

Supporting students during their undergraduate research projects using audio recordings

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Abstract

Undergraduate final year research projects are part of many degree programmes and help students enhance a variety of transferable skills. A challenge for supervisors is encouraging students to develop as independent learners, while simultaneously providing support and structure for a successful, timely completion. In this project we trialled a student-centred supervision approach where all supervisory meetings were concluded by producing audio recordings of students summarizing the discussion. The recordings were emailed to the students who were instructed to write and return a short reflection to the supervisor. Students found that the audio summaries ensured that they stayed engaged and focused during the meetings. The recordings helped them understand and remember the issues discussed and encouraged them to take ownership of their project. Willingness and ability to reflect, however, were patchy, indicating that students may need more training in the skills of reflection earlier on in their studies.

Keywords: undergraduate, research project, dissertation, supervision, student-centred, reflection, audio recording, independent learning

Introduction

Undergraduate final year research projects / dissertations¹ are widely used in Higher Education institutions in the UK and in many other countries. Seen as the ‘traditional undergraduate capstone’ and the ‘gold-standard of British Higher Education’ (Healey, Lannin, Derounian, & Stibbe, 2012, p. 4), honours dissertations usually contribute significantly to students’ overall degree results (Luck, 2008). During their research project students are expected to develop subject-specific research skills. Wisker (2012, p.12) finds that ‘... for many, the dissertation is THE key moment when students begin to appreciate the stages, problems and potentially successful practices of research’. Moreover, research projects enhance students’ transferable skills and attributes that are valuable to employers and for future studies. These include, for example, problem solving, time management, critical thinking and independence (Luck, 2008; Wisker, 2012).

The dissertation is often the first substantial piece of work that students complete largely

independently. Although students generally value the autonomy they experience during their project (Stefani, Tariq, Heylings, & Butcher, 1997), the magnitude of the task can be initially daunting (Woolhouse, 2002). Other problems include a feeling of losing track and time-management problems (Stefani et al., 1997; Todd, Bannister, & Clegg, 2004).

Models of supervision

It is the role of the supervisor to support students in their research (Wisker, 2012). Staff perceptions and student expectations of the supervisory role agree on several points: supervisors should provide guidance, constructive criticism (feedback) and encouragement throughout the project (Stefani et al., 1997). However, an appropriate supervision strategy should take into account variations in student expectations and the extent to which they depend on their supervisor (Kam, 1997).

Various models have been developed that characterize the relationship between supervisor and research student. Acker, Hill and Black (1994) describe two distinct models of supervision: In the 'technical rationality model' the supervisor is seen as the 'manager' of the project and is expected to keep students motivated and on track, providing guidelines and timetables. In the 'negotiated order model' both supervisor and student equally participate in negotiating the mutual expectations, and supervision is open to change. Focusing on power relationships, Armitage (2008) proposed a continuum of supervisory approaches where on the one end the supervisor is the technical expert who organises the project in a prescriptive manner and does not take the student's needs into account. The other end of the continuum is characterized by a 'collaborative and participative style of supervision'. Shadforth and Harvey (2004) use similar descriptions to distinguish between 'subject-centred' and 'student-centred' supervision style. They also stress the importance of student reflection and state that the predominant 'subject-centred' style leaves little room for staff or student continuing

professional development. Irrespective of the model that is used to describe supervisory approaches, it is clear that there is a potential for dissatisfaction if there is a mismatch between the organisation and support provided by the supervisor and the student's needs and expectations (Kam, 1997; Wisker, 2012).

Supervision challenges

Undergraduate dissertations are relatively small, time-restricted projects and probably require more control and guidance from the supervisor than postgraduate projects. This can lead to tensions between the 'supervisory responsibility and control, and the need for students to grow as independent learners and researchers' (Wisker, 2012, p. 6). Todd et al. (2004) found that undergraduate research students struggled with issues related to time management and experienced conceptual challenges during the course of their dissertation. This tends to happen when students encounter "threshold concepts" (Meyer & Land, 2003) that challenge their understanding. Todd et al. (2004) suggest that supervisors' support may be of particular importance during such challenging periods, for example when students are trying to identify 'researchable' questions which they find particularly difficult due to their lack of experience.

