

Original citation:

Sinclair, Jane and Kalvala, Sara. (2016) Student engagement in massive open online courses. International Journal of Learning Technology (IJLT), 11 (3). ISSN 1477-8386

Permanent WRAP URL:

<http://wrap.warwick.ac.uk/78141>

Copyright and reuse:

The Warwick Research Archive Portal (WRAP) makes this work by researchers of the University of Warwick available open access under the following conditions. Copyright © and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable the material made available in WRAP has been checked for eligibility before being made available.

Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge. Provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

Publisher's statement:

© Inderscience 2016

<http://dx.doi.org/10.1504/IJLT.2016.079035>

A note on versions:

The version presented here may differ from the published version or, version of record, if you wish to cite this item you are advised to consult the publisher's version. Please see the 'permanent WRAP URL' above for details on accessing the published version and note that access may require a subscription.

For more information, please contact the WRAP Team at: wrap@warwick.ac.uk

Student Engagement in Massive Open Online Courses

Jane Sinclair* and Sara Kalvala

Department of Computer Science,
University of Warwick, Coventry, CV4 7AL, UK

E-mail: J.E.Sinclair@warwick.ac.uk

E-mail: Sara.Kalvala@warwick.ac.uk

*Corresponding author

Abstract: Completion rates in Massive Open Online Courses (MOOCs) are disturbingly low. Existing analysis has focused on patterns of resource access and prediction of drop-out using learning analytics. In contrast, the effectiveness of teaching programs in traditional Higher Education (HE) settings internationally is increasingly assessed by surveys measuring student engagement. The conceptualisation of engagement used is much richer and more informative than the way the term is currently interpreted in the context of MOOCs. This paper considers MOOC participation, learning and drop-out in the context of this richer conceptualisation of student engagement. MOOC pedagogy and practice are examined and we evaluate how far HE engagement measures can be successfully used in the MOOC context. We identify the need for a MOOC engagement model and suggest recommendations for basic, initial steps which MOOC developers can make towards improving engagement.

Keywords: MOOCs; Massive Open Online Courses; student engagement; drop-out; pedagogy, open resources

Reference to this paper should be made as follows: Sinclair, J., and Kalvala, S. (xxxx) 'Student Engagement in Massive Open Online Courses', *Int. J. Learning Technology*, Vol. x, No. x, pp.xxx-xxx.

1 Introduction

The rise of Massive Open Online Courses (MOOCs) in recent years has seen many millions of people enrol on such courses to study a diverse range of topics. Coursera, one of the major platform providers, currently has a portfolio of over a thousand courses and has over 22 million registered students [11]. The not-for-profit edX platform now offers over 300 courses to more than 3 million users [16]. Yet despite the large amount of effort and expense invested by providers and the corresponding commitment of time and effort from learners, the completion rates for most MOOCs remain stubbornly low [21, 20]. This issue has been

raised as a topic of concern in many articles and discussions, and commentators have speculated on the reasons and debated the meaningfulness of using attrition statistics as a measure of success.

One reason that drop-out rates are cited so often is that they provide a simple, convenient and easy way to calculate a success measure for online courses. If they were not so dramatically low as they are for most MOOCs they would not have become such a focus of attention. Even if the meaning and relevance of such figures are challenged, they can still make for eye-catching and critical headlines. While we may criticise this measure as being too simplistic, the fact remains that the numbers are startling and there is currently little else on offer as an acknowledged and practical measure of MOOC ‘quality’ or ‘success’ which can provide a meaningful and inclusive alternative across a wide range of courses.

A further concern connected to high attrition is the nature of learning and pedagogy in MOOCs. At the time when provision of MOOCs expanded worldwide, caution was raised about the lack of pedagogical basis of this venture [5]. The concern is that, without well-structured teaching and learning strategies in place to cope with large numbers of distance learners, MOOCs may be unable to provide a suitable learning environment for many users. Little was known about how existing pedagogic strategies would work and little had been done to develop new ones. This position seems to be changing only very slowly with a continuing trend of MOOC pedagogy trailing far behind the development and deployment of courses. Most MOOCs continue with largely didactic, instructional approaches which seem at odds with the understanding on effective ways of teaching and learning in general.

In contrast to the situation with MOOCs, there is an understandable focus in traditional Higher Education (HE) (including distance learning courses) to research, develop and assess effective pedagogy. Similarly, in recent years there has been a move in HE to evaluate courses not only on student experience (which can be a somewhat passive measure and may be weighted heavily towards provisions that please students whether or not they are educationally beneficial [18]) or on learning gain (which can be extremely difficult to evaluate and to compare, and then does not provide answers as to why certain patterns are observed) but by considering student engagement. Student engagement in this context is conceptualised, not just as a student-centred construct (how motivated they are; how much time they spend studying) but it involves considering what students actually spend their study time doing and what types of activity the course provides. Certain activities are considered likely to be most beneficial to students and to provide the best opportunities for learning. Time spent engaged in the so-called ‘high impact educational practices’ is mapped and interpreted against a number of benchmark areas to provide an indication of how strongly these areas are addressed across different subjects. Many institutions internationally are now using such data to identify areas of weakness or to develop strategies to better support under-represented groups [30]. While there may be concerns over the interpretation of this data and some of the conclusions drawn [2] it nevertheless seems likely that courses which incorporate large amounts of “high impact” activities may be more beneficial to students.

This paper is an extended version of a previous workshop paper [38] in which we noted that, despite the great importance placed on engagement

measures internationally, there has been little research relating MOOCs to student engagement of this kind. Indeed, the term is often interpreted rather differently in the context of MOOCs and assessed simply by counting, for example, number of videos watched. Since the publication of our previous paper, several further studies of interest have been conducted including one which followed the approach we outlined to apply an established engagement instrument for investigating the engagement of MOOC participants [45]. In the current paper we consider both the current landscape of MOOC participation and the use of engagement measures within traditional HE classroom teaching. MOOC activity is assessed from the perspective of student engagement (in the sense of the widely-used international engagement surveys and benchmarks) and the extent to which MOOCs incorporate high impact activities is discussed. Further, we consider the implications of recent results on MOOC engagement and pedagogy and outline a framework for a different approach to MOOC design to address some of the issues raised.

