

Student experiences and perceptions of compulsory research projects: a veterinary perspective

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ABSTRACT

Background Although research underpins clinical work, many students training to be clinicians are not inherently interested in developing research skills.

Aim To characterise and understand veterinary student experiences and perceptions of compulsory research projects.

Methods This was an explanatory sequential mixed-methods study, with a questionnaire survey of an entire cohort informing purposive selection for focus group discussions. Student views were triangulated with staff questionnaire data.

Results About a third of the cohort felt that the project had not been worthwhile or had not fostered useful skills. Focus group data analysis identified fragility of motivation and lack of clear schemata for the research process as key themes. Students were easily demotivated by typical research challenges and lack of schemata contributed to a poor understanding of the rationale for the project, encouraging highly extrinsic forms of motivation. Triangulation with staff questionnaire data indicated that staff understood students' challenges, but were more likely than students to consider it to be a valuable learning experience.

Conclusions Findings support ongoing curriculum development and emphasise that, to optimise motivation, engagement and learning, students training to be clinicians need a clear rationale for research, based on development of critical inquiry skills as a core clinical competency.

INTRODUCTION

Academics generally agree that direct research experiences are important for medical and veterinary students to foster the critical thinking, appraisal skills and understanding of research required for evidence-based practice,^{1 2} and to encourage consideration of a research career.^{3 4} However, it is also recognised that many such students are single-mindedly focused on becoming clinicians and not inherently interested in, or even positively disposed towards, research.^{5–8} This presents a particular challenge in encouraging student engagement with research and maximising the value of their experiences.

Research project experiences are available to medical and veterinary students in a

variety of ways in different settings, and may be compulsory⁹ or optional.^{10–13} Optional experiences mean students lacking interest or conviction of the value of research are more likely to miss out on research skills training, while other barriers may prevent even those interested in research or convinced of its value from participating.¹⁴ However, it has been reported that compulsory research experiences for veterinary students do not necessarily increase the likelihood of a later research career,¹⁵ while an international survey of medical students suggests that consideration of a future research career is dependent on a positive research experience and a supportive mentor.¹⁶ The value of good supervision, or mentoring, and a supportive academic community is a consistent finding across studies in medical, veterinary and the wider literature.^{6 9 17}

There are few empirical qualitative studies of medical student research projects, and none of veterinary student projects. Therefore it is not known how successfully such experiences foster critical thinking skills or change perceptions. This study explored students' experiences and perceptions of a compulsory research project, undertaken within their first two years of study. The example used was veterinary students at the Royal Veterinary College (RVC) and their 'Research Project 1' (RP1). A brief introduction to the setting is provided here; however, this paper does not seek to describe the RP1 protocol in detail, but rather to explore more widely the potential benefits, and challenges, of compulsory research for students training to be clinicians.

In the UK, students usually enter veterinary training directly from secondary (high school) education, with a smaller proportion entering after an undergraduate degree. The RVC veterinary student population comprises a mixture of standard-entry and graduate-entry students. Almost all have two



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research experiences: RP1, followed by RP2, which is conducted during their final year. At the time this work was undertaken, the exceptions were graduate-entry students who could instead opt to submit a literature review or agricultural enterprise evaluation. The intended purpose of RP1 is to introduce students to the process of scientific research and to begin the development of critical inquiry skills that will continue through clinical training and RP2. Although RP2 is supervised, RP1 is focused on the process, rather than the product, of research and is minimally guided. For the cohort studied, guidance during the project period was available via optional 'drop-in' sessions arranged at strategic time-points, at which students could discuss issues with a member of staff, and through routine small group meetings with academic tutors (approximately twice-termly). Students therefore work largely independently, over the course of their first two academic years, to attain the following goals:

- ▶ develop a project idea
- ▶ formulate a research question and testable hypothesis
- ▶ obtain suitable data
- ▶ conduct appropriate basic data analysis
- ▶ draw appropriate inferences
- ▶ write up the project in the form of a scientific report.

Data are usually population data collected from extramural placements on farms, equine yards or small animal kennels. Students receive training in descriptive statistics and univariable hypothesis testing through a series of lectures and practicals in year 2, and some experience of literature searching and appraisal, data analysis and scientific report writing via summative assessments during years 1 and 2.

The aims of this study were to summarise and understand student experiences of doing RP1 and their perceptions of the purpose and value of this compulsory, minimally guided, introductory research project.

