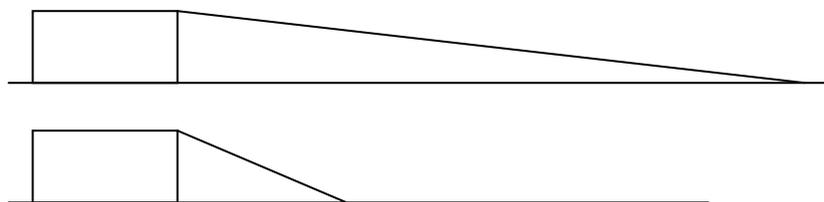
If I place two blocks here under the ruler, how does that affect the slope? What number would you give the steepness?



If I slid the ruler along like this, how has the steepness changed? What number would you give it now? How did you decide that?



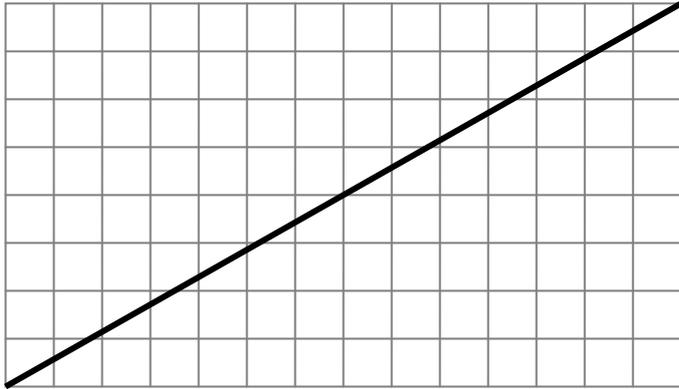
Which of these two slopes is steeper?



Part 3. Now I would like to ask you some questions about what you might have learnt at school about this measurement.

Do you remember learning about measuring slope at school? (If yes.) Do you remember how it was done? (if yes.) How?

How would you find the slope of this dark line?



That's all I need. Thank you very much for your cooperation with my project.

Researcher's introductory outline to participants

This is the estimation activity that will be run for groups of education students. They will be met in their regular tutorial space and time. The activity should take less than 30 minutes.

“Hello everyone and thank you for participating in my research project. I am interested in Mathematics education and, in particular, measurement. To begin with I would like you to follow me to the barbecue area just down in the bush nearby because the type of measurement I am interested in often takes place outside. This part of the activity will take around half an hour. I will tell you more about the project and what I want you to do when we get there. So, let's go to the barbecue area.”

The group are led down to the barbecue area where they can sit at the tables for the next set of instructions.

“I would like you to look around and think about the ground in this area. The paving around the barbecue is flat. It has been made level because we find level surfaces easier to move across. Much of the ground around here, however, is not flat and that's what I would like you to measure.”

“Many people in their work need to make measurements of the slope of the ground. Builders and landscapers need to make decisions based on how steep the ground is. For instance, when the steepness of a path exceeds a certain value, steps need to be built. In coming here we walked down some steps that were built at the steepest part of the path.”

“I am interested in how people perceive steepness, how they measure it, and how their own experiences of steepness relate to their learning of this measurement in school.”

“For this task, I want you to each take a clipboard and pencil and go for a little walk around the paths here. I would like you to follow a circuit that I have mapped out and, at various places that I have indicated, I want you to estimate how steep the ground is. You may work at your own pace but I would like you to not discuss your ideas with your peers. Each section that I want you to measure has two markers of the same colour. I want you to walk from one marker to the next and estimate the steepness of the ground between the two markers. You may walk back over each section more than once in order to make the best estimate of the slope but I do need to you make your best estimate without using any measuring equipment.”

“I want you to record your estimates in two ways for each section of ground. You will see on your sheet that you have two spaces to record your estimates. The first space is a box with a horizontal line at the bottom. (refer to the sheet). This line represents the horizontal and I want you to draw a line from it that you think best represents the slope at that particular place. Any questions? In the second box I would like you to record a number that you think corresponds with the slope. There are various methods that can be used to do this but I would like you to choose the method that you feel most comfortable with. I also need you to use the same method to answer question 4 on your sheet. You see four diagrams of slopes that have different steepness. Put a number under each diagram that represents the steepness. This will tell me what method you have used in question 2. Any questions?”

“The next thing that I would like you to do for this activity, once you have walked around the path and recorded your estimates of each slope, is to put the slopes in order from flattest to steepest. Mark in the third column of your sheet by placing a 1 next to the flattest slope and then number the rest in order up to 4 for the steepest slope. Any questions?”

“The last thing I need you to do is to indicate the highest level of mathematics education in which you have been successful. Mark one of the tick boxes in question 5. Any questions?”

“You can walk around the path now and record your estimates. Take your time but I will emphasise that this is a survey and there is no prize for the person who is most accurate. I do need for this data to represent your own perceptions, so I will just remind you to not talk to anyone while you work. If you have any questions you may come and ask me. When you have recorded your estimates in both methods, indicated the order of steepness and answered the other questions, please return your clipboard and pencil to me and you are free to leave.”