Evaluating the impact of lecture capture on learning outcomes in dyslexic students

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The use of lecture recordings as supplemental learning materials has particular promise for supporting educationally disadvantaged students, but the impact of this approach remains largely unexamined. Previous studies, including from our group, find dyslexic students view these as valuable learning materials, but whether this impacts on their academic performance remains unclear.

We propose to address this by using a between-subjects, controlled study to assess the impact of supplemental lecture recordings on learning outcomes in dyslexic and neurotypical (Control) students. We hypothesise that any positive effect is likely to reflect the ability of lecture capture to facilitate independent study and note-taking, so we focus on these elements of learning, and will compare lecture recordings against other learning material formats. Our use of collaboration between universities to recruit a large pool of participants, and a study design that models a typical higher education setting, should ensure any outcomes are robust and relevant to faculty in a range of disciplinary and institutional backgrounds. This study integrates with our ongoing evaluation of lecture capture in Birmingham University Medical School, and will inform learning support policy within the UK.
Section 2: Detailed overview

The audio and video recording of lectures (i.e. Voice and PowerPoint slides), with subsequent ‘publishing’ via virtual learning environments is a routine approach in many higher education systems, and used with increased frequency within the UK. These recordings, typically used as a supplement to lecture attendance are used by the majority of students (Davis et al., 2009), primarily in a ‘targeted’ manner to revisit difficult concepts, make additional notes, or for revision (Williams & Farndon, 2007). In contrast the quantitative impact of this approach on student learning remains largely unexplored (Kay, 2012), though lecture recordings are known to be a valuable component of blended learning (Wieling & Hofman, 2010), and the use of supplemental audio-only lecture recordings (‘podcasts’) correlates with statistically significant increases in grades (Morris, 2010; Abdous et al., 2012). Importantly, one study indicated that students that used these materials took more extensive notes (McKinney et al, 2009). This is likely to be a central issue given that note-taking in lectures is known to increase academic performance (Kiewra, 1984a,b). Some authors have speculated that the observed increase in academic performance reflects students’ ability to pause recordings at difficult concepts, and/or listen to lectures several times, encouraging more note-taking than in lectures (Basssili & Joordens, 2008).

The ability to create coherent lecture notes is a key issue for dyslexic students, who are often disadvantaged in this area due to weaknesses in working memory and language processing (Olofsson et al., 2012). Dyslexic students represent a significant proportion of the undergraduate cohort in the UK (5.2%, Higher Education Statistics Agency, 2010/11), however, analysis of these students’ academic performance find they achieve a lower proportion of 1st/2(i) class degrees than comparable non-dyslexic students (Richardson & Wydell, 2003). Similar ‘achievement gaps’ are observed in other HE systems (e.g. Australia; Foster, 2012), implying the issue is ongoing and internationally relevant.

Audio lecture recordings are a recommended study aid for dyslexic students, and are highly valued learning aids (Hannaford et al., 2011), though there is evidence that dual format (audio-visual) recordings may not be optimal for dyslexic students (Beacham & Alty, 2006). Our recent evaluation of supplementary lecture capture in a Medical Science programme appears to contradict this (Leadbeater et al., 2013) – as we found dyslexic students accessed significantly more material, and used it for longer than the cohort average. We are currently repeating this evaluation in a controlled study, using a large preclinical medicine programme (~350 students: ~15 dyslexic, ~30 Non-English Speaking Background students per cohort) to focus on how educationally disadvantaged students use lecture recordings and whether it impacts on their academic performance. Our preliminary findings show that the extent to which individual students experience
problems in taking lecture notes correlates with how long they use lecture recordings (Figure 1), and suggests that this is a key driver to engage with these materials.