This paper is organised as follows. Section 2 presents a literature review relating to MOOC background, participation and attrition. Section 3 provides an introduction to the current landscape of student engagement in HE and maps some of the existing instruments and initiatives in this area. We then consider (Section 4) the issue of ‘engagement’ within MOOCs, noting the divergence of terminology and limited assessment in the MOOC context. This section also draws on the results of a recent MOOC engagement study to extend the analysis. Section 5 links the concept of engagement to issues of learning and pedagogy in MOOCs. Finally, we discuss the implications for MOOCs and their participants and outline recommendations for establishing student engagement as a central feature of MOOC design.

2 Literature review: background, participation and learning

The term MOOC has come to be used for a very wide range of approaches. In terms of philosophy, ‘cMOOCs’ or connectivist MOOCs focus on knowledge generation within a network of learners and emphasise the creation of digital artefacts as an inherent part of the learning process. In contrast, ‘xMOOCs’ are more about knowledge dissemination and are often characterised by didactic, expert-led teaching (commonly via lecture videos). In terms of size, courses can range from just a few dozen participants to hundreds of thousands. Despite the name, not all MOOCs are open and the majority do not offer free resources for unlimited download and use beyond the learning activities. With respect to accreditation, many give course certificates as evidence of completion, with so far only a small minority offering transferable university level credits [44]. Those courses offering recognised accreditation generally require the learner to pay for and complete a final examination or project. Coursera has recently abandoned its policy of giving a free ‘lower category’ Statement of Accomplishment, requiring all certification to be paid for.

MOOCs are now being offered as leisure activities, as remedial and access courses and also for continuing professional development [36, 15]. In terms of mode of operation, many MOOCs are fully online courses intended to be used for individual development and interest. Those being offered for credit provide an

alternative mode of learning to existing face-to-face course, thus widening the pool of participation to higher level courses. There is also a growing number of blended learning or flipped-classroom approaches where the MOOC is not an externally accessible course but is an integrated part of a face-to-face programme [35]. A further approach seen in a number of computer programming MOOCs is that of providing scalable tutorial help allowing students to access expert assistance for their specific problems [36, 43].

Although it is impossible to obtain an exact figure, the number of courses available and the size of registrations indicate that many millions of people have enrolled for one or more MOOCs. For example, Coursera alone offer nearly 1,500 courses and claim to have almost 16 million registered learners [11]. It is worth noting that although some MOOCs have a specific international reach, in practice it appears that MOOC participation has so far been predominantly from Europe and the US [8]. MOOCs have often been heralded as the way forward for education in developing countries and a number of individual success stories have been reported. However, many communities are still inhibited by lack of awareness, weak technology infrastructure, poor connectivity, lack of (e-)learning skills or a language barrier [25].

2.1 MOOC completion

As the first reports on MOOCs emerged, so did the disquiet about low completion rates [13]. This has continued as a constant theme in MOOC literature [33, 37, 20]. A meta-analysis of published data conducted by Jordan [21] indicates completion rates ranging from 0.9% to 36.1% with an average of 6.5%. The average rises to 9.8% if only active students (those taking at least some part in the course) are included. Length of course is positively correlated with high drop-out rate.

It has been noted that drop-out rates may not be a useful measure of MOOC success since, on average, half of those who enrol do not even start the course [21]. Many may have personal reasons for not continuing and others may never have intended to complete the course but still feel they have achieved their objectives by studying specific parts. These considerations have led some to question how attrition should be counted, and whether it really matters anyway. There are a number of reasons why it should be considered important [9]. Firstly, it is useful to investigate if learners are leaving through choice and not because of lack of support. Secondly, it may indicate that courses are not providing enough information for learners to make an informed choice about suitability. Having to drop a course part way through may have an adverse effect on learners and damage confidence. From the course providers' perspective, time spent producing materials which are accessed relatively rarely may be better invested elsewhere. Some authors oppose the call for more flexible formats, arguing that a "course" structure is fundamental to the nature of a MOOC (along with other aspects such as pacing and "star professor" lead [34]. However, these views do not address the issue of what exactly constitutes a "course". Neither do they answer the question of why, if most participants are not using courses as the developer intended, providers persist with the formats and approaches currently used.

One benefit provided in abundance by MOOCs is data. Learning analytics are being used to discover more about the reasons for drop-out and to predict

when a participant is likely to leave from their pattern of behaviour [39, 46]. Kizilcec et al [22] identify four separate categories of MOOC user according to their engagement pattern (that is, how much they interact with different types of resource). Prediction of drop-out is useful, but does not in itself provide a means of prevention. Neither does it necessarily give insight into why students behave in the manner observed. There is very little information on remedial initiatives in MOOCs to help support those at risk of dropping out. Perhaps it is already too late by the time the behaviour begins to be observed. Further, any planned remedial action has to work within the constraints of a MOOC. It would be beneficial to investigate these issues further and to consider effective, adaptive action for those at risk. However, it may also be useful to view the problem from a different perspective and consider how far the methods and approaches of the basic course are likely to promote engagement and active learning.

2.2 Who completes MOOCs?

Drop-out rates are undoubtedly high, but within that there are further concerns that studying a MOOC to completion appears to be more achievable for certain groups of people. Some commentators have noted the great disruptive and transformative potential of MOOCs [10] and there have been suggestions that MOOCs are ideally suited to students who have barriers to accessing education, for example, through geography, personal circumstances or lack of opportunity [17]. Others refer to MOOC learners whose lives have been transformed by MOOC study [14]. However, initial research points to the difficulties in practice imposed by technology, language, learning skills and digital skills [26]. A study of participation encompassing 32 Coursera MOOCs found that less than 20% of the participants were from developing countries and, of these participants, nearly 80% already had a college degree [8]. Caution has been urged over “Western neocolonialism” in MOOC education [1] and anecdotal evidence suggests that in many parts of the world MOOCs are still considered (if at all) as an irrelevance. Attempts to roll out MOOCs for remedial college courses in the US encountered difficulties with unacceptably high failure rates [14] although it appears that blended learning incorporating MOOCs may be having greater success.

