

Evaluation of a web-based interactive teaching tool for clinical cases in veterinary undergraduate education

Karin Allenspach*, Jodie Bell & Kim Whittlestone

Royal Veterinary College

Abstract

This study set out to encourage veterinary undergraduates to adopt independent and deep approaches to their study in a 5-week third year course entitled "Alimentary System" by incorporating problem solving and decision analysis. We were interested in exploring the effectiveness of two implementations of online interactive case scenarios and the amount of staff time required to develop, deploy and support their use by students. The majority of students who responded to our questionnaire attempted all the cases available and were able to work with very little tutor input. Cases that prompted students to type an answer before allowing them to progress were voted by all students as making them think more. The realistic nature of the cases, the way they stimulated students' interest and the need to apply existing knowledge gained in lectures were cited as three of the top five characteristics that students most liked. These characteristics map to a range of learning processes that are considered to form a fully-developed deep approach by research in this field over the past 40 years. While resource implications are still high, this use of these case scenarios did engage the vast majority of students in independent and deep approaches to their study.

Introduction

The recent increases in numbers of veterinary undergraduates, the trend towards increased student-centered learning and the emphasis on patient-related teaching means a great pressure on teachers and resources in veterinary schools. Karin Allenspach's (KA) previous experience in adopting a case-based approach with inexperienced third year students had been less successful than she expected and had prompted a re-think in approach. Additionally, recent data collected at the Royal Veterinary College suggests that many veterinary undergraduates, across all five year groups, are adopting surface approaches to their learning. This is worrying as many research studies have demonstrated that students who consistently adopt a surface approach to their study were less successful in passing examinations than those students who consistently adopted a deep approach (Marton & Säljö, 1976; Svensson, 1977, quoted in Newble and Entwistle, 1986).

Objectives

The primary objective of this study was to promote independent and deep approaches to study in the 5-week third year undergraduate veterinary course entitled 'Alimentary System' involving problem solving and decision analysis. We were interested in exploring the effectiveness of two implementations of online interactive case scenarios as well as the amount of staff time required to develop, deploy and support their use by students.

* Author for correspondence

We set out to gain a better understanding of students' engagement with these different approaches and to clarify the requirement and role of the teacher in relation to students' use of these resources. An additional, but perhaps less formalised objective was to investigate how we could successfully build on the educational implications of the KILT PGCAP course (see <http://www.kcl.ac.uk/learningteaching/acadprogs/masters.html>) in a collaboration between the lecturer (KA), the LIVE CETL (Kim Whittlestone, KW) and the eMedia unit (Jodie Bell, JB).

Methods

Three web-based cases were developed using a feature of the colleges Virtual Learning Environment (Blackboard – see <http://www.blackboard.com/>) 'adaptive release' which provided a guided and active approach to working up clinical cases. These 'adaptive release' cases took several hours to convert from PowerPoint to adaptive release format and there was insufficient staff time to develop any additional cases in this way. A further three cases were therefore delivered using PowerPoint. These PowerPoint cases followed a similar format and structure to the 'adaptive release' cases with regular questions for students to answer, but did not require students to actually type in an answer or make a selection before moving on (although the instructions in the PowerPoint cases encouraged students to do this). These PowerPoint cases took little time to prepare.

Third year undergraduate students were introduced to all the cases at the beginning of a series of nine lectures given by KA and asked to complete all six cases before the summary session in the final week of the module. In addition to the lectures, one practical of 4 hours and two Directed Learning (DL) sessions totaling 4 hours were scheduled. A summary session in the lecture theatre was scheduled towards the end of the course and students were informed that the cases would be discussed in this session with the whole student group.

Students' use of the 'adaptive release' cases was recorded in Blackboard's logs and students answers to questions in these cases were accessible by KA during and after each DL session. The final two questions in each of these adaptive release cases asked students what, if anything, they still needed to learn and what they would like to be covered in the summary session. Students working in small groups were also asked to provide names of all members of the group at the beginning of each case. The data was viewed by KA prior to the summary session and analysed as part of the evaluation later on.