**Figure 1. Individual students lecture recording usage per week correlates with their degree of experiencing problems in taking notes in lectures. Green boxes indicate students amount of recording use (Nil - >2 hours/week), and the number of responses per category. Responses to the question on a Likert scale are indicated. Combined data from Yrs. 1 & 2 MBChB cohort (Questionnaire data 2012-13, n= 482 / 673 = 72% response).**

This suggests that dyslexic students may gain particular benefit from lecture recordings via their ability to facilitate note-taking, and is consistent with our observations that (i) a high proportion of dyslexic students use the material, (ii) access it more quickly (i.e. *within 1 or 2 days post lecture*), and (iii) spend more time listening per recording (Figure 2). Importantly though, dyslexic students appear to maintain a considered, ‘targeted’ approach to the material (i.e. *accessing only 1 or 2 recordings*, Fig 2). We will examine whether this impacts on their academic performance by comparing individual student’s lecture recording use and exam performance in recorded and non-recorded modules.
Figure 2. Aspects of lecture recording use in a Yr. 2 MBChB cohort compared with self-disclosed dyslexic students (Pie charts) Responses indicate the period taken to access recordings after the lecture, or the number of recordings accessed. (Bar charts) Average length of use per recording in the whole cohort and dyslexic students (Questionnaire data 2012-13, whole cohort, n = 235 / 331; Dyslexics, n=12)

This study evaluates whether lecture recording use impacts on the academic performance of neurotypical / dyslexic students in a ‘real world’ learning environment, but its outcomes are likely to affected by parameters we cannot control (i.e. diversity in the cohort, small number of dyslexic students etc.). We also cannot test our hypothesis that lecture capture impacts on student learning by facilitating note-taking during independent study. Here, we propose to address these issues in a complementary ‘laboratory’ study of the impact of lecture capture on dyslexic student’s learning. Together these studies will examine the extent to which this is an effective approach to support educationally disadvantaged students.

Objectives

In this study we use a combination of quantitative and qualitative approaches to examine three key questions: (1) To what extent is the use of supplementary lecture recordings effective in enhancing learning in a typical higher education environment? (2) Is the approach appropriate for supporting dyslexic student learning and, (3) Does it facilitate more effective note-taking during independent study?

We propose to use a controlled, between-subjects study to assess student learning in a design that replicates a typical higher education learning environment (lecture – extended period – exam). The study
will focus on student note taking in lectures and independent study, and whether lecture recordings are more effective support materials than other formats.

Participants
The study will examine the impact of supplemental lecture recordings using sufficient participants to generate statistically significant data (10 per group), allowing for a 30% drop-out. We will initially recruit 50 dyslexic undergraduate students and matched numbers of neurotypical (control) students, allowing 15-16 students/treatment group. Students will be recruited from three Universities (University of Birmingham, Aston University and Birmingham City University), to identify sufficient students within a narrow disciplinary range (i.e. Biology, medicine, pharmacy, nursing, dentistry) and stage of education (Yr. 2), with similar educational backgrounds (A-level biology). Potential participants will be required to have only dyslexia (i.e. no overlapping conditions). Dyslexic participants will be recruited via the respective learning support teams, whereas neurotypical participants will be recruited from matching courses on a first-come basis. All will be offered a financial inducement to join the study.

Study design
The study is designed to model a typical higher education learning environment, with an initial lecture followed by a prolonged period (~6 months) when the student is encouraged to undertake independent study, before learning is assessed by an exam. As such, the study centres on two ‘Study days’ (plan overleaf).

Study day 1 will initially use two established instruments to define participant’s condition and ideal learning approach. We will use the Felder & Silverman Learning Styles Inventory (Felder & Silverman, 1988), an instrument for profiling learning styles, and Lucid Adult Dyslexia Screening (LADS+), which tests areas where adult dyslexics encounter difficulties (Lucid Research Ltd). These two approaches will allow groups to be matched on the basis of three criteria: (i) preferred learning style, as measured by the inventory, and (ii) cognitive ability and (iii) information processing skills, as measured by LADS+.