Results of research conducted on MOOC participation and completion suggest that successful learners are predominantly established independent learners [3] who have a high level of academic or professional education and are used to learning in traditional ways [4]. Studies consistently show that, in general, over 80% of MOOC participants already have a degree. For all the amount of effort expended on course development and discussion of the MOOC mission, there is as yet little evidence that MOOCs are really having significant impact in widening participation. Barriers to starting or progressing on these courses still seem to be significantly higher for the very groups they might be hoped to target. While this remains the case, MOOCs will find it difficult to move beyond being leisure activities or career progression opportunities for those who already have a high level of education.

2.3 MOOC pedagogy

Although MOOC attrition may be the result of many factors, a number of which are outside the control of MOOC providers, the structure and pedagogy used in any educational course influences the ability and motivation of students to continue and to achieve their learning objectives. For example, activities which promote deeper learning, practices which encourage learner engagement, collaborative working and strategies allowing users to be actively involved in planning and directing their own learning have all been associated with lower levels of attrition [40]. At the time of initial MOOC enthusiasm, very little consideration had been given to the pedagogy appropriate for this novel type of course or for supporting the target audiences. Indeed, many of the courses were (and still are) recorded versions of existing traditional courses. Although pedagogy is now mentioned in more research articles, in many cases it is speculative and further, it is unclear how far it has started to influence the design of MOOCs. A recent study sponsored by the Gates Foundation concludes that the methods of learning generally employed in the main MOOC platforms are content-focussed, do little to foster self-regulation, and promote passive learning [7]. The study also found that, despite the potential for discussion and collaborative learning through forums and online debate, in practice this was not achieved and levels of interaction were poor.

One further aspect of note is that MOOCs are very often valued for their provenance. That is, courses may be held in esteem simply because they come from a world-ranking institution. FutureLearn are not alone in publicising their offerings by statements such as: “Enjoy free online courses from top universities and cultural institutions” [19]. However, it is not necessarily the case that such institutions have best understanding of appropriate pedagogy for supporting the majority of MOOC participants.

2.4 Assessing MOOC quality

Drop-out figures may be deprecated as a means of judging MOOC success, but nevertheless, measures are needed to assess MOOCs, the quality of their teaching and learning and their ability to engage and support a diversity of learners. There has been growing concern over MOOC quality, as evidenced by, for example, the EFQUEL MOOC quality project [12] in which contributors considered the issue from a variety of perspectives (for example, quality for different stakeholders; quality of information to learners and quality of peer interaction). Conole [10] approaches the issue from the perspective of quality of learner experience, linking this to quality enhancement through learning design. The ‘7Cs of Learning Design’ suggested by Conole constitute a fairly abstract checklist of points for course developers to consider (‘Conceptualize’, ‘Capture’, ‘Communicate’ and so on). The ‘Consider’ aspect focuses attention on course design, content and activities but does not provide specific guidance on how to do this or what criteria should guide development of an evaluation rubric (referred to as ‘Consolidate’).

The ‘OpenupEd’ quality label is provided by the European OpenupEd MOOC portal as a benchmark for quality assurance in MOOCs [34]. The OpenupEd initiative provides a set of benchmarks and a self-assessment instrument based on an existing initiative for e-learning in Higher Education. At an institutional

level, 21 features are identified, such as having an overarching e-learning strategy and stating the relationship of its MOOC portfolio to its mainstream curriculum. Eleven course-level factors are included. These are a mixture of fairly specific desirable properties (such as an open licence and clear statement of objectives) and targets relating to content (such as accuracy and clear presentation). Much of the benchmark is process related. While a focus on process is one valuable and long-recognised approach to course quality assurance, it does not necessarily relate to how learners experience the course, how they engage with it or the outcomes they achieve.

A quality assurance approach using high level guidelines is also taken by Read and Rodrigo [32]. They propose a 5-point metric to assess course structure (including, for example, specificity of topic and ensuring learning materials are in short chunks). This work appears predicated on MOOCs which are largely adaptations of existing courses to a MOOC format.

The paucity in assessment methodologies for MOOCs contrasts with the accepted practices in development of measures of ‘good’ learning in general. As we see in the next section, not only is quality of process and application of instructional design principles recognised, but emphasis is also placed on the need to assess the product by focussing on students, what they achieve and how they interact with the course and learning activities. Without this perspective, often elicited via student experience and engagement surveys, courses would be in danger of being decoupled from the student dimension derived from the experienced reality of learners.

3 Student Engagement in Higher Education

Given the importance traditional learning now places on experience and engagement data, it is of concern that so little attention has been given to it in the context of MOOCs. This section introduces the concept of learner engagement and considers the concept in relation to MOOCs.

3.1 Student Engagement in Higher Education

Over the past decade, there has been increasing emphasis on assessing the learning benefits to students of (traditional) HE courses. Learning gain is notoriously difficult to measure, and one model for gathering information is to focus on student experience which is easier to determine. Many surveys (such as the UK’s National Student Survey) provide a national measure of student satisfaction and generate data which is made public to provide, for example, information for applicants. While helpful, such surveys do not give much insight on students’ learning activities nor on the educational strength of their course. There has thus been a move to assess student engagement.

Engagement is generally characterised as a multi-dimensional construct, referring to students’ interactions in behavioural, emotional and cognitive spheres. Major international survey instruments, such as the widely used North American National Survey of Student Engagement (NSSE) [27], investigate engagement largely at the behavioural level. Engagement is seen not simply as an attitude of

the student but as resulting from the synergy between the style of provision of the course and the behaviour of the student. As defined by Trowler: [41, p3]:

Student engagement is concerned with the interaction between the time, effort and other relevant resources invested by both students and their institutions intended to optimise the student experience and enhance the learning outcomes and development of students and the performance, and reputation of the institution.

Engagement surveys such as NSSE identify high impact activities associated with high levels of learning, personal development and skills acquisition [24]. These are used as the basis for the instrument's benchmarks which investigate how much time students spend on each. Some have questioned the validity of the instruments used and the legitimacy of viewing the benchmark indicators as easy-to-implement proxies for learning gain [29]. However, a good deal of research indicates that they do correlate to learning gain [28] and they are now used in many countries including North America, Canada, Australia, New Zealand, China and the UK. While we share the concerns over legitimacy of the instruments and the need to interpret results with caution, we use this conceptualisation of engagement for current purposes as it is the prevailing, most widely measured perspective on engagement.

