Learning Design – creative design to visualise learning activities

The focus on quality improvements by institutions for better online and blended teaching can be delivered in different ways. This article reports on the implementation of this process and the approaches taken; first, in terms of the design of new learning materials, and second, when reviewing the existing curriculum. The study aims to ascertain whether the combination of a collaborative, networked approach at the initial design stage, augmented with visualisations, has changed the way educators design their courses at The Open University. Analysis of 148 learning designs, show both before and after the introduction of Learning Design, which of the pedagogic decisions that educators made substantially changed. Courses that were designed after the introduction of Learning Design were more focused on the development of a range of skills and included fewer assimilative activities (reading, watching videos and listening to audio). Our findings suggest that by visualising the design upfront, educators focussed less on traditional teaching patterns, such as the "teach, practice, apply" model. Remarkably, just by visualising initial decisions and working in collaborative workshops educators created more student-centred and creative designs aimed to develop a range of skills which support students in both their studies and the workplace. Further studies are needed to establish whether these pedagogic decisions have an impact on student outcomes and whether these findings can be replicated in different institutions.

Keywords: Learning Design, pedagogy, Learning Analytics.

Introduction

The need for Higher Education to focus on learning and teaching is becoming more pressing. Students in the UK are paying higher fees than ever before and the political drive to improve the teaching provided by Higher Education institutions is becoming more insistent. A significant proportion of Higher Education institutions are responding to this change by introducing mandatory teaching qualifications for staff (Parsons, Hill, Holland, & Willis, 2012) in line with the requirement that by 2020 all staff teaching in Higher Education should have received certified pedagogical training (José Couto, 2013, p47). Pedagogical training includes instruction relating to course and curriculum design, as well as delivery. At The Open University (OU), delivery of online learning is partly supplied by associate lecturers who provide support and tuition, and partly through the teaching materials. The terms 'instructional design' and 'learning design' are used when describing the design of teaching materials in an online environment and both terms are often used interchangeably, even though the theories on which they were founded are divergent. MacLean and Scott (2011) suggest that this is because both 'instructional design' and 'learning design' are the application of theories relating to learning and instruction with the aim of creating learning experiences and the learning materials to support these experiences. This article is based upon the learning design methodology described by Conole (2012) discussed in the next section.

In 2014/2015, to improve the quality of the learning experience for students, the OU implemented a mandated Learning Design approach across the various disciplines. This article reports on the implementation of this process and the approaches taken; first, in terms of the design of new learning materials, and second, when reviewing the existing curriculum.
This work build on previous studies (Author A 2015, Author A 2016a; 2016b) which have found that learning design decisions made by OU teachers indeed substantially influence actual student behaviour, satisfaction and academic performance. Building on these three studies, we were keen to explore whether

(or) not the use of learning design workshops could help to nudge teachers to design relatively more student-centred courses.

This article compares the learning designs of 80 courses that were developed prior to the introduction of Learning Design at the OU with the designs of 68 courses that were produced after it was mandated (March 2014). This study took place at the OU, which is the largest Higher Education provider of distance education in Europe. With over 200,000 students undertaking 400+ courses, the OU is a market leader in the provision of online content. Unlike traditional universities, the OU does not restrict enrolment on the basis of previous attainment, resulting in a widely varied learner population (Richardson, 2013). A new process for designing the curriculum and mapping modules (i.e. analysing and providing visualisations of module learning activities and resources) has been developed as part of a university-wide initiative which aims to improve student outcomes by the introduction of a Learning Design process. This ground-breaking study considers whether, by visualising course design amongst a large number of modules, different pedagogical decisions are made. More specifically, this study explores whether these decisions lead to courses that are more skills-based, include more support materials, and make less use of traditional teaching methods, such as lecturing.

Learning Design approach to curriculum design

Learning Design is widely studied in the Higher Education sector, but the definition of this concept has various meanings in different settings and 'similar work has been carried out under such names as pedagogical patterns, learning patterns and pattern language' (Lockyer, Heathcote, & Dawson, 2013, p1441). Although originating from an attempt to reduce costs by developing models that could function as templates for new courses, the OU has since moved away from the use of defined templates as an institutional policy. However, individual faculties still see the benefits of a model-based approach and as a result in some faculties academics are guided by a model-based approach when creating a learning design for their courses.