MATERIALS AND METHODS

An explanatory sequential mixed-methods approach¹⁸ was used, with a quantitative questionnaire study of the entire cohort informing a qualitative focus group study of purposively selected questionnaire respondents. Data triangulation was provided by an assessment of staff views, solicited using an electronic questionnaire modelled closely on the student questionnaire. All participation was voluntary.

Student questionnaire

All third-year veterinary students, who had completed RP1 in December 2012, were invited to participate in the questionnaire study in April 2013. Students were informed about the study by email a week in advance. The paper-based questionnaire was distributed at the beginning of a core lecture session and collected at the end, with a chocolate reward for each participant.

The questionnaire (see online supplementary appendix 1) was designed to capture the whole cohort's

views and experiences, and to allow purposive selection of focus group participants. It comprised eight 5-point Likert items with response options ranging from strongly disagree to strongly agree (eg, 'I gained useful skills through doing RP1'; 'RP1 has given me a greater interest in research') to assess students' perceptions of RP1, and six 5-point Likert items with response options ranging from extremely negative to extremely positive to assess experiences of specific components of RP1 (from developing a project idea to writing up the report) and the overall experience. There was one binary response question 'Have you ever done a research project previously?' Students could either complete the questionnaire anonymously or provide contact details if they were willing to participate in a focus group.

Staff questionnaire

The staff questionnaire was created by minor rewording of the student questionnaire. Respondents were asked whether or not they were academics with a direct role in relation to RP1. An open-ended question invited further views on RP1 purpose and value to allow capture of all issues staff felt to be important.

Student focus groups

Purposive selection of focus group volunteers was based on questionnaire responses, with the aim of creating one group holding largely 'negative' views and one holding largely 'positive' views, in order to explore both perspectives with some degree of within-group homogeneity.¹⁹ Likert responses were scored from 1 (strongly disagree or extremely negative) to 5 (strongly agree or extremely positive), and summed to create a total score ranging from 12 to 60. One item ('RP1 was a stressful experience for me') was reverse-scored and another ('RP1 was a challenging experience for me') excluded, as it could not be unambiguously classified as positive or negative. From this, 12 of the lowest scoring (most negative) and 12 of the highest scoring (most positive) volunteers were invited to participate in one of two focus groups, with reselection as required until a minimum group size of 7 had been obtained for each.²⁰ The approach to selection was not explained to volunteers and group designation was not indicated to focus group participants. Focus groups were held on campus and arranged and facilitated by an experienced qualitative researcher (KM), who is not involved in RP1-related teaching and was not known to the students. The 'negative' group comprised seven female students, of whom three were graduate-entry students of US origin. The 'positive' group comprised seven female and one male student, with five graduate-entry students and three of US origin. A semistructured approach was used to guide participants towards the research questions. Discussions were initiated with a general question 'What have your experiences of undertaking RP1 been?' followed by non-leading prompts, as required, to encourage elaboration or explanation. Similar approaches were used to ask 'What do you think the purpose of RP1 is?' and 'What do

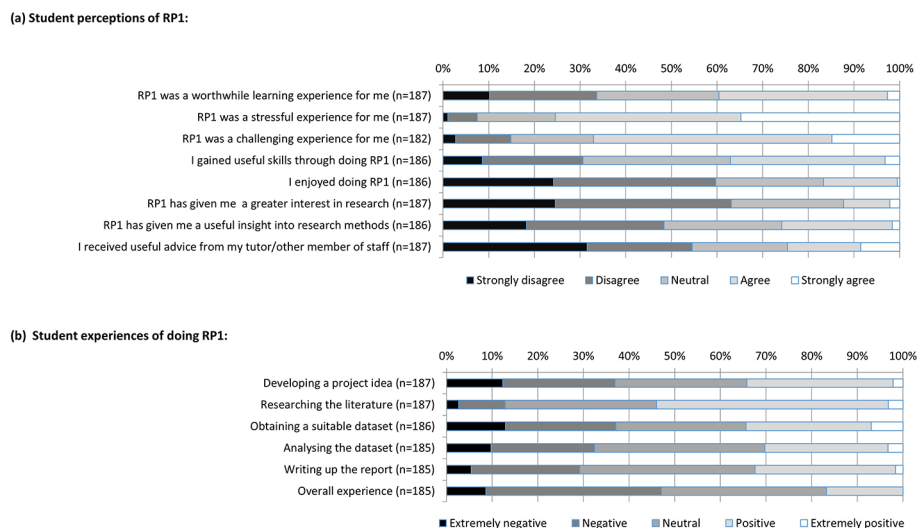


Fig 1: Summary of student Likert item responses. RP1, Research Project 1.

you think you gained from doing RP1?’ Discussions were audio-recorded, with written consent, and transcribed for thematic analysis.