There is no doubt that supervising final year research projects demands time, effort and resources (Luck, 2008). Nevertheless, many researchers are involved in supervising students; in our School approximately 90% of the academics supervise undergraduates. Although some publications provide guidance for undergraduate supervision (e.g. Luck, 2008; Wisker, 2012), the majority focus on postgraduate dissertations and do not address problems that are specific for undergraduate projects (Rowley & Slack, 2004). As a consequence, many new supervisors are 'thrown in at the deep end', not knowing how much and what kind of support undergraduate students require. Harrison and Whalley (2008) report that although student experience is largely positive, some encounter serious difficulties.

One of the main challenges of undergraduate project supervision is how to encourage students to become independent learners while at the same time making sure that the dissertation is completed in time. Stefani, Clark and Littlejohn (2000, p. 163) argue that in order to help students become independent learners ‘it is necessary to shift our emphasis from teaching to facilitating effective learning and to promote the concepts of ownership and “reflection on learning”’. This idea relates to the concept of student-centred project supervision that was mentioned above (Shadforth & Harvey, 2004). Shadforth and Harvey (2004, p. 150) acknowledge, however, that ‘Undergraduates are unlikely to be experienced researchers, and are therefore likely to need support and encouragement to develop confidence in their abilities and knowledge before they even begin to develop the more formal skills of research’. Hughes (2001, p. 6) points out: ‘If students are to develop independence, they need to be given the space in which to act as autonomous learners, they need freedom. However, this does not mean that to develop independent learning skills students simply need to be abandoned. Rather, a safe learning structure needs to be constructed that provides training, support and guidance from tutors and peers through the experience. The key challenge is the balance between freedom and structure.’

In the context of science, students’ experience with their undergraduate research project can determine their willingness to consider science as a future career (Chopin, 2002). Hunter, Laursen, & Seymour (2006, p. 2) say that ‘during their undergraduate research, learning involves more than just simply mastering content or technical skills; it also involves gaining mastery of the cultural knowledge, norms, values, and practices within a discipline or profession’. Therefore, it is important that students have a well-designed and supported undergraduate research experience while having the opportunity to develop independence. Thus, during their undergraduate research, students should develop their ability to generate hypotheses and design experiments to test them.

Our supervisory approach

This project aimed to help students become independent learners while at the same time ensuring that they stay on track and complete their project within the tight time restrictions of an undergraduate research project. To achieve this, we introduced the following supervisory approach (Figure 1): supervisory meetings were concluded by students producing an audio recording that summarised the main issues and outcomes of the discussion. The rationale for this process was to keep students engaged throughout the meeting and to encourage students' reflection and development of their own ideas. As the recorded summary happened in front of the supervisor, this could be checked and corrected there and then providing an opportunity for instant formative feedback. The audio recording was then emailed to the student who was instructed to write a short reflective piece which would then be checked by the supervisor (see methods for detail). Asking students to listen to the recording and to reflect aimed to increase students' critical thinking skills, to encourage them take decisions, and therefore to increase their sense of ownership of the project. Reflection in the context of this study is associated with the development of independence, and is viewed as the students' capability to plan future learning, taking control of their learning (Jarvis, Holford, & Griffin, 2013). The option to send their reflection to their supervisor aimed to help students to develop confidence as they could check if they were going in the right direction, knowing that the supervisor would come back to them if that was not the case. This process starts anew at the next supervisory meeting when student and supervisor discuss what happened since the last meeting and reflect together on the outcome before then discussing next steps.

Methodology

Ethics permission for this study was granted by the University's ethics committee. Two supervisors (authors 1 and 2) worked with a total number of 9 undergraduate research

students (8 female, 1 male) during the academic year 2013/2014. The research students were in their third and final year (level 6) of undergraduate study in a range of biological sciences programmes. The (individual) research project was a compulsory part of their final year and contributed 25% towards their year 3 average mark. All 9 students agreed to be part of this research study.

