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Learning Through Videos: Are Disabled Students Using Good Note-Taking Strategies?

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Abstract. The importance of note-taking in face to face teaching and learning situations is well understood in terms of successful outcomes for the majority of students. Outcomes from interactions with online learning and the use of videos as a way of revising has been less well researched, in particular with disabled students. This paper aims to introduce the notion that not all disabled students who could use technology to support note taking necessarily find it effective although they prefer to listen and watch videos. A small survey provides an indication that students may not necessarily be making the best use of their technologies or have access to alternative ways of viewing online learning materials. Where there are options to view videos using lecture capture systems; time constraints and the quality of the videos prove to be further barriers, rather than providing a successful outcome. Despite the possibility of multi-modal/multi-channel approaches there also remains very little research on the subject in particular when using more recent Massive Open Online Courses (MOOCs). There are, however, indications that with the increased use of transcriptions and graphical tools, these options could offer good note-taking strategies as part of a more inclusive approach for all students.

Keywords: Videos · Note taking · Graphical tools · Disabled students · Dyslexia

1 Introduction

One of the most important strategies that students develop for learning is the ability to take notes from educational resources. Research has shown that students who are able to take extensive and accurate notes while learning are likely to achieve higher grades [1]. Note-taking can prove to be a particular barrier for disabled students who may have print impairments. While some students with disability may face physical or sensory difficulties in terms of independently capturing notes, others may struggle to concentrate or process information. For example, Boyle [2] identified that students with Learning Disabilities such as dyslexia were likely to miss important points in multiple sections of a lecture. They tended to record fewer points, make incorrect points or record nothing at all. Common adjustments for disabled students have either focused on human-aid such as scribes, translators and transcribers or personal devices for assisting with capturing notes (e.g. audio recorders, smart-pens). But, for students studying in traditional face to face teaching sessions, note-taking remains a challenge [3] and it is a

concern that this may also be true when disabled students are presented with videos or other multi-modal online lecture systems such as those offered in MOOCs or distance learning courses.

This paper will examine the evidence behind such claims and consider whether the tools to aid disabled students make notes match their requirements when using online courses. In lectures if poor note-taking is a barrier to learning for disabled students, is e-learning providing the right solutions or causing further stumbling blocks.

2   The Importance of Note-Taking While Studying

Note-taking is considered the process of summarizing information in a systematic way. For learning to occur it requires the student to actively listen or read information while connecting and relating this new information to ideas they already know [4]. Making notes during a lecture is considered to be more cognitively demanding than playing chess [5] as students are required to "attend, store, and manipulate information selected from the lecture simultaneously, while also transcribing ideas just presented and processed" [6]. Studies have shown that the amount of information a student is able to capture while taking notes and how they structure their notes affects their quality [7] and the quality of the notes is a predictor of test performance whether they study their notes or not [8, 9].

However, there is some differing evidence about whether using a computer to type notes is more effective than a more traditional hand-written approach. For example, for those with poor working memory, typing may offer a better solution [10, 11] but for others the process of handwriting increases levels of recall [12]. Bui et al., and others [10–12] also found that when the traditional note-taking approach of summarizing information in hand-written notes was deployed, the students working memory ability predicted the quality of the notes (as defined by the number of important points captured by the student). This would account for the difficulties with note-taking reported by students who have problems with processing information or concentrating (such as those with dyslexia, mental health, learning, and communication difficulties).

Students with sensory or physical impairments which impact on note-taking could experience a similar working memory burden due to the additional effort involved with capturing the information being shared by the instructor. Bui and Myerson [11] also found that a technology based note-taking approach – that of attempting to transcribe the speaker through typed notes – was independent of the student's working memory abilities and as effective at producing high-quality notes for those who are proficient typists.

3   Multimedia E-Learning

Video is increasingly playing a role as a medium for delivering learning resources [13] whether as part of a distance learning provision or supporting face to face delivery. MOOCs and online content creating tools combine video resources with reading materials and discussion forums [14]. Although research has shown that recordings used in this way should be short and informal [15], they still pose an extra demand on the learner

to extract information both from the visual aspect of the video and the auditory output. There may be the functional accessibility barrier to video players with perhaps limited keyboard access for those who are unable to use the mouse or use a screen reader. There may also be content barriers related to the audio and visual elements that need to be captioned, audio described and/or have the provision of a written transcription. These issues can all be overcome with some forethought by offering accessible players and alternative formats [16].

