What are the expectations of disabled learners when participating in a MOOC?

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ABSTRACT
Massive Online Open Courses (MOOCs) are making low cost learning opportunities available at large scale to diverse groups of learners. For that reason, MOOCs need to be accessible so that they can offer flexibility of learning and benefits to all. In order to direct efforts towards developing accessible MOOCs, it is important to understand the current expectations of disabled learners. Analysis of data from MOOC surveys that support disclosure of disability provide quantitative information such as the proportions participating in MOOCs; their reasons for participating, and the types of MOOCs they prefer. This paper presents analysis of pre- and post-study survey data from eight MOOCs offered by the UK's Open University on the FutureLearn platform. Results from disabled learners are compared with those of other learners and preliminary findings are used to frame an agenda for our further work.

Author Keywords
MOOC; instructional design; eLearning; universal design; accessibility

ACM Classification Keywords
H.1.2 **[Information systems]:** User/Machine Systems – human factors, human information processing. H.5.2 **[Information Interfaces and Presentation]:** User Interfaces – standardization, prototyping, user-centered design. K.3.1 **[Computers and Education]:** Computer Uses in Education – Collaborative learning, Distance learning. K.4.2 **[Computers and Society Issues]:** Social Uses – assistive technologies for persons with disabilities, handicapped persons/special needs.

INTRODUCTION
Open education can provide opportunities at scale for lifelong learning amongst currently underserved populations, such as those with disabilities [13]. In comparison to other online learning opportunities [1] MOOCs have potentially beneficial characteristics such as: open access within a structured learning framework, low cost of learning, flexibility to allow individual planning in terms of the learner's time and preferred pace and place, opportunities for social learning, as well as scope to gain knowledge.

Despite this potential suitability as an approach to support disabled learners, there is limited research to understand accessibility and MOOCs, and also on the expectations of disabled MOOC learners. This paper outlines a preliminary study to analyse existing MOOC survey data, in order to understand the expectations of disabled learners participating in MOOCs. We provide a brief background to research in disability and open learning, introduce the aims and methodology of the research project and the study described here, and then describe preliminary findings and directions for future work.

OPEN LEARNING AND DISABILITY
The changing attitude of society to disability is shown in the growing proportion of learners who declare disabilities. With more disabled students than any other university in Europe, data from The Open University (OU) provides an illustration of the changes. Analysis shows a rise in students declaring a disability from 6.8% in 2010/11 to 16.4% in 2014/15 [9]. This is close to a World Health Organization (WHO) estimate that disability affects approximately 15% of the world population [14]. The OU is also a major provider of Open Educational Resources (OER), and the proportion of declared disability amongst OER users has been found to be higher than in the registered student population, comprising 19% of users of the OpenLearn Platform[1] [6].

Analysis has shown complex differences between disabled and non-disabled learners. For example, Richardson identifies variable levels of lower achievement in distance education for groups with specific disabilities [11], and Perryman & de los Arcos find that a larger proportion of disabled users of OER report problems with technology and digital skills [10].

Research that considers MOOCs and accessibility directly is limited, and more needs to be done to understand disabled learner perspectives [5]. Learner analytics and survey data have been explored as a means to identify accessibility problems in online distance courses [3], but such approaches have yet to be applied to MOOCs. Few quantitative studies have explored the accessibility of MOOCs or the expectations of disabled learners. Rizzardini

[1] OpenLearn, http://www.open.edu/openlearn/

et al. [12] developed a MOOC that incorporated accessibility features and got feedback from disabled learners via online surveys. Liyanagunawardena and Williams [7] analysed data via a pre-course survey for 10 MOOCs to show evidence that learners in their old age, who require accessible content, are participating in MOOCs. However, studies reporting demographic data may miss disability as a factor (e.g. [2]) and there are no published studies relating to the number of disabled learners taking up MOOCs, and their interests and expectations from MOOCs.

