

Honey I shrunk the data: data-informed blended learning design

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Keywords

Blended learning, curriculum design, digital learning activities, learning analytics, learning design.

1. ABSTRACT

Blended learning (a combination of face-to-face activities and use of digital tools and resources) is increasingly common in higher education. However, it is not always evident that people fully understand the benefits of including digital in the learning mix or, indeed, how to tell if the approaches they use are actually working.

In some cases institutions are setting 'quotas' for moving learning online without really thinking through what kind of learning is best supported in this manner. Conversely, there are some institutions that pride themselves on face-to-face learning and do not see how a blended approach can improve on this.

The authors of this paper are currently undertaking research intended to help academics, and those supporting the development of academic programmes, to improve how they design and evaluate blended learning. This paper outlines the approach and the supporting conference presentation will outline the results of pilot work and evaluation to date.

We are developing a technique to help ensure that blended learning designs are purposeful. We seek to make explicit the pedagogic intent in a learning design and then go on to explore how data can enable us to understand whether learner behaviour is corresponding to our expectations or not.

This is a proactive approach to learning analytics. Rather than sifting through a mass of data looking for patterns, we are designing in such a way that the data to tell us exactly what we need to know is readily available. We will show how the insertion of digital activities, with a clear pedagogic purpose, into the learning design has the power to support real-time interventions that can make a difference to learner outcomes.

We chose the title to make the point that, with a carefully crafted learning design, small data 'hooks' can be every bit as useful as Big Data.

2. ABOUT THE PAPER

Higher education institutions are making increasing use of digital tools and resources to support learning. Blended learning (a combination of face-to-face activities and use of digital tools and resources) is now the normal approach in many universities.

The shift to blended learning does however involve considerable investment in many cases both in terms of financial investment in the tools themselves and the human resources needed to develop staff skills and develop learning resources. Ever since we started using technology to support learning and teaching, senior managers have asked for tangible evidence that technology enhanced learning actually works.

What we are attempting to do with this approach is to provide a method to design digital learning activities with specific pedagogic intent and then collect the supporting data to see whether student behaviour actually corresponds to what we think we have designed.

This is a proactive approach to learning analytics. Rather than sifting through a mass of data looking for patterns, we are designing in such a way that the data to tell us exactly what we need to know is readily available. We will show how the insertion of digital activities, with a clear pedagogic purpose, into the learning design has the power to support real-time interventions that can make a difference to learner outcomes.

This approach will serve to demonstrate that the digital footprint of these activities makes it considerably easier to measure success than with traditional analogue activities. For example, how do you tell if a student who takes a book out of the library has actually read it and, if so, how do you know they have actually learned anything from it?

The dual benefits of this work should therefore be:

- improved learning design and
- demonstrating the value of digital learning activities

This paper discusses the approach and the accompanying presentation at the EUNIS 2018 Congress will discuss the outcomes of piloting the approach across the UK in February and March 2018.

3. APPROACHES TO LEARNING DESIGN

3.1. Good design practice

It is only a few years since Professor David Nicol wrote, '*Curriculum design in higher education is not a formal activity and there is little support, formal or informal, provided in most higher education institutions to help academics become better at designing learning activities, modules and courses.*' (Nicol 2012).

A review of approaches to learning design over the last 10 years, conducted for a Jisc project (see Ferrell and Smith 2018), has however revealed that incremental changes in thinking about pedagogy have amounted to a significant shift over this period of time.

In the UK 10 years ago people tended to talk about curriculum design and curriculum delivery as if they were separate things. This separation was founded, to a considerable extent, on a heavily content-based model whereby we designed learning content to be 'served up' to learners during the delivery phase.

Current approaches are much more concerned with designing learning *activities* and *experiences*. We are taking a more learner-centred approach that says not '*What am I going to teach?*' but rather '*How are these people going to learn?*' Content is no longer king.

Many universities are now promoting 'active learning' which requires students to participate in their learning rather than being passive recipients of others' knowledge, as occurs in traditional lectures or taught classes.