While the uses to which engagement survey data is put may be questioned, these surveys nevertheless come from a perspective which is entirely lacking in assessment of MOOCs. By considering the profile of learners across a particular course (or subject) they address the issue of the types of activities a course is in general encouraging participants to engage in. They investigate whether students spend all their time sitting in lectures, or if they are actively engaged in more active and analytical tasks associated with effective learning. These are questions which are currently not being asked of MOOCs.

NSSE is currently the most widely used student experience survey with 561 institutions in the US and Canada participating in the 2015 survey [27]. The survey instrument and benchmark groupings have been adapted and developed by other national surveys, but most have used NSSE as a starting point. NSSE benchmark areas and the key indicators which contribute to them are:

academic challenge assessed by 17 questions covering reflective learning, higher order learning, learning strategies and quantitative reasoning;

learning with peers assessed by 8 questions covering aspects of collaboration and diversity;

experiences with faculty assessed by 9 questions relating to student-staff interaction and effective teaching practices;

campus environment assessed by 13 questions relating to quality of interactions and supportiveness of environment.

While some of the questions asked (such as opportunities for research activities with faculty) may not seem directly relevant to student learning they have been identified as being associated with high levels of learning gain [42]. Such measurements should not be taken uncritically and care must be taken in how

they are interpreted. It is also likely that some aspects will not be applicable to online courses, and specifically to MOOCs. However, the approach of investigating student experience can offer some insights into MOOCs and suggest a way of providing an alternative framework (or at least one aspect of a framework) for benchmarking MOOCs. As noted above, the activities assessed in engagement surveys are exactly those which are identified as being associated with desirable outcomes such as high levels of learning and low attrition. If it is beneficial for on-campus students to be spending their time on high impact learning activities, it is also desirable for learners on a MOOC to do so (although the benchmark activities may need to be different in the context of a MOOC).

3.2 Student Engagement in MOOCs

In the growing MOOC literature, student engagement is a recurring theme. However, the term is generally used in a different way to its conceptualisation within the engagement surveys. Student engagement in MOOCs overwhelmingly refers to student actions such as videos watched, quizzes answered and posts made to forums. In some cases, this is a basic count, in others the time spent on the various activities and the scores obtained in assessments are used. These measures quantify the level of activity with respect to the resources provided, but do not question whether that activity is likely to lead to meaningful learning. Activities that are considered are generally either any signs of a student's presence in a given session or are chosen from the parts most students are likely to access (watching recordings, submitting quiz attempts or posting to forums). Some studies use student engagement patterns to classify users into different types, but the main way the data is employed is in predicting drop-out. Prior to our work, only one study on MOOCs [31] referred to student engagement in the sense used by the surveys, yet even in this work, the measures relate to counts of posting, viewing and so on, and are intended to predict student survival on a course.

The position with connectivist MOOCs (cMOOCs) is a little different as there is more emphasis on active, user-centred engagement. Learning is not simply via viewing and reading resources but involves actively creating and communicating knowledge within a networked community. In this respect, and with their emphasis on creativity and connected learning, cMOOCs are much more likely to involve students in high-impact activities. However, cMOOCs have issues of their own and, while they have provided an inspirational experience for some participants, others have found them confusing and lacking in direction. They also represent a very small minority of current MOOC provision.

In a context in which engagement has apparently not been considered as a high priority in MOOCs and that no corresponding engagement factors have been identified it is perhaps not entirely surprising that MOOC learning experiences are found, in general, to be mainly passive and unable to harness or promote aspects such as learner involvement and self-regulation to a significant degree [7].

4 How do MOOCs fare on engagement measures?

Student engagement instruments elicit the extent to which students on a course are engaged in high impact activity. In this section we consider how this relates to

what students on a MOOC might spend their time doing. Here, we are considering the more common “xMOOC” format and, of necessity, referring in generalities to the activities most commonly provided by major platforms.

4.1 Engagement benchmarks

The specific benchmarks used and the questions which evidence them differ between surveys. NSSE, the largest and longest-running engagement survey, sets 10 key indicator areas: Higher Order Learning, Reflective Learning, Learning Strategies, Quantitative Reasoning, Collaborative Learning, Discussions with Diverse Others, Student-Faculty interaction, Effective Teaching Practice, Quality of Interactions and Supportive Environment. Each is evidenced by a group of questions which provide very specific measures contributing towards each benchmark area. The full NSSE survey instrument can be viewed at the NSSE website [27]. The following are examples of NSSE questions to indicate the structure and the level of data sought. Participants are asked to state how often they have performed certain activities, with answers on a 5-point Likert scale ranging from Very Often to Never. Activities that were investigated include whether the learner:

- asked questions or contributed to course discussions;
- asked another student to help them understand course materials;
- connected their learning to societal problems or issues;
- examined the strengths and weaknesses of their own views on a topic or issue;
- connected ideas from the course to their prior experiences and knowledge;
- discussed their academic performance with a faculty member;
- summarised what they learned in class;
- worked with a faculty member on a research project.

Participants are also asked how much emphasis there is on a range of activities such as memorizing course material, applying facts and theories, evaluating information, doing assigned reading. Further questions illicit information on provision (such as giving feedback and support), and on knowledge, skills and personal development.

Other engagement surveys differ in emphasis, in the specific questions asked, in the groupings into benchmarks and in the additional information they elicit. However, the intention of each is to investigate levels of activity promoted by the course which have been demonstrated to relate to high learning gain.

4.2 Typical MOOC activities

Within many MOOCs, activity is centred around video presentations. These are often used to introduce a topic, with additional reading suggested to encourage learners to explore further. Forums are widely used to facilitate active, social participation and to provide a means for discussion and support either from tutors

or peers. Real time conversation may also be incorporated using, for example, Google Hangouts. Quick quiz assessment is a main form of assessment as this is automatically marked and can therefore be used for large numbers of participants. Peer assessment may also be employed to allow feedback and evaluation of more detailed assignments such as essays or programming tasks. The creation of digital artefacts such as a blog is also often employed as a means of encouraging engagement and reflective learning.

In Higher Education, it has long been recognised that lectures are a very passive form of engagement and videos are even more so. Forums may in theory provide the opportunity for active, collaborative learning but in practice they are often used only by a minority and, in larger MOOCs, the proliferation of threads can become confusing and difficult to navigate. Virtual study groups and peer review are used to encourage social learning and to encourage skills of critical analysis and reflection (as well as being scalable).

