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TURNING INTERACTION DESIGN STUDENTS INTO CO-RESEARCHERS: HOW WE TRIED THIS AND SOMEWHAT FAILED

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ABSTRACT
There are many potential benefits of involving university students in research (as researchers, not subjects). It can help students to increase their retentive knowledge in the subject they study, and also develop research skills such as problem framing and analysis. While disciplines such as psychology and medicine have a tradition of students contributing to research publications, Design and Product Development does not. This indicates an untapped potential for researchers in these fields to more actively engage their students in their work.
In the spring of 2014, we made an effort to involve Interaction Design master's students in our research. It was in a Product Development course on "User Requirements Elicitation". The research itself dealt by comparison with the effectiveness of two research methods; namely, individual interviews compared to group interviews. During the course, students in groups made a quantitative and qualitative comparison of the two methods.
It was clear that the students did not appreciate this initiative. Their opinion was that it did not have a high enough "pay-off" in relation to their efforts. The course received very low scores when the students evaluated it. However, we could see quite clearly that they had developed an in-depth knowledge of the compared methods. The students also discussed issues such as reliability and validity of their research in a way that we had not seen in the course in its previous years. The whole experiment resulted in significant knowledge generation regarding how (and how not) to involve students in research.

Keywords: Co-research, student research, user requirements elicitation, research-based teaching.

1 INTRODUCTION

The relationship between education and research addresses a fundamental premise and philosophy that underpins the quality of teaching and learning in the modern University [1]. Inductive teaching, which employs research as a tool allowing students to learn by constructing their own versions of reality rather than simply absorbing versions presented by their teachers, is a key to learner-centered education [2]. "Student research" therefore, in both undergraduate and post-graduate level, has been described as "the pedagogy of the 21st century" [3]. Despite its importance, not many detailed definitions of what "student research" per se means, are available in the literature. The American National Council on Undergraduate Research (NCUR) defines student research as "an inquiry or investigation conducted by a student that makes an original intellectual or creative contribution to the discipline" [4].
There are many potential benefits of involving university students in research as researchers and not simply as subjects. From a learning performance perspective, it has been showed that it helps to increase students' grades [5] and that it helps students to develop a deeper [6] and more retentive [7] knowledge in the subject they study. Recent research suggests that students taught in lecture-based classes gain knowledge that decays over time but those taught with activity-based reformed methods (like research project-based learning) retain the knowledge they gain [8]. The research-based teaching approach helps students develop more general knowledge related to the research process itself, e.g. planning experiments, choosing methods, data analysis etc. [9], and it strengthens the bonds between

students and faculty [9]. Co-researching with students may also be beneficial for the researchers, as they get fresh and original ideas as well as extra manpower to carry out the work.
While it is difficult to find evidence of any negative effects regarding the inclusion of student research in taught educational programmes, there are some indications that it may be difficult to carry out effectively. The main barrier is often time constraints, as described by Buddie and Collins: “However, the overall picture that emerged from this research was that of an overtaxed faculty member who sees value in student research but who has too many professional commitments, too many research pressures, and not enough time” [10]
According to NCUR, there are four important steps in student research [3]:

- The identification of and acquisition of a disciplinary or interdisciplinary methodology.
- The setting out of a concrete investigative problem.
- The carrying out of the actual project.
- The dispersing/sharing a new scholar’s discoveries with his or her peers.

In addition to this, there are also descriptions of what characterizes a good student research project [11]:

