Challenges in recruiting and retaining participants for smart learning environment studies

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Abstract. Conducting studies to assess the efficiency of smart learning environments, including learning analytics tools, is essential to the success of this emerging field. Recruiting and retaining research participants is fundamental to obtaining meaningful results from such studies, and yet, this remains a major challenge. Understanding the research participant enrollment experience, their satisfaction with the study information received and with the research staff, and their intent to promote and participate in future similar studies are important factors to collect and report to tailor recruitment strategies and experimental designs that would attract more participants in studies with smart learning environments. This paper reports the results of participant satisfaction to a study on java programming involving a suite of learning analytics tools. Answers reveal a high satisfaction level among participants, though the participation rate of the study was very low.

Keywords: recruitment • retainment • satisfaction • motivation • research participant • computer science • smart learning • learning analytics

1 Introduction

The challenge of recruiting and retaining participants in research studies is well known and documented [1, 2, 3]. Several researchers, mostly in the medical and psychology fields, have reported their recruitment process, lessons learned, proposed strategies as well as the research participant satisfaction over their study process [4, 5, 6]. However, finding such participant satisfaction reports in studies conducted in Science, Technology and Computing is quite rare, even almost nonexistent. With the rising popularity of smart learning environments (SLE) – including learning analytics tools – in educational institutions, careful examination of these tools to

M. Chang et al. (eds.), *Foundations and Trends in Smart Learning*,
Lecture Notes in Educational Technology, https://doi.org/10.1007/978-981-13-6908-7_8

study and measure their benefit on learning, and to gauge needed improvements in the tools, is becoming a compelling necessity. Yet, finding research participants for such studies in postsecondary institutions remains a challenge. The purpose of this paper is therefore twofold: 1) reporting the recruitment and retainment process in a study involving a suite of learning analytics tools [7] and the research participant satisfaction over this process along with recommendations; and 2) encouraging researchers in the SLE field to survey their research participant satisfaction and report this important segment of their study to help the SLE research community develop recruitment and retainment strategies specific to this field or find alternative experimental designs that would alleviate this challenge.

2 Study Context

2.1 Procedure and Participants

Students from the School of Computing & Information Systems at Athabasca University, Canada (an open university offering online and distance education), were invited through various means (email, university webpages and social medias) to voluntarily participate in a research study about the impact of a suite of learning analytics tools on students' performance in Java programming [7]. Invitations included the link to the study website (http://lambda.athabascau.ca/jav.au/), which provided clear and detailed information on the study with the possibility to inquire by email for further clarification. A Register button was leading to the consent and registration form with a few demographic and educational background questions, with participants selecting either a student or tutor role in the study. Upon submitting the form, a contact person started a follow-up process with that participant. The recruitment period closed after seven weeks (mid-May to early July) in 2017. And, the study, which was intended to last four months, had to be extended for another two months to allow for more participants to complete the study requirements.

In spite of significant financial and prize incentives ($200 after fulfilling the study requirements, and a possibility to win 1 out of 5 tablets for highest grades) that had to be justified to the Research Ethics Board due to their unusual high value, there were only 148 participant registrations out of about 1000 potential participants (students enrolled in at least one computing course). At the end of the study, 67 participants completed the requirements (students: n=48; tutors: n=19), meaning that 66 either withdrew or dropped out during the study period. All 67 participants reported their demographic information except for one who entered an invalid birth date. Most participants aged between 18 and 50 years old ($\bar{x}$=34; Mo=22), were from Canada (n=65; 97%) with English as their first language (n=60; 90%), and approximately three-quarters were male (n=51) and one-quarter female (n=16).

2.2 Recruitment and Retainment Strategies

This section briefly describes several recruitment strategies adopted in this study that are recommended by the Higher Education Quality Council of Ontario, Canada [2].

First, recruitment strategies should incorporate major motivations of research participants across genders: 1) the study at stake is worthwhile and meaningful – the study website highlighted that this study would help researchers better understand how to aid students to be more efficient and successful in programming, 2) the targeted participants have an interest in the study – students registered in computing courses were targeted, and 3) the participants are gaining benefits – incentives included a fair financial compensation following the rule of thumb that it must be equivalent to a working wage (rate close to Alberta's minimum hourly wage of $15) for the estimated time and effort (15 hours) [5], the possibility to win 1 out of 5 tablets (worth about $1200), and the offer to obtain a summary of the results at the end of the study. Moreover, this study was announced through several modes of communications including direct (targeted emails from the faculty, course coordinators, research assistant) and indirect methods (university webpages, course management system, social media), thus reaching all students registered in computing courses at Athabasca University, Canada. This study also provided easy and continual online access to the study information, which was deliberately offered in a language easy to understand, to the point, without any exaggeration, and in an easy-to-read format with visuals, thus helping participants to make an informed decision. Surveys used in this study were easy to access, included realistic time estimates (maximum of 20 minutes as recommended), clear indication of the number of questions, and a progress bar to encourage completion. Realistic time estimates were also provided for other study requirements (e.g. coding assignments). Besides, a research assistant was assigned as the main contact point for this study, ensuring that participants receive prompt answers from the start to the end of the study period.

However, two aspects of this study design were contrary to the recommendations by [2]: 1) it was announced at the end of a semester; and 2) all study requirements were additional to normal course activities.

2.3 Instrument and Data Analysis

An adaption of the Research Participant Satisfaction Survey originally developed to capture research participant experiences of an Academic Medical Center [6] was used to survey participants enrollment experience and satisfaction over the research process in this study. Separate instruments were used to assess their satisfaction of the educational experience and learning analytics tools, which will be reported in a subsequent paper. The survey data reported in this paper were collected in the LimeSurvey tool and exported as Excel files, with the descriptive statistics computed using the Jamovi software [8].