The outcome of these changes is that the curriculum is much less fixed and can be viewed more as a fluid set of activities that can produce different outcomes with different groups. Putting digital tools in student hands facilitates this flexibility. Such tools are 'disruptive' in the sense that the teacher

has less control but also enriching in terms of giving students more agency resulting in deeper and accelerated learning because of their greater involvement in, and ownership of, the learning process.

3.2. Early use of tools to support learning design

When higher education first began regular use of digital tools for technology enhanced learning (or e-learning as it was usually called), it was recognised that there was a lack of guidance and structured processes for designing learning. Curriculum design relied very heavily on tacit knowledge and most academics did not (and, indeed, this is still the case) have time to stay up-to-date with published research into learning and teaching practice.

Advocates of technology enhanced learning therefore also focused their attention on creating technology solutions to support the sharing and reuse of effective learning designs. Many of those tools such as [Phoebe](#) (developed at the University of Oxford), [Cloudworks](#) (developed at the UK Open University) and the [London Pedagogy Planner](#) (developed at University College London) were influential in causing people to think more about learning design but failed to gain any kind of widespread adoption in academic circles.

The first learning design tool to really have an impact on the practice of significant numbers of academics was [Viewpoints](#) (developed at the University of Ulster 2008-2012). Viewpoints is a structured, workshop-based process to help course or module teams design academic programmes and/or find solutions to particular design challenges.

During the course of the workshop session, the participants use a series of prompt cards to facilitate discussion about the learning design and a 'storyboard' to build up their design plan. The prompts serve to keep the participants focused on the underlying pedagogy rather than content and to take a learner-centric rather than teacher-centric view. The catalyst for rethinking existing approaches is often framed in terms of a challenge to do with learning e.g. *How can we get more engagement from learners? How can we encourage deeper reflection? How can we ensure that they make use of the feedback we give them?*

The Viewpoints materials were made available under a creative commons licence and were widely adopted in the UK. The relationship between this work and many learning design approach is now in common use can be seen in our 'family tree' in appendix 1.

3.3. What kind of tools work best?

The Viewpoints materials ultimately produced, and still well used, were however very different to the original plan. The initial aim of Viewpoints, like many of its predecessors, was to develop a suite of interactive software tools that would provide educational and practical support to academics as they engaged in curriculum design or redesign activities. The Viewpoints team had the time, the funding and the capability to achieve this but, piloting the approach with academics resulted in the project taking a different direction.

It became evident that using the resources in a face-to-face setting facilitated more productive reflection and dialogue about learning design. The planned software tool became more similar to a social board game that walked participants through the learner experience. The success of Viewpoints taught us much about developing the skills of academic staff in effective design practices. Even where the goals of curriculum redesign involve making more effective use of technology, it appears that trying to undertake the design in an online environment can actually stifle creativity, '*... if you introduce technology too early without adequate support and planning, it becomes a barrier to staff engagement that can be difficult to overcome.*' (Ferrell and Smith 2018).

This lesson has been carried forward in the approaches that succeeded Viewpoints to the extent that some form of storyboard and prompt cards is now the *de facto* standard where structured approaches to curriculum design exist.

'That really basic but very profound design meme of a team sitting around, having some physical objects, usually cards, on which some words or symbols are written which describe aspects of the curriculum, physically moving them around in a shared space, putting them on a timeline, annotating them, picking them up and giving them to each other: that is really valuable. Tools we

can use to do that more effectively or to bring more information into that space are going to build on existing practices. We can't expect teachers to suddenly gallop off and do that process completely differently. That is the process that works.' Helen Beetham, educational consultant (Ferrell and Smith 2018).

3.4. Current learning design methods

Viewpoints remains a popular approach to learning design in the UK and there are a number of other popular approaches (some of which are themselves adaptations of Viewpoints - see appendix 1).

Carpe Diem

Carpe Diem is an approach to overall course design based on blueprinting and storyboarding. It was developed by Professor Gilly Salmon and is widely used in the UK and elsewhere. Carpe Diem workshops take place over two days. The approach has strong links to Professor Salmon's work on activities (Salmon 2013) with a focus on designing blended and fully online learning. The blueprint and storyboard are created in a face-to-face setting and the design is then created and tested in the online environment. More about Carpe Diem can be found on Professor Salmon's [website](#).

