Chapter 21: The Virtuous Circle of Learning Design and Learning Analytics to Develop Student-Centred Online Education

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Abstract
Over the last decade, blended and online education have become mainstream approaches to deliver learning opportunities to a range of learners. In particular, with the affordances of different pedagogical models in blended and online provision there has been a heightened expectation of more student-centred Learning Designs (Sharples 2019). Allowing students to work online together in a digital space has never been so easy. At the same time, providers of blended and online learning as well as the learners themselves feature more diverse characteristics. Whether or not teachers actually design online education opportunities for these diverse sets of learners has received some conceptual attention, but relatively few studies have empirically tested whether teachers actually design inclusive learning environments. In this chapter, we will explore the lived experiences of teachers who have aimed to introduce student-centred approaches in their online environment at one of the largest providers of online education, the Open University UK, and how we can distil success criteria from effective student-centred approaches that work online.
From Distance Learning to Online Education

In the last 20 years there has been unprecedented change in higher education, in part driven by a fundamental shift in Technology Enhanced Learning (TEL, Kirschner, Beers, Boshuizen & Gijselaers 2008; Palvia et al. 2018; Sharples 2019). With the increased availability of technology, both in the hands of teachers and students, the boundaries between formal education and informal learning have been stretched, and become increasingly blurred (Ferguson et al. 2019). As also indicated in Part IV of this book, thanks to a range of TEL innovations, in terms of synchronous (e.g. online gaming, social media, web-videoconferencing) and asynchronous tools (e.g. chat, email, discussion forums) over the last 20 years, an unprecedented richness and diversity of technological affordances have become available for teachers to design, support, and evaluate student-centred learning (Belland, Kim & Hannafin 2013; Kember & Ginns 2012; Rienties & Toetenel 2016; Struyven, Dochy & Janssens 2011).

Furthermore, another boundary that has become substantially blurred is that between distance learning, blended, and face-to-face provision by higher education institutions. While distance learning environments have been present for nearly 200 years (Madge et al. 2019), a tremendous surge of distance learning provision has emerged in the last 20 years across the globe (Tait 2018). In parallel, with the maturing of many distance learning provisions and blended learning provisions in “traditional” face-to-face universities, an increasing number of these traditional universities have stepped into the online market and have provided a range of blended and online educational products (Palvia et al. 2018, Shah 2018).

A very good example of the increased blurring of boundaries between formal and informal learning as well as online versus face-to-face provision are the rise of Massive Open Online Courses (MOOCs). With the conception of MOOCs, the growth of online education expanded worldwide. Recent research indicates that 11 thousand MOOCs are available for 101 million learners in 2018 (Shah 2018). While many of the early MOOCs were available free of charge and open to all in 2012-2016, online learning has become a mainstream vehicle (Palvia et al. 2018). At the same time, providers of blended and online learning as well as the learners themselves have become more diverse (Ferguson et al. 2019, Sie et al. 2018). Although initially instigated by Higher Education Institutions, other organisations such as non-profit organisations, universities, related companies and venture capitalists increasingly provide online education, often for free or for a relatively low fee. Whilst commercial
companies, for instance, mainly attract professionals, who are mainly interested in short courses to supplement their own professional development, the arrival of these wide-ranging organisations means that the demographics of learners taking part in online education have also broadened. As such, it is even more important to ensure that these widening demographics are considered in the Learning Design process.

What is Learning Design?

Online learning has changed the way in which courses are produced (Belland et al. 2013, Conole 2013, Laurillard 2013). Whereas classroom-based courses are mainly designed by a single teacher or a small group of practitioners, online education is often produced by a larger group of various experts from subject matter experts to media specialists (Olney, Rienties & Toetenel 2018). Classroom-based sessions are typically fairly flexible and dependent on the expertise of the teacher. In an online environment, the learning experience cannot be quickly adjusted or even ‘rescued’ by an additional activity or intervention from the teacher, once the online curriculum is ‘in motion’. As highlighted by a range of studies (Herodotou et al. 2019; Wan, Liu, Yu & Gao 2019; Wong & Li 2018), successful interventions in online learning environments are often difficult to implement, as issues are often identified far too late to warrant an intervention. As such, online teaching has become a ‘design science (Laurillard 2013, Wang & Hannafin 2005) where the ultimate goal of improving teaching quality by supporting practitioners along the process of designing innovative and more effective learning situations (that is, producing “Learning Designs”) (Hernández-Leo et al. 2018, p. 1).