With respect to the PowerPoint cases, no data on student usage was collected automatically but students were asked about their access to these cases in the summary session (see below). In the summary session, two modes of data collection were used. The summary session PowerPoint presentation prepared by KA, contained questions which required a response from the audience using the Turning Point voting system (<http://www.turningtechnologies.com/>). A four-page optically marked questionnaire was also distributed to all attendees at the beginning of this summary session and collected at the end (see Appendix A). The questionnaire data was summarised and analysed using SPSS for Windows Version 14.0.

Following the end of the module, KW conducted an Appreciative Inquiry interview (Cooperrider and Srivastva, 1987) with KA to explore what had worked well and why. All the above data collection methods were used to compare the effectiveness of the two different case scenario approaches.

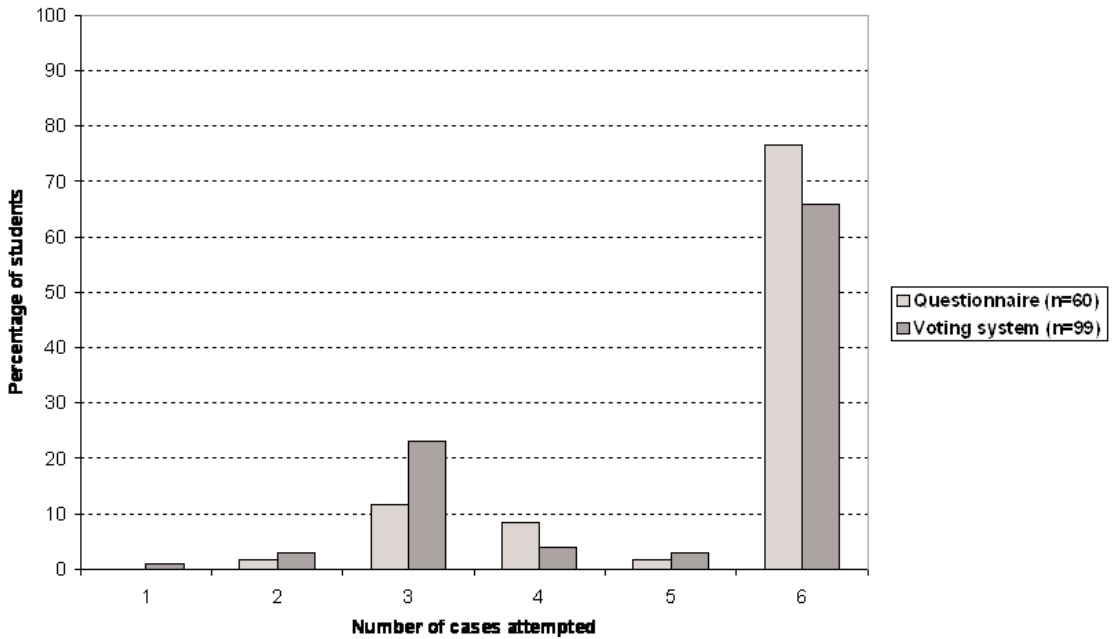
Results

In investigating our aim to promote independent, deep approaches to study we explored several factors: How many cases did students attempt?

This data was collected via the questionnaire and the lecture voting system (the same group of students but n=60 for the questionnaire where students were asked to indicate which cases they attempted and n=99 for the voting response where students were asked 'How many cases did you work through?') - see Figure 1.

The majority of students attempted six or more cases (77% and 66%) with three cases being attempted by the next largest group of students (12% and 23%). Students who did not answer this question on the questionnaire were mostly from the three cases group (difference n=16) and the six cases or more groups (difference n=8+11).