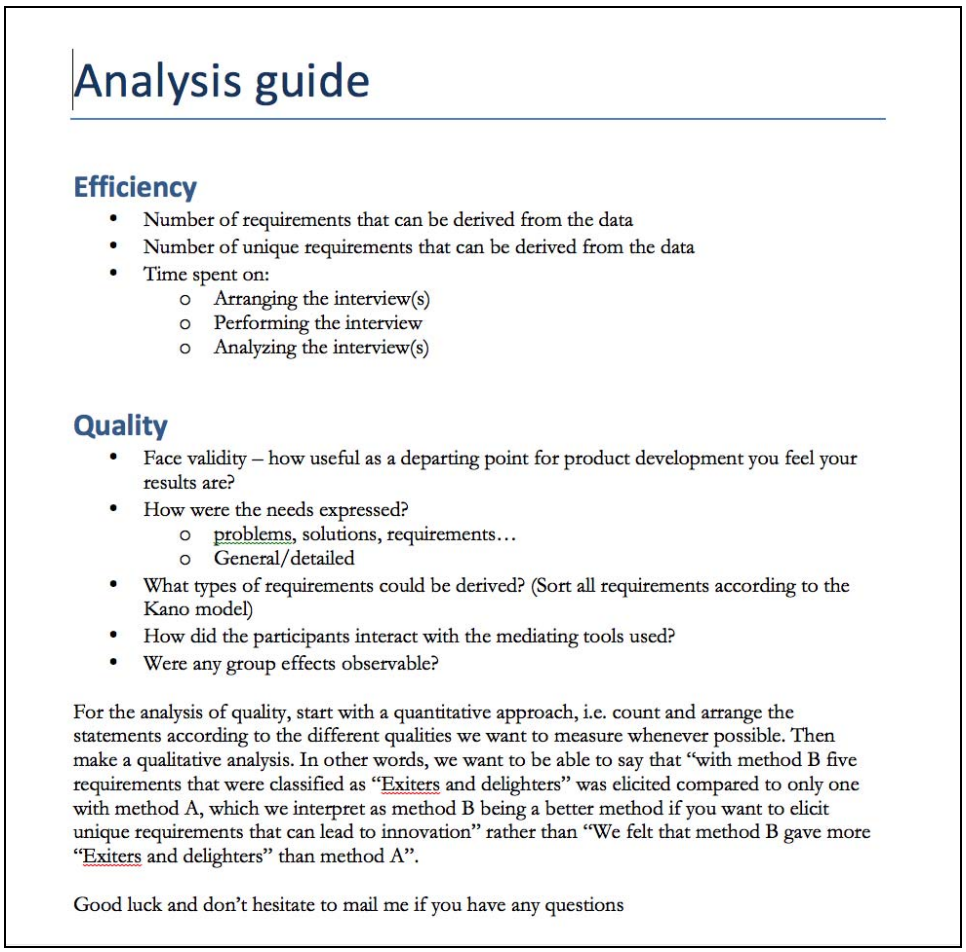
- Clearly-communicated purpose and potential outcomes,
- Well-defined objectives and methods,
- Substantial in scope (as opposed to a collection of small projects),
- Reasonable chance of completion in available time,
- Requires contact with the literature,
- Avoids repetitive work,
- Requires use of advanced concepts,
- Requires a variety of techniques and instruments (not exclusively library work),
- Culminates in a comprehensive written report.

Some disciplines have a tradition of involving students in research (and in particular in research publications) such as psychology and medicine. In the area of Design and Product Development it seems more unusual; the literature available is very sparse. A systematic attempt to identify academic journals dedicated (or somewhat specialized) on student research reveals that while there are journals available for a wide range of subjects, there is seemingly none on design related topics. This indicates an untapped potential for Design and Product Development researchers to more actively engage their students in their work, hopefully resulting in the aforementioned positive effects. This paper describes the experiences from such an initiative.

2 THE STUDENTS’ RESEARCH PROJECT

In the spring of 2014, we made an effort to involve Interaction Design masters’ students in our research. It was in our course on "User Requirements Elicitation”, in which the students learned how to use methods such as ethnography, questionnaires and interviews to elicit requirements on products/services to be developed. The research itself dealt with the comparison of two qualitative methods; namely interviews and focus groups. The students were asked to assess their respective effectiveness after using them both.
As a first step, the students were given a number of scientific papers on the subject, as a means to provide them with deeper knowledge of the assumed relative merits of the different methods, as well as highlighting the fact that there still is a disagreement in the scientific community regarding the relative efficiency of the different methods. Furthermore, the papers negotiated the fact that the argumentation for the two methods differs in that those in favour of one-to-one interviews mostly argue from a quantitative standpoint, while those in favour of focus groups tend to have more qualitative (and considerably less quantitative) arguments for their standpoint. The papers were discussed in a literature seminar session that ended with the identification of a number of qualitative and quantitative measures for assessing the relative merits of the two methods.
During the course, students, in groups of four, conducted user requirement elicitation studies for a specific product/service system to be developed spanning from a bike-sharing scheme to a clothes pool. For the means of this study, it was mandatory to carry out a certain number of individual interviews (minimum five) and a focus group with the same number of participants as the number of interviewees. It was stressed that care should be taken to ensure that the participants of the two sample groups were as similar as possible. The material collected was then to be transcribed and analyzed in

order to identify user requirements. Each group made a quantitative comparison of the two methods, based on data such as time spent, number of requirements elicited etc. Moreover, they did a qualitative assessment of the information gathered with the two methods, using an analysis plan developed by us based on the measures that were agreed upon at the literature seminar (see figure 1 – the analysis guide). At the end of the course, a concluding seminar was held for the whole class, where we comprised the data of all the groups, and discussed them together with the students. The discussion focused on the identification of the method that the students felt was the most useful for them as designers. Each group also wrote a short report on their comparative study, which was part of the examination process of the course.