Allocation to groups will be followed by a short exam to establish student’s baseline knowledge of the topic, and a ~50 minute, Powerpoint-based lecture. This will match typical HE practice - handouts will be distributed and students encouraged to make notes, on the understanding that they will be subsequently examined on the topic. This will be an area that the students are unlikely to have encountered (Epigenetic regulation of gene expression), and will be at a Yr. 1 undergraduate level of conceptual challenge and detail. After the lecture students will be asked to submit a copy of their lecture notes (with ID#), and allocated to one of three groups which model typical approaches to learning support in higher education: (1) Textbook
chapter available, (2) Textbook chapter and audio recording available, or (3) Textbook chapter and audio-visual recording (echo360) available.

Study design

- 50 dyslexic students
- 50 neurotypical (control) students
- Learning styles / dyslexia assessment
- Exam (Assess previous knowledge)
- Lecture (~50 mins)

Data formats

- Descriptive data (Student LS etc)
- Learning outcomes (Omeset data)
- Analyse lecture notes
- Analyse independent study notes
- Descriptive data (pattern of use)
- Descriptive data (student use, etc.)
- Learning outcomes
- Qualitative data (student opinions)

Detailed breakdown of study design, indicating the components and data to be collected and analysed.

Students will be paid a proportion of their incentive at the end of study day 1 (£20), a further £20 if they attend the subsequent exam, or £30 if they attain 60% to encourage engagement. They will be asked to record the pattern and duration of any independent study they undertake, and to bring any notes they generate to Study day 2.

Study day 2 will be timed to avoid clashing with exam periods to maximise participation. Students will perform a 30-minute MCQ exam to probe recall and understanding of the topic, prior to entering 40-minute (i) Dyslexic-only, or (ii) neurotypical focus groups. These will be semi-structured and will focus on student’s attitudes to learning support, note taking in lectures and independent study.

If funded, the study will be submitted to the University of Birmingham Research Group for ethical oversight. All participants will be asked to sign a consent form.
**Data collection and analysis**

In this study, two groups of students (dyslexic and neurotypical controls) are exposed to one of three forms of learning support, and the impact of this on their pattern(s) of independent study, study notes, learning outcomes, and attitudes will be examined by a number of instruments. Specifically, we will use:

1. **A questionnaire to survey students’ uptake and uses of study support.**
   
   This is based on a questionnaire developed for our previous studies, and will request students to disclose their dyslexic status and ‘treatment group’. It will focus on student’s perceived ability to take lecture notes, use of learning materials, and their opinion on what constitutes useful learning support. Data will be analysed by SPSS and allow comparisons between dyslexic and neurotypical students.

2. **Analyze patterns of independent study / download data to assess students’ access to support material.**

   Students in the three ‘treatment’ groups will be asked to keep a log of the date and duration of any independent study, and these will be collated and presented as (i) timelines of activity and (ii) the average study duration calculated. For the lecture recordings these data will be validated by *echo360* analytics software to build a picture of the overall pattern of downloading. This will allow the comparison of dyslexic and neurotypical student’s approaches to independent study.

3. **Analyze pattern of note-taking.**

   The students’ lecture notes will be examined and coded (grounded theory), focusing on aspects such as the techniques used; gaps in information, and comparisons made between dyslexic and neurotypical note-takers.

4. **Analyze exam grades in different treatment groups to assess the impact on academic performance.**

   The use of a controlled design (*i.e. comparing textbook only, vs. audio or echo360 recordings*) allows us to examine whether the learning support approach correlates with changes in students’ academic performance. We will compare the distribution of marks of dyslexic and neurotypical students subjected to the three treatments by statistical analysis (t-test, ANOVA), to examine whether there are differences between (i) dyslexic and neurotypical controls, and (ii) the three treatment groups.
(5) Use focus groups to identify / examine student’s attitudes.

All students in the study are invited to participate focus groups containing (i) dyslexic-only or (ii) neurotypical-only participants. We will use a semi-structured approach to explore the different approaches to learning support, and how this may play a role in note-taking and academic performance. Discussions will be audio recorded for transcription and analysis using NVivo software. Transcripts will be analysed and coded (grounded theory) for content by two independent researchers and subsequently discussed to identify the key themes.