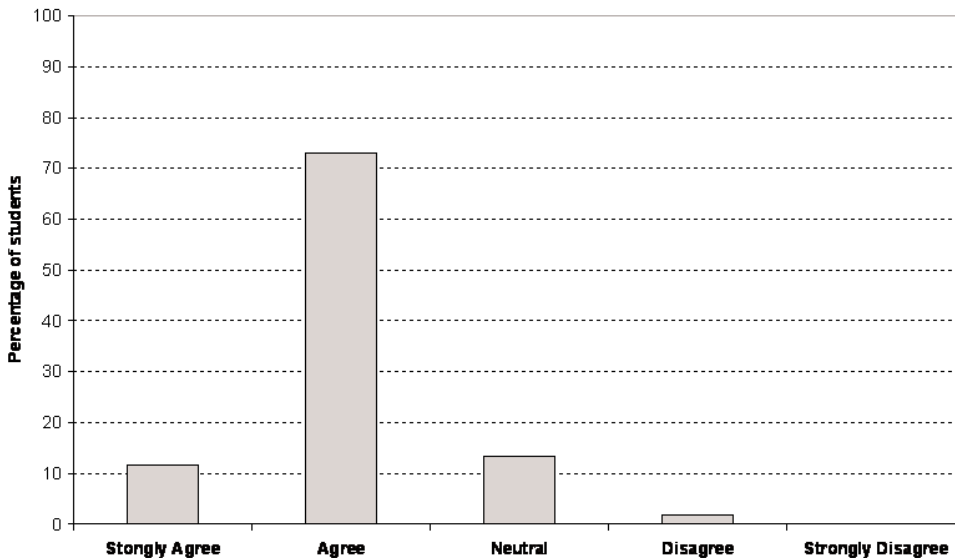
Figure 1 Number of cases attempted by students



Were students able to work independently of the tutor? (Figure 2)

84.6% of students agreed or strongly agreed that they were able to work through most of the cases without tutor support. Seven students (13.5%) were neutral and one student (1.9%) disagreed.

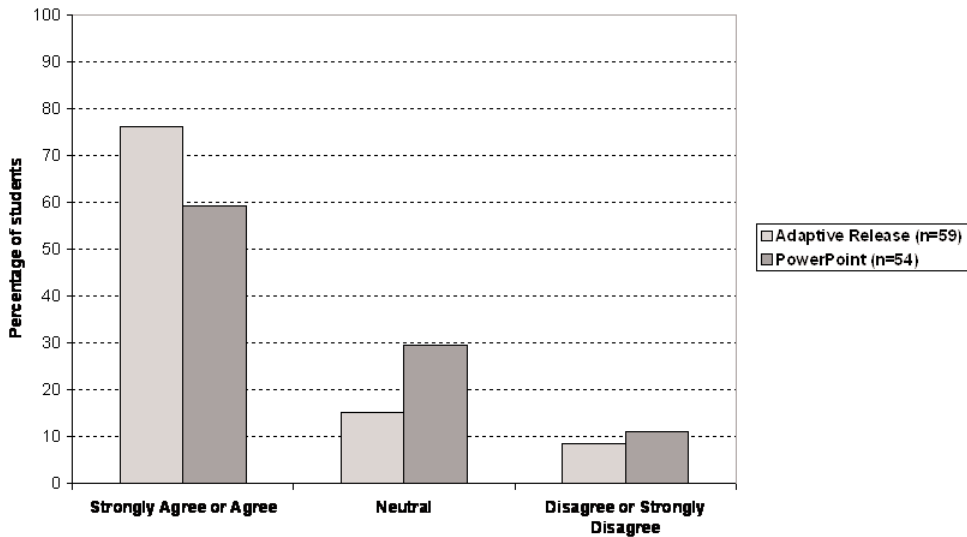
Figure 2 I was able to work through most of the cases without tutor support (n=52)



In aiming to determine if one type of case was more effective in promoting independent, deep approaches to study: How did the students respond to questions about their respective effectiveness? (Figure 3)

76% of students agreed (or strongly agreed) that the 'adaptive release' cases encouraged them to think about / discuss each part of the case in depth, compared with 59% of respondents to the same question for the PowerPoint cases. 15% of students were neutral and 8% disagreed for the 'adaptive release' cases compared with 30% neutral, 9% disagree and 2% strongly disagree for the PowerPoint cases.

