

Research Methods for Evaluating Technology-enabled Learning Environments

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About this booklet

This booklet accompanies the tutorial, 'Research Methods for Evaluating Technology-enabled Learning Environments', which will be presented at the 2nd annual international conference on Technology for Education, T4E 2010, <http://tfore.org/> to be held at IIT Bombay, Mumbai, India during July 1-3, 2010.

The contents of this booklet are as follows:

- a toolbox of methods that educators, course designers and researchers can apply to evaluate the student experience with technology-enabled learning applications such as blogs, wikis, 3D virtual worlds (e.g. Second Life)
- an overview of the ethical considerations for conducting educational research
- a set of resources such as a list of papers and web resources related to educational research methods and ethical guidelines for educational research
- tutorial description submitted to the conference committee

If you have any queries, feedback and comments, please contact Shailey.

Techniques in educational research (toolbox)

Data collection and analysis techniques	Comments and sources
Pre-interview questionnaire (by email)	<ul style="list-style-type: none"> • The pre-interview questionnaire helps to gather preliminary information about the participant and the resources that would be useful to refer to before the interview takes place; these resources could be blog(s) addresses, websites, pointers to papers and books • The pre-interview questionnaire also helps to establish an early rapport with the participant • For an example, see page 88 of (Minocha, 2009)
Surveys (using SurveyMonkey.com)	<ul style="list-style-type: none"> • I view surveys as information collection mechanisms to get a broad perspective of the area of research; • Surveys can also help in recruiting participants (e.g. Minocha and Reeves, 2010 and Reeves and Minocha, 2010)
Open-ended questions (by email)	<ul style="list-style-type: none"> • After receiving the completed pre-interview questionnaire and before conducting a structured or semi-structured interview, we send two-three questions by email to the participant • The open-ended questions help to trigger thoughts and reflect on the experiences and, thereby, help the participant to prepare for the main interview (based on descriptive phenomenology, Langdridge, 2007). • The email interactions also help to establish rapport with the participant
Semi-structured interviews (on phone, via Skype, using instant messaging, within Second Life)	<ul style="list-style-type: none"> • We carry out semi-structured interviews after receiving the responses to pre-interview questionnaire and open-ended questions • In the interview template, we have questions and the probes; probes help the interviewer to re-word the main question or to delve deeper into the question • For an example, see pages 99-102 of (Minocha, 2009) • We conduct interviews by phone, Skype, within Second Life which is a 3D virtual world (e.g. Minocha and Reeves, 2010), or an instant messaging tool (e.g. Volda, et al., 2004)
Epistolary interviews (by email)	<ul style="list-style-type: none"> • When participants are not available for synchronous interviews or prefer asynchronous ways to communicate their views, we send the questions by email; sometimes a series of emails rather than sending a long list of questions which may overwhelm the participant (Debenham, 2007)
Reflective diaries (provided as Word documents)	<ul style="list-style-type: none"> • If we are observing the user behaviour and experiences over a period of time, we give reflective diaries to students (Schon, 1983; Ghosh, 2003) • A reflective diary consists of questions at different stages over which the user experiences are captured over a period of time (Johns, 1994)
Reflective questions (within assessment)	<ul style="list-style-type: none"> • We also include reflective questions – asking students to reflect on their experiences as a part of the assessment (Minocha and Thomas, 2008)
Focus groups or group interviews (face-to-face, or in Second Life)	<ul style="list-style-type: none"> • We conduct focus groups or group interviews when a broad perspective of the research area is required before one-to-one interviews are carried out • We also conduct group-interviews as a way to establish early rapport with the participants • Focus groups also help in clarifying and refining the research questions
Case study methodology	<ul style="list-style-type: none"> • Where a comprehensive study of an initiative involving several stakeholders has to be carried out, we employ case study methodology e.g. pages 16-19 of (Minocha, 2009); (Schroeder et al. 2010).
Thematic analysis	<ul style="list-style-type: none"> • This is a data analysis technique which we use for extracting the themes or key concepts from the data and we are guided by the research questions (e.g. Minocha and Reeves, 2010; Braun and Clarke, 2006)
Analysis of the blogs	<ul style="list-style-type: none"> • Discourse analysis (e.g. Wetherell, 2001a and 2001b)

References

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- Wetherell, M., Taylor, S. and Yates, S.J. (2001a) *Discourse Theory and Practice: A Reader*, London: Sage/The Open University.
- Wetherell, M., Taylor, S. and Yates, S.J. (2001b) *Discourse as Data: A Guide for Analysis*, London: Sage/The Open University.