Questionnaire data analysis

Likert item responses were summarised using numbers, percentages and stacked bar charts. Comparisons of student responses by previous research experience, of staff responses by role in relation to RP1 and of student and staff responses were made using ordinal logistic regression. Charts were created in Microsoft Excel and all other analyses were conducted in Stata software.ⁱ

Focus group data analysis

Thematic analysis of focus group transcriptions followed inductive methods described by Braun and Clarke.²¹ Initial open coding of all issues raised, without imposition of any particular theory or prior assumptions, was followed by an iterative process involving re-examination of the text to refine codes, moving from topic (descriptive) to inferential coding,²² arrangement of related codes into preliminary themes, further re-examination of the text to refine themes and ensure that they remained faithful to raw data, and final arrangement of related themes into overarching themes. Analysis was undertaken manually by a researcher involved in teaching quantitative data analysis techniques to RP1 students, with an interest in understanding the RP1 experience from the student perspective, to whom the identity of focus group participants was not known (JMC). Codes and themes were reviewed and verified by KM using a constructivist approach.

Staff free-text comments

An approach based on recommended methods for the analysis of quasi-qualitative data was used to explore staff comments.^{23 24} Comments were coded to topic level and

all multiple instances of the same code were then incorporated into a word cloud using WordItOut,ⁱⁱ with font size representing relative frequencies of appearance of different topics.

QUANTITATIVE RESULTS

Student questionnaire responses

Of the 260 year 3 students, 187 (71.9 per cent) completed a questionnaire. Students’ perceptions of RP1 are summarised in Fig 1a. Approximately 30 per cent disagreed (disagree/strongly disagree) that RP1 had been a worthwhile experience (33.7 per cent; 63/187) or that it had given them useful skills (30.6 per cent; 57/186). About a quarter agreed that it had given them a greater insight into research methods (25.8 per cent; 48/186) and that they had received useful advice from a member of staff (24.6 per cent; 46/187). A majority agreed that it had been stressful (75.4 per cent; 141/187) and challenging (67.0 per cent; 122/182), while a small minority agreed that they had enjoyed it (16.7 per cent; 31/186) or that it had given them a greater interest in research (12.3 per cent; 23/187).

Reported experiences of doing RP1 are summarised in Fig 1b. Only 16.8 per cent (31/185) reported that it had been a positive (positive/extremely positive) experience overall. The largest proportion of positive responses was for researching the literature (54.0 per cent; 101/187), and the largest proportions of negative responses were for developing a project idea (36.9 per cent; 69/187) and obtaining a suitable data set (37.1 per cent; 69/186).

Of the 186 who answered the question about previous research experience, 115 (61.8 per cent) reported that they had done a research project previously. A comparison of responses according to prior research experience

ⁱIntercooled Stata version 9; Statacorp, College Station, Texas

ⁱⁱWordItOut; <http://worditout.com/>

TABLE 1: Ordinal logistic regression comparisons of student Likert item responses according to previous research experience

Perceptions of RP1: (1=strongly disagree; 5=strongly agree)	Previous research experience	Odds ratio*	P value
Worthwhile	No	Ref	<0.001
	Yes	0.2	
Stressful	No	Ref	0.4
	Yes	0.8	
Challenging	No	Ref	<0.001
	Yes	0.3	
Useful skills	No	Ref	<0.001
	Yes	0.2	
Enjoyed	No	Ref	1.0
	Yes	1.0	
Greater interest	No	Ref	0.07
	Yes	0.6	
Useful insight	No	Ref	<0.001
	Yes	0.3	
Useful advice	No	Ref	0.8
	Yes	0.9	
Experiences of doing RP1 (1=extremely negative; 5=extremely positive)			
Overall experience	No	Ref	0.03
	Yes	0.5	
Developing a project idea	No	Ref	0.5
	Yes	0.8	
Researching the literature	No	Ref	0.8
	Yes	0.9	
Obtaining a suitable data set	No	Ref	0.2
	Yes	0.7	
Analysing the data set	No	Ref	1.0
	Yes	1.0	
Writing up the report	No	Ref	0.7
	Yes	0.9	

*Odds of a 1 unit increase in each Likert item response in students with previous research experience compared with students without previous research experience. RP1=research project 1; Ref=reference category

is summarised in [Table 1](#). Students with prior experience recorded significantly less agreement than those with no prior experience that the project had been worthwhile (odds ratio [OR] 0.2; $P<0.001$), challenging (OR 0.3; $P<0.001$), provided useful skills (OR 0.2; $P<0.001$) or provided useful insight (OR 0.3; $P<0.001$), and rated the overall experience significantly more negatively (OR 0.5; $P=0.03$).