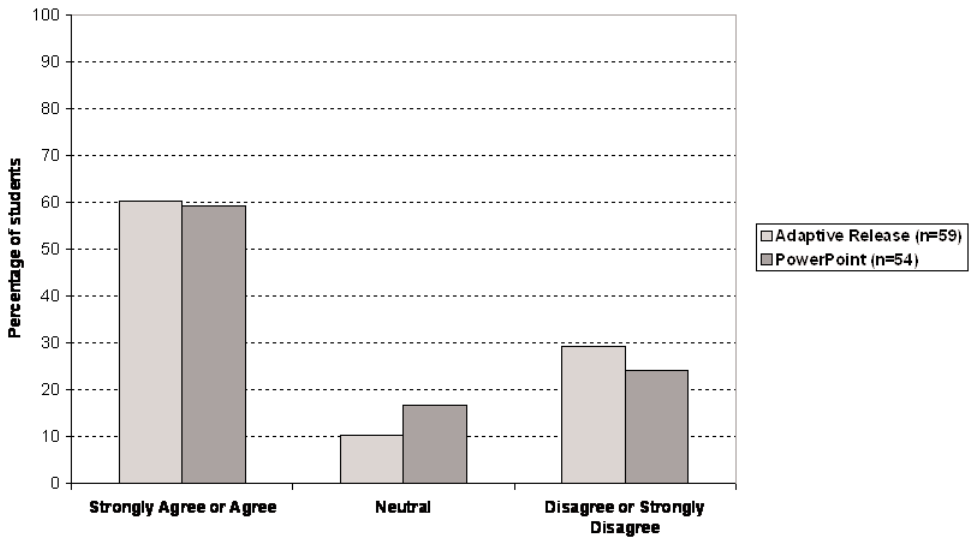
Figure 3 These cases encouraged me to think about / discuss each part of the case in depth



How did having to type answers to questions affect students' views? (Figure 4)

60% of students agreed or strongly agreed that having to type in answers to each part of the 'adaptive release' cases encouraged them to think carefully about their response, but interestingly, a very similar percentage (59%) agreed or strongly agreed with the statement "Even though I did not have to type in answers to each part, I still thought carefully about my responses" in relation to the PowerPoint cases.

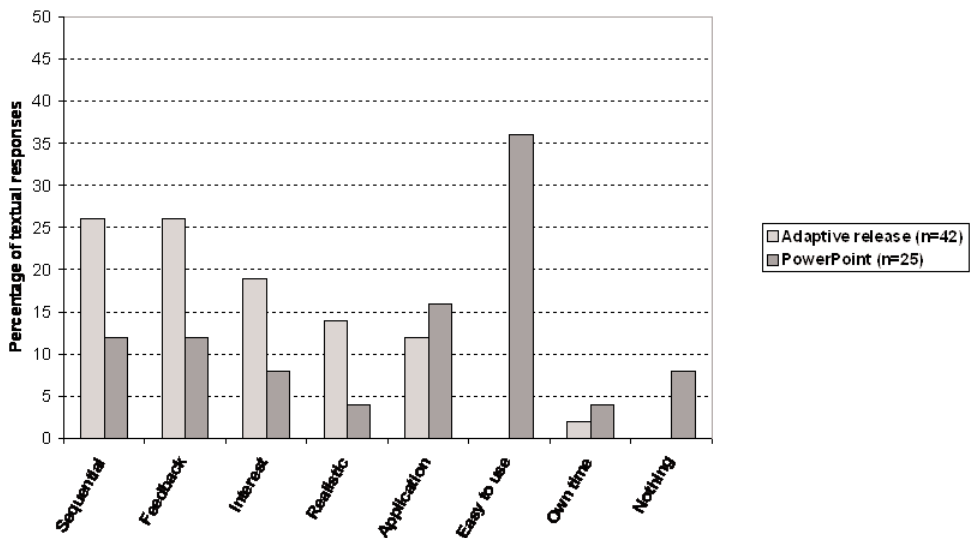
Figure 4 Having to type in answers encouraged me to think carefully about my response (Adaptive Release) versus Even though I did not have to type in answers, I still thought carefully about my responses (PowerPoint)



Which cases made students think more?

However, when asked to vote in the summary session on the question "Which cases made you think more?" all students (n=99) selected the 'adaptive release' cases.