3 Results

All 67 participants (tutors and students) answered all questions in the Research Participant Satisfaction Survey, meaning that there were no missing answers.

The first section surveyed participants on the means by which they learned about the study. Results indicate that most students (n=55; 82%) learned about the study via an email from their course professor, the study's lead researcher or the main research assistant, and that 12 students (18%) saw the study announcement on the university webpages (course i.e. LMS, faculty, Twitter, or Facebook).

In the second section, participants were asked to select all the reasons that motivated them to participate in the study from the list shown in Table 1. "To obtain the promised incentives" and "to help the cause of the researchers" were among the highest motivations across all participants regardless of gender. For student participants, "to grow in my coding skills" ranked very high for both genders, while "to help students in their coding skills" was an important motivation for more than half of the tutor participants.

Table 1. Reasons that motivated participation in the study with gender differences.

	Male	Female	Total
1. To obtain the promised incentives	36 (71%)	12 (75%)	48 (72%)
2. To help the cause of these researchers	35 (69%)	11 (69%)	46 (69%)
3. To know more about my coding skills (students)	23 (66%)	4 (31%)	27 (56%)
4. To grow in my coding skills (students)	29 (83%)	11 (85%)	40 (83%)
5. To experience this new role (tutors)	8 (50%)	1 (33%)	9 (47%)
6. To help students in their coding skills (tutors)	9 (56%)	1 (33%)	10 (53%)
7. Because of the good reputation of this research group	2 (4%)	0 (0%)	2 (3%)
8. Because of a positive experience in another research study	4 (8%)	1 (6%)	5 (7%)
9. Because I was encouraged/invited to do so	11 (22%)	3 (19%)	14 (21%)
10. Other	4 (8%)	1 (6%)	5 (7%)

Note: Reasons 3 and 4 were proposed to Students only (N=48; Male=35; Female=13); Reasons 5 and 6 were proposed to Tutors only (N=19; Male=16; Female=3); All other reasons were proposed to all 67 participants (Male=51; Female=16).

The third question asked participants to rate their satisfaction on a 5-point Likert scale from "Strongly disagree" (1) to "Strongly agree" (5) over different aspects regarding the study information and their informed consent, as well as on their satisfaction with the research staff. Table 2 indicates that on average, 91% of the 67 participants either agreed or strongly agreed with each statement. Except for the first statement, the means are higher than 4 (average mean = 4.51), which is between "agree" and "strongly agree". The internal consistency reliability for the data collected in this section has been estimated by computing the Cronbach's Alpha and McDonald's Omega, with 0.81 and 0.86 respectively, which indicate high reliability.

Table 2. Students' satisfaction of the research study experience.

	Mean	% Agree / Strongly agree
1. I found the study website easy to navigate	3.70	69%
2. I found the study information well explained	4.06	81%
3. I understood easily how to register to the study	4.60	100%
4. I understood the study procedures before providing my informed consent to participate	4.37	90%
5. The research staff answered all my questions	4.63	94%
6. I understood that participation was voluntary	4.88	100%
7. I understood that I could withdraw from the study anytime	4.79	99%
8. I understood the risk(s) involved with participating in the study	4.22	82%
9. I understood which of my data would be collected during the study	4.12	79%
10. I felt the research staff were approachable when I had questions or concerns	4.66	96%
11. I felt the research staff were easy to contact	4.70	96%
12. I felt the research staff were professional	4.79	97%
13. I felt the research staff were knowledgeable	4.70	94%
14. I felt the research staff were courteous	4.82	99%
15. I felt the research staff were sensitive to my concerns	4.54	91%
16. My overall experience was positive	4.55	96%

The last section surveyed the likelihood that participants would participate themselves or encourage others to participate in a future study by this research group. On a four-point Likert scale from "very unlikely" (1) to "very likely" (4), all 67 participants responded positively ("likely" and "very likely").

4 Discussion and Conclusion

Considering the estimated pool of potential participants (N=1000), the number of registrants (N=148), and the number of participants who completed the study (N=67), the participation rate for this study was 15% with an attrition of 55%, which is considerably lower than the common expectation of participation rates at 33% with attrition of 20% [3]. This surprisingly low participation rate is even more alarming given that several recommended recruitment strategies have been followed. The high degree of satisfaction of those who completed the study on a) study information, b) communications with the research contact person who was highly available throughout the study period, c) their overall experience, and d) their positive intent to participate or promote another study with this research group are indications that those aspects of the study are not to be blamed for the low participation rate. Yet, the satisfaction level of the participants who withdrew or dropped from the study was not captured, which should be done in future studies.

One main reason that might have contributed to this low participation rate is that this study was an additional load to students' normal course workload. To circumvent this downside in future studies of SLE conducted in postsecondary institutions, two

alternatives may be considered. First, which is more on the long term and left to the executives of computer science faculty to consider and decide, is to create a different culture among students of their faculty similar to the one found in psychology programs where students are highly exposed to research studies and are expected to participate in research as part of their degree requirements, resulting in students viewing research as a normal part of their educational experience. A second alternative would be to adopt an observational study design rather than a controlled study design [9], where SLEs would be integrated in a course and students could voluntarily use it while accomplishing the assignments already required in that course. These proposed alternatives are preliminary and require further efforts and research to verify their efficacy.

This experience report highlights challenges faced by the research community in recruiting and retaining participants for research studies in postsecondary institutions where smart learning environments are looking to make significant inroads. Efficacy and future development of smart learning environments rely on authentic recruitment of research participants. The community will be well served if SLE researchers report their recruitment and retainment strategies, their success rates, and participant satisfaction. Altruism, intrinsic motivation and enticement are the predominant factors in participant recruitment. In addition, smart learning environments need to cultivate a level of trust to attract and retain potential participants.

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