The definition of Learning Design has various meanings in these different settings (Bakharia et al. 2016; Conole 2013; Dalziel 2003; Mor, Ferguson & Wasson 2015). For instance, many training providers use the terms Learning Design and instructional design interchangeably (Conole 2013, Dalziel 2003). This can be related to the size of the organisation, as in smaller settings, such as corporate environments, an instructional designer will also be responsible for pedagogy. Conole (2013, p. 121) described Learning Design as “a methodology for enabling teachers/designers to make more informed decisions in how they go about designing learning activities and interventions, which is pedagogically informed and makes effective use of appropriate resources and technologies”. Learning Design can be described as a process of creating a blueprint for a course, designed for the anticipated student population, consisting of pedagogic activities. Descriptions of these designs (e.g. blueprints, Learning Design visualisations) are used, as well as “pedagogical patterns, learning patterns and pattern
Learning Design enables educators to articulate how educational contexts, learning, and assessment activities are designed to promote effective learning interactions with an ultimate aim to facilitate learning (Bakharia et al. 2016).

The Open University (OU), the largest provider of distance learning in Europe, has been an early developer and adopter of Learning Design (Conole et al. 2008). Perhaps more importantly, while many institutions have started to think about Learning Design, the OU is one of the few institutions that have implemented Learning Design on a large scale, with hundreds of modules being mapped and analysed. As indicated by a review of ten years of Learning Design practices at the Open University UK (OU) by Rienties, Nguyen, Holmes, and Reedy (2017), the origin of Learning Design at the OU was an attempt to save costs by templating module materials. The OU Learning Design Initiative (OULDI) (Cross, Galley, Brasher & Weller 2012) in consultation with eight higher education institutions aimed to explore how to effectively build a framework to map and identify the diverse Learning Design activities. More recently, Learning Design data is also being used to help build a richer picture of the learning behaviour of students (Mangaroska & Giannakos 2018; Nguyen, Rienties, Toetenel, Ferguson & Whitelock 2017). Although Learning Design is widely studied in blended and online education, the consistent application of it has been lacking, as often the original design of a course is very different to the final offering taken by learners (Toetenel 2018).

In the rest of this section, we will describe how the OU has implemented and enhanced the OULDI approach in practice by explaining the four underpinning principles of its implementation of Learning Design. Based upon five years of experience of running dozens of OULDI workshops for 200+ modules, as well as many published research projects at the OU and abroad (Mittelmeier et al. 2018), we believe that Learning Design is most effective when designed in multi-disciplinary collaborative teams, Learning Designs are effectively visualised, are student-centred, and combined with Learning Analytics.

**Multidisciplinary Collaboration**

With the expansion of blended and online learning, the need to include staff from different teams within an institution becomes increasingly important, as well as ways of ensuring that staff collaborate effectively together (Herodotou et al. 2019; Stalmeijer, Gijseleers,
Wolfhagen, Harendza & Scherpbier 2007). As such, this is one of the key principles for a collaborative Learning Design approach, as bringing academic staff together with experts from other units within the institution helps the module team to focus on areas of expertise outside their own discipline or expertise, and think about the module in a more holistic way (Rienties et al. 2016). For example, including members of the library and employability teams in the Learning Design process means that their specialist knowledge can inform skills development in the module material right from the initial design stage. This collaborative approach enables more innovative design decisions and has been found to be more effective when compared to teachers working as individuals (Kinshuk, Chen, Cheng & Chew 2016; Toetenel & Rienties 2016a).