Distance and online learning has often been considered a more accessible approach to learning for those students with disabilities who struggle to attend or follow face to face courses. Providing online videos of lectures through lecture capture systems has become more common-place within post-secondary and Higher Education (HE) sectors. This investment has been justified by some as a way of improving access for those who have a disability or struggle to attend lectures [17].

The link between lecture capture and improved student performance is still unclear [18]. The ability to pause, rewind and revisit video content should reduce the processing requirement for the student, compared to face-to-face lectures. Recently developed video players allow for video clips to tagged and bookmarked where key points need to be remembered. Furthermore, MOOCs and lecture capture platforms may provide the facility for students to take text notes while watching a video; time-stamping the notes to allow the student to return to a particular point in the recording. Registered students on MOOCs may also have the chance to return to the course at any time in order to revisit content to enhance overlearning and revision for examinations etc.

Vajoczki et al. [19] investigating the principles of Universal Design and the use of lecture capture stated that the majority of students with disabilities reported it met their accommodation needs, however it appears that this was primarily due to its ability to address issues of non-attendance. It is also well known that unless there is 'universal access' to video content [20] those students who have sensory impairments may not be able to make the most of these resources. A lack of quality captioning and audio descriptions can render a video useless to those with hearing and visual impairments. The positive impact on being able to control the video may also be lost for those with motor and dexterity difficulties.

Little work has been undertaken to understand how students take notes from video resources or whether any particular aspects of the design of the features aids learning. Dunn [21] reported that students were unsure how to take notes from online course materials and did not know whether their strategies were effective. Few studies have looked at the potential impact on disabled students of short or long videos embedded within other learning materials. However, Leadbeater et al. [18] found that students with dyslexia were part of a cohort of students who accessed videos the most. The authors went on to report on a further research study that compared the effectiveness of revision from students' own notes, a video recording of a lecture or a textbook [22]. They compared the results of students with dyslexia to those without dyslexia (neurotypical). Students' test results when revising from the students' own notes provided the smallest improvement for both groups. Neurotypical students performed equally well if they revised from a lecture recording or textbook and better than when revising from their

own notes. Dyslexic students performed similarly to their neurotypical peers when revising from a textbook but attained lower scores when revising from a video recording.

Despite the lack of studies in this area, there are indications that although disabled students may prefer to use video resources, (in particular those with specific learning difficulties/dyslexia), they may not be able to reap the benefits from these resources based on their own expectations, skills and abilities and those of the instructors.

4   Investigating Disabled Students Note-Taking Preferences

4.1   Method

A survey was undertaken in order to establish how disabled students (n = 60) in higher education were using technology to take notes and which strategies they found most effective. The disabled students had access to computers and appropriate assistive technologies along with training in their use through the Disabled Students' Allowances [23] or institutional provision. The students were using all forms of learning materials in their daily studies but were most used to taking notes whilst listening to lectures and operating in tutorials or classroom/lab situations. The students were asked to comment on their use of videos but there was an understanding that online learning was only offered as an adjunct to face to face teaching methods. Participants were asked to rank their confidence with note-taking and to rate the effectiveness of various note-taking approaches.

The survey was presented online and publicized through HE staff related online forums. The staff then contacted the disabled students of which 45 % had dyslexia or other Specific Learning Difficulty, 25 % physical difficulties or chronic health conditions, 22 % had a mental health condition, 7 % had sensory impairments and 3 % had social and communication needs. Two students mentioned the fact that they had a hearing impairment but were able to use audio recordings. Two Likert scales were offered using a one to five rating for evaluating frequency and effectiveness of note-taking. The chance to comment was encouraged throughout.