More relevant than the provision of patterns or models for quality improvement is the idea that Learning Design enables a shared vision for the learning to be created (Conole et al. 2008). Designing learning materials is a collaborative process and as such it is difficult to share 'the idea in your head' until it has been developed. Visualisations can 'support teaching staff in better understanding what is happening on their course' (García et al., 2012, p111). Using visualisations also allows for a more collaborative approach as it is easier to "play back" and decisions made in order to arrive at a shared vision. The OU has adopted a Learning Design taxonomy approach developed by Conole (2010), fine-tuned by Cross, Galley, Brasher, and Weller (2012) in consultation with eight Higher Education institutions. Conole (2012, p121) describes 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'. The use of visualisations helps to make these decisions collaboratively, as has become apparent by decades of research (Mayer, 1992, 2003). For example, Verbert, Duval, Klerkx, Govaerts, and Santos (2013) have illustrated the benefits of 15 different types of data visualisations how teachers can make more informed learning design decisions. At the same time, Thompson et al. (2013) stress that an appropriate theoretical framework is essential to make learning interactions and designs visible to teachers and learners. Therefore, any design decision is immediately apparent in the visualisation produced, providing benefits similar as to immediate feedback (Whitelock & Watt, 2008) and allowing academic teams to learn from previous iterations in order to make informed decisions.

The Learning Design approach outlined in this section also supports the notion of 'constructive alignment' (Biggs, 1996) where activities that are undertaken by learners are matched to the

learning outcomes and assessment strategy. It is important to note here that learning outcomes are aligned to the overall course design, content and assessment, rather than a more singular approach where 'nothing is taught that is not assessed and nothing is assessed that has not been taught' (MacLean & Scott, 2011, p561). Skills are developed over time, in the case of an OU student, over a period of three to seven years, and not all skills are necessarily assessed in each learning design.

Workshop approach

In order to establish an upfront design for a new curriculum, a Learning Design workshop is held in which the course team focuses on designing a profile for student activity which will act as a 'blueprint' or profile for the new course. Bringing all academic staff together with experts from other units within the institution, for instance the library and employability teams, helps the course team to focus on skills development in their course material. Collaborative design is also found to be more effective compared to teachers working individually (Hoogveld, Paas, & Jochems, 2003). In the Learning Design workshop, this collaborative team undertakes a range of activities, which are tailored to the course, learners and possible design challenges that have been identified by the lead academic. Activities focus on analysing the data of the student population for similar courses; the course's/module's place in the qualification framework; and visualising the student body. As a result, further design challenges are identified. Through considering potential issues and restraints for the design in advance, the overall process aims to address these foreseen challenges. Other activities focus on identifying features for providing support and guidance; assessment; content and demonstration of learning; supporting the introduction of employability skills; digital literacy; and constructive alignment. The alignment of skills - in terms of employability is key: Guidry and Stevens (2014, p40) suggest that 'comparing skills required by employers must exist to ensure adequate preparation for students', suggesting that this alignment is not just important for students when they enter the workforce but also to support them during their studies.

This Learning Design approach contrasts with traditional course design approaches (MacLean & Scott, 2011) whereby content decisions normally are decided based on the topic to be delivered. This new Learning Design process supports teams in asking questions such as: What will students do on this course? How much will they be reading? Will they do any practical activities? This student-centred approach can feel alien to academic teams as they traditionally have considered only the course content before making any decisions about the delivery. It feels natural to practitioners to allocate content to the time available and then consider the best method of delivery, rather than establishing an overall design profile upfront. But it is important to improve practice as, due to this content-based approach, there are courses which have not been significantly updated for several decades (Conn, 2010). Collaborative design teams consider this workshop approach as a good way of making substantial progress in the initial design, as illustrated by a comment from a faculty staff member: 'I am feeling very proud of what has been achieved in a very short period of time'. Although this traditional approach might have been valid in a historic educational setting where the key consideration is what students need to know, today it is important to consider what students need to be able to know or find out, do, experience, produce and convey to be successful and find employment in a given subject area. As careers change over time, students need to be able to develop approaches in identifying content themselves in order to adapt to continuously changing employment market.