In practice, many learners have encountered serious difficulties with the operation of these methods which in themselves create barriers to learning rather than enhancing it. The conception of engagement encompasses both the provision of activity by the course and the degree to which learners participate in each type of activity. However, a third component is also important: the degree to which the course encourages, enforces and supports the use of the most meaningful and beneficial activities by the student. The pedagogies which are used to achieve this are also vitally important.

An initial inspection suggests that the engagement measures used for traditional learning might fall into the following categories for the main MOOC platforms:

- well-supported in main MOOC formats (such as opportunity for interaction with diverse others);
- representation within main MOOC format but current evidence suggests that existing pedagogy and technology are not serving the purpose well for most students (such as contributing to discussions);
- could be incorporated but are currently not much in evidence (such as connecting ideas to prior experience and knowledge);
- would be hard to support within current mainstream formats (such as discussing academic performance with faculty members);

In addition, there may be additional engagement measures which could be identified which are more appropriate to a MOOC context than the NSSE-style one, such as the time spent in creation of digital artefacts.

Some developers, such as Edinburgh University's EDCMOOC (E-learning and Digital Cultures), are attempting to push the boundaries of the generic MOOC platforms to include more good educational practice. Public resources (videos and readings) are harnessed and linked by text and questions, with students being guided yet expected to find their own learning path [23]. In particular, EDCMOOC sought to improve the area (notably high impact) of interaction between students and staff which is often lacking in MOOCs. Teaching presence was maintained in the usual MOOC ways (forum responses, curation of materials and so on) but further supported by video discussion panels.

4.3 *Comparing with existing findings on MOOC engagement*

In the discussion above, we have used the NSSE survey (as the most widely-used instrument) and have referred to the engagement key indicators it uses. Initially based on NSSE, the UKES survey has evolved somewhat to suit UK needs but is still very similar in most respects. The UKES is administered on an optional basis by UK universities, and limited public information on results is published through an annual overview report [6]. A recent report for the UK's Higher Education Academy (HEA) was conducted by Wintrup, Wakefield and Davies to gather engagement data relating to the UKES from users of two MOOCs offered by the University of Southampton, UK [45]. This data, collected from 974 MOOC participants, thus provides information relevant to the current consideration of NSSE key indicators. Some of the results from that study can be grouped according to the NSSE indicators. We show here how these results can be used to indicate areas of particular strength and weakness according to indicators. UKES results are generally on 4-point Likert scales with options: Very much / Quite a bit / Some / Very little (or slight variations depending on the context of the question). The percentage figures in Figure 1 combine the two most positive options relating to the engagement indicators shown. The HEA report [45] provides a detailed account of the Southampton study.

It should be noted that these results were obtained from just two MOOCs, both by the same provider and both on the FutureLearn platform. Further, the survey was administered at the end of the courses and thus represents the perspective of 'successful' (at least in terms of perseverance) learners. However, this data provides an interesting example of a MOOC engagement profile. Some aspects appear to be very similar to those reported for many other MOOCs (for example, the demographic and the level of participants' previous learning). However, there are also aspects in which these courses are atypical. For example, it was the designers' intention to engage participants in their research [45] which explains why the responses relating to this aspect are impressively high. In this respect the MOOCs surveyed cannot be viewed as being representative, however, they do demonstrate what can be achieved when such factors are specifically designed into the course.

The results highlight issues for engaged learning in MOOCs and raise questions about how the potential of MOOCs is being harnessed. One striking result is the low reported occurrence of collaborative learning. The Southampton results indicate that 30% or more of MOOC participants never contribute in any way, and around 90% do not seek support within the learning community. It should be noted that the respondents were the 'active' course members who had continued study to the end of the course.

While it is hardly surprising that contact is lower and collaboration less than for a face to face course, the extent to which the vast majority of MOOC participants are 'going it alone' raises questions about the effectiveness of current approaches to encouraging social and collaborative learning and how they can be improved. Given the nature of MOOCs and the lack of tutor-led, central support, one of the main resources such a course has is its diversity of learners and the support they can provide for each other. Indeed, the building and use of online

<p>Higher order learning</p> <p>Areas of strength Over 70% of participants formed a new understanding from the course.</p> <p>Areas of weakness Fewer than 40% applied their learning in new situations. Roughly 50% spent very much or quite a bit of time memorising material.</p> <p>Academic challenge</p> <p>Areas of strength Nearly 70% of participants felt quite challenged.</p> <p>Collaborative learning</p> <p>Areas of weakness Just over 20% of learners explained work to others, while only around 10% asked others for help. Less than 30% discussed ideas outside the course, and only around 20% contributed often by asking questions or joining discussions.</p> <p>Reflective and integrative learning</p> <p>Areas of strength Around 70% of participants frequently connected ideas from the course to other life experiences and felt that the course had changed the way they understood an issue.</p> <p>Areas of weakness Most students did not often connect their learning to 'real' problems or try to view an issue from the perspective of others.</p> <p>Development of learning skills</p> <p>Areas of strength Nearly 70% felt the course helped them become independent learners and engaged them to think critically.</p> <p>Areas of weakness Only 15% of respondents in one course and 28% in the other felt their course related significantly to work issues or to solving real world issues.</p> <p>Engagement with research</p> <p>Areas of strength In one of the courses, over 90% of participants felt they learned a lot about current research, with this figure being over 60% for the other course.</p> <p>Areas of weakness Less than 20% of participants felt they were actively contributing to creating knowledge.</p>

Figure 1 Strengths and weaknesses for MOOC engagement based on data from Wintrup, Wakefield and Davies [45]

communities is often claimed as one of the positive factors and main strands of pedagogy for MOOCs. However, in practice, this does not appear to be happening. Collaborative learning is a currently under-utilised feature which needs to be explored.

It is very encouraging to see that reported levels of reflective learning and higher order learning are high. Also, most students felt challenged to produce their best work. However, there was a surprisingly large amount of memorisation of material, and a low score on application of knowledge and connecting learning to real problems.