**Visualisations**

Designing learning materials in a multidisciplinary group is an abstract process, and as such it is difficult to ensure that all members of the design team have a common understanding. It is difficult to share ‘the idea in your head’ until it has been developed. Visualisations can be an excellent vehicle to communicate abstract ideas within a group of people, including staff (Agostinho 2011; Jivet, Scheffel, Specht & Drachsler 2018; Schwendimann et al. 2017) and students (de Quincey, Briggs, Kyriacou & Waller 2019; Hillaire, Rappolt-Schlichtmann & Ducharme 2016). Visualisations of Learning Design can “support teaching staff in better understanding what is happening on their course” (García et al. 2012, p. 111). For example, Conole et al. (2008) argued that a shared vision for the learning to be created is an important element of Learning Design. Indeed, a large-scale implementation study of 148 Learning Designs at the OU by Toetenel and Rienties (2016b) found that the use of visualisations enabled educators to include a larger range of student-centred learning activities in their courses. Without being able to see the course design, teachers are more likely to use assimilative activities. By contrast, when they can see their course visualisations, they adjust their learning materials towards more active learning, such as enabling students to find information themselves (finding information) or share the information with their peers (communication) (Toetenel & Rienties 2016b). Therefore, visualisations can help to make design decisions apparent, providing benefits that are as similar as possible to immediate feedback (Mangaroska & Giannakos 2018, Olney et al. 2018).

Furthermore, a visualisation can be reviewed once it has been drafted. Using visualisations allows you to “play back” and review decisions made (Agostinho 2011, Bakharia et al. 2016,
Dalziel 2003, Toetenel & Rienties 2016b). This means that teachers can also review designs from successful modules, or modules which were particularly successful for a specific group of students. Such an approach allows teachers to learn from previous design iterations in order to make informed decisions and, ultimately, to tailor the learning material more to the needs of their students.

**Student-Centered**

Learning Design is most effective when the approach is student-centered. In effective Learning Design workshops, a diverse team of staff including subject matter experts as well learning and instructional designers will be asking questions such as: What will students do in this module? Will all students engage with the module in similar ways? How much will they be reading? What practical activities will they do? This is a change from traditional Learning Design (MacLean & Scott 2011), as subject matter experts expect learners to complete all learning activities and engage in all materials that is offered as part of the course. Furthermore, traditionally subject matter experts focus mainly on the disciplinary content, rather than the learning experience (Norton, Richardson, Hartley, Newstead, & Mayes 2005; Rienties, Brouwer & Lygo-Baker 2013). In a student-centred Learning Design approach the diverse needs of the learners are the starting point of the course design, from which the learning activities are designed, the content is of secondary importance (Conole 2013, Hernández-Leo et al. 2018, Mittelmeier et al. 2018, Nguyen et al. 2017). In practice, this means that a high level, initial Learning Design is produced which is suitable for the anticipated learners who are expected to undertake the course. In Table 1 the seven key Learning Design activities that teachers can choose from are illustrated. These range from “traditional” learning activities like assimilate and assessment, to more student-centred approaches like finding and handling information, communication, productive, experiential and interactive.

Insert Table 1 here.

In 2015, the OU introduced a refined method for retrospectively analysing and coding learning materials. This method relied on module authors to specify how much time students should spend on an activity, for instance “read the article and then spent 10 minutes on commenting on it and responding to your peers in the forum”. It also relied on “conventions” where, for instance, the word count for all reading material was calculated and then divided
by the relevant reading speed to calculate the time students would be expected to spend on these learning materials. These conventions included a different assumed reading speed for different levels of student and also varied based upon the complexity of the material. For example, the convention for assessing a legal text would be different to a case study, even if both texts were included in the same module. The use of standard conventions for a diverse student population seems to contrast with a student-centred learning approach, but using a standardised way of categorising learning, means that modules can be compared like-for-like at an institutional level. This becomes even more important when considering this fine-grained analysis in combination with completion data as discussed later in this chapter.

An example of a high-level initial Learning Design draft is shown below. The planner in Figure 1 was designed for an access course in Arts and Social Sciences, which introduced learners to higher education. As such, these courses aim to be highly practical, with relatively limited reading and mainly formative assessment activities. At this initial design phase, educators considered the respective learning objectives that the course was targeting. Beyond the knowledge and understanding learning objectives, there was a specific focus on practical skills that might be useful to start a higher education journey, such as P1 developing a learning plan and P2 reflective practice.

Insert Figure 1 here.

Subsequently, the educators discussed how the Learning Design taxonomy could address the respective learning objectives and decided what the balance of activities should be for the module. As indicated in Figure 2, just over half of the activities, or 101+ hours of study, were focussed on assimilative activities, such as reading, watching and listening; a further 42 hours were devoted to productive activities, such as doing, creating and making; and the remaining 40 hours were devoted for assessment. Only 1.7 hours were devoted to communication (student-to-student, teacher-to-student, student-to-teacher) activities in this access module, as practical experience indicates that many participants in access modules can find it overwhelming to have to work with others.