Ethical considerations

Establishing trust with the participants is important in a research study. Trust is closely linked to a participant's perception of privacy. If a participant feels that their answers are likely to risk their privacy they will not complete the research or distort their responses.

Participants also need assurances of confidentiality – details of how the information is going to be stored and who will access it. Of key concern is how identifiable the information is. If the information is held anonymously, then it will be re-assuring for the participants. So it is helpful to emphasise to the participants that the information that they provide will be anonymised. Sometimes disclosing the number of the participants who are involved in a study also helps to increase their perceptions of anonymity.

The concern for privacy and anonymity will be of particular concern if you are conducting evaluations of a system or initiative within your own organisation (e.g. with other educators). Your colleagues may have valid concerns that their performance during evaluations may affect their reputation or credibility and may even shown them poorly in front of their superiors.

Informed consent: Project summary sheet and consent form

To build up this trust with the participants, it is useful to take an informed consent from the participants at the recruitment stage. Even if you are recruiting participants through an agency, it is useful to provide as much as information upfront through the agency. In fact, in one of the interviews with a usability experience manager which I conducted recently, she mentioned that they stopped doing business with a recruitment agency as the agency was not providing enough information to the participants upfront – so the participants were somewhat taken by surprise when they came for the usability session.

We create a project summary sheet to provide information about the evaluations and to create an initial trust with the participants. Please see *Appendix 1* for a sample.

The *project summary sheet* has the following information: who we are? what is the project about?, how will the session(s) be carried out, time it will involve? So if the study involves two or three stages such as pre-interview questionnaire, an interview and a de-briefing session – we outline the stages and also mention at which stages the audio and video recordings will be done. We mention who would have access to the data?, what we will do with the information that we collect: where we will store the data and for how long, what are the end products of the study – papers, articles or reports; we also mention that there is an accompanying consent form and they have the right to withdraw from the study; and finally we provide them with full contact information of the project leader so that they can contact us at any point during the study.

The notion of informed consent is that the participants must understand the reason for conducting the study so that they can make a meaningful decision as to whether or not they wish to participate. The project summary sheet provides this information.

The second part is the '*consent*': participation should be voluntary and free from any coercion. Potential participants should not be given the reason to believe that a decision not to participate will lead to any repercussions or disapproval. In the consent form, we again mention the title of the project and that they are agreeing to be audio and video recorded and observed (depending upon the usability session

that has been planned), the anonymity of their information will be maintained and the copyrights of any publications or reports will belong to the organisation or to the publisher; and most importantly that they have the right to withdraw at any point. Please see *Appendix 2* for a sample consent form.

Even if the participant has given the consent, it is again useful to reiterate about the setting of the session: about the recording, who will be observing, how the session will be carried out and giving them the option to stop and take a break at any point.

Giving incentives to participants

Talking to colleagues, I have noted that there are different practices in different organisations – for example, some tend to give the participants incentives at the start of the session or the study if the study involves several stages and some give the incentives at the end of the session or study. Actually, the general guidance, especially in our university is that incentives should only be given to cover expenses or inconvenience otherwise it can be perceived as coercion or inducement to participate. If we are conducting remote evaluations where travel expenses have not been incurred, we send book tokens to our participants and not give cash. But in the industry, I have noted that giving cash incentives is the norm.