CAleRO

CAleRO stands for Creating Aligned Interactive educational Resource Opportunities. The [CAleRO](#) approach was developed by Professor Ale Armellini, using elements of both Viewpoints and Carpe Diem, and now underpins a university wide approach to the development of active blended learning (ABL) at the University of Northampton. CAleRO workshops are aimed at course teams and take two full days.

To meet the University's criteria for active blended learning, a programme must be taught through student-centred activities that support the development of subject knowledge and understanding, independent learning and digital fluency. Face-to-face teaching is facilitated in a practical and collaborative manner, clearly linked to learning activity outside the classroom. In Professor Armellini's view traditional 'broadcast' (i.e. non-interactive) lectures do not qualify as 'contact time' with students and the University is building a new campus without traditional lecture theatres.

ABC

ABC stands for the Arena Blended Connected approach, developed by Clive Young and Nataša Perović at University College London (UCL). UCL is a research-intensive institution and a member of the League of European Research Universities (LERU). The name of the approach emphasises its link to the [Connected Curriculum](#) project (Fung 2017) which aims to ensure that all UCL students are able to learn through participating in research and enquiry at all levels of their programme of study.

[ABC](#) is, like many other techniques, a workshop format using a storyboard that has its origins in the Viewpoints approach and Professor Diana Laurillard's [conversational framework](#). ABC is however suitable for any scale of learning from a lesson, module or short course through to a full degree programme.

Part of the appeal of this approach is that ABC workshops are conducted in 90 minutes and oblige academic teams to make rapid progress with designs that can be refined later. The ABC workshop resources are available under a creative commons licence in the following languages:

- English
- Flemish
- French
- Italian
- Spanish

EUNIS members wishing to translate the ABC materials into their own language are invited to contact the authors.

ABC is the learning design approach on which the research in this paper is based.

4. MOVING TO BLENDED LEARNING

The ABC approach can be used to design learning when starting from scratch and it is also particularly useful when considering how increased use of digital tools and resources might enhance learning in a blended approach.

When starting with a pre-existing design, participants are invited to produce a radar graph showing the balance of different types of learning in the current design. They can then think about what types of learning activity are really best suited to meeting the learning outcomes of the course. The prompt cards for each of six types of learning support this and give examples of both analogue and digital activities that can be used.

Participants build up their storyboard of the student journey selecting an appropriate mix of face-to-face and digital activities to provide the best possible learning experience. During the workshop they will also be invited to consider which of the activities will be assessed and in what ways.

4.1. Design tips for blended learning

Certain types of learning activity are well suited to achieving certain types of learning outcome. Achieving the right mix of digital and face-to-face learning activities for each programme of study is the art of the learning designer.

'In learning that is truly digital by design, students have an enhanced set of learning experiences and can move seamlessly between physical and virtual environments that are supportive, stimulating, engaging, challenging and inspiring.' (Ferrell and Smith 2018).

Here are some tips for the effective design of blended learning (adapted from Palmer *et al* 2017):

- Ensure there is an explicit relationship between online components of the course and face-to-face sessions
- Connect face-to-face and online components so that face-to-face sessions use the outputs of online components or vice versa
- Ensure that staff mediate online activities
- Avoid repetition of content in the classroom that has already appeared online and vice versa
- Progressively increase digital and cognitive skill requirements over time
- Clarify the value of online activities and the skills learned, for example in relation to employability
- Vary the tools and types of activity to avoid doing the same thing and overemphasising particular tools
- The tool, the task or the knowledge can be new and challenging but avoid all three at the same time!

4.2. Tools for blended learning

In the ABC approach decisions on what kind of tools to use to support the digital aspects of blended learning are supported by a tailored 'tool wheel' mapping commonly used applications to the different types of learning.

Figure 1 shows an example of the tool wheel for University College London. Tools shown in the inner circle are fully supported by the University IT department. Those in the middle ring are recommended and offered some support. Those in the outer ring are known to be suitable for this type of learning but are not specifically supported by the University. The tool wheel template is also available for universities to adapt for their own use.

