Quantitative Methods for Child-Computer Interaction

Lisa Anthony
Dept of CISE, University of Florida,
Gainesville, FL 32611 USA
lanthony@cise.ufl.edu

ABSTRACT

This course will introduce quantitative methods for use in research on child-computer interaction. We will discuss the types of research questions that can be answered with quantitative methods. Experiment design, data logging, data analysis, and simple statistical techniques will be covered. We will also cover important considerations for conductive quantitative work with young children, especially attentional issues that may affect data quality.

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KEYWORDS

Child-computer interaction; interaction design and children; quantitative methods; experiment design; data analysis; statistics; course proposal.

LEARNING OBJECTIVES

The learning objectives targeted by this course include:

- To be able to identify whether a research question is better suited to a qualitative or quantitative approach
- To understand the definitions of the terms "independent variable" and "dependent variable", and to be able to identify them for a particular research question of choice
- To understand the difference between "within-subjects" and "between-subjects" experiment designs, and to be able to select an appropriate design for a particular research question of choice
- To be able to identify the types of information to collect, log, or capture in a study to enable quantitative data analysis
- To be able to perform basic exploratory data analysis techniques in tools like Microsoft Excel to compute means/averages, standard deviations, and confidence intervals
- To be able to perform basic statistical analyses (e.g., t-test, ANOVA) in tools like Microsoft Excel
- To understand the challenges associated with conducting quantitative research studies with children, and to be able to design a quantitative study for a particular research question of choice that will work well for children as participants

BENEFITS

This course will provide newcomers or students with the necessary background to decide if quantitative methods are the right choice for their research in child-computer interaction, and will also develop their ability to conduct a basic quantitative research study.

INTENDED AUDIENCE

This course is targeted toward beginners in quantitative methods, or those who have not conducted quantitative methods with children. The second population will get the most out of the last quarter of the course than the earlier parts of the course, however.

PRE-REQUISITES AND REQUIRED BACKGROUND

No specific pre-requisites are required for this course. Course participants should come to the course prepared to discuss some of their own research questions to be able to contribute to the discussion of when to choose quantitative methods.

CONTENT AND PRACTICAL WORK

Besides a brief overview and introduction to the course, this course will be divided into four modules: (1) Identifying Your Research Question, (2) Designing Your Study, (3) Data Logging and Analysis, and (4) Considerations for Children as Participants. Approximate times are provided as an estimate of the length of each module, but these may change depending on the conference course times and structure. This course is likely best suited as a full day course.

Identifying Your Research Question (45 minutes)

In this module, we will discuss the difference between quantitative and qualitative research methods, and the types of research questions each method is best suited to answer. Course participants will be asked to generate a few example research questions from their own research. As a group, we will discuss possible methods to use to answer these questions, and discuss how quantitative and qualitative methods can provide different useful perspectives. I will then provide examples from my own lab's work in which we chose to answer with quantitative research methods, and why we did so. At the end of the module, course participants will identify a research question related to their own current work, to use as a context for the remaining activities.

Designing Your Study (90 minutes)

In this module, I will introduce key terms of quantitative methodology, including "independent variable", "dependent variable", "within-subjects design", and "between-subjects design". In small-group work, course participants will identify the variables of their proposed research question. We

will also discuss as group when to choose within- or between-subjects designs, and course participants will identify which design they would choose for each variable in their example study.

Data Logging and Analysis (90 minutes)

In this module, I will present the concept of data logging to enable quantitative analyses. We will discuss researcher-developed logging tools, and off-the-shelf tools. Course participants will identify the types of data they will need to log in their example study, and create an action plan for how they could collect those types of data. We will also cover basic exploratory data analysis and statistical tests using tools like Excel. For this part of the course, course participants will be able to follow along on their own computers to learn how to perform these tasks on a small sample (anonymized) dataset I will make available from my own lab's work for the course.

Considerations for Children as Participants (45 minutes)

Finally, we will discuss as a group lessons learned over the course of my lab's work with respect to designing and conducting quantitative studies with young children. In particular, we will cover the concept of gamification [4, 6] of study procedures as a means to improve children's attention and completion rates. We will also cover practical considerations such as piloting, length of a study, break time, practice time, compensation, and other factors [5, 7, 8]. Course participants will write an action plan for how they would approach these issues in the design of their own example study.

INSTRUCTOR BACKGROUND

Lisa Anthony, Ph.D., is an Assistant Professor in the Department of Computer and Information Science (CISE) at the University of Florida, USA. She has over 15 years of experience with quantitative research methods for child-computer interaction [1–3, 9, 10], and she has been a member of the IDC research community since her first attendance of the conference in 2013. Lisa regularly teaches quantitative methods informally to both graduate and undergraduate students in her research lab, as well as individual modules from this proposed course in the broader context of other HCI courses she has taught, including User Experience Design and (most recently) Human-Centered Input Recognition Algorithms. For more information, her professional website URL is https://lisa-anthony.com/ and her lab website URL is https://init.cise.ufl.edu/.

RESOURCES

The following books and resources may be of use to course participants as a reference after the course has concluded:

- David W. Martin. 2007. *Doing Psychology Experiments*. 7th edition. Thomson/Wadworth.
- Jacob O. Wobbrock. 2011. *Practical Statistics for HCI: An Independent Study Combining Statistics Theory and Tool Know-How*. Annual Workshop of the Human-Computer Interaction Consortium (HCIC '11). http://depts.washington.edu/madlab/proj/ps4hci/
- Larry Wasserman. 2010. *All of Statistics: A Concise Course in Statistical Inference*. Springer.

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