Although almost all codes of conduct for ethics state that giving incentives can create a bias in sampling or participant's responses, but at the start of the session if the moderator mentions how significant their participation is in improving the usability and learnability of the product/service, participants tend to focus on the task in hand and are very forthcoming with their feedback and thoughts. So the moderator or facilitator's role is key in establishing trust for the participants, giving them assurance and highlighting the significance of their participation. If the participant turns up, but for some reason is unable to participate or withdraws from the study, the norm is that you still offer the incentives.

Web-based resources for ethical considerations

AOIR. Ethical decision-making and Internet research: recommendations from the AOIR ethics working committee, 2002 Available from:

<http://www.aoir.org/reports/ethics.pdf>, accessed 26 June 2010.

Code of Conduct for Usability Professionals,

http://www.upassoc.org/about_upa/leadership/code_of_conduct.html, accessed 26 June 2010.

Sample consent form, <http://www.sensible.com/rocketsurgery/index.html>, accessed 26 June 2010.

Code of Ethics and Conduct, British Psychological Society,

http://www.bps.org.uk/the-society/code-of-conduct/code-of-conduct_home.cfm, accessed 26 June 2010.

Managing Ethics in Research, <http://www.ucc.ie/academic/apsych/ethics/>, accessed 26 June 2010.

Research Ethics at the Open University,

<http://www.open.ac.uk/research/ethics/index.shtml>, accessed 26 June 2010.

Ethical guidelines for Educational Research,

<http://www.bera.ac.uk/files/2008/09/ethica1.pdf>, British Educational Research Association, accessed 26 June 2010.

Statement of Ethical practice,

<http://www.britsoc.co.uk/equality/Statement+Ethical+Practice.htm>, British Sociological Association, accessed 26 June 2010.

Minocha, S. and Tzanidou, E. (2010). Ethics in usability engineering. In: India HCI 2010/Interaction Design for International Development, 20-24 March 2010, Industrial Design Centre, Indian Institute of Technology, Bombay, Mumbai, India.

<http://mcs.open.ac.uk/sm577/documents/Shaily India HCI 2010 Ethics Resource s.pdf>, accessed 26 June 2010.

Additional resources

Blogs

Minocha, S. and Kerawalla, L. (2010). Understanding students' self-motivated blogging and development of study skills and research skills. In: Lee, Mark J. W. and McLoughlin, Catherine eds. *Web 2.0-Based E-Learning: Applying Social Informatics for Tertiary Teaching*. IGI Global, (In Press).

Kerawalla, L; Minocha, S; Kirkup, G and Conole, G (2009). An empirically grounded framework to guide blogging in higher education. *Journal of Computer Assisted Learning*, 25(1), pp. 31–42.

Kerawalla, Lucinda; Minocha, Shailey; Kirkup, Gill and Conole, Grainne (2009). Supporting student blogging in higher education. In: Hatzipanagos, Stylianos and Warburton, Steven eds. *Handbook of research on social software and developing community ontologies*. New York: Information Science Reference, pp. 222-237.

Kerawalla, Lucinda; Minocha, Shailey; Kirkup, Gill and Conole, Grainne (2008). Characterising the different blogging behaviours of students on an online distance learning course. *Learning, Media and Technology*, 33(1), pp. 21-33.

Wikis

Thomas, Pete; King, David and Minocha, Shailey (2009). The effective use of a simple wiki to support collaborative learning activities. *Computer Science Education*, 19(4), pp. 293-313.

Minocha, Shailey; Petre, Marian and Roberts, Dave (2008). Using wikis to simulate distributed requirements development in a software engineering course. *International Journal of Engineering Education*, 24(4), pp. 689-704.

Minocha, Shailey and Roberts, Dave (2008). Social, usability, and pedagogical factors influencing students' learning experiences with wikis and blogs. *Pragmatics & Cognition*, 16(2), pp. 272-306.

Social software

Minocha, Shailey (2009). An empirically-grounded study on the effective use of social software in education. *Education and Training*, 51(5/6), pp. 381-394.

Minocha, Shailey (2009). Role of social software tools in education: A literature review. *Education and Training*, 51(5/6), pp. 353–369.