Tools for design

In order to visualise learning activity, a series of online tools were developed by the Institute of Educational Technology at the OU. The tools are accessible via an OU website, but hard copies were made available for use in the Learning Design workshops. In face-to-face workshops, course teams prefer to engage with paper and pen, rather than generating their learning designs

using the online tools. The use of a web-based database allows the OU to collect data about these initial designs which can then be shared across the University. It also enabled this Learning Design data to be combined with other data sets, including student outcome data and data relating to student behaviour on the virtual learning environment, in order to ascertain which design features are most effective. By capturing design challenges as identified in the workshop, course teams can consider particular design features to address a range of challenges and if changes are made later on in the development process, it is possible to review the design to verify that these changes are still in line with the overall plan for the curriculum.

A profile or 'blueprint' is produced using the learning design taxonomy, which consists of seven different learning activities (see Table 1). These categorisations were captured in an "activity planner", sometimes referred as to as a pedagogy planner: a planning and design tool supporting the development, analysis and sharing of learning designs (Diego et al., 2008). Figure 1 shows an activity planner for module X which outlines the percentage of time that students are expected to spend on each of the activity types. In the Learning Design workshop the course team decided on the distribution of student activity across the seven categories (indicated by the percentages) and workload as totalled in the directed study hours column.

- ➔ Insert Figure 1 about here
- ➔ Insert Table 1 about here

Mapping or 'coding' existing curriculum retrospectively

In addition to the benefits of visualising learning activities when designing a new curriculum, the use of the activity planner can also be helpful when reviewing a module for quality purposes or if changes need to be made. Visualising the learning design of a module or other piece of curriculum provides information at a glance and allows teams to compare their profile to those of other courses, either in their own discipline or with similar learning design approaches. To create the activity planner, activity within the module's weeks, topics, or blocks is categorised according to the learning design taxonomy (see Table 1). For instance, the activity in Figure 2 is a series of tasks that students undertake as part of the first year science module Y. This was a module designed to sit alongside the BBC television series and was produced prior to the introduction of Learning Design, but is not a 'typical' Open University module given the relatively strong focus on assimilative activities. However, it is a good example of how an activity includes a range of tasks and how these are broken down by the Learning Design specialist and categorised in order to estimate student workload.

- ➔ Insert Figure 2 about here

The activity consists of a series of four video clips, text and six questions. The academic team allocated one hour for these tasks, this is verified by calculating the time to complete these activities through the use of institution-wide conventions that include estimated reading speed and the estimated amount of time that students watch video clips. Once the estimated time is established, the Learning Design specialist breaks these activities down further by using the taxonomy in Table 1. For this activity, the Learning Design specialist allocated times to each of the different activities: 45 minutes for assimilative activities (watching the video clips and reading the text) and 15 minutes for assessment (completing the self-assessment activity). All the activities that take place in a week, or for this module a bi-weekly period, are analysed in this way and then entered into the activity planner. Figure 3 shows activity as part of the workload entered for week 1 and 2.. As stated previously, this is not a typical 'OU module' prior to the introduction of Learning Design, but it does give a good illustration of a module where the majority of student time is heavily focussed on assimilative activities.

- ➔ Insert Figure 3 about here

Once the mapping process has been completed by a Learning Design specialist, the Learning Design team manager reviews the completed module map before the findings are sent to the faculty. Course teams have the opportunity to comment on the data before the status of the design is finalised. This is in line with principles of Change lab and wider organisational change processes (Daly, Moolenaar, Bolivar, & Burke, 2010) which indicate that substantial time and opportunities for reflection are needed to embrace new ways of working. In other words, each completed visualisation is reviewed by at least three people, with substantial opportunities for reflection and revision, which enhances the reliability and robustness of the data relating to each learning design. The visualisations produced provide a context for any further analysis, for instance investigations into student pass rates, the level of utilisation of the virtual learning environment by students on a weekly basis, and student feedback. This context is important in order to make an informed decision as to whether changes need to be made to the pedagogy of the module, content, support or learning delivery.