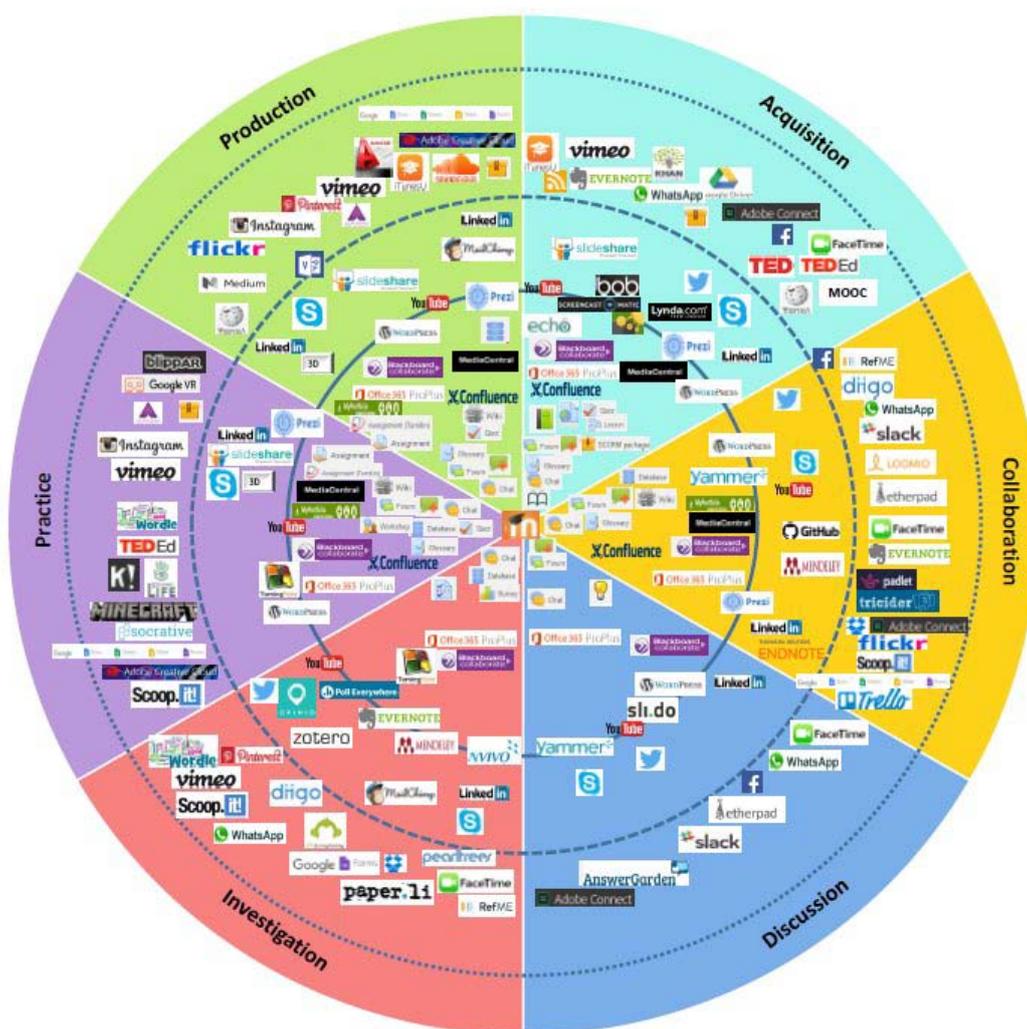


Figure 1. Blended learning tool wheel for University College London.

5. LEARNING ANALYTICS

Learning analytics is a rapidly growing area of interest in higher education worldwide. The term learning analytics refers to the measurement, collection, analysis and reporting of data about student progress and how the curriculum is delivered. Colleges and universities are beginning to develop increasingly sophisticated dashboards to present the outcomes of such analysis to staff and learners.

Much of the emphasis of the interest in learning analytics, particularly in the United States where the techniques have been in use for longer, is on 'predictive' analytics. Students using digital resources and systems generate data that can be analysed to reveal patterns predicting success, difficulty or failure which enable tutors, and students, to make timely interventions.

There is compelling evidence that some of these predictive models are very effective (see for example the case studies in Sclater *et al* 2016). There are equally many concerns about the ethics of such models (see Sclater 2014b) and the risk that predictions of failure become self-fulfilling prophecies.