Minocha, Shailey (2009). A case study-based investigation of students' experiences with social software tools. *New Review of Hypermedia and Multimedia*, 15(3), pp. 245-265.

3D virtual worlds

Minocha, S. and Reeves, A. J. (2010). Designing for usability and accessibility in 3D virtual worlds. *Learning Technology*, 12(2), pp. 4-6.

Minocha, Shailey and Roberts, Dave (2008). Laying the groundwork for socialisation and knowledge construction within 3D virtual worlds. *ALT-J: Research in Learning Technology*, 16(3), pp. 181-196.

Also please refer to this website for a full list of publications:

<http://oro.open.ac.uk/view/person/sm577.html>

About the presenter

Shailey Minocha, Ph.D., is a Reader in Computing in the Department of Computing at The Open University, UK. Her research involves understanding users' interactions with technology and investigating the socio-technical contexts in which computer systems operate. Shailey's research and consultancy activities have led to insights into factors that affect usability, user experience and user adoption of technology-enabled systems. Her recent research projects have involved investigating the role of social software (Web 2.0) and 3D virtual worlds (e.g. Second Life) in training and skills development with a particular attention to the virtual team-working, socialisation, collaborative learning and community-building capabilities of these tools. Shailey has authored three requirements engineering and Human-Computer Interaction (HCI) courses at The Open University, UK. She regularly conducts tutorials and residential schools for software engineering practitioners in the UK.

Shailey is the co-author of the HCI book: 'User Interface Design and Evaluation' <http://tinyurl.com/y8qjt7a> and three chapters from her HCI book have been included in the November 2009 book 'User Experience Re-Mastered: Your Guide to Getting the Right Design': <http://tinyurl.com/ygbrfuw>

Shailey's website has more details of her activities and publications <http://mcs.open.ac.uk/sm577>. Her recent publications are listed on: <http://oro.open.ac.uk/view/person/sm577.html>

Appendix 1: Sample project summary sheet

The Role of the Educator in a Social Software Initiative

We hope this leaflet will answer the questions you might have about participating in our study.

Who are we?

We are a team of researchers at the Open University, UK, and in the Faculty of Maths, Computing and Technology. The Project team consists of Dr. Shailey Minocha (Principle investigator and Reader in Computing) and Dr. XXXX (research fellow).

What do we want to know?

We are investigating the role of social software in education and the resulting impact on the role of an educator. We would like to know about the range of activities which are involved in the use of social software in an educational setting and your related experiences. We would really value your experience on this and hope you will agree to participate in the study.

What will it involve?

Your involvement would include three steps:

1. We would first like to send you a short email-based question where we enquire about your experiences of using social software. Answering this question should not take more than 20 minutes and you could return your response by email.
2. We would then conduct a face-to-face interview where we would focus on specific aspects of your social software initiative. This interview will take no longer than 45 minutes and will be audio recorded.
3. Following the interview we would provide you with a short email-based validation activity to verify our understanding of your role in the social software initiative.

If you decide to participate you will be asked to sign a consent form. We have received the appropriate ethics permission to conduct the study from the University's Research Ethics Committee. You maintain the right to withdraw from the study at any time. Upon your withdrawal from the study all data collected from you will be deleted and will not be further used in the research.

What will we do with the information we collect?

We will produce case studies and scientific publications based on the information we can collect during interviews. We aim to produce results which help other people to learn from your experiences.

We will keep all of the information – recordings, notes and picture – secure and as per the Data Protection Act. Only members of the team will have access to this material. We would request you not to provide us with any information which might force us to inform others and breach confidentiality.

We may use anonymous quotes from the recordings as highlights in the case. We will send you copies of the material so that you know what will be published.

How can you contact us?

If you have any other queries about this study, please email or call Dr. Shailey Minocha at s.minocha@open.ac.uk, XXXXX (office), XXXXX (mobile).

We look forward to hearing your experiences. Thank you for taking the time to read this project summary sheet.

Appendix 2: Sample consent form

Role of the Educator in a Social Software Initiative

I, the undersigned, consent to participate in the study on 'the role of the educator in a social software initiative' as outlined in the project summary provided.