Comparing pedagogy pre and post Learning Design

In addition to the benefits of the introduction of Learning Design, both at the initial design and retrospective mapping stages, the OU now has built up a database of its modules and their blueprints, as is evident from Figures 1 and 3. By capturing the pedagogic decision-making process, further analysis can be undertaken using this data. This study is only a first attempt at using this data to analyse whether the implementation of Learning Design has changed the way in which colleagues in the University design their courses. This study is only a first step in the analysis of this data; once all post Learning Design courses have run, this data will be combined with other data sources. The Learning Design data and associated student outcome and satisfaction data will provide a rich data source to assess the impact of pedagogical decision making on student satisfaction and success.

Method

The Learning Design data were extracted from the activity planner, which forms part of the web-based Learning Design tools, as displayed in Figures 1 and 3. This extract included data for 238 courses. We then cleaned the data and excluded the designs for informal learning courses, such as Massive Open Online Courses (MOOCs) and Badged Open Courses (BOCs), after which 148 courses remained. We split these into two categories: pre Learning Design and post Learning Design. As Learning Design was mandated from March 2014 and the target production time at the OU currently is 18 months, any modules available to students from September 2015 were classed as post Learning Design. Post Learning Design courses consisted of 68 modules, whilst the remaining 80 modules were classed as pre Learning Design.

First, we combined all pre Learning Design courses and calculated the average time students were asked to spend on the seven different activity types as per the taxonomy in Table 1. We did the same for the post Learning Design courses. We then calculated the workload in each group as a percentage of expected study time per credit. This was calculated by adding up the time allocated per activity for the study week. For modules that are recognised with 30 credits, the expected study time would be 300 hours, as a credit equates 10 hours of study. We then compared the total study hours per module to the calculated workload hours in order to compare the average workload as a percentage of the total for both data sets. The average was calculated first as the mean (sum of all variables, divided by the number of variables) and then as the mode (value that appeared most in the data set).

Findings

When comparing the data from the activity planner in both data sets, we found that the distribution of time designed for students to undertake various learning activities was

considerably different when comparing the 80 pre Learning Designs those of the post Learning Design. Figure 4 shows the breakdown of activities, first the pre Learning Design distribution, followed by the post Learning Design breakdown.

➔ Insert Figure 4 about here

These findings show that overall the pedagogic designs within the data sample substantially changed after the introduction of the mandated Learning Design process. New courses are much more focussed on the development of a range of skills and include less assimilative activities (reading, watching videos and listening to audio). Although students might be taking notes when engaging in assimilative activities, previous research by Author B (2015a, 2015b) indicated that students are less active compared to when they engage in other activities such as finding and handling information. Assimilative activities can also be considered as more teacher- led. Our initial findings suggest that by visualising the design upfront, educators focus less on traditional teaching patterns, such as the "teach, practice, apply" model that focuses on transmitting knowledge from the tutor to the learner (Hodgson, 2002), but instead create designs which enable students to develop a range of skills, not only in their studies, but also in the workplace. Further studies are needed to establish whether these pedagogic decisions have an impact on student outcomes and whether these findings can be replicated in different research settings.

When we analysed the workload of the modules both pre and post Learning Design, our findings suggested that the balance of workload pre and post Learning Design hardly changed. Pre Learning Design, the workload per course was 62% on average, thus the planned student activity for a course with 60 credits (600 hours of learning) was 372 hours on average, while this was 64%, or 384 hours, after the implementation of Learning Design. Both findings suggest that the workload on average is lower than the institutional target of 80%. Interestingly, when analysing the mode, or the value that occurs most, in this data set, the findings suggested that the implementation of Learning Design did have an impact. Prior to the implementation of Learning Design, most academic teams designed their courses with activities that led to a student workload of 82%, while after the implementation of Learning Design this decreased to 80%, which meets the institutional target of 80%. This could mean that after the implementation of these visualisations, most academic teams were able to be more precise in designing their workload figures to meet the institutional benchmarks.