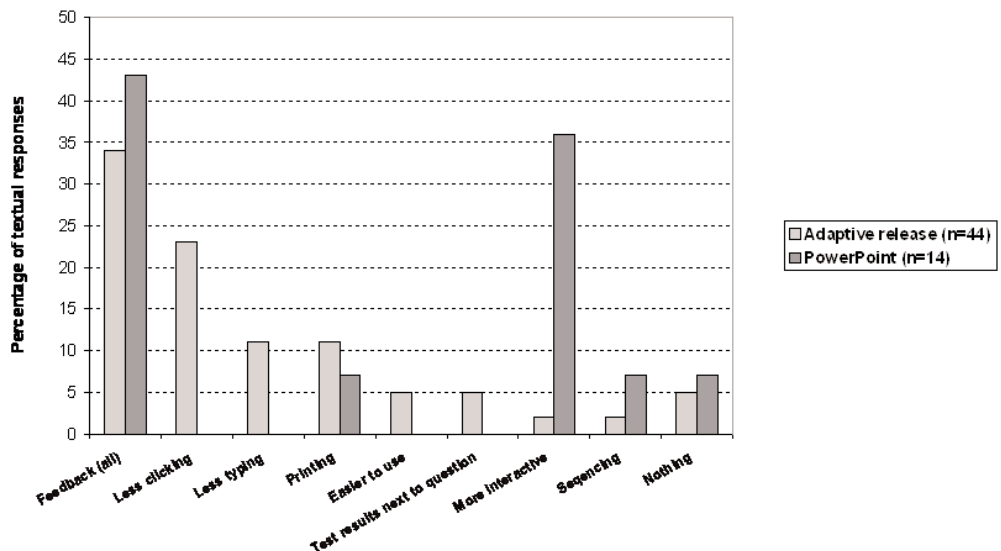
Figure 5 Characteristics of the cases that students particularly liked (from textual responses)



Characteristics of cases that students particularly liked

Figure 5 shows the range of characteristics that students particularly liked for each type of case (by percentage of characteristics reported). For the 'adaptive release' cases the top three characteristics particularly liked were the sequential (step by step) approach, attempting a question and then getting feedback, and the interest/thought provoking nature of these cases. For the PowerPoint cases the top three were that they were easy to use, they gave an opportunity to apply the lecture material and (equal third) the sequential and feedback characteristics. For 'adaptive release', n=42; for PowerPoint, n=25.

Figure 6 Characteristics of the cases that students would like to change (from textual responses)



Characteristics of cases that students would like to change

Figure 6 shows the characteristics that students would have liked to have changed about the way each type of cases worked (by percentage of characteristics reported). The most popular characteristic for both case types that students would like to change was to provide answers/feedback to all questions. For adaptive release cases the next most requested change was to reduce the amount of button clicking, and for PowerPoint cases, to make them more interactive. For 'adaptive release', n=44; for PowerPoint, n=14.

Discussion & conclusions

Promoting independent approaches to study

The fact that most students who answered the questionnaire (n=60) attempted all six cases (77%) and reported that they were able to work without tutor involvement (85%) suggests that this approach did at least support the initiation of independent study. Textual comments suggest that most of the cases seem to have provided the majority of students with a structured, step by step and suitably realistic experience that supported their study. Several students commented on this and two typical comments are shown below:

- ‘Nice logical progression. Helpful that early answers were confirmed so that you could progress to the end even if you got first part wrong’;
- ‘The systematic way they approached each problem i.e. writing up problem list through to treatment’;
- Encouraged ‘real world’ thinking’.

Realistic cases with just enough feedback (but probably not too much) are key features that were highlighted in the textual feedback. This is one of the common features of a powerful learning environment as described by De Corte (2000, 2003): ‘authentic tasks and realistic problems that have personal meaning and future use’.

Promoting deep approaches to study

Research into deep approaches to study based on inventories and interviews with students over the past 40 years by Biggs (1987, 1993), Entwistle (1995, 1997), Entwistle and Ramsden (1983), Entwistle, Tait and McCune (2000), Marton (1976), Marton and Saljo (1976, 1997) and Tait and Entwistle (1996) has developed a list of elements that categorise this approach.