Insert Figure 2 here.
Once a high-level design was agreed, the module team then produced the learning activities based upon the initial design, as illustrated in Figure 3. In this particular block of learning activities, learners were “expected to find their own voice” by critically working through a range of different written historical and contemporary texts and media-artefacts. In week 2, for example, students were expected to spend three hours reading through sections 1.1-1.4 about the use of language, and at the same time work through seven productive activities for two hours, such as interpreting and understanding a letter written in Jane Austin’s *Pride and Prejudice*, or working through a modern poem. By mapping these activities both on a macro and a fine-grained level, teachers can share their student-centred Learning Designs with their peers more effectively. Some may also share this directly with their students.

*Insert Figure 3 here.*

Research from the OU (Toetenel & Rienties 2016b, Cross et al. 2012) showed that actual learning materials are often different from the balance of activities stated in the original design. For example, Olney et al. (2018) described how Learning Design visualisations were reviewed with several module teams in a pilot project on this innovative approach. These visualisations, which included the first four weeks of study, were mapped for a module that was already in progress. The actual activities were then reviewed against the anticipated activities established in the Learning Design workshop. The study found that the student-centred communication activities in the actual module were much lower than anticipated. The review also found that the workload on the course was significantly different than anticipated and, in some weeks, exceeded the guidance.

A retrospective review of learning tasks is not only helpful in improving learning materials, but it can also help to provide context or explain findings in research projects. For instance, Toetenel (2018) coded the intended task design and the actual learning materials for an English language class using the fine-grained Learning Design coding methodology described earlier in this chapter. This enabled a comparison of the actual and final design, which subsequently helped to explain unexpected findings. The initial design for Toetenel’s (2018) study showed highly productive (33%) and communicative (25%) activities, in line with the Sociocultural theories that informed the task design for the class, but the actual time that students spent on communicative activities was much lower. In other words, whilst the study’s aim was for students would spend the majority of their time producing materials (text,
cartoons, posts on the social networking sites) and communicating about their work, the actual design conveyed a different balance of activities. Toetenel (2018) found that students focussed more on ‘finding and handling information’ tasks and ‘assessment’ tasks than initially envisaged, and less time on communication and simulation activities. The time spent on productive tasks (i.e. students produce an artefact or a piece of written work) was higher than initially planned. These findings may have contributed to the unexpected finding that peer interaction on the social networking site was lower than initially anticipated.

The findings in this section have substantial implications for teachers both in terms of task design and evaluation of their teaching materials. It is easy for even an experienced practitioner to stray away from their intended educational objectives when they start writing learning materials. The coding of learning materials following set conventions can be helpful in evaluating learning materials before they are released to students.

**Learning Design and Learning Analytics**

As indicated before, TEL developments have allowed researchers to capture the digital traces of student and teacher learning activities in learning management systems (LMS). These rich and fine-grained datasets of actual learner behaviours offer educators incredibly valuable insights into how students react to specific Learning Design activities. This unprecedented increase in education data has also given birth to the field of learning analytics. Learning analytics is defined as “the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs” (Ferguson 2012). As highlighted by a recent systematic literature review by Mangaroska and Giannakos (2018) of 43 Learning Design & learning analytics studies, considerable literature has emerged around the conceptual development of linking Learning Design and learning analytics (Bakharia et al. 2016, Lockyer et al. 2013, Persico & Pozzi 2015). Perhaps more importantly, there is also an emerging body of empirical studies (e.g. Hernández-Leo et al. 2018, Nguyen et al. 2017, Rientes & Toetenel 2016, Toetenel & Rientes 2016b) showing how Learning Design and learning analytics are inherently intertwined.