It is not the purpose of this paper to give an overview of learning analytics activities to date: useful summaries can be found in Sclater 2014a and Sclater *et al* 2016 and there are a number of

interesting presentations from EUNIS member institutions on the web page for our [learning analytics event](#) held in November 2017.

5.1. Types of learning analytics

Learning analytics is something of an umbrella term for a range of different types of analysis.

Sclater *et al* (2016) identify three types and state: 'There are overlaps across the three rapidly developing fields but educational data mining, learning analytics and academic analytics are increasingly diverging. Educational data mining is focused primarily on the technical challenges of extracting value from learning-related big data. Learning analytics is concerned with enhancing aspects of learning, while academic analytics focuses more on utilising data for marketing and administrative purposes'.

Jisc is currently piloting a learning analytics service for UK further and higher education. You can find out more about the first stages of this work [here](#) and Jisc has published a roadmap for an increasingly comprehensive service covering a number of different types of analytics. The Jisc definitions are somewhat different to those described above and include, ultimately, the use of artificial intelligence (AI).

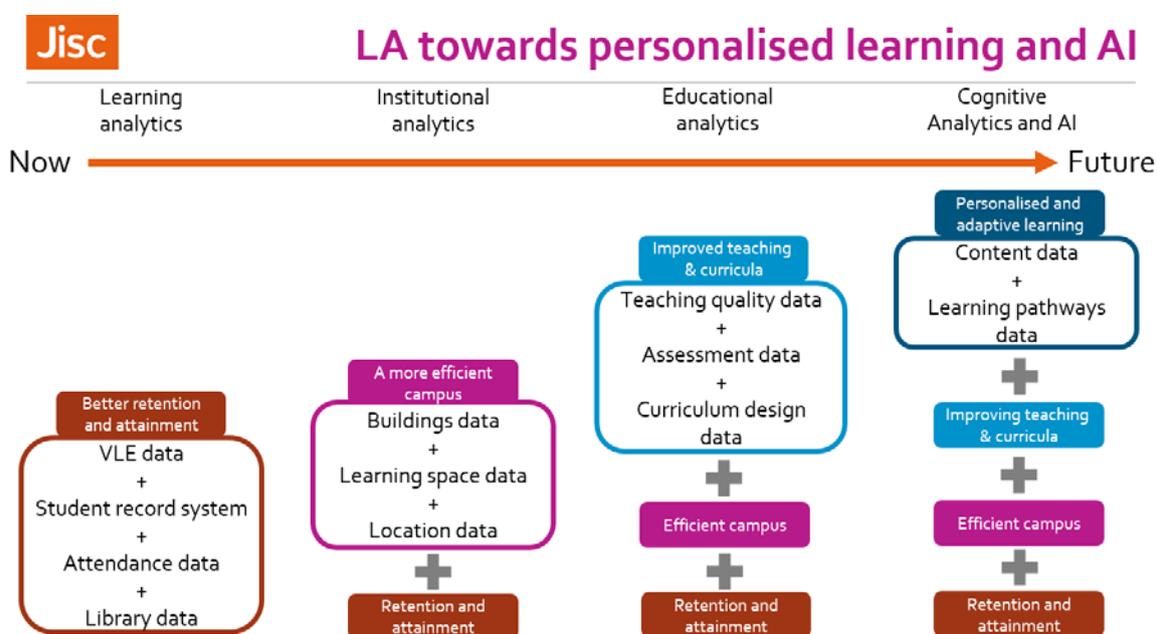


Figure 2. Jisc learning analytics roadmap.

6. DATA AND ACADEMIC PRACTICE

What is clear from the brief overview above, is that learning analytics is becoming big business. Mention learning analytics and most people automatically think about technical solutions and big data sets.

All of this feels worlds apart from day-to-day learning and teaching practice. Given our experiences to date in encouraging academics to use structured approaches to thinking about learning design and to take some first steps in introducing digital into their blend of learning activities, it seems a huge leap to be talking to them about data and modelling and predictions.

Indeed, in many parts of academia, business intelligence and metrics are viewed as bureaucratic/punitive. They are often treated with scorn and derision and not seen as motivating for staff.