Between September 2013 and April 2014 individual student-supervisor meetings took place during term time, approximately weekly, according to School policy. During the supervisory meetings students reported on their progress, and had the opportunity to raise questions and discuss problems encountered during the week. This was followed by a discussion of future steps. Meetings usually lasted 30-45 minutes. At the end of each meeting the supervisor asked the student to summarise their work plan for the upcoming week. The student's response was recorded using a handheld recording device. If necessary, the supervisor would provide feedback, i.e. correct or add to the student's response which was also recorded. The typically 5-minute recordings were saved as mp3 files and emailed to the students. Students were instructed to listen to the recordings in their own time and to produce a brief written reflection on their progress, including any problems they encountered. Although, there were no formal instructions or requirements, students were asked to include evidence of understanding of the discussed work plan, i.e. to explain how the next steps would complement what has already been achieved, and/or address further research questions. It was suggested that they might use additional material from published articles or other sources to include a different perspective into their work. The reflective piece was not marked and students were not penalised if they did not produce one.

After the completion of their research projects, the students were invited to take part in a focus group which was facilitated by a member of staff outside the department (author 3).

The focus group was designed to address the key steps of our supervisory approach (Figure 1). In particular, we wanted to know how much students engaged in each of the steps (producing the audio summary, listening to the recording, writing a reflection) and how useful each step was for their learning and their project experience.

All students agreed to take part, but three students were unable to attend, so the focus group report is based on the contributions of 6 students (all female). The discussion was recorded and transcribed to which all students agreed in writing. The transcript was sent to the focus group participants and all agreed that it was accurate. Two of the remaining students contributed by email. Focus group transcripts and emails were analysed using a thematic approach (Braun & Clarke, 2006). The full text was read by all three of the researchers who then agreed on three main themes that were directly related to the supervisory approach: the process of recording, listening to the recordings, and reflecting on them. An additional theme relating to students' general project experience was also identified. Two researchers then analysed and coded the text independently resulting in a total of 11 final categories (table 1). The third researcher checked the coding for any discrepancies or missed topics revealing only negligible differences that were easily resolved by consensus.

Results

The text analysis revealed that all students perceived the audio summary produced at the end of each meeting as useful. The benefits cited by students were manifold (see table 1). Having to do the audio summary prompted students to really pay attention and stay engaged in their supervisory meetings. It made students synthesise their learning, and it made them aware of their own progress. Several students also expressed an increased sense of ownership and control over their project. There was general agreement that a verbal meeting summary was particularly useful and that a written summary would not have had the same benefits.

Some students said they used the summary recording to go back over the meeting and the action points. There were a few students who – still remembering their actions from the meeting or because they also wrote notes during their meeting – didn't feel the need to refer back to the summary. However, students found it reassuring to have the recordings, to be able to go back and listen to them so that they knew what they were supposed to be doing and why. Sometimes the recordings were used to clarify details after the meeting (table 1).

The extent to which students submitted reflective pieces after each meeting was variable. Of five of the students that were supervised by author 1, for example, one wrote weekly extended pieces of up to 3 pages length, much of which was reporting activities or questions for the next meeting. Three students wrote only a few 'reflections' but stopped doing so early in the project. Only one student regularly wrote truly reflective documents that addressed questions relating to, e.g. what went well (or not) and why, and what this would mean for their future practice (Race, 2006). Students reported that writing a reflective piece was not always easy, but it helped those students who did it to keep on top of the work (table 1).

The text analysis also showed that all students reported an extremely positive project experience and felt very well supported. Students praised their supervisors' availability, approachability and helpfulness. The overall effect of the supervisory approach was that students felt they were allowed to work to the best of their ability.

Discussion and conclusion

This study set out to improve student experience during their final year undergraduate research project and to maximize their acquisition of transferable skills such as the ability to work independently. There is no doubt that students involved in this study had a positive experience during their project. Regular supervisory meetings meant that they felt supported. Several studies emphasize the 'importance of an accessible and available supervisor'

(Derounian, 2011, p. 96) and spending time with one's students (Shellito, Shea, Weissmann, Mueller-Solger, and Davis, 2001).