RESEARCH AIMS AND METHOD

The quantitative study reported in this paper is a part of a wider research programme to investigate the current accessibility of MOOCs, the processes through which this accessibility is achieved, and the potential use of data to improve MOOC accessibility [4,5]. This particular study aims to understand the current expectations of disabled learners when taking part in MOOCs. To explore this, data is analysed from surveys conducted with a set of FutureLearn MOOCs that were designed and supported by the OU. FutureLearn[2] is a MOOC provider with 109 partners from around the world and over 5 million registered users. A sample of eight MOOC presentations from 2015 were selected to cover a range of subjects. Table 1 shows the MOOCs in the sample, with subject coverage according to Higher Education Statistics Agency (HESA) classifications.

Subject	Name of the MOOC	Start-date
Medicine & dentistry	The Science of Nutrition	Sep 2015
Physical sciences	Elements of Renewable Energy	Jan 2015
Computer sciences	Learn to code for data analysis	Oct 2015
Architecture, building & planning	Smart Cities	Sep 2015
Business & administrative studies	The Business of film	Oct 2015
Historical & philosophical studies	The Lottery of Birth	Aug 2015
Creative arts & design	Understanding Musical Scores	Aug 2015
Education	Get Started with Online learning	Aug 2015

Table 1. MOOCs selected for the study

Responses to the same pre- and post-course surveys were requested from learners across all eight MOOCs. Those completing these surveys are asked to indicate if they consider themselves to have a disability. Our preliminary study uses this to allow comparison focussed on three key questions in the survey that can be used to understand the expectations of disabled learners from MOOCs: Why are you interested in studying this course?, Which of the following subject areas are you interested in?; and, What sort of online course have you taken?

PRELIMINARY FINDINGS

The total number of learners who completed the pre-course survey is 14,396. Of these, 752 respondents declined to answer the question "Do you consider yourself to have a disability" reducing the total replies to 13644. The number of learners who consider themselves as disabled are 1468 (10.8%). A smaller number completed the post-course surveys where the total number is 2564, of which 2259 provided a response, and the number of disabled learners was 255 (11.3%).

Table 2 shows the information disaggregated by MOOC. In all courses, the number of learners who completed the post-course survey is smaller than the pre-course survey. The MOOCs 'The Science of Nutrition', 'The Business of Film', 'Understanding Musical Scores' and 'Get Started with Online Learning' show a bigger proportion of disabled learners in the post-course survey than the pre-course one. 'Get Started with Online Learning' has the biggest percentage of disabled learners with 15.2% (pre) and 15.7% (post) in the sample.

Name of course	Pre-Course Survey		Post-Course Survey	
	Total	% Disabled Learners	Total	% Disabled Learners
The Science of Nutrition	2812	10.5%	702	11.9%
Elements of Renewable Energy	655	12.7%	175	10.5%
Learn to code for data analysis	3454	8.8%	158	7.6%
Smart Cities	1020	5.0%	137	2.9%
The Business of film	977	8.3%	240	9.6%
The Lottery of Birth	1427	13.5%	116	7.3%
Understanding Musical Scores	1631	12.8%	435	14.0
Get Started with Online learning	1668	15.2%	280	15.7%
Total	**13644**	**10.75%**	**2259**	**11.28%**

Table 2. Pre-and post-course survey participation

The following tables show the percentage positive responses for all learners, then non-disabled and disabled, and compares the response levels in percentage terms between non-disabled and disabled learners. (Significance is indicated in these tables by * at $p<0.01$ using z-test.) Table 3 considers the various reasons for interest when taking part in a MOOC. The highest relative percentage response levels for disabled learners are: 'Relevant to voluntary work' (146.4%), and 'To find out if I can study at this level' (165.9%). On the other hand the sub questions 'Relevant to my work' (70%) and 'To improve my English' (49%) show least relative interest.

[2] FutureLearn, https://www.futurelearn.com

Sub question	Percentages in each category indicating 'Yes'. Total	Non-Disabled	Disabled	Disabled /Non-disabled
Personal Interest	80.6%	82.9%	86.2%	104.0%*
Relevant to my work	27.7%	29.7%	20.8%	70.0%*
Relevant to my current studies	13.7%	14.0%	15.1%	108.4%
To prepare me for future study	21.3%	21.4%	25.5%	119.1%*
For the purpose of teaching others	9.6%	10.2%	8.3%	81.6%
For the purpose of sharing with others	15.1%	15.4%	17.3%	112.5%
Relevant to voluntary work	6.1%	6.0%	8.8%	146.4%*
To improve my English	11.9%	12.8%	6.3%	49.0%*
To find out if I can study at this level	9.3%	8.8%	14.6%	165.9%*
To find out more about FutureLearn or MOOCs in general	9.1%	9.1%	10.9%	119.8%
The course was free	34.0%	34.0%	42.4%	124.7%*
To try out learning online	20.5%	20.5%	25.1%	122.0%*

Table 3. Interest in the MOOC from response to 'Why are you interested in studying this course?'