Staff questionnaire responses

Questionnaire responses were received from 61 staff members (estimated 30 per cent response rate), of whom 46 (75.4 per cent) were academics with direct RP1 involvement. Responses are summarised in [Fig 2](#). Two did not complete the full questionnaire, omitting the

questions about how positive or negative they believed most students' experiences to be. The majority agreed (agree/agree strongly) that RP1 is a worthwhile experience (70.5 per cent; 43/61) and that students gain useful skills (72.1 per cent; 44/61). Most also agreed that RP1 is challenging (82.0 per cent; $n=50$) and stressful (60.7 per cent; $n=37$) for students. However smaller proportions agreed that RP1 stimulates greater interest in research (42.6 per cent; $n=26$), provides useful insight into research methods (32.8 per cent; $n=20$) or that students enjoy doing it (41.0 per cent; $n=25$), and approximately 50 per cent disagreed that RP1 students receive sufficient support from academic staff (52.4 per cent; $n=32$). Only 22 per cent ($n=13$) rated the overall student experience as positive. The largest proportion of positive responses was for '*researching the literature*' (62.7 per cent; $n=37$) and the largest proportion of negative responses was for '*analysing the dataset*' (37.3 per cent; $n=22$). Staff views did not differ significantly according to role in relation to RP1. Those who provided free-text comments ($n=31$; 50.8 per cent) were less likely to have agreed that students received sufficient support (OR 0.3; $P=0.01$) and rated the overall student experience more negatively (OR 0.4; $P=0.04$) than those who did not comment.

Comparison of staff and student responses

A comparison of staff and student responses is summarised in [Table 2](#). Students were significantly more likely than staff to agree that RP1 had been stressful and less likely to agree that it had been worthwhile, challenging or enjoyable, had provided useful skills, stimulated greater interest in research or provided useful insight. Student and staff views on advice or support did not differ significantly. Students' ratings of the overall experience were significantly more negative than staff ratings, but there were no significant differences between staff and student ratings of the individual components of this experience.

QUALITATIVE FINDINGS AND DISCUSSION

Two key themes were identified in focus group data: fragility of motivation and lack of clear schemata for research.

Fragility of motivation

Students did not entirely lack motivation to engage with RP1, but their motivation was easily undermined or 'fragile'. This fragility was particularly evident in relation to the degree of autonomy students were given and highlighted the need for tailored support or 'scaffolding'.

Benefits and challenges of autonomy

At the outset, the sense of autonomy gained from having a free topic choice provided some intrinsic motivation. However, this was easily eroded, especially during the early stages of the project, because of the limited amount of personally tailored direct support available.

"I enjoyed the actual process of doing [RP1], once I'd got my idea and that had been okayed and then I could just

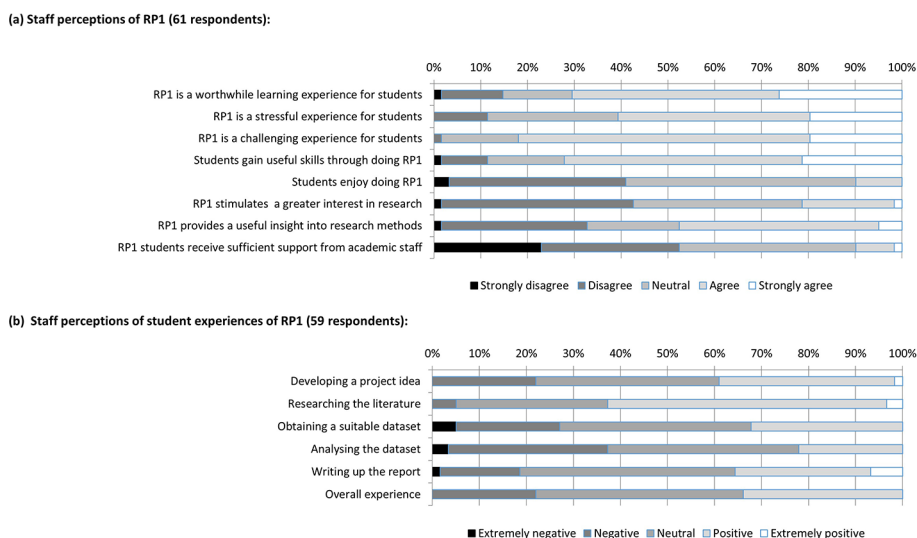


Fig 2: Summary of staff Likert item responses. RP1, Research Project 1.