'You don't get staff to improve by saying 'let's have a higher NSS (national student survey) score' or 'let's improve your progression rates'. From an interview with Rachel Forsyth, Manchester Metropolitan University.

'We want to be data informed not data driven. You need to look at patterns but not get lost in the detail. If the focus is the wrong way round it can be a punitive thing eg focusing on teachers or learners who don't seem to be achieving the right kind of learning gains instead of thinking more generally about what we can do better right from the very beginning.' From an interview with Jasper Shotts, University of Lincoln.

The issue is therefore how do we make the most of these two areas of expertise in some kind of [appreciative inquiry](#) approach to bringing what we know about good learning and teaching practice into play before we begin looking for patterns in a swirling sea of data?

We have already talked about designing for active learning but, equally, active teaching comes into play in ensuring that the learning design comes alive in a way that is fresh, topical and adapted to the needs of a particular student cohort.

'Curriculum design is often seen as a linear process with design occurring only at set points but interventions should be possible at any point making the design process a core part of ongoing educational practice.' From an interview with Clive Young, University College London.

Good teachers do this instinctively and the use of digital tools and resources by students opens up even greater possibilities for different groups to interpret the scope of the curriculum in more contextualised ways. However, a tendency towards increasing class sizes in higher education can make it difficult even for the best teachers to know all of their students and monitor their progress closely.

This is where data can help.

7. DATA-INFORMED CURRICULUM

An important part of the value in using the learning design tools discussed above is the ability to create a representation of the curriculum and the dialogue that ensues because of this. For many course teams it is the first time they have really had a dialogue about what types of learning activities best suit the learning outcomes of the course. Previously tacit pedagogic approaches are made explicit.

Once such pedagogic intentions are revealed, it becomes a much easier job to identify whether or not the intended approach is working. If you are clear about what you are trying to achieve, then with the right data available, you are able to tell whether student behaviour matches your expectations. This can apply to whether the cohort as a whole is progressing as expected or to whether individual students are having difficulties with particular concepts or activities. This makes possible a more fluid, dynamic response to curriculum development. If a particular learning design isn't working as expected, you don't need to wait for a distant course review to make any changes that are necessary.

Rather than passively using data to predict future success or failure, and intervening at a point which may already be too late, you really need data that will help you make timely interventions. In this case we are not talking about dashboards of aggregated 'big data'; we are talking about the small data that really matters.

7.1. A purposeful blend

You will of course already have elements of formative and summative assessment in the design but the answer to better supporting student progress isn't simply to add in more assessment. There is good evidence that we already tend to over-assess students in higher education with serious implications for both staff and student workload (see for example Ferrell 2013).

What you need to find are the right kind of data 'hooks' to help you monitor progress and take action, based on what the data tells you, at a point where you can still make a difference. This means that you need a purposeful design and you already know what questions you want the data to answer. This is a very different approach to gathering a lot of data and looking for patterns. Indeed such approaches often tend to generate a lot of 'data debris' that never gets used.

The suggested approach also gives a clear purpose to adopting blended learning because the students' digital footprint gives you information that an analogue approach can not.

You are likely to focus these data hooks on [threshold concepts](#) related to the course and on verifying that the students have carried out, and learned from, the activities they should be undertaking outside of their scheduled contact hours with the tutor (following our tips in section 4.1 on how to ensure that the face-to-face and digital elements of the course interrelate in an effective manner).

It also makes sense to ensure that the 'hooks' relate to data that the average academic can readily access and interpret e.g. a quiz on the VLE where you can easily see how many students completed the quiz and how many questions they got right or a 'flipped' approach to a lecture where you can identify how many students viewed the lecture in advance before engaging them in a facilitated discussion on the topics covered.

7.2. Finding out what works

Whilst there is immense value in this kind of data supporting real-time interventions to enhance learning, the approach also lends itself to post-hoc analysis over time. We can start to build up a picture of what kind of blended learning activities work best in what situations to feed back into better design. Even where this serves to support what you already think you know, it will be backed up by data.

The evidence can also serve to convince academics who do not yet see the point in adapting their existing practice to benefit from the opportunities afforded by digital elements.

Finally senior managers may get the evidence they have so long sought that digital tools and resources do actually enhance learning.