I consent to the use of my words being used within a scientific publication or report. I understand that this will be used for academic and research purposes only and that copyright will reside with the Open University, UK or the respective outlet of the research publication in print or on the Web.

The data collected from me and my personal details will not be made available to third parties.

Please complete and return the form to Dr. Shailey Minocha, either by email or by post.
Email: s.minocha<at>open.ac.uk

Postal address: Department of Computing, The Open University, Walton Hall, Milton Keynes, MK7 6AA

Participant's details

NAME

ADDRESS

Signature

Date

Attached: Project Summary Sheet

Research Methods for Evaluating Technology-enabled Learning Environments

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Abstract—A technology-enabled learning environment should be easy to use by the students and should meet the learning objectives for which it has been included in the course/curriculum. Evaluating the student experience can help in determining the usability and pedagogical effectiveness of the environment. Conducting such evaluations can be challenging in a distance education programme where the students and educators or course designers are not co-located. In this tutorial, we will present a toolbox of data collection and analysis techniques that educators and researchers can apply to evaluate the student experience. We will also discuss the ethical considerations of conducting educational research.

Keywords: *e-learning; evaluation; student experience; technology-enabled learning; usability*

I. INTRODUCTION

An inclusion of a blog in a course to encourage reflective learning, or inclusion of a wiki in a course for collaborative authoring and for fostering team-working skills, or inclusion of activities in a 3D virtual world such as *Second Life* to enable students to learn organic chemistry through 3D simulations are examples of technology-enabled learning environments.

A technology-enabled learning (TEL) environment should be usable, that is, it should be easy to use and navigate. Further, the learning activities designed within this environment should meet the intended learning objectives: for example, does the inclusion of a discussion forum in a distance education course enable students to discuss their queries and receive feedback from their peers?; or do the students find it easy to negotiate, decide and collaboratively develop documents in the wiki?; or does the time it takes to learn to navigate through a 3D space outweigh the benefits it provides in terms of learning the compositions of organic compounds in a chemistry course through 3D simulations in *Second Life*?

In order to evaluate the usability and pedagogical effectiveness of a TEL environment, it is important to elicit students' experiences with and perceptions of the TEL environment. In a face-to-face campus-based setting, student feedback can be elicited through informal conversations, visual cues, and formal mechanisms such as interviews and surveys. In distance-education, there may not be the flexibility to conduct face-to-face interviews or to receive implicit feedback through visual cues or informal conversations.

Over the last five years at The Open University, UK, we have integrated several technologies such as blogs, wikis, podcasts, and *Second Life* in our courses to support distance learners. We have applied techniques such as

surveys, reflective protocols, diary studies, email interviews, interviews over audio/video conferencing tools such as Skype, descriptive phenomenology or narrative enquiry, text-based interviews by using instant messaging tools, interviews and focus groups within *Second Life*, and a combination of these techniques. In addition, we received funding from JISC (Joint Information Systems Committee), UK to investigate the effectiveness of social software in higher and further education in the UK in face-to-face and distance education contexts. In this JISC-funded project, we applied the case study methodology involving educators, students and policy makers to investigate the effectiveness of TEL environments in twenty-six courses in the UK.

In this tutorial, we will share our experiences of applying a variety of techniques to evaluate the effectiveness of TEL environments for student learning and engagement. The concepts and techniques for eliciting student and educator feedback are from disciplines such as Human-Computer Interaction (HCI), social sciences, psychology and education. We will provide a practical guide to applying the techniques based on the literature and our experiences [e.g. 1-4]. We will discuss the individual techniques but also provide guidance through scenarios about how the research question(s) and the evidence requirement inform the choice of technique or a combination of techniques. The chosen technique(s) must answer the evidence requirement – that is, fit for the purpose. The ethical considerations of conducting educational research will be discussed through real-life examples from our experiences and we will provide pointers to resources related to ethics on the Web [e.g. 5]. We will also provide guidance on how to make sense of the data and the process involved in conducting qualitative data analysis by applying the inductive analysis or thematic analysis technique.