crack on with it. But I think it's because I chose something I was interested in as well. I think if it was something that I wasn't that interested in or I just kind of fell into doing something else, it would have made it a bit more difficult. (positive group)"

"They do give you the openness to do whatever you want. For someone who knows what they want to do that is really great [...]. But if you're completely stuck... it would be nice if you could just go to someone and [say] 'I just have no idea... I'm interested in this species' – just someone to chat with and bounce ideas off. (negative group)"

For some, the challenge of obtaining suitable data was another potential threat to their fragile motivation. If placements were reluctant or unable to provide data, the original project idea sometimes had to be abandoned for something the student was less interested in, resulting in reduced engagement:

"I was really pushed for time getting data ... I bribed it off [placement staff] with some cake and managed to make a project out of it... and it was really boring but I was very lucky to get data. (positive group)"

"My original idea had to do with dairy flushing systems ... I basically cold-called a bunch of farms until I found one that had enough data and even then that didn't work out [...], so I had to go to a friend who had extra data left over from her pig farm and I ended up writing something completely different on pig mortality. (negative group)"

These observations provide insight into quantitative findings that developing a project idea and obtaining a suitable data set were the most negatively rated components of the RP1 experience. For some, particularly those with previous research experience, problems obtaining data were regarded as an authentic research challenge. This was more evident in the positive group:

"I just drove, literally drove, to a couple of [equine yards] and manually took data from their phone-in records and stud books and had to cross-reference it with other stuff, so

it did take time but I didn't feel that was a negative experience. (positive group)"

By contrast, others with previous experience felt that RP1 was inauthentic because of the lack of direct supervision. This was mirrored by one staff comment (Table 3; id 20) but countered by another asserting the value of RP1 nevertheless (id 8). For some students, this lack of authenticity contributed to a demotivating sense of isolation in their work:

"I've worked in research before for years and what I found really odd about this project was that you were doing this whole scientific process alone and I've never had that happen beforeIt just seemed weird that in a whole scientific process there's nobody to talk to, nobody to bounce an idea off. (positive group)"

These findings are consistent with contemporary theories of motivation. True intrinsic motivation for compulsory research might not be expected from many veterinary students if inherent interest, relative to other aspects of their training, is low. Therefore, nurturing the more internalised forms of extrinsic motivation, such as identification of the immediate or future value of the activity rather than simply responding to externally imposed requirements, is important. Self-determination theory²⁵ proposes that the most volitional, highest quality forms of motivation are fostered by conditions supporting a sense of autonomy, perceived confidence (self-efficacy) and a sense of belongingness (feeling accepted, valued, included and encouraged by teachers and peers). As indicated above, a sense of belongingness is likely to be difficult to achieve in this minimal-guidance situation, and those with prior research experience may have had greater expectations in this regard. Furthermore, while prior experience provides some students with a degree of self-efficacy, more support is required for others.

The need for scaffolding

Tackling a research project places many veterinary students in the 'zone of proximal development' proposed

TABLE 2: Ordinal logistic regression comparisons of staff and student Likert item responses

Perceptions of RP1: (1=strongly disagree; 5=strongly agree)			
	Respondent	Odds ratio*	P value
Worthwhile	Staff	Ref	<0.001
	Student	0.2	
Stressful	Staff	Ref	0.01
	Student	2.0	
Challenging	Staff	Ref	0.02
	Student	0.5	
Useful skills	Staff	Ref	<0.001
	Student	0.2	
Enjoyed	Staff	Ref	0.02
	Student	0.5	
Greater interest	Staff	Ref	<0.001
	Student	0.4	
Useful insight	Staff	Ref	0.001
	Student	0.5	
Useful advice	Staff	Ref	0.8
	Student	1.0	
Experiences of doing RP1 (1=extremely negative; 5=extremely positive)			
Overall experience	Staff	Ref	<0.001
	Student	0.3	
Developing a project idea	Staff	Ref	0.06
	Student	0.6	
Researching the literature	Staff	Ref	0.2
	Student	0.7	
Obtaining a suitable data set	Staff	Ref	0.6
	Student	0.9	
Analysing the data set	Staff	Ref	0.4
	Student	1.2	
Writing up the report	Staff	Ref	0.2
	Student	0.7	