We aim to show that with a carefully crafted learning design, small data can be every bit as useful as Big Data.

8. WHAT NEXT?

This approach is being piloted with staff from across UK further and higher education in February and March 2018 and the conference presentation which accompanies this paper will include further information on the outcomes of the pilots.

9. ACKNOWLEDGEMENTS

This research has formed part of a Jisc project and been supported by the HEFCE [catalyst fund](#). We are particularly grateful to Sarah Knight, senior co-design manager, Jisc, for her support and encouragement.

The project team has benefited from discussion and sharing of experience via the International Learning Design Cross-Institutional Network ([LD-CIN](#)).

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<https://www.jisc.ac.uk/reports/learning-analytics-in-higher-education>

11. AUTHORS' BIOGRAPHIES



Gill Ferrell has teaching and research experience and has held senior management positions in a number of university administrative functions as well as directing a UK support service enhancing the use of ICT in further and higher education. She acts as a consultant to universities and national agencies in both the UK and Europe and has been an invited speaker at many national and international events. Current interests include: data and information management, technology enhanced learning, assessment and feedback, learning analytics and learning space design. <http://uk.linkedin.com/in/gillferrell>



Samantha Ahern is a member of the Digital Education Futures team at UCL. Her work is project based, with current work predominantly focusing on exploring learning analytics. Areas of interest include learning design, social learning and inclusion and accessibility.



Patrick Lynch is a Teaching Enhancement Adviser at the University of Hull. He also the Community Officer for the Learning Analytics Initiative of the Apero open source organisation. Patrick has worked within the JISC Effective Learning Analytics project providing Readiness consultation with organisations across the UK. Current work is around Learning Design and Learning Analytics. Patrick has many years of teaching experience in a number of disciplines and currently teaches on the Postgraduate Certificate in Academic Practice at Hull University.



Nataša Perović is a Digital Education Advisor in UCL with work focus on learning design, OERs and videos in education.



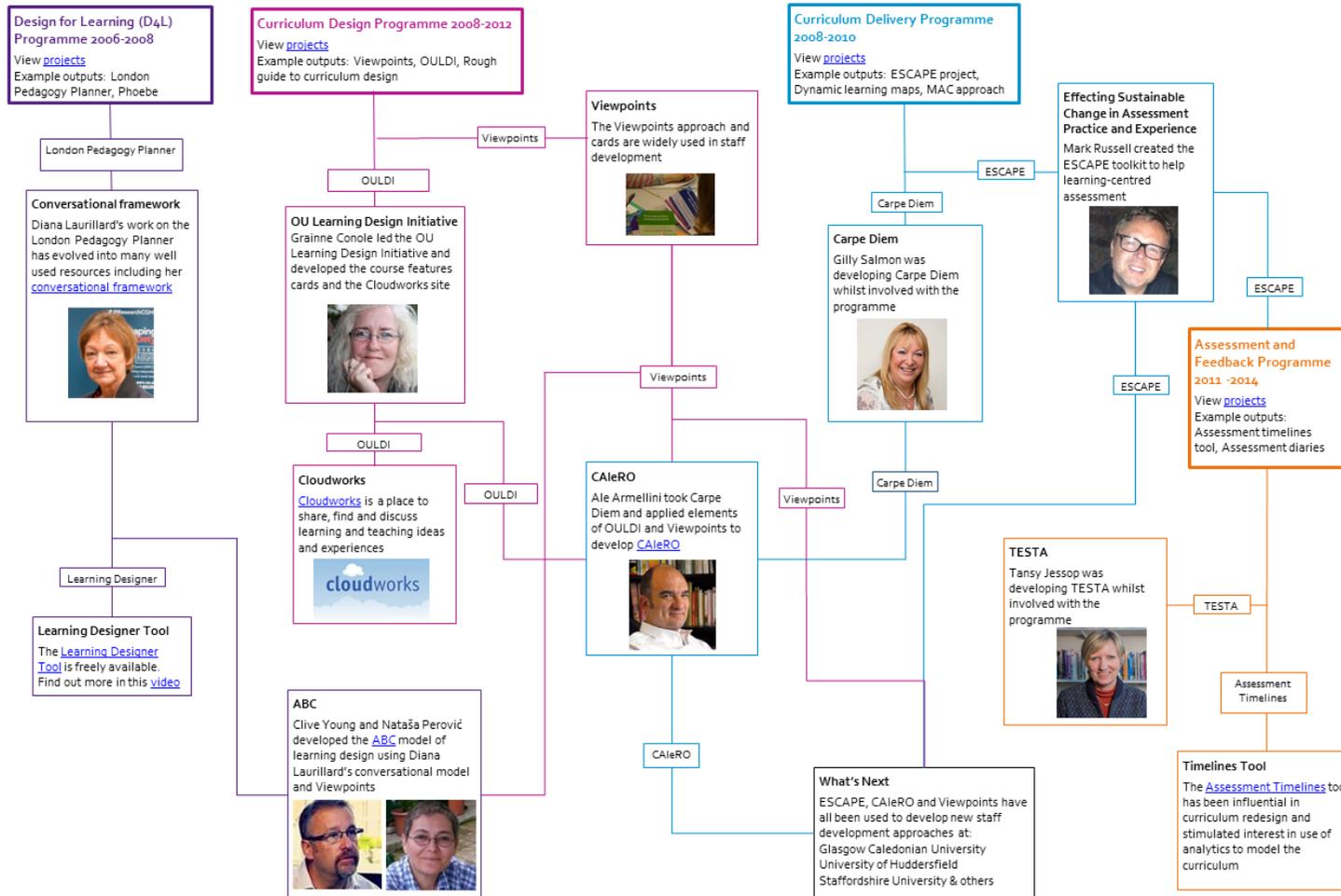
Clive Young leads the Digital Education Advisory Team at UCL with an interest in institutional change, learning design and educational media.