Several OU studies were conducted linking activity type data with data from student behaviour. For instance, Rienties and Toetenel (2016) compared Learning Design data for 151 modules (111,256 students) with student behaviour, satisfaction and performance data.
using multiple regression models. The study found that students behaved in the LMS relatively congruent by completing activities at certain peak times. The study found a negative correlation between an over-reliance on assimilative activities and academic retention, where excessive or unequal workload per week exacerbated the issue. Furthermore, the study found that the primary predictor for academic retention was the time spent on communication activities in blended and online environments. At the same time, it is perhaps surprising that the amount of communication activities was typically rather limited in these 151 modules, with on average just 5% of all learning activities, and a substantial number of modules having no communication activities. Follow-up research by Nguyen, Rienties, Toetenel, Ferguson, and Whitelock (2017) on longitudinal design decisions by OU design teams amongst 74 modules with 72K students indicated that 38 Learning Design activities per week significantly predicted 68% of LMS behaviour per week. In plain English this means that nearly two-thirds of behaviour of students on a week-by-week basis are determined by how teachers design these online courses. As the empirical research clearly suggests a link between Learning Design, learning behaviour, and academic outcomes, surely a substantial part of the typical high drop-out rates in distance education should also be linked to how teachers design and improve their courses over time.

The different use of learning materials can have significant impact on success. For example, Nguyen, Huptych and Rienties (2018) found that students’ timing of engagement did not match the Learning Design. In fact, most of the “successful” students tended to work ahead of the course schedule, whilst those that failed the module increasingly spent their time catching up from previous weeks. This became more problematic later on in the module, where “failed students spent on average much higher proportion of their time on catching up activities compared to passed and excellent students” (Nguyen et al. 2018, p145). Interestingly, the proportion of activities in a module had a significant impact on whether students work ahead or not. In modules with a higher proportion of assimilative and assessment activities, successful students would spend more time studying in advance, which disadvantaged less successful students; “one hour increase in productive activities was associated with 7.25% increase in the time spent on catching up” (Nguyen et al. 2018, p146).

Obviously one of the main challenges for learning analytics research is to deliver actionable feedback, which might be achieved by taking into account the context in which the learning data is situated (Joksimović, Gašević, Loughin, Kovanović & Hatala 2015; Rienties &
Toetenel 2016). As eluded earlier, by showing learning analytics data to teachers as well as Learning Design data, Herodotou et al. (2019) showed that teachers can actively intervene when behaviour is not aligned with Learning Design or, where necessary, redesign the respective learning activities. In other words, there is an increasing interest in aligning learning analytics with Learning Design, as the former facilitates making tacit educational practice explicit, while the latter provides educators with pedagogical context for interpreting and translating LA findings for direct intervention (Bakharia et al. 2016, Lockyer & Dawson 2011, Lockyer et al. 2013, Mor et al. 2015, Persico & Pozzi 2015).

**Case Study: Hybrid Design of MOOC Content and Formal Accreditation**

The original MOOCs were driven by the open educational resources (OER) movement (Margaryan, Bianco & Littlejohn 2015) and, as such, were available free of charge. However, a lot has changed in the educational landscape since 2012, “the Year of the MOOC”, and many MOOCs now offer different participation levels, including pathways that are available for a charge (Blackmon 2018; Rizvi, Rienties, Rogaten & Kizilcec 2019). Some courses approach this by making a subset of their materials available free of charge, whereas others offer all learning materials for free but charge when learners want to partake in the assessment elements.

Some consider the early MOOCs more as a movement, led by prominent faculty members promoting their research field (Blackmon 2018; Kizilcec, Saltarelli, Reich & Cohen 2017). These early MOOCs encouraged students to collaborate on projects, for instance, as a more creative experience than the majority of MOOCs provided now on platforms such as Coursera. These initial MOOCs are also referred to as the cMOOCs, as based upon a connectivist pedagogy, which are based upon the belief that learning is founded in social relationships, although the extent and nature of their participation can be freely decided by the participant (Kizilcec et al. 2017; McAuley, Stewart, Siemens & Cormier 2010).

In contrast, the xMOOC is based upon a more traditional Learning Design as it uses video lectures, effectively converting traditional classroom lectures to a new medium. These video lectures are often supplemented by opportunities for peer-review and group collaboration, quizzes, and automated feedback. Most MOOCs seem to be well-packaged, in terms of the use of media, navigation, and easy presentation of course materials (Margaryan et al. 2015). However, Margaryan et al. (2015) also found that MOOC design quality was low, and
different learning needs were only considered in one of the 76 MOOCs evaluated. This is even more pertinent considering the diversity of learners that undertake MOOCs (Kizilcec et al. 2017, Rizvi et al. 2019). As a result of this diversity, Deng, Benckendorff, and Gannaway (2019) found that learners displayed a variety of intrinsic, extrinsic, and social motivations for their participation. Indeed, analysis of MOOCs in Europe by Brasher, Weller and McAndrew (2016, p. 166) suggested “combining instructional principles and guidelines of xMOOCs and cMOOCs.” However, both the lack of pedagogical diversifications and high workload have often failed to bring fundamental change to the educational landscape (Schulmeister 2014).