*Odds of a unit increase in each Likert response in students compared with staff. RP1=research project 1; Ref=reference category

by Vygotsky²⁶—that is, a conceptual zone between their current level of cognitive development, at which they are capable of working independently, and the level at which they need to be to succeed at the task. Within this zone, cognitive support, or ‘scaffolding’,^{27 28} from a more knowledgeable person is required to minimise frustration and maintain motivation. Once the required understanding and skills have been achieved, scaffolding can be removed and students will be able to complete similar tasks independently.

Although RP1 is unsupervised, it is not entirely unguided. The rationale for the indirect approach to guidance (drop-in sessions and tutor group discussions) was to encourage deep learning and foster confidence in independent learning by giving students space to develop autonomy while providing some direction and

support. However, this is a difficult balance to achieve, as others have also described.²⁹ Focus group data indicated that drop-in sessions were quickly overwhelmed and that students perceived that tutors did not necessarily have knowledge or expertise aligned with their projects:

“Those drop-in sessions that they did, you couldn’t really speak to anyone and if you did get to the front of the queue then it would be for like a few minutes or something. (positive group)”

“The project is meant to be a husbandry project and most of the pre-clinical tutors are basic scientists... so actually their interests and their experiences are not going to be what we need. (negative group)”

The importance of scaffolding, which explains the majority of student questionnaire responses indicating that useful advice had not been received from staff, was evident from both focus groups and mirrored by the predominance of related topics in staff comments (Fig 3). Some staff referred implicitly to scaffolding (Table 3; id 15 and id 25), while ‘supervision’ or ‘guidance’ was mentioned explicitly in two-thirds of the comments and not countered by the remainder. However, as scaffolding is most valuable when tailored to specific needs,³⁰ and ideally involves the provision of appropriate support at appropriate moments, no single strategy is likely to be successful for all students. It is understandable that students can feel insufficiently supported in this situation. The predominance of staff comments relating to resource issues (Fig 3) provided some insight into the challenges of providing timely, appropriately tailored support to every student (eg, Table 3; id 18).

Lack of schemata for research

Lack of clear schemata for research appeared to be at the root of some confusion about the purpose of RP1, and discussions suggested that students viewed research as a means of accessing, rather than contributing to, knowledge.

Perceptions of purpose

Students described problems knowing where to start developing a project idea, providing some insight into their cohort’s negative rating of this aspect of the experience in questionnaire responses. These problems appeared to be related to a lack of a clear conceptual framework, or ‘schema’,^{26 31} for the research process, which was not confined to those without a previous degree:

“I’ve done a degree, but a non-science degree... for somebody like me who didn’t know what the difference was between a descriptive report and an analytical report at that stage, I basically spent most of the first year flapping around in a complete state thinking ‘I’ve got to come up with an idea...’. (negative group)”

Perhaps more fundamentally, given that a further key factor for nurturing internalised extrinsic motivation is

**TABLE 3:** Selected staff free-text comments related to student focus group themes

Supervision	
id	Comment
15	<i>Although some students are sufficiently motivated to develop and execute a research project with minimal support, there is too little guidance and feedback for the experience to be a positive one for most students. The lack of guidance is a cause of great anxiety to many, and if 2 research projects were to be maintained, one could argue that it is RP1 where there is most need for advice and support, not RP2.</i>
25	<i>I believe they need close supervision for an RP1 and less so for an RP2.</i>
20	<i>It also gives the erroneous impression that research can occur with little supervision. This is completely opposite of what true research or scientific discovery involves. To impart enthusiasm in research one needs to be mentored, not just supervised.</i>
18	<i>If the students would be assigned a supervisor who would help them from the beginning this could be a much more beneficial experience for the students and the staff involved. I find that staff is asked to put effort into this project without a chance of getting anything useful (*eg, a publication) out of it, since they are not involved from the start and students are too inexperienced to produce something worthwhile without proper supervision.</i>
Perceptions of purpose	
id	Comment
19	<i>Many students have a complete obsession about using statistics for statistics sake in the projects whether it makes sense or not. I consider it wrong that so much emphasis is being put on them using statistics in RP1 as many good research projects could be carried out without the use of statistics.</i>
28	<i>I am continually frustrated year after year by the [very basic] statistical methods that the students use.</i>
26	<i>The RP1 provides students with an introduction to reading the literature with research in mind and not just finding out facts.</i>
Opinions on value	
id	Comment
8	<i>I believe its primary value is to get the students thinking, writing and reviewing literature. It is too poorly supervised and supported for it to be a true 'research' learning experience but this doesn't negate its value.</i>
30	<i>The value of RP1 is that it enables students to have some experience of research skills and theoretically increases confidence in independent :working prior to RP2.</i>
1	<i>As RP1 is conducted without supervision (though general support is available), there is little learning and insight gained. The default feedback through the summative assessment process is too general at best and detached from the experience, and thus of limited effectiveness.</i>