The HEA exercise demonstrates the possibility of using an engagement survey for MOOC evaluation. The report states that “The constructs used in the UKES 2014 appear to be meaningful to MOOC learners” [45, p8]. However, this points to a current difficulty with the use of face-to-face engagement questions used

in this context. Engagement instruments in a traditional teaching context have been the subject of much research-based enquiry linking the factors investigated to favourable outcomes within such courses (high attainment and low attrition). However, no such work has yet been carried out in the context of MOOCs. It may be that certain aspects are fundamental to effective learning whatever the format. Other measures may not be appropriate in current mainstream MOOC contexts although some might be altered to fit the situation. New measures may also be identifiable which are significant in a MOOC context. With no validation of such instruments in the current context and no clear link to desirable learning outcomes, further work is needed to establish the most appropriate MOOC engagement measures.

5 Learning in MOOCs

Instead of counting accesses to videos, a better indicator of MOOC student engagement may be to investigate the learning time devoted by students to different types of beneficial learning time. Further, in assessing MOOC quality, it may be more beneficial to ask how far a course leads participants towards engaging with activities most associated with high levels of learning. Evaluation then relates to what types of learning activity (and learning) a MOOC promotes, and engagement is about students' interaction with meaningful learning experiences.

The need to provide more active learning has been recognised by some MOOC commentators [7]. Indeed, Daphne Koller, co-founder of Coursera, has advocated breaking videos into 10 minute chunks interspersed with activities and using social media to encourage interactive study groups. However, there is still a long way to go in setting out an agenda for more active, higher impact MOOC learning. It may be said that current xMOOCs provide the opportunity for high impact learning activity. For example, learners may be forming themselves into effective groups for peer collaboration and using the opportunity to benefit their learning through interaction with diverse others. But we need to ask how often this is actually happening, and to what extent MOOCs are leading students toward this type of activity. Further, we need to investigate what opportunities there are to increase the levels of high impact activity within a MOOC format. The need to understand and support the 'community' nature of MOOC learning may be a crucial aspect here as there is potential for a great diversity and richness of learning collaboration and peer interaction.

The results of the HEA survey provide promising indications of successful aspects of MOOC engagement and suggest area where provision could be improved. However, it should be remembered that the participants surveyed are largely already educated to degree level and are therefore likely to be reasonably proficient as independent learners. Further, as the survey is at the end of the course it catches only those who have made it to the end. If MOOCs are to be the hoped-for disruptive vehicle for change, widening access and providing opportunities to those who would otherwise be unable to participate, we need to consider how to engage an entirely different demographic. A less experienced group of learners may be less able to succeed without help in learning how to engage within a MOOC, and this in itself may necessitate different criteria for measurement.

It has long been recognised that transitional phases of learning (such as from school to university) present a critical phase for the learner which course providers need to manage and support. Certainly, the importance of transition to a new learning environment, greater learning independence and new ways of learning is seen as crucial for those starting university, and drop-out rates have been linked to the inability to make that step effectively. Similarly, the move from traditional learning to a MOOC learning environment necessitates a very different approach to learning. This points to the need to better understand the concept of learning in MOOCs and the associated learning strategies which will best equip learners to succeed.

One further issue relates to the learners' perspective on what they spend their time working on and how they prefer to learn. The problem is illustrated by the difficulty in establishing communities of learners and encouraging participants to be active within them. Just as in traditional teaching, it is sometimes difficult to convince learners of the benefit of collaboration. Course developers may see the benefit of such strategies but unless learners share this commitment then they may choose more passive activities. This may be particularly true if learners feel that more active contribution takes them 'out of their comfort zone' and it may be useful to focus on pedagogy which could draw students towards active participation. It may also be appropriate to make learners more aware of the importance of different educational activities.

Any attempt to increase the engagement of learners requires a realistic understanding of the necessary commitment for effective learning. Convenience is important for learners and most have time constraints which mean that the possibility of learning a subject in a few hours per week and in small chunks is very attractive. However, the image of learning as bite-sized, compartmentalised and passively soaked-up can lead a learner away from activities which may require time and thought to develop and which may expose their thoughts and ideas to thousands of other learners.

6 Discussion

Although there is currently no conclusive data, it appears that learners on many MOOCs are spending much of their learning time on activities which are not generally associated with high learning gain. When time is limited, it may well be the more time-consuming reflective and interactive activities that are skipped. It is certainly the case that most published measures of student engagement for MOOCs assess very narrow areas of participation some of which (notably watching videos) can be very passive activities. This contrasts with the current perspective on student engagement in HE in general and the approach to assessment being widely adopted worldwide. While there are legitimate doubts about the interpretation of SE surveys, the aim of investigating the amount of 'worthwhile' activity seems a very useful one. Engagement measures have attained a high level of importance in HE with aggregated results widely available and even in some cases the suggestion that university funding might be linked to such surveys. While this level of response may be a little alarming, it highlights the difference between traditional courses and MOOCs. While MOOCs are perceived

as leisure activities for the highly-educated, this gap may not be an issue. But as soon as claims are made that MOOCs can, for example, solve participation problems in HE and experiments are undertaken to replace more traditional methods, the concerns become very real.

It has long been known that passive pedagogies are not the best way for students to learn, so it is odd that such measures of learning are deemed acceptable when considering MOOCs. Research shows that some learning activities are more associated with high levels of learning than others. So why are we evaluating traditional courses in this way but continue to limit measures of MOOC success to counts of how many times learners watch videos? In terms of evaluation, quality and the hope of reducing drop out rates, we may wish to consider what high impact activities MOOCs promote and what students on these courses are in practice spending their learning time doing.

Related to the issue of engagement is the need to understand what pedagogies can effectively engage students in the MOOC context and can cater to a diversity of learners. There is an acknowledged lack of effective pedagogy in MOOCs. Measures that might be hoped to increase engagement and interaction (such as forums and peer review) have proved problematic in MOOCs and results on whether participation is associated with learning gain are mixed. One question that therefore needs to be addressed is what engagement measures are the most appropriate for MOOCs. There are aspects which would be difficult to replicate, but in other areas (such as interaction with diverse others and opportunities for social learning) there is massive potential even if the way to harness it is as yet elusive. Current engagement survey instruments are unlikely to be directly appropriate for MOOCs, but a selection of relevant questions already provides a starting point. Investigating MOOCs from the perspective of engagement opens up the discussion on which high impact activities can be framed within this context.