Limitations

A potential limitation of this study is that the pre Learning Design courses were mapped retrospectively, while the post Learning Design courses were based on the profiles established as part of the Learning Design process. There might be a potential discrepancy between the designs of the courses and the actual materials produced in terms of students' activity. Further fine-grained studies comparing the initial design to the ensuing learning materials through retrospective mapping would help educators to better understand how pedagogical decisions are made 'in flight', when the learning materials are in production. Another possible limitation is lack of qualitative data (e.g. from module teams) to collaborate these findings.
Our previous studies have highlighted the crucial importance of learning design on student behaviour and performance. In our first study (Author A 2015), we found significant negative correlations between assimilative learning design activities and performance amongst 40 modules. By comparing the learning designs of 157 modules, in our second study we found that educators heavily rely on assimilative and assessment activities. In our third study, we found that learning performance of 111K students was significantly predicted by learning design, in particular the amount of communicative

activities. In other words, visualising learning design decisions is not a nice-to-have luxury for online and blended higher education institutions, but an essential component of providing a fit for purpose design for the 21st century online learner.

Conclusion

This study has shown that the introduction of Learning Design as a mandated process substantially changed the way that pedagogical decisions are made as courses that have been designed with Learning Design in mind are much more focussed on the development of a range of skills and include less assimilative activities (reading, watching videos and listening to audio). The way in which academics engaged in curriculum design collaboratively, combined with the use of visualisations, has improved the balance of activity that academic teams asked the students to undertake. Our initial findings suggest that by visualising the design upfront, educators focussed less on traditional teaching patterns, such as the "teach, practice, apply" model but created designs which develop a range of skills that support students not only in their studies but also in the workplace.

In terms of practical implications for the field, researchers, educators, and policymakers need to be aware of how these visualisations influence subsequent learning processes and learning performance over time. Further research that combines the Learning Design data with student outcome data and virtual learning environment data, building on the study (Author B, A & C, 2015), will help the University in improving its courses. This data source may also provide opportunities for further academic research in the effect of other modifications in future course designs and the use of these over time. By continuing to combine research data and institutional data, and exploring further connections between Learning Design and what learners do, we can improve our capacity to understand and enhance the learning journeys of our students.

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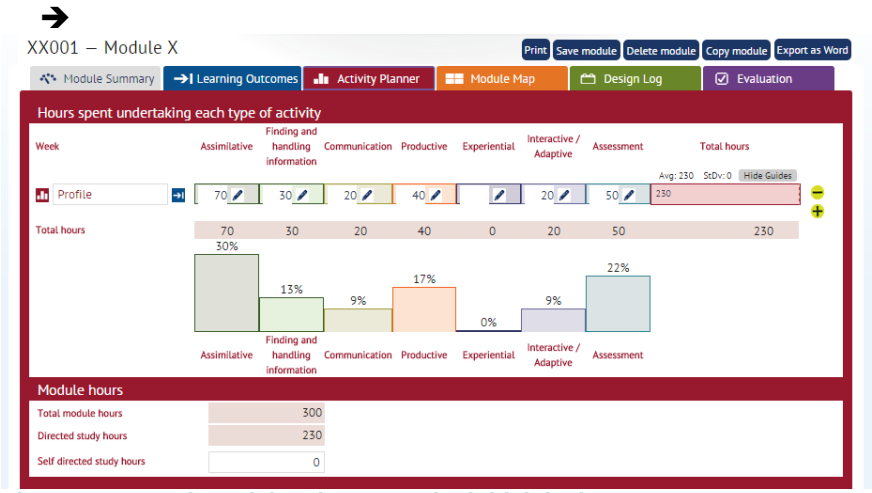

Figure 1. Example activity planner at the initial design stage

Activity 1.2 The poles: the most beautiful places on our planet

The estimated time for this activity is 60 minutes.

Main learning outcomes developed: KU3, KU5, KS2.