McCune and Entwistle (2000) state ‘The core aspect of a fully developed deep approach is the intention to form a personal understanding of the topic under study. This is then combined with a range of conceptually related learning processes.’ These related learning processes could be potentially useful in determining if a particular course or module has promoted a deep approach to study in students. In this study, due to time constraints, the literature review was started after the questionnaire was developed and deployed, so we can only apply the analysis in retrospect. An adapted list of these processes is shown below.

A fully developed deep approach (adapted from McCune and Entwistle, 2000) constitutes an intention to form a personal understanding - plus a range of conceptually related learning processes:

1. Active interest and personal engagement
2. Thinking for yourself
3. Relating ideas
4. Gaining an overview
5. Questioning and using evidence critically
6. Seeking the main point / seeing the purpose or wider context of a task
7. Drawing conclusions
8. Monitoring understanding and regulating

‘Active interest and personal engagement’ were apparent from being present in the DL sessions and from student comments: once students had logged into the system and got started on the cases they were clearly actively engaged with problem solving, discussing with each other and entering answers, although with observation alone it is possible that this perceived ‘engagement’ could be strategic (getting the answer as quickly as possible without caring about the process). Student comments on the DL sessions though, suggested they were actively engaged:

- ‘V. helpful activity’;
- ‘V. helpful and made material more attractive to learn’;
- ‘These were excellent!’
- ‘I felt the DL sessions in this module were the most informative ones we've had’.

Students reported that both sets of cases encouraged them to think about or discuss each part of the case in depth and they thought carefully about their responses whether or not they had to type in an answer. However, when asked in the summary session which type made them think more, all responded that 'adaptive release' cases did. It would have been useful to probe the nature of this thinking a little deeper in relation to how each case type affected this approach and whether working in a group or alone had a significant effect on this. Our original hypothesis that students would just skip through the PowerPoint cases without thinking deeply was not supported by the overall results, although some textual comments did outline exactly that approach:

- 'Was tempting to flick through them quickly – a few multiple choice questions would have been good';
- 'I actually just clicked through + didn't answer them. Better if actually had space to write the answers';
- 'To be honest they were a bit of a let down after the first three'.

We are perhaps identifying that many students are, at least reporting that they are, taking a thoughtful and careful approach to questions in a case, whether or not their response is submitted, but that for some students, they will only take this approach if their answers are submitted and available for checking by the teacher. However, when asked what they would like to change about the PowerPoint cases the majority of responses (79%) wanted more feedback and more interaction, suggesting that these were seen as deficiencies of these cases.

The other conceptually related learning processes (3 - 8) are related to the application of knowledge in clinical reasoning. The way the cases are structured would hopefully encourage processes 3, 5, 6 and 7 and two questions at the end of each 'adaptive release' case ('What do you still need to learn?' and 'What would you like covered in the summary session?') did seem to support many students in monitoring their own understanding. However, definitive assessment of how applicable the cases were will not be possible until the students have seen their own cases, having made a connection to the knowledge they gained in our sessions.

Promoting research into, and development of teaching

Conducting an Appreciative Inquiry Interview was an interesting experience for both parties (KW interviewing KA). It drew out many of the difficulties of the teaching environment (time constraints, control over timing of sessions, difficulty of trying to apply educational theories in a practical setting) as well as the more positive aspects (success of the intention to get students working on the principles of case diagnosis, students' positive responses in DL session, direct feedback on students' understanding of module and the relationship to teaching).

Biggs (1999) states 'my own assumption is that helping teachers improve their teaching is best done using a theory that helps teacher reflect on what they are doing' and this study certainly helped by setting aside time and surfacing data for evidence-based reflection. An unexpected outcome was KA's ability to check student understanding as the DL sessions progressed and relate this to specific instances of teaching on the module. This was particularly interesting in relation to some concepts that many students had not grasped particularly well. These concepts had been covered in a practical session in the Clinical Skills Lab rather than during a traditional lecture, and the authors wonder if students might come to the Skills Lab primed to learn skills rather than factual knowledge/concepts. This would perhaps be counter to situated learning scenarios (Lave & Wenger, 1991) where knowledge needs to be presented in an authentic context, i.e., settings and applications that would normally involve that knowledge. Further research is required to follow this up.