Given these developments, we specifically selected a MOOC module called Module X that was both relatively student-centred and could be combined with formal accreditation. Module X considered in this case study is an assessment vehicle to assess the learning completed in eight MOOCs in the Business and Fundamentals program available from Future Learn, as indicated in Table 2. FutureLearn is owned by the OU and is the largest MOOC provider in Europe when the number of enrolled learners are considered (Rizvi et al. 2019, Shah 2018). It employs a social-constructivist pedagogical style, mainly visible in activities on its forum, which are designed so that learners are encouraged to ‘comment’ on the learning content. As such, FutureLearn promotes ‘learning through conversations’ (Chua, Tagg, Sharples & Rienties 2017, Ferguson & Clow 2015). The module requires 9-10 hours of study each week in addition to the 96 hours of study for the MOOCs.

Insert Table 2 here.

Module X followed a collaborative design approach, whereby a multi-disciplinary team spent a day in a Learning Design workshop. The team consisted of faculty members, specialists in the areas of digital literacy and employability, media designers and Learning Design facilitators. Activities during the day focussed on exploring learner characteristics, based upon evidence drawn from the MOOC enrolments. Activities considering learning aims, support requirements, and place of the module within the qualification were also considered, working towards an overall outline for the module.
The module focused on assessing the principles, concepts and terms central to business and personal finance. Students were asked to work through two case studies so that they could demonstrate analysis of problems in business and finance and suggest improvements for financial decision making. As part of the module, more generic employability skills were also tested, such as utilising digital tools and numerical skills, as well as setting personal goals in a professional and ethical manner.

Module X included a range of media, including a podcast, which outlined the module rationale and the links between the material covered in the completed MOOCs and the assessment in this module. Module X included several forum activities that enabled students to construct and later in the module ‘test’ their analysis and recommendations, before submitting them in their assignment. Students were also asked to use existing free web tools to, for instance, manage simple project management tasks, such as a Gantt chart and create a budget plan. The distribution of student activity across the seven categories and workload shown in Figure 4.

Insert Figure 4 here.

The planner is based upon a detailed week by week overview of outline activities in each of the pedagogical categories using the Learning Design taxonomy used by the OU, as included in Table 1. For instance, the time reading the case studies is classified as assimilative, whilst the time spent on a peer discussion in the forums is labelled as communication. When students create a budget plan or a Gantt chart, this would be classified productive.

Module X’ structure is different to the majority of FutureLearn courses mapped by the OU, which often have a balance of assimilative, communication, adaptive, and assessment activities, which in line with FutureLearn’s socio-constructivist approach (Chua et al. 2017, Ferguson & Clow 2015, Rizvi et al. 2019). These categories in the MOOCs are often based upon two types of assimilative activities (video, article), two types of assessment activities (test, quiz) and one communication activity (discussion). Whereas quizzes in MOOCs are available to all learners, the test is only available to learners who pay for their course (Rizvi et al. 2019). Only the learners who paid for the MOOCs are eligible for Module X, as they need
to submit their certificates for the individual MOOCs as well as successful completion of Module x to ensure that they receive 30 credits.

**Conclusion**

As highlighted in this chapter an increasing number of institutions and academics are using principles of Learning Design to map blended and online learning practices, while at the same time using principles of learning analytics to link actual student behaviour with the respective Learning Design. Student retention is vital to the continued success learning providers, as such understanding what factors play a role in success, such as workload and activity design, may play a role in motivating students to continue studying (Li *et al.* 2017, Rienties *et al.* 2016, Toetenel & Rienties 2016a). Learning Design continues to gather pace as it grows, informs, and is informed by, new developments in educational practice (Mangaroska & Giannakos 2018). As indicated in this chapter, although approaches that employ a Learning Design approach enable teachers to design creative and student-centred online courses, in reality, many teachers only include limited student-centred activities and primarily focus on assimilative and assessment learning activities.