In your answer to Activity 1.1 you were asked your personal impressions of the polar regions. Because the regions are remote to most people, these impressions will most likely have been shaped by previous interaction with the media such as newspapers and television documentaries. In this activity you will view four clips from some of the most famous BBC Natural History Unit TV documentaries of the recent past. The clips were chosen because they are all at the beginning or very close to the beginning of the series (or episode).

The first clip is relatively long, but the other three are much shorter. Together these video clips represent a glimpse of 'the state of the art' of readily accessible information on the polar regions. They are also clearly aimed to shape your perception about the regions and they make some sweeping and general statements.

Before watching the clips get a notepad and pencil and keep a simple count of the numbers of different species of animals in the four clips and any other general statements that tell us about the polar regions. Don't worry about being too precise – remember to enjoy the clips as well.

After watching the clips think about and answer the questions that follow. You may wish to view the clips a second time to remind you of what was said.

Clip 1: From episode 1 of the BBC series Planet Earth (first broadcast in 2007) and is called 'From Pole to Pole'. (Duration: 14 minutes 41 seconds.) Download Show transcript

Figure 2 Example of activity as part of Module Y

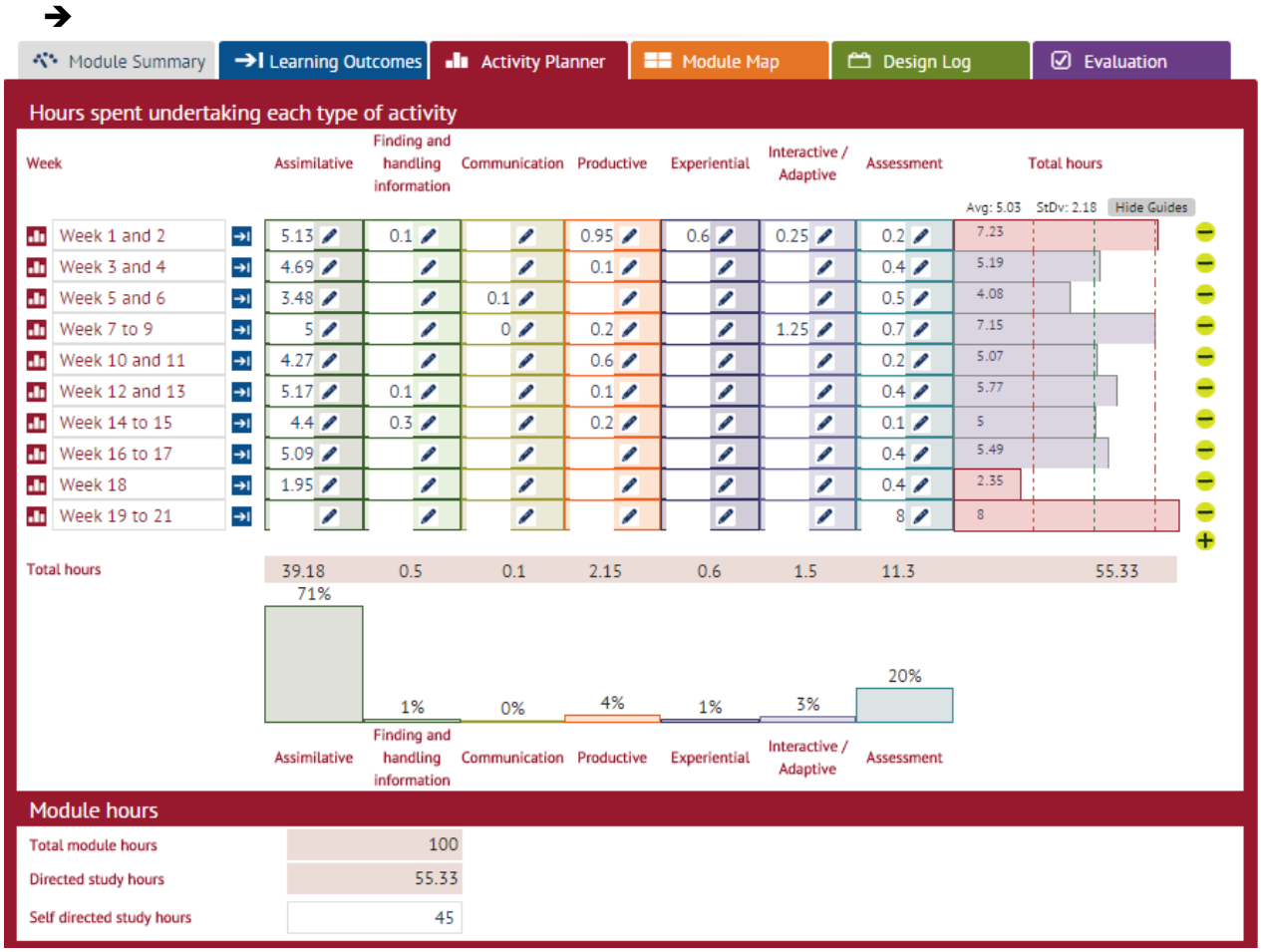

Figure 3 Activity planner for Module Y

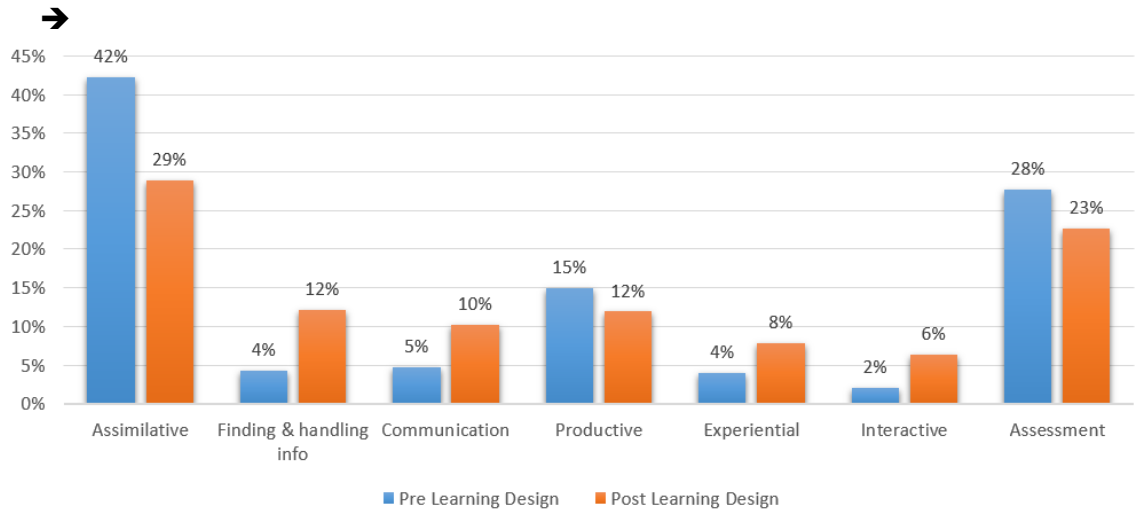

Figure 4. Percentage of student activity pre and post Learning Design

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Table 1. Learning design taxonomy

	Assimilative	Finding and handling information	Communi-cation	Productive	Experiential	Interactive/ Adaptive	Assessment
Type of actvity	Attending to information	Searching for and processing information	Discussing module related content with at least one other person (student or tutor)	Actively constructing an artefact	Applying learning in a real-world setting	Applying learning in a simulated setting	All forms of assessment, whether continuous, end of module, or formative (assessment for learning)
Examples of activity	Read, Watch, Listen, Think about, Access, Observe, Review, Study	List, Analyse, Collate, Plot, Find, Discover, Access, Use, Gather, Order, Classify, Select, Assess, Manipulate	Communicate, Debate, Discuss, Argue, Share, Report, Collaborate, Present, Describe, Question	Create, Build, Make, Design, Construct, Contribute, Complete, Produce, Write, Draw, Refine, Compose, Synthesise, Remix	Practice, Apply, Mimic, Experience, Explore, Investigate, Perform, Engage	Explore, Experiment, Trial, Improve, Model, Simulate	Write, Present, Report, Demonstrate, Critique