id=unique respondent identifier. RP1=research project 1

that the task is regarded as meaningful,³² lack of schemata also appeared to affect student perceptions of the intended purpose of RP1. Negative group discussions were dominated by the perception that it was primarily a writing exercise:

"If you were going to say what the purpose was [...] you could say it was just to write, or to prove that you have the ability to write, an academic report. (negative group)"

The positive group discussed the purpose in more depth, with one student in particular demonstrating good understanding of how gaining competency in research skills might contribute to the ultimate goal of becoming competent clinicians—that is, 'endogenous instrumentality'.³³

"If you're going to be using evidence-based medicine and using other people's research to be able to justify what you're doing in practice, you have to have an understanding of the limitations that someone's gone through when they've been doing that study, and not just being able to read a study that says 'Yes I've found X, Y and Z' and take it at face value – you have to be able to critically assess what you're reading. If you've never done research before [...] it's very easy to read someone's nice glossy article that they've published in something and take it at face value [...] I think you need the experience of actually doing

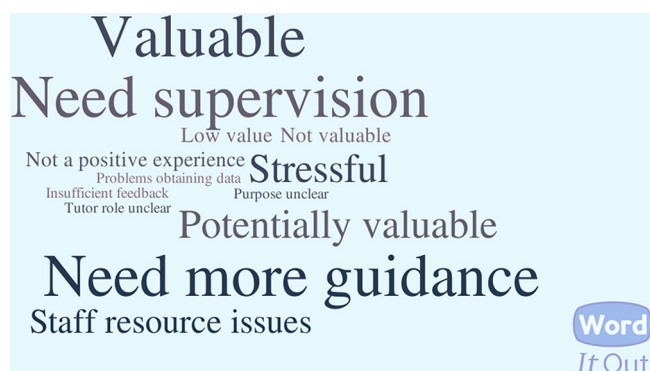


Fig 3: Word cloud summary of staff free-text comment analysis.

something for yourself and seeing how it runs and seeing the problems that you encounter and just doing it yourself so that you really understand what you're reading. (positive group)"

Therefore a key difference between positive and negative groups appeared to be related to underlying motivation orientations, which ranged from the highly extrinsic forms predominant in the negative group to the more internalised forms relating to the potential higher order, long-term value of the task expressed by the positive group. Orientations are likely to have been underpinned by the presence or absence of a schema for the relationship between research and clinical practice, as well as perceptions of the intended purpose of RP1.

Accessing knowledge

Some students perceived RP1 to be valuable because of the increased knowledge gained through a gathering of information about their chosen topic, with no indication of an appreciation of critical inquiry. This suggests that they remained at the earlier stages of the developmental journey described by Baxter Magolda,³⁴ from an understanding of knowledge as absolute, to be obtained from experts, towards an understanding of knowledge as contextual, to be constructed from a judgement of available evidence:

"It did achieve the aim of getting me to do more research in something I found interesting and so I did do some extra research and as a consequence of the project I theoretically know more about it now. (negative group)"

"I picked something of my choice, of my interest, to go into in more detail and obviously I learnt a huge amount about that area of veterinary medicine. (positive group)"

However, one staff comment (Table 3; id 8) notes that students' relative enthusiasm for this aspect could be capitalised upon, at least with additional guidance during the literature review phase, to support the transition along this cognitive pathway during the process.

Regardless of perceptions of the intended purpose of RP1, participants in both groups, particularly those without previous research experience, appreciated its short-term value as preparation for the later RP2, reflecting motivation related to exogenous instrumentality—that is, valuing the task as an important hurdle that must be cleared in order to reach the desired goal of becoming a veterinarian.³³ It was notable that the value in this respect was largely described in terms of 'knowing what to expect' rather than any higher order understanding.