Students clearly recognized the benefits of the process of making the recordings. Because they knew that they had to summarize the meeting at the end, they paid attention and took a more active part during the meeting. An important point was that students had a sense of ownership of the progress because they themselves were the ones summarizing the agreed tasks. This committed them to do what they said they would do. At the same time they gained confidence as they knew that the supervisor would correct them if they were going in the wrong direction or had misunderstood a task or idea. These findings indicate that the recorded summary was successful in achieving its aim to encourage students' active participation in the meetings, leading to an increased confidence and student satisfaction.

We would argue that the success of the audio summary is based on several things. Firstly, the fact that the audio summary had to be recorded at the end of the session made students listen actively during their supervisory meeting, to digest the discussion and to synthesise their understanding in a coherent form. If the whole meeting was recorded, instead of a summary at the end, students would have felt less need to listen actively. Another advantage of the approach lies in the mode of recording. The spoken summary is an act of speech (Austin, 1962). An uttered plan of action is a commissive kind of illocutionary speech act (Searle, 1975). The student who summarises the supervisory meeting in audio format is not just simply stating a sentence. Their audio summary has performative power: it commits the speaker to future action. Had the supervisor uttered the summary, the student's performative agency would have been lost. A video summary could have had the same effect as the audio, but would have been less practical as this would have required more equipment and digital memory on the recording device, and higher bandwidth to transfer the video from supervisor

to student. A written (instead of a spoken) summary on the other hand would have been time consuming and would have removed the element of instant feedback, which represents the third advantage of this approach as the meeting summary presented an opportunity for the students to check their understanding and appropriateness of ideas.

Another aspect is the fact that the recordings helped students to understand expectations, to manage their time and to 'provide opportunities that will challenge them but not overwhelm them' (Shellito et al., 2001, p. 462). Referring to undergraduate research, Todd et al. (2004, p. 336) argue that 'many students may not feel fully prepared for this form of study' which would allow them to be involved in decisions about content, pace and learning methods. Independence has to develop over time, and 'undergraduates might need a much tighter rein than PhD students' (Wisker, 2012, p. 39). It was, therefore, important for the students that they had the recordings available when needed, so the recordings helped them to always be aware of their own progress.

Listening to the recording and reflecting aimed to increase students' critical thinking, to help them take decisions and develop their confidence and autonomy. It is perhaps not surprising that only a small proportion of students in our study developed a habit of producing truly reflective pieces of writing. Shadforth and Harvey (2004) find that in higher education large class sizes and the need for accountability drive a subject centred approach to teaching which is characterized by knowledge transfer rather than facilitation. Stefani et al. (2000, p. 169) argue '... that in the context of higher education, we lead students into believing that rewards come in the form of 'good marks' rather than in them having a sense that they have achieved their own self-identified goals.' In our study, the student reflections were not rewarded with any marks and therefore students would be disinclined to reflect unless they can see the direct benefit of it. Shadforth and Harvey (2004) found two factors presenting a barrier to reflection

in undergraduate research students: the lack of time, but also the fear that reflection may lead to realisations of mistakes and therefore cause problems. In the biosciences students have little experience in reflective practice (Parry, Walsh, Larsen, & Hogan, 2012) and are therefore unaware of any benefits. While reflective practice is routinely used in, for example, health care education (Mann, Gordon, & MacLeod, 2009), it is clear that bioscience students need more training and guidance in reflective practice.

This study has a number of limitations. Firstly, it is a small scale project with 2 supervisors and 9 undergraduate students working within the biosciences. Secondly, the results could have been influenced by the fact that the two supervisors and 8 out of the 9 students were female. Hammick and Acker (1998) found that female supervisors have a higher tendency to emphasise personal relations whereas male supervisors are more task oriented. Students whose supervisor is female might therefore be more comfortable to admit to mistakes or ignorance which may have an effect on the reflective writing. Finally, it is possible that the students in this study were unusually engaged. It remains to be seen if the outcome would be similar with higher staff and student numbers and diversity and in different subject areas.