4.2   Results

The initial results from this very small scale study highlighted the issues discussed in this paper with over half the students reporting moderate, low or no confidence in their note-taking abilities (56 %) even though they had access to additional support and assistive technologies when taking notes. As can be seen from the figure below (Fig. 1) despite the wide availability of technology, the most frequently used approach to note-taking remained the use of pen and paper. However, only 56.6 % found this approach to be effective, the lowest percentage of all the strategies surveyed for their effectiveness. The next most used strategy reported by 55.0 % of students was the creation of mind/concepts maps, either on paper or using technology. Of those students that used mind/concept mapping, 75.8 % stated that it was an effective strategy.
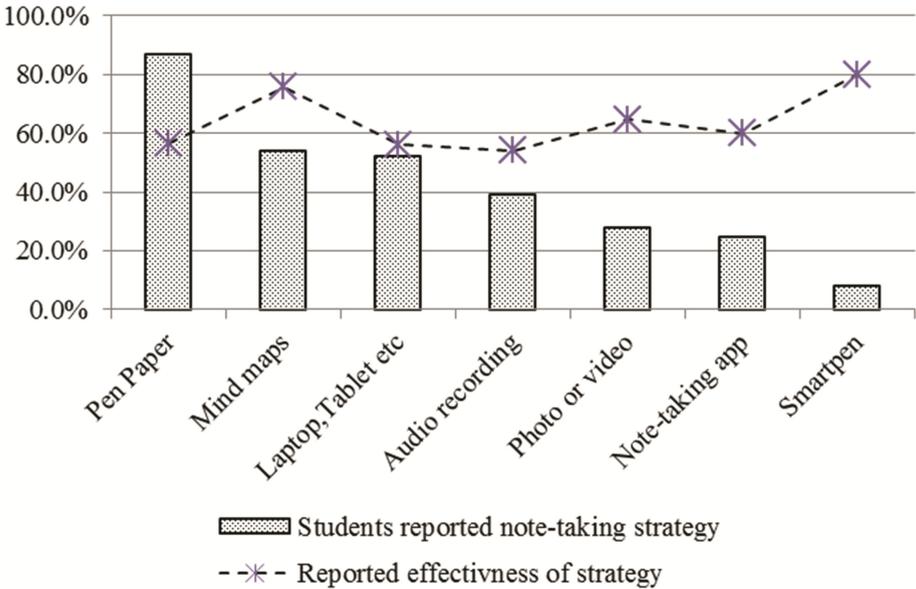
Fig. 1. Reported use and effectiveness of note-taking strategies by disabled students.

It should be noted that typing was used by 53.3 % of the students, but only 56.3 % of this group reported that it was an effective strategy. A few students took photos or used video capture (28.3 %) and some also used dedicated note-taking apps (25.0 %). These tended to be more successful approaches for this group of students with 64.7 % of those using photos or video capture and 60 % of those using note-taking apps rating them effective.

It appeared that only 26 % of the students had access to video recordings and all reported satisfaction with these strategies. But further analysis of the comments revealed that the strategy of reviewing videos as a revision technique was not as effective as the students first thought. The comments included such statements as "watching videos can make note taking more time consuming" and "effectiveness of the video very much depends on the production quality". Production quality was mentioned by Guo et al. [15] as being an issue for all students and is reflected in terms of engagement. As a disabled student (who completed the survey) commented "the effectiveness of video[s] very much depends on the production quality. Clear audio, in focus speaker, close enough to make out etc." 14 % of those accessing videos also noted limited access to transcripts but this may be an awareness issue as much as a need, in terms of transcript availability. A hearing impaired student who also had specific learning difficulties commented on the use of video capture saying "that it was very effective but she rarely had access to captions or transcripts."

5   Discussion and Conclusion

The number of students who took part in this study is low so generalization of any of the results should be undertaken with caution, but the authors believe the outcomes highlight issues that require further research. It appears that currently there is a miss-match between the tools disabled students have available and the strategies they deploy when accessing online video content. Disabled students' preferences for online video resources and perceived benefits are not necessarily leading to improvements in their performance. Not only has this study gone some way to illustrate these issues but recent research [20] and the survey results also indicate that extracting information from multimedia resources remains a challenge.

Given the positive results and marked preference for visual/graphical note-taking tools it is remarkable these strategies have yet to be embraced as part of the support mechanisms offered by MOOCs and other online learning systems.

Furthermore, there is the potential impact of synchronized transcripts with text highlighting, annotation and/or captions for these students. While transcripts and captions are often considered necessary for students with hearing impairments, the synchronization of the text with audio and annotations enables students to use dual channels for processing information in order to increase processing capacity [24, 25]. However, there remains the issue of introducing both students and lecturers to the idea that a range of technology based note-taking tools needs to be offered to students with disabilities. It should also be noted that there may be some trialling and training involved to find the best individual match of note-taking tools and their features to gain the best outcomes.

As the boundaries between video, multimedia e-text and other online learning resources become increasingly blurred, it is important that developers of learning content and digital delivery systems consider both the usability and efficacy of these tools for the wider disabled student community, not just those requiring access through well-known assistive technologies such as text to speech and screen reading.

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