There is a great deal here for future research, but there are also immediate lessons which could be of value as recommendations for MOOC developers.

Developer awareness Some MOOCs, such as the Southampton ones referred to here, have demonstrated that it is possible to achieve high levels of desirable activity and content (such as links to current research) factors if the instructional design incorporates them. If developers work with engagement measures in mind, then the result is likely to be more engaging MOOCs. In a number of countries, engagement survey questions are a well-publicised fact of life and teachers of traditional university courses keep engagement in mind because they know that they and their courses will be judged on it. While the reliance placed on engagement data might be open to criticism, a similar level of awareness of the issues amongst MOOC developers is needed in order for such considerations to become part of the design.

Evaluation from an engagement perspective Measuring learning analytic features such as videos watched can provide good, predictive information. However, if evaluation is limited to this, opportunities are missed to explore the students' involvement with activity most likely to promote effective learning. If engagement data is collected, it can also provide a benchmark which could be used as a basis for improvement.

Promoting understanding of effective learning to participants Providing engaging activities gains little if learners opt to spend their time in passive, less demanding ways. Another option is to ensure that routes within courses necessitate a larger amount of active, engaged learning.

Engaging a diversity of learners and developing learning skills A MOOC must be flexible enough to take into account the different cognitive profiles and learning skills of its users. This is needed in order to genuinely widen participation (that is, the MOOC should not be accessible only to those who already effective learners). It is however an issue which is not straightforward given the wide range of learners, experiences and needs.

Incorporating and scaffolding productive learning activities As noted in the previous point, learners do not necessarily start with good learning skills. MOOCs need to consider both how to incorporate activities which foster the development of learning skills and how to ensure learners interact with these activities. For example, summarizing, paraphrasing and evaluating material are all recognised activity for prompting higher-order learning (relating to Bloom's taxonomy). There is no reason why activities which require these steps should not be incorporated in a MOOC as central elements. This however also links to the earlier point concerning raising learner awareness about productive activity.

Improving collaboration While many MOOC provide collaborative activities of some kind, many users do not engage in them. It may be useful to investigate other areas which could help suggest techniques to improve this. For example, in some game-based approaches, collaboration is "forced" for the purposes of game progression. Small groups are formed dynamically - a technique which could be useful in the context of a MOOC where learners enter and leave the environment constantly.

7 Conclusions and Future Work

There are many reasons why students drop out of MOOCs. High attrition rates are likely to be, at least in part, a symptom of problems within the course. But because of the diversity of causes they are not in themselves a meaningful measure of what is going on in a MOOC. We need to consider further the nature of the courses and the activities they incorporate. One approach to this is to consider them (and participants' interaction with them) in terms of the level of meaningful, high impact, engagement activity. This paper makes the case for the need to understand MOOCs from the student engagement perspective. MOOCs are different to face to face courses or even to 'traditional' online learning courses. Student engagement is likely to need a different interpretation but the questions to be asked are similar: to what extent is it possible to promote engagement in MOOCs? Are there different (possibly new) aspects that constitute appropriate high impact activities for MOOCs? Making progress on this agenda will lead to a clearer strategy for course evaluation.

We are currently investigating engagement within a wider range of MOOCs with the aim of developing appropriate measures of engagement for the MOOC

context. The discussion in this paper has been framed in the context of Higher Education instruments such as NSSE and UKES. This has also been the approach in the MOOC engagement exercise at Southampton. However, it should be questioned as to whether we should also be looking at engagement from a school perspective. MOOCs are not all university level and neither are they all for experienced, degree-level learners. There may therefore be much to learn from other conceptualisations and contexts of engagement which may be appropriate. A further area of current work is the exploration of different, more flexible MOOC formats which allow the user to become a more active participant in directing and regulating their own learning.

Finally, we believe that a number of questions raised in this paper are still open ones. In particular: can stand-alone MOOCs provide a good learning experience for more than an exclusive few participants (mainly those with existing learning skills and experience)? It may be that other ways of using MOOCs (such as for blended learning or flipped classrooms) can be harnessed to good learning effect, but if MOOCs appeared to have little prospect of achieving this there would be reason to question their rationale for the purpose of widening participation.

References and Notes

- 1 P. Altbach. MOOCs as neocolonialism: Who controls knowledge? *International Higher Education*, (75):5–7, 2014.
- 2 P. Baron and L. Corbin. Student engagement: rhetoric and reality. *Higher Education Research & Development*, 31(6):759–772, 2012.
- 3 Y. Belanger and J. Thornton. Bioelectricity: A Quantitative Approach. Duke University's First MOOC. Technical report, Duke University, 2013. Accessed 22/10/15.
- 4 M. M. Ben-Ari. MOOCs on introductory programming: a travelogue. *ACM Inroads*, 4(2):58–61, 2013.
- 5 R. Boyatt, M. Joy, C. Rocks, and J. Sinclair. What (Use) is a MOOC? In *The 2nd International Workshop on Learning Technology for Education in Cloud*, pages 133–145. Springer, 2014.
- 6 A. Buckley. Surveying student engagement in the UK, 2014.
- 7 Caledonian Academy. PL-MOOC: Professional Learning through Massive Open Online Courses. <http://www.gcu.ac.uk/academy/pl-mooc/>. Accessed 14/10/15.
- 8 G. Christensen, A. Steinmetz, B. Alcorn, A. Bennett, D. Woods, and E. J. Emanuel. The MOOC phenomenon: who takes massive open online courses and why? *Available at SSRN 2350964*, 2013.
- 9 D. Clow. MOOCs and the funnel of participation. In *Third Conference on Learning Analytics and Knowledge*, 2013.
- 10 G. Conole. MOOCs as disruptive technologies: strategies for enhancing the learner experience and quality of MOOCs. *Revista de Educación a Distancia*, 39:1–17, 2013.
- 11 Coursera. <https://www.coursera.org/>. Accessed 22/10/15.
- 12 A. Creelman, U. Ehlers, and E. Ossiannilsson. Perspectives on MOOC quality - an account of the EFQUEL MOOC quality project. *INNOQUAL-International Journal for Innovation and Quality in Learning*, 2(3), 2014.