In conclusion, it is clear that the recorded meeting summaries were very popular and useful for both, staff and students. We believe that they represent an excellent tool for a supervisory approach that enables us to 'midwife the dissertation' (Blanton, 1983). The recordings provide a support framework that helps students gain confidence throughout their dissertation. The recordings are easy to implement and not time consuming. It is likely that the recordings would be useful not just for biosciences, but also in other disciplines that use undergraduate research projects. A further study could investigate the potential use of recording summaries in postgraduate supervision although the approach would require changes to fit to the longer and the more autonomous nature of a PhD project.

¹Notes

In this study, the terms “research project” and “dissertation” are used interchangeably.

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Table 1: Themes and categories with number of independent occurrences in the transcripts and student emails, and typical quotes illustrating the categories

Theme	Categories	Number	Quotes
Recording the summary	Paying attention/ engagement	7	“[the summary] made me put a lot more attention into the meetings themselves”; “I knew [...] at the end of the meeting, I’m going to have to think about what it is I need to do”
	Remembering	5	“It was more the summarizing it at the end of the meeting that made me remember it”
	Clarifying	6	“[the summary] helped to organize my thoughts and made it a lot clearer for what I had to do next week”; “Cos then you just say [...] right, I need to do that, need to start work on that”
	Synthesizing	4	“Just the act of summarizing it up at the end of the meetings I found really helpful”
	Ownership	5	“And then for you to have to say it – not someone else tell you – it was helpful that I was saying it”
Listening to the recording	Speaking versus writing	5	“If someone is talking [...] it’s so much more descriptive than I think that a sheet of paper could ever be”; “[...] even if you didn’t record it, actually it’s a great practice”
	Clarifying	6	“I knew that it would be explained to me, or reiterated again, through the voice recordings”
	Remembering	3	“Sometimes when I got home [...] I’d go back and check and there’d be little bits which I would have forgotten otherwise”
	Reassurance	3	“I always felt safe in what I was doing”
	Reflections	Keeping on top of the work	2
Project experience	Nature of reflections	3	“I found it quite hard to reflect on my week without just repeating the aims in the audio recording. “
	Feeling supported	4	“...definitely very supported”. “I was always safe in what I was doing”

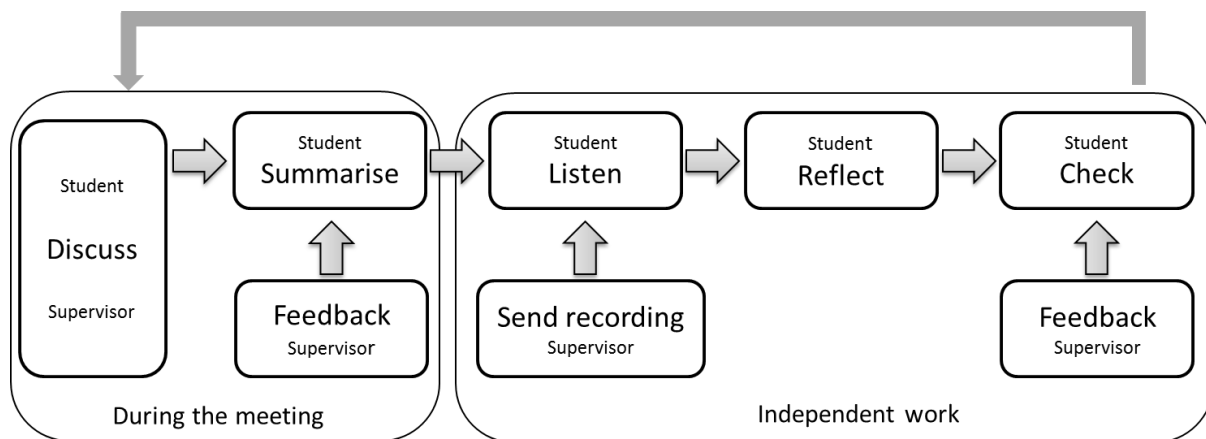


Figure 1: Weekly individual meetings with students were concluded by producing an audio recording of the student summarizing the main outcomes of the discussion. The recording was emailed to the student, who was asked to submit a short reflective piece back to the supervisor to check their understanding. The supervisor was then able to intervene if necessary. Grey boxes indicate what happened during the meeting, white boxes show what was done independently. Student activities are indicated in the upper line, supervisor activities are shown in the lower line. See text for further explanation.