Analysis guide

Efficiency

- Number of requirements that can be derived from the data
- Number of unique requirements that can be derived from the data
- Time spent on:
  - Arranging the interview(s)
  - Performing the interview
  - Analyzing the interview(s)

Quality

- Face validity – how useful as a departing point for product development you feel your results are?
- How were the needs expressed?
  - problems, solutions, requirements…
  - General/detailed
- What types of requirements could be derived? (Sort all requirements according to the Kano model)
- How did the participants interact with the mediating tools used?
- Were any group effects observable?

For the analysis of quality, start with a quantitative approach, i.e. count and arrange the statements according to the different qualities we want to measure whenever possible. Then make a qualitative analysis. In other words, we want to be able to say that "with method B five requirements that were classified as "Exiters and delighters" was elicited compared to only one with method A, which we interpret as method B being a better method if you want to elicit unique requirements that can lead to innovation" rather than "We felt that method B gave more "Exiters and delighters" than method A".

Good luck and don't hesitate to mail me if you have any questions

Figure 1. The analysis guide that was handed out to the students

3 OUR RESEARCH QUESTIONS AND METHOD

The initiative of involving the students in research was evaluated in terms of:

- Quality of the conducted research.
- The students' knowledge development of the course topic.
- The students' development of research skills.
- The students' experiences and perceptions of the research initiative.

Furthermore, the goal was to provide some explanations on why these effects occurred, and show implications for future initiatives of a similar kind. In order to evaluate this, the following data sources were utilized:

- Direct observations of the students during the course process, made by the faculty staff involved in the course (the examiner, a lecturer/supervisor and a course assistant).
- A course evaluation consisting of an anonymous survey.
- In the research seminars during the course, part of the time was spent discussing the students' views on the research process and how they experienced it.
- The examination of the course consisting of a written exam, a report and an oral presentation.

4 RESULTS

The results of our study have been organized in sections answering the following four questions: 1. What was the quality of the conducted research? 2. What was the outcome in terms of the students understanding of the subject compared to previous years? 3. What was the outcome in terms of the students understanding of research and the research process? 4. How much did the students appreciate taking an active part in research? It should be noted however that this paper does not intend to provide an analytical record of the students' results but instead document the insights of a first-time educational experiment that the authors conducted with their course as a way to promote Chalmers University of Technology's initiative of research-based learning.

4.1 Quality of the conducted research

The quality of the research, in spite of us having created a fairly strict scheme to follow, differed between the groups. While some of the groups did come up with a large number of requirements (100+), others identified much less. There were also different opinions and experiences between the groups regarding which method of the two provided the most and/or the best quality data. These differences could not be easily explained by any other means than the differing qualities of the students as researchers (e.g. some of them being more systematic than others). Nonetheless, despite these inconsistencies, the authors which are all active researchers with a significant experience in qualitative research methods, after carefully reviewing the material submitted, feel that the combined results with the right treatment are of publishable quality and they are currently preparing a journal paper submission dedicated to them.

4.2 The students' knowledge development

Looking at the students' reports and presentations it is clear that there were some improvements compared to previous years. Similarly the discussions at seminars, not only the ones discussing results, but also the literature one, were more in-depth than ever before. Some examples of topics that were discussed more apprehensively during this year's course include:

- How even the slightest changes in data collection method will affect the collected data.
- The efficiency of different methods, i.e. how valuable they are in relation to the efforts needed.
- The importance of eliciting the 'right' requirements and not just as many as possible.

Understanding in real terms the strengths and weaknesses of the two aforementioned qualitative research methods in design is not a simple textbook-based learning process. On the contrary is a demanding process requiring a hand-on approach of systematic comparisons between the two that can be achieved only through practicing both in similar conditions. The more thorough one is in organizing, conducting and analyzing the interviews the better results one gets and the more one understands what contributes to these findings. The demands on rigor in order to fulfil the "research-conducting" criterion forced the students to make a better job at eliciting requirements and as a consequence allowed them to develop a better theoretical and empirical understanding of the subject. The students also learnt more about the existing state-of-the-art knowledge in the field.

4.3 The students' development of research skills

Not very surprising, the students' understanding of research improved. For most of them this was the first time they employed a more systematic and comparative research approach. Having on-top of that to actually provide an in-depth comparison of the two compared method allowed them to retrospectively look into a process they had just experienced from an evaluator's point of view. Some examples of topics that were discussed more apprehensively during this year's course include:

- The quality of earlier conducted research in the field.
- The quality of their own data collection in terms of reliability.
- The quality of the comparison made across the different student groups' data in terms of validity.

Thus, we found improvements in the students' estimations of their results' (and others) value and generalizability, compared to students taking the course in previous years. In particular, we saw our students in 2014 taking a much more critical view on their studies and on the research presented in the papers they had read as part of the course than any year before that.