II. OBJECTIVES OF THE TUTORIAL

The tutorial has the following objectives:

- To present a toolbox of methods that educators, course designers and researchers can apply to evaluate the student experience with technology-enabled learning applications
- To discuss the application of these techniques through examples and case studies
- To provide guidance on how to make sense of the data and the process involved in conducting qualitative data analysis techniques
- To highlight the ethical considerations of conducting educational research involving remote participants

- To provide a set of resources such as a list of papers, web resources on ethical guidelines for educational research and, specifically, research of technology-enabled learning applications.

III. OUTLINE OF THE CONTENT

The tutorial will start with an introduction of the need for evaluating student experience with TEL environments. Real-life examples will be discussed where the feedback from the students on the usability and pedagogical effectiveness of the TEL environments led to the re-design of the user interfaces of these environments and the learning activities that the environments supported. A toolbox of the techniques will then be presented. The usage of each of the techniques will be explained with the help of examples to demonstrate the applicability of the technique to a particular situation or context: such as face-to-face learning versus distance-learners; study level of the students (under-graduate versus post-graduate); the kind of technology in the TEL environment; and the learning activity that is supported by TEL. Participants will be given an opportunity to discuss and justify the choice of the proposed techniques for their contexts in small group-activities.

Finally, the ethical considerations of educational research will be explained. The ethical issues are particularly significant in two situations: (a) when the participants are involved in learning and communicating with fellow students and the educator through online tools in the public domain (e.g. a group on Facebook or a social networking site such as Ning); (b) when the participants and the researcher or the research team are not co-located. The process of integrating ethics in the research design for educational research will be explained through examples and experience stories.

A. Presentation style

The two and a half-hours tutorial will comprise of brief lecture segments interleaved with discussions, group activities, and hands-on exercises.

B. Intended audience

This proposed tutorial would provide professional development to educators and researchers. The participants will learn new techniques for conducting evaluations of technology-enabled learning applications. The tutorial is not an introductory tutorial on research methods in education but is targeted mainly at participants who have familiarity with traditional research methods in education but would like to learn about the challenges both in the choice of methods and in the ethical considerations of conducting educational research of technology-enabled applications and particularly in distance education settings where the students and educators are not co-located. The tutorial will cover a wide range of educational environments such as Web 2.0 or social software tools such as blogs, wikis, podcasts and 3D virtual worlds.

IV. EQUIPMENT REQUIRED

A room with an overhead projector, an Internet connection, and, if possible, a white board and flip chart. The presenter will bring her own laptop.

ACKNOWLEDGMENTS

The author would like to thank the following institutions: The Faculty of Mathematics, Computing and Technology, and The Centre for Open Learning of Mathematics, Science, Computing and Technology at the Open University, UK; and the Joint Information Systems Committee (JISC; <http://www.jisc.ac.uk>), UK.

ABOUT THE PRESENTER

Shailey Minocha, Ph.D., is a Reader in Computing in the Department of Computing at The Open University (OU), UK. Her research involves understanding users' interactions with technology and investigating the socio-technical contexts in which computer systems operate. Shailey's research and consultancy activities have led to insights into factors that affect usability, user experience and user adoption of technology-enabled systems. Her recent research projects have involved investigating the role of social software (Web 2.0) and 3D virtual worlds (e.g. Second Life) in training and skills development with a particular attention to the virtual team-working, socialisation, collaborative learning and community-building capabilities of these tools. Shailey has authored three requirements engineering and Human-Computer Interaction (HCI) courses at the OU. She regularly conducts tutorials and residential schools for software engineering practitioners in the UK. Shailey is the co-author of the HCI book: 'User Interface Design and Evaluation' <http://tinyurl.com/y8qjt7a> and three chapters from her HCI book have been included in the November 2009 book 'User Experience Re-Mastered: Your Guide to Getting the Right Design': <http://tinyurl.com/ygbrfuu> Shailey's website has more details of her activities and publications <http://mcs.open.ac.uk/sm577>.

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