Appendix 1 Learning design family tree



Learning Design Family Tree: Jisc project outcomes and key external relationships

There were many other excellent projects in each of these programmes whose outputs are still being used and, of course, each of the projects was the result of teamwork but here we have chosen to feature a few prominent individuals and outcomes



EXTENDED ABSTRACT Honey I shrunk the data: data-informed blended learning design

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12. SUMMARY

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The authors of this paper are currently undertaking research intended to help academics, and those supporting the development of academic programmes, to improve how they design and evaluate blended learning. This paper outlines the approach and the supporting conference presentation will outline the results of pilot work and evaluation to date.

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The shift to blended learning does however involve considerable investment in many cases both in terms of financial investment in the tools themselves and the human resources needed to develop staff skills and develop learning resources. Ever since we started using technology to support learning and teaching, senior managers have asked for tangible evidence that technology enhanced learning actually works.

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This approach will serve to demonstrate that the digital footprint of these activities makes it considerably easier to measure success than with traditional analogue activities. For example, how do you tell if a student who takes a book out of the library has actually read it and, if so, how do you know they have actually learned anything from it?

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The full paper discusses the approach and the accompanying presentation at the EUNIS 2018 Congress will discuss the outcomes of piloting the approach across the UK in February and March 2018.

14. TOPICS COVERED IN THE FULL PAPER

14.1. Good design practice and learning design tools

We review the way in which approaches to learning design have changed over the last 10 years. We review tools used to support learning design in the UK over the last 10 years and draw conclusions about what has been proven to work best for academic staff development in an HE context.

We review the main tools in current use with particular emphasis on the [ABC](#) approach which has been used throughout Europe and translated into a number of European languages.

14.2. Moving to blended learning

We talk about introducing digital tools and learning activities with specific pedagogic intent and provide guidance on good practice in designing blended learning.

14.3. Learning design and learning analytics

We look at the variety of current approaches to and uses of learning analytics and conclude that much of this work is far removed from day-to-day academic practice.

We suggest that designs that make explicit their pedagogic intent make it easier to use data to identify whether or not the intended approach is working. We talk about how to identify data 'hooks' to help you monitor progress and take action, based on what the data tells you, at a point where you can still make a difference to student outcomes.

We aim to show that with a carefully crafted learning design, small data can be every bit as useful as Big Data.

15. SHORTENED LIST OF REFERENCES

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16. AUTHORS' BIOGRAPHIES



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