4.4 The students' experiences and perceptions of the research initiative

Despite the conclusion that the students developed a more thorough understanding than any previous students taking this course before, the student's evaluation of the course did not reflect this outcome. The course got an all-time low score. While the overall rating usually is in the 3,4 to 3,8 range (on a 1 to 5 scale), last year's score was 2,2. The main objection from the students seemed to be that they felt used, and that their efforts did not contribute enough to the learning objectives of the course, as illustrated by the following quotes from the course survey:

"The course only seems to focus on forming a basis for Wallgren's research."

"After taking this course, I have strongly begun to doubt the credibility of academic research in general. The course must focus on the student's learning objectives and not Pontus himself."

5 DISCUSSION

The initiative to involve students in research resulted in the positive effects that have been indicated in earlier research. Although it is not possible to identify precisely the magnitude of the effects, it is clear that there was an increase in knowledge development among the participating students at this year's course. However, while we as teachers saw these effects, the results of the course evaluation indicate that the students did not. To some extent this is expected, as they did not have the possibility to compare the outcome of this year's course to earlier ones. Still, it is clear that the students generally did not appreciate the research initiative; even if some students did see some positive effects, they did not think the learning benefits were representative of their efforts.

If compared to the nine recommendations provided by the ACS Committee on Professional Training [11] (presented in 'Introduction'), this research initiative basically fulfilled all of them. The research task had a well-defined objective, was clearly communicated, had a reasonable work load etc.

The negative experiences seem to be more connected to how the research task was embedded in the course, and the roles the students had in the research process. There are four aspects of the overall set-up that seem to have had a particularly negative impact on the students' experiences:

1. The research task focused heavily on data collection and analysis, and not on the early phases of the research process (problem identification, choice of method etc.), nor on the later phases (publication and sharing results).
2. The students were not voluntary co-researchers; it was obligatory for all the students in the course to carry out the research task.
3. The relationship between the students and teachers was not 'collegial'. The teachers were clearly in charge of the main decisions in the research process.
4. The teachers were open about potentially using the students' research project results for complementing their work in comparing interviews against focus groups; they even asked whether some students would be interested in co-authoring an eventual paper. This was the ethical approach to take, and was used as a motivational strategy aiming to make clear that their work was of actual research significance, good enough for the means of publishable academic research. Despite these intentions, the 'openness' seemingly undermined the whole 'learning through research' framework of the course making perhaps the students to feel that they do extra work for their teachers' sake that could have easily been avoided.

Most of these problems arose from the course context, i.e. the course conveyed limitations for how the research task could be organized. For instance, there was limited amount of time available, and there were a relatively large number of students to carry out the research. In addition, the research task needed to be aligned with the learning objectives of the course. All this resulted in a research task that was heavily guided and steered by the teachers and not the students. While the students may have shown a greater interest in a research task that could be of their own choice, it could have resulted in problems of keeping it contained within the course structure. Furthermore, the number of students also called for heavy guidance of the research task. As all the 25 students could not form a single project group, they needed to be divided into smaller groups. This in turn made it necessary to make sure that the data from all groups were comparable and could be used to make scientific claims. Yet another reason for the heavy guidance was the students' level of knowledge at the start of the course. Identifying relevant research questions within a field generally requires a relatively deep knowledge of it.

The course context also brought along another important issue; the students' expectations. Their main objective was to partake in the course, and not develop themselves as researchers. Although the

research task helped them to reach the learning objectives of the course, a lot of them still viewed it as a detour on their way towards passing the course as efficiently and effortlessly as possible. Unfortunately this also resulted in some of them feeling used by the teachers, as they though the main purpose of the research task was to favour the teachers' personal research careers.

6 IMPLICATIONS AND RECOMMENDATIONS

Although the results of the experiment were particularly encouraging in terms of knowledge generation and research skills' development due to the all-time low course ratings of the student evaluation there will not be a continuation of the course in the current form. Teachers at our university are evaluated based on the students' course ratings and as teacher one cannot afford to get such low scores for an extended period of time. We will revert to a course more similar to previous years where the students do projects of a more applied character. A smaller comparative study will be conducted within the project and every group will get their own supervisor to try to influence the students so that the studies get higher reliability, which may make the results possible to aggregate to something useful over time.

In general our advice for teachers wanting to do research with students is the following:

- If it is part of a course, be aware of the challenges this conveys. In particular, be aware of the students' expectations and try to make the research-based part of the course its main objective, rather than something they perceive as "extra work"
- Make them true co-researchers. Take part in the "simpler" tasks yourself and let them take part in the more advanced tasks. They will learn more by actively working with you, than by merely cooperating with you through an asynchronous division of the work in the research process. This will also have a positive effect on the scientific quality of the research, which may suffer if the students work on their own.

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