Table 4 shows the subjects areas of interest in MOOCs. While many subjects show similar or higher interest there is low interest in Business (81.6%) and in Languages (83.8%).

Sub question	Percentages in each category indicating 'Yes'. Total	Non-Disabled	Disabled	Disabled/Non-disabled
Health, Sports and Psychology	42.0%	43.0%	46.3%	107.7%
Nature and Environment	40.7%	41.3%	48.5%	117.4%*
Science, Technology, Engineering and Maths	54.6%	56.5%	55.5%	98.2%
Business and Management	28.3%	29.9%	24.4%	81.6%*
Education	29.1%	30.5%	32.9%	108.0%
History and the Arts	40.6%	40.6%	51.2%	126.1%*
Languages	33.7%	35.3%	29.6%	83.8%*
Society	31.1%	31.1%	39.4%	126.9%*

Table 4. Subject areas of interest from response to 'Which of the following subject areas are you interested in?'

Previous experiences in taking online courses is similar for professional development and MOOCs, however noticeably higher for open educational resource (138.6%) and for university credit (140.9%), (Table 5).

Sub question	Percentages in each category indicating 'Yes'. Total	Non-Disabled	Disabled	Disabled /Non-disabled
An online course for continuing professional development	22.6%	23.5%	22.4%	95.4%
A MOOC	49.7%	51.4%	50.6%	98.4%
An online course for university credit	14.0%	13.8%	19.5%	140.9%*
An online course based around open educational resource	14.1%	13.9%	19.2%	138.6%*

Table 5. Previous experience with online courses from response to 'What sort of online course have you taken?'

CONCLUSIONS AND FUTURE WORK

Limitations to this analysis are that it was undertaken with a small number of MOOC presentations, and that a simple disability marker may not reflect diversity within the population. It should not be assumed that these results generalise to the whole of the disabled learner population, or that this population is homogenous in nature. Nevertheless, some preliminary findings can be drawn for further investigation:

- The proportions of disabled learners taking part in MOOCs and responding to these surveys are lower than the disabled population in general, and also below current proportions found in OU registered students and in the OER repository OpenLearn.
- In comparison with other learners, disabled learners are particularly interested in taking up MOOCs to determine if they can study at a higher educational level and to link to voluntary work. They are less interested in the relevance of the MOOC to their work, or in using MOOCs to improve their English.
- Based on this initial analysis, disabled learners appear to be more interested in these subject areas: Society, History and Arts and Nature and Environment. Languages seem to be of least interest.
- Finally, disabled learners have previous experience in online courses that allows them to get university credit, which is related to their interest in studying at a higher educational level. They have less experience of participating in online courses for continuing professional development. They have more previous experience using OERs than MOOCs, which has also been outlined in the statistics from Table 1.

These findings will inform our future direction with this work. Planned further work with this data includes the following aspects:

- It would appear fruitful from other work [3, 8] to include related data in the analysis, such as demographics, completion rate and satisfaction.

- Including categories of disability, (e.g. Visual impairment, hard of hearing or learning difficulties) will provide greater insight into differences within the population of disabled learners.
- Extensions to the analysis approach to include clustering of responses, and identification of correlations.
- Increase the sample to more MOOCs and their survey data to form a more comprehensive picture. Look to introduce and utilise comparable survey approaches across platforms
- Analyse further sources of data that describe the activity of learners inside the MOOC.
- Undertake a qualitative interview study of learners, building on a recent interview study of providers and stakeholders [5], to capture the disabled learners' experiences with MOOCs in depth. This study will be useful to understand in detail the accessibility issues learners may be facing in MOOCs.

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