A second important reflection from this chapter is that using a Learning Design taxonomy enhances the clarity of visualisations, and enables teachers and management to compare courses which can provide insight into the student learning experience (Nguyen, Rienties & Toetenel 2017; Nguyen, Rienties, Toetenel *et al.* 2017). By linking the visualisations of Learning Design with learning analytics data, this approach allows researchers and practitioners to critically analyse and reflect on what learners are doing, giving a different and unique view from those that only measure students by their academic ability. When looking only at utilisation data on the platform without these fine-grained Learning Design data, it is hard to develop an understanding of the pedagogical context that influences student activities, and how identifying patterns in students’ learning behaviours can be used to influence and contribute to more positive teaching and learning experiences (Bakharia 2014).

Designers of learning need to leverage the use of Learning Design and data, to focus on developing students’ skills and natural predispositions by offering activities that are pedagogically sound and engaging. To accommodate an ever-greater diversity in the student population, Learning Design needs to be directed towards personalising learners’ experiences and developing learning activities which accommodate learners’ strengths, interest, and
aspirations. This means that different pathways need to be designed for learners, and the risks relating to excessive workload and overreliance on assimilative and assessment activities should be mitigated. Also, educators need to re-think their role of simply being providers of knowledge, to designers and facilitators of personalised learning.
References


Chua S.M., Tagg C., Sharples M. & Rientes B. (2017) Discussion analytics: Identifying conversations and social learners in FutureLearn MOOCs. Paper presented at the FutureLearn data: what we currently have, what we are learning and how it is demonstrating learning in MOOCs. Workshop at the 7th International Learning Analytics and Knowledge Conference, Vancouver, British Columbia.


Table 1: Learning design taxonomy

<table>
<thead>
<tr>
<th>Type of activity</th>
<th>Assimilative</th>
<th>Finding and handling information</th>
<th>Communicating</th>
<th>Productive</th>
<th>Experiential</th>
<th>Interactive / Adaptive</th>
<th>Assessments</th>
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<tbody>
<tr>
<td>Attending to information</td>
<td>Reading, watching, listening, thinking, accessing, observing, reviewing, studying</td>
<td>List, analyse, collate, plot, find, discover, access, use, gather, order, classify, select, assess, manipulate</td>
<td>Communicate, debate, discuss, argue, share, report, collaborate, present, describe, question</td>
<td>Create, build, design, construct, contribute, complete, produce, write, draw, refine, compose, synthesise, remix</td>
<td>Practice, apply, mimic, experience, explore, improve, model, engage</td>
<td>Explore, experiment, trial, improve, model, simulate</td>
<td>All forms of assessment</td>
</tr>
<tr>
<td>Searching for and processing information</td>
<td></td>
<td>Discussing module related content with at least one other person</td>
<td>Actively constructing an artefact</td>
<td>Applying learning in a real-world setting</td>
<td>Applying learning in a simulated setting</td>
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Example:
- Reading, watching, listening, thinking, accessing, observing, reviewing, studying.
- Discussing module related content with at least one other person.
- Actively constructing an artefact.
- Applying learning in a real-world setting.
- Applying learning in a simulated setting.
- All forms of assessment.
Table 2: Structure of Module X

<table>
<thead>
<tr>
<th>Course</th>
<th>Study time</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Business Fundamentals MOOC: Effective Communication</td>
<td>12</td>
<td></td>
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<tr>
<td>Business Fundamentals MOOC: Effective Networking</td>
<td>12</td>
<td></td>
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<tr>
<td>Business Fundamentals MOOC: Customer Engagement</td>
<td>12</td>
<td></td>
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<tr>
<td>Business Fundamentals MOOC: Project Management</td>
<td>12</td>
<td></td>
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<tr>
<td>Business Fundamentals MOOC: Personal financial planning and budgeting</td>
<td>12</td>
<td></td>
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<tr>
<td>Business Fundamentals MOOC: Managing the household balance sheet</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Business Fundamentals MOOC: Investment theory and practice</td>
<td>12</td>
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<td>Business Fundamentals MOOC: Financial services after the banking crisis</td>
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<td>Module X Business and Finance Fundamentals</td>
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Figure 1: Learning objectives of Module A

Figure 2: Aggregate activity planner Module A
Figure 3: Fine-grained activity planner Module A

Figure 4: Activity planner Module X