"It definitely gave me confidence... at least now I feel like I can do it and [know] how I would structure the report and where to start as well because I think it's really daunting initially... just having done it and knowing you can get through it and the stages you have to go through makes the whole RP2 thing a lot less daunting. (positive group)"

"It's good to know I can write – I didn't know how to write a scientific paper and therefore RP2 will be a lot easier. (negative group)"

While this might seem like an underestimation of the potential educational gains from a direct research experience, this view is in fact well-aligned with the intended learning outcomes of RP1, as the assessment of students' work is focused on the process, rather than the product, of research. Ultimately, it is the combination of this initial research experience and the final-year research projects, along with teaching on evidence-based medicine and research skills elsewhere in the curriculum, which is intended to deliver the overarching outcome of a higher order understanding of research and how it underpins clinical work.

TRIANGULATION WITH STAFF VIEWS

Although the primary aim of this study was to understand student experiences and perceptions, it was recognised that students within the educational setting could become overly critical of the institution, or individuals in positions of authority, especially if disappointed with their general experience or marks. Therefore staff data provided a useful triangulation of student perspectives and some insight into the observed differences between staff and student views of the value of RP1. Analysis of staff free-text comments should be interpreted cautiously, as time limitations meant relying on what are considered 'quasi-qualitative' data rather than obtaining rich, balanced data from purposively selected groups.²³ The observation during quantitative analysis that staff responding more negatively in the questionnaire were more likely to provide comments suggested that staff comments might have been negatively biased overall. Finally, the staff response rate was relatively low, although this could only be estimated as the correct denominator was not known. However, the selection of comments received from staff was consistent with questionnaire results in indicating that staff had accurate perceptions of students' experiences but were more likely than students to consider the experience to be valuable. This is illustrated by the predominance of the 'valuable' codes in the word cloud (Fig 3) and reflected in some staff comments (Table 3; id 8 and id 30) but not others (id 1). Staff comments also revealed some differences in opinion about the purpose and intended scope of the projects, particularly regarding the use of statistics, for example (Table 3; id 19 and 28), while other comments expressed more clearly a focus on the development of basic research skills (id 26).

Differences between staff and student perceptions of project value are understandable, given that staff have the benefit of clear schemata for the research process and the relationship between research and clinical work, a broader understanding of the value of direct research experience in general, and an overview of the spiral nature of the curriculum,³⁵ including this initial



research experience as a step towards a later clinical research project. It is encouraging, however, that in the student cohort studied only a minority felt that the project had not given them useful skills or been worthwhile overall.

CONCLUSIONS

While optional research experiences mean that many students training to be clinicians miss out on research skills training altogether, management of compulsory research projects for such students presents particular challenges, including protecting and nurturing the often fragile motivation to engage with research. Emphasising to students a clear rationale for the purpose of the projects, based on the development of critical thinking and inquiry skills as core competencies for clinicians,^{136 37} rather than expecting them to have implicit faith in this aspect of the curriculum, is important. Although this study focused on veterinary students in a single UK school, these findings are relevant to all schools training future clinicians.

The combination of methods used in this study proved to be a useful approach to the understanding of veterinary student experiences and perceptions, with focus group discussions and staff comments from a small number of people providing valuable insight into questionnaire findings from a more representative sample of the population. The student cohort chosen for the study had recently undergone their compulsory research project and therefore provided a prime source of student experience. Previous research has tended to focus on student views alone; however, their perceptions of research may differ from reality.¹⁶ Therefore, the novel triangulation of data sources, including staff, in this research adds to the growing literature that could guide development of student research projects. In the interests of beneficence, all issues raised by students during this study, including issues beyond the scope of inclusion in this paper, have been relayed to and discussed with relevant academic staff. A more clearly defined research methods strand, spanning all five years of the course, is already being developed as a result of continuous curriculum review. This will provide students with stronger foundations in the research principles underpinning clinical work, from the early years of their studies, with repeated revisiting to build on these foundations (spiral curriculum) and to develop research methods skills. Staff training will ensure consistent communication of project rationale, and restructuring of the system of project support through small tutorial groups will ensure better alignment of projects with tutors' expertise. As an institution we will continue to strive to understand and improve the student experience and to foster and support optimal motivation, engagement and learning.

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Contributors JMC designed the study, distributed questionnaires, analysed questionnaire and focus group data, and prepared the manuscript. KM conducted the focus groups and reviewed and verified their analysis. KM, TK and AS-F assisted with manuscript preparation. JMC is responsible for the overall content as guarantor.

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