Dissemination

Our previous experience of dissemination there is broad interest in studies that evaluate the impact of lecture capture on student performance. This will be at local, national and international levels: (1) University of Birmingham. This study has high level support within the Student Support Team - outcomes will inform policy on lecture capture and student support. Wider dissemination within the University will be via specialized and general teaching interest groups. (2) National teaching & learning fora. KPN anticipates presenting this study at the HEA STEM Annual Learning & Teaching Conference 2015. VA and SO propose to contribute to a conference focusing on dyslexic teaching in HE (British Dyslexia Association’s 10th International Conference). (3) Publications. Our last study of lecture recording was published in a international learning and technology journal (Leadbeater et al., 2013, Computers & Education) and by the HEA-funded ‘Compendium of effective practice’. We will use a similar approach to maximize the impact of this study.

References


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Section 3. Appendices

Project Team.

This project is a collaboration between the three large higher education institutions in Birmingham, UK: Birmingham University, Aston University and Birmingham City University. The learning support teams at all three institutions have agreed to advertise the study to appropriate dyslexic students.

(1) Project Coordinator:
Karl Nightingale PhD FHEA,
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Dr Nightingale is an established academic, with teaching programme lead responsibilities in the Birmingham Foundation Academy, and contributions to a range of UG and PG courses (Pre-clinical Medicine, Medical Science & Dentistry). He has research interests in both biochemistry (gene expression) and pedagogy (lecture capture evaluation for dyslexia / international students).

(2) Co-investigator
John Couperthwaite PhD
Manager, Educational Technology Team, University of Birmingham Medical School.

Dr Couperthwaite is the key manager for developing and evaluating new educational technologies within the College. He played a key part in rolling out a comprehensive echo360 lecture recording programme within pre-clinical medicine in 2012-13.

(3) Co-investigator
Vikki Anderson
Learning support Advisor, Student Support & Development Team, University of Birmingham

(4) Co-investigator
Sue Onens
Learning Support Manager, Student Support Services, University of Birmingham

As members of the Learning Support Team, Sue Onens and Vikki Anderson contribute to developing university policy, guidelines on student support and continuing professional development across the University.

Project plan

The timeline of the project will largely correlate with academic year 2013-14, with student recruitment, and initial learning styles assessment and lecture (Study day 1) occurring early in semester 1. Study day 2 (exam, questionnaires and focus groups) will take place in late semester 2 (April '14). Data collection will take place at various points and constitute milestones (MS 1-4 on figure), with details below.
Timeline of study, indicating recruiting, analysis and dissemination phases, and optimal spacing of study days to model the higher education environment. Milestones (MS1 -4) are indicated.

**Milestone 1 (Nov ’13):** (i) Study day 1 completed. (ii) Learning styles and LAD dyslexia screening completed, (iii) Initial lecture notes copied

**Milestone 2 (April ’14):** (i) Study day 2 completed. (ii) Lecture recording analytics / student records collated, (iii) independent study notes, (iv) questionnaire responses, (v) exam scripts and (vi) focus group recordings collected

**Milestone 3 (Summer ’14):** (i) Notes analysed, (ii) focus group transcripts made and coded, (iii) questionnaire data analysed and descriptive data generated.


**Justification**

**Incentives**
We have found financial incentives are necessary to recruit University of Birmingham students to participate in focus groups. This study requires participation at two linked events – both of 2 hours. An incentive of £50 is appropriate (Minimum wage is ~£7.00 in the UK), particularly as some students will be travelling from another university campus.
Research assistant
We propose to use a post-graduate research assistant to assist with quantitative analysis of questionnaire data and transcription of focus group data / coding. We anticipate this will require 2 weeks, at a typical University of Birmingham rate of £390 / week (including tax etc)

Dissemination (Conference registration & travel)
KPN, SO and VA will disseminate the findings of this study at national teaching and learning fora and specialist conferences. Conference registration, accommodation and train travel are indicated