Overall effectiveness of the cases

The case scenarios we developed were effective and well received by the students. This approach may provide a way to increase the exposure of students to clinical cases involving interactive diagnostic and treatment procedures that mimic real-world scenarios. However, resource implications are still high, as the development of well designed interactive case scenarios is time-consuming for teachers (although re-use of these scenarios would reduce this commitment in subsequent years).

Acknowledgements

We would like to thank Linda Jones (LIVE Centre) for her help in setting the outline for this study and support in developing the questionnaire, Cheryl Lawrence (Academic Development) for creating the OMR questionnaire at very short notice and processing the data afterwards, and the students for providing such useful feedback.

References

- Biggs, J. (1999) What the student does: Teaching for enhanced learning, *Higher Education Research and Development*, 18(1), 57-75.
- Cooperrider, D. L. S., Suresh (1987) Appreciative inquiry in organizational life, in: R. Woodman & W. Pasmore (Eds) *Research in organizational change and development* (Vol. 1) (JAI Press, Greenwich, Conn.), pp. 129-169.
- De Corte, E. (2000) Marrying theory building and the improvement of school practice: A permanent challenge for instructional psychology, *Learning and Instruction*, 10(3), 249-266.
- De Corte, E. (2003) Designing learning environments that foster the productive use of acquired knowledge and skills, in: E. De Corte, L. Verschaffel, N. Entwistle & J. Van Merriënboer (Eds) *Powerful learning environments: Unravelling basic components and dimensions* (Pergamon, Boston), pp. 21-33.
- Lave, J. & Wenger, E. (1991) *Situated learning: Legitimate peripheral participation* (Cambridge University Press, Cambridge).
- Laurillard, D. (2002) *Rethinking university teaching: A conversational framework for the effective use of learning technologies* 2nd Edition (RoutledgeFalmer, London).
- Marton, F. & Säljö, R. (1976) On qualitative differences in learning: II - outcomes as a function of the learners conception of the task, *British Journal of Educational Psychology*, 46, 115-127.
- Mccune, V. & Entwistle, N. (2000) The deep approach to learning: Analytic abstraction and idiosyncratic development, paper presented at the *Innovations in Higher Education Conference*, Helsinki, Finland, 30 August - 2 September 2000.
- Newble, D. I. & Entwistle, N. (1986) Learning styles and approaches: Implications for medical education, *Medical Education*, 20, 162-175.
- Svensson, L. (1977) On qualitative differences in learning: III - Study skills and learning, *British Journal of Educational Psychology*. 47, 233-43.

Address for correspondence

Karin Allenspach, kallenspach@rvc.ac.uk
Department of Veterinary Clinical Sciences, The Royal Veterinary College, University of London, North Mymms, AL9 7TA.

Notes on contributors

Dr Karin Allenspach is a Lecturer in Small Animal Internal Medicine at the Royal Veterinary College.

Ms Jodie Bell is the VLE Co-ordinator in the Electronic Media Unit at the Royal Veterinary College.

Mr Kim Whittlestone is a Senior Lecturer in Independent Learning at the Lifelong and Independent Veterinary Education, Centre for Excellence in Teaching and Learning, at the Royal Veterinary College.

Appendix A



The Royal Veterinary College
Student Feedback Evaluation: Undergraduate

2006/2007

15
18

E v a l u a t i o n o f A l i m e n t a r y
S y s t e m D L S e s s i o n s -
K a r i n A l l e n s p a c h

Please shade circles like this: ●

Not like this: ⊗ ⊙

Date Form Completed

06 / 02 / 07

1. Please indicate which of the six cases you attempted:

- | | | |
|-------------|---|----------------------------------|
| (a) Canelle | A | <input checked="" type="radio"/> |
| (b) DJ | B | <input checked="" type="radio"/> |
| (c) Donovan | C | <input checked="" type="radio"/> |
| (d) Nala | D | <input checked="" type="radio"/> |
| (e) Rico | E | <input checked="" type="radio"/> |
| (f) Sneaki | F | <input checked="" type="radio"/> |

2.a Approximately how many hours did you spend working on DL cases?