- 13 J. Daniel. Making sense of MOOCs: Musings in a maze of myth, paradox and possibility. *Journal of Interactive Media in Education*, 3, 2012.
- 14 K. Devlin. MOOC Mania Meets the Sober Reality of Education. *Huffington Post*, 19 August 2013.
- 15 M. Ecclestone. MOOCs as a professional development tool for librarians. *Canadian Journal of Library and Information Practice and Research*, 8(2), 2013.
- 16 edX. <https://www.edx.org/>. Accessed 22/10/15.
- 17 Escher, G. and Noukakis, D. and Aebischer, P. Boosting Higher Education in Africa through Shared Massive Open Online Courses (MOOCs). *Education, Learning, Training: Critical Issues for Development*, page 195, 2014.
- 18 F. Furedi and R. Attwood. Satisfaction and its discontents. *The Times Higher Education Supplement*, 2040, March 2012.
- 19 Futurelearn. <http://futurelearn.com/>. Accessed 22/10/15.
- 20 L. Huin, Y. Bergheaud, P. A. Caron, A. Codina, and E. Disson. Measuring completion and dropout in MOOCs: A learner-centered model. *Proceedings of the European Stakeholder Summit on experiences and best practices in and around MOOCs (EMOOCs 2016)*, page 55, 2016.
- 21 K. Jordan. Initial trends in enrolment and completion of massive open online courses. *The International Review of Research in Open and Distributed Learning*, 15(1), 2014.
- 22 R. Kizilcec, C. Piech, and E. Schneider. Deconstructing disengagement: analyzing learner subpopulations in massive open online courses. In *Proceedings of the 3rd international conference on learning analytics and knowledge*, pages 170–179. ACM, 2013.
- 23 J. Knox, J. Ross, C. Sinclair, H. Macleod, and S. Bayne. Mooc feedback: Pleasing all the people? In *Invasion of the MOOCs*, pages 98–104. Parlor Press, 2014.
- 24 G. Kuh. The National Survey of Student Engagement: Conceptual framework and overview of psychometric properties. *Bloomington, IN: Indiana University Center for Postsecondary Research*, pages 1–26, 2001.
- 25 T. Liyanagunawardena, S. Williams, and A. Adams. The impact and reach of MOOCs: a developing countries perspective. *eLearning Papers*, (33), 2013.
- 26 M. Nanfito. *MOOCs: Opportunities, Impacts, and Challenges: Massive Open Online Courses in Colleges and Universities*. CreateSpace Independent Publishing Platform, 2013.
- 27 NSSE: North American National Survey of Student Engagement. <http://nsse.iub.edu>. Accessed 20/10/15.
- 28 E. Pascarella, T. Seifert, and C. Blaich. How effective are the NSSE benchmarks in predicting important educational outcomes? *Change: The Magazine of Higher Learning*, 42(1):16–22, 2010.
- 29 S. Porter. Do college student surveys have any validity? *The Review of Higher Education*, 35(1):45–76, 2011.
- 30 S. Quaye and S. Harper, editors. *Student engagement in higher education: Theoretical perspectives and practical approaches for diverse populations*. Routledge, 2nd edition, 2014.
- 31 A. Ramesh, D. Goldwasser, B. Huang, H. Daume III, and L. Getoor. Learning latent engagement patterns of students in online courses. In *Twenty-Eighth AAAI Conference on Artificial Intelligence*, 2014.

- 32 T. Read and C. Rodrigo. Toward a quality model for UNED MOOCs. *eLearning Papers*. http://www.openeducationeuropa.eu/en/elearning_papers, (37), 2014.
- 33 R. Rivard. Measuring the MOOC dropout rate. *Inside Higher Ed*, 8 March 2013.
- 34 J. Rosewell and D. Jansen. The OpenupEd quality label: benchmarks for MOOCs. *INNOQUAL: The International Journal for Innovation and Quality in Learning*, 2(3):88–100, 2014.
- 35 C. Sandeen. Integrating MOOCs into Traditional Higher Education: The Emerging MOOC 3.0 Era. *Change: The Magazine of Higher Learning*, 45(6):34–39, 2013.
- 36 J. Sinclair, R. Boyatt, J. Foss, and C. Rocks. A tale of two modes: initial reflections on an innovative MOOC. In *3rd International Workshop on Learning Technology for Education in the Cloud*, pages 49–60. Springer, 2014.
- 37 J. Sinclair, R. Boyatt, C. Rocks, and M. Joy. Massive open online courses (MOOCs): a review of usage and evaluation. *International Journal of Learning Technology*, 2015. Accepted for publication.
- 38 J. Sinclair and S. Kalvala. Engagement measures in massive open online courses. *Proceedings of 4th International Workshop on Learning Technology for Education in Cloud*, 2015.
- 39 T. Sinha, N. Li, P. Jermann, and P. Dillenbourg. Capturing “attrition intensifying” structural traits from didactic interaction sequences of MOOC learners. *Proceedings of the Empirical Methods in Natural Language Processing Workshop*, 2014.
- 40 T. Sitzmann and K. Ely. Sometimes you need a reminder: the effects of prompting self-regulation on regulatory processes, learning, and attrition. *Journal of Applied Psychology*, 95(1):132, 2010.
- 41 V. Trowler. Student engagement literature review. *York: Higher Education Academy*, 2010.
- 42 P. Umbach and M. Wawrzynski. Faculty do matter: The role of college faculty in student learning and engagement. *Research in Higher Education*, 46(2):153–184, 2005.
- 43 A. Vihavainen, M. Luukkainen, and J. Kurhila. Multi-faceted Support for MOOC in Programming. *SIGITE 12*, 2012.
- 44 D. H. Welsh and M. Dragusin. The New Generation of Massive Open Online Course (MOOCs) and Entrepreneurship Education. *Small Business Institute® Journal*, 9(1):51–65, 2013.
- 45 J. Wintrup, K. Wakefield, and H. C. Davis. Engaged learning in MOOCs: a study using the UK Engagement Survey. 2015. http://eprints.soton.ac.uk/373640/1/HEA_engaged-learning-in-MOOCs.pdf. Accessed 04/03/2016.
- 46 D. Yang, T. Sinha, D. Adamson, and C. Rose. Turn on, tune in, drop out: Anticipating student dropouts in massive open online courses. In *Proceedings of the 2013 NIPS Data-Driven Education Workshop*, volume 10, page 13, 2013.