- 1 2 3 4 5 6 7 8 9

If over 9 hours please fill circle



2.b Approximately what proportion of this time was spent in a scheduled DL session in the Library Computer Room (S79/80)?

- | | | |
|----------|---|----------------------------------|
| 1 = 0% | 1 | <input type="radio"/> |
| 2 = 25% | 2 | <input type="radio"/> |
| 3 = 50% | 3 | <input type="radio"/> |
| 4 = 75% | 4 | <input checked="" type="radio"/> |
| 5 = 100% | 5 | <input type="radio"/> |

2.c Approximately what proportion of this time was elsewhere / at other times?

- | | | |
|----------|---|----------------------------------|
| 1 = 0% | 1 | <input type="radio"/> |
| 2 = 25% | 2 | <input checked="" type="radio"/> |
| 3 = 50% | 3 | <input type="radio"/> |
| 4 = 75% | 4 | <input type="radio"/> |
| 5 = 100% | 5 | <input type="radio"/> |

3. If you were in a group, how many of you worked together?

- 1 2 3 4 5 6 7 8 9



4. Thinking about the first 3 cases (online "adaptive release") please rate how strongly you agree/disagree with the following statements:

SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree

- | | 1 | 2 | 3 | 4 | 5 |
|--|-----------------------|----------------------------------|-----------------------|-----------------------|----------------------------------|
| (a) These cases encouraged me to think about/ discuss each part of the case in depth | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |
| (b) I found having to type in answers to each part encouraged me to think carefully about my response | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |
| | SA | A | N | D | SD |
| (c) Overall I would say this type of case supports my learning best when used after the lectures | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |
| (d) Overall I would say this type of case supports my learning best when used before the lectures | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |
| | SA | A | N | D | SD |
| (e) What did you particularly like about the way that these cases worked? | | | | | |

Sequential thinking.

- (f) What would you have liked to have changed about the way these cases worked?

Finding the cases & answers wasn't straightforward.

5. Thinking about the last 3 cases (the PowerPoint ones) please rate the following statements from strongly agree to strongly disagree :

SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree

- | | 1 | 2 | 3 | 4 | 5 |
|---|-----------------------|----------------------------------|-----------------------|----------------------------------|----------------------------------|
| (a) These cases encouraged me to think about/ discuss each part of the case in depth | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |
| (b) Even though I didn't have to type in answers to each part, I still thought carefully about my responses | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |
| (c) Overall I would say this type of case supports my learning best when used after the lectures | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |
| (d) Overall I would say this type of case supports my learning best when used before the lectures | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |
| | SA | A | N | D | SD |



(e) What did you particularly like about the way that these cases worked?

Easy to go through

(f) What would you have liked to have changed about the way these cases worked?

Answers to be available

6. Thinking about the DL sessions (whether you attended a timetabled session or not) please rate the following statements from strongly agree to strongly disagree :

SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree

- | | 1 | 2 | 3 | 4 | 5 |
|--|-----------------------|----------------------------------|----------------------------------|-----------------------|-----------------------|
| (a) The DL sessions were a useful opportunity to apply knowledge presented in lectures | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |
| (b) The DL sessions were a useful opportunity to explore gaps in my knowledge/ understanding | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |
| (c) I was able to work through most of the cases without tutor support | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |

(d) Comments

Are a good idea - not sure I had revised enough at the time to have a complete idea of what was going on.

7. I found the summary session particularly effective for:

SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree

- | | 1 | 2 | 3 | 4 | 5 |
|--|----------------------------------|-----------------------|----------------------------------|-----------------------|-----------------------|
| (a) highlighting gaps in my knowledge/ understanding | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |
| (b) answering questions that were still outstanding for me | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |
| (c) supporting my revision | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | SA | A | N | D | SD |



24369



8. Any further suggestions/ comments regarding the Alimentary System module DLs and summary session?

The powerpoints that were worked through with a tutor were most helpful. -gd to be able to ask questions as go through.

Round up session of small animal DLs useful to re-iterate major points.

Thank you very much for completing this evaluation