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Unleashing "currents of curiosity": Reconfiguring learning design using academic comics in higher education.

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Abstract

This paper considers the experience of developing an online, blended learning approach for use within university education. It explores the learning design process for the delivery of learning and teaching across three academic 'worlds', each of which has a human factors component. These are management, medicine, and psychology, where the common elements in the teaching across those three disciplines include: risk and uncertainty, human error, systems failure, and the role of information and expertise in decision-making. The approach to learning design reported here is based on a systems approach which integrates the use of visualisation, bespoke academic comics, and animations in addition to more traditional academic publications. The affordances associated with each of those technologies provides students with the opportunity to support their learning in ways that suit their preferences and, because of the synergistic nature of the materials in a student-centred approach, allows them to develop a deeper understanding of the issues. The integration of these learning technologies is contextualised within the notion of a multiverse of learning in which students across the three disciplines can consider core issues through multiple disciplinary lenses. The paper is based on the author's experience of redesigning both masters and undergraduate courses to address this integrated approach to learning design.

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INTRODUCTION

> "*Professor Seymour Papert of the MIT Media Lab once observed that although a mid-19th-century surgeon would be unable to do anything in a modern operating room, a mid-19th-century teacher would probably get by in a classroom today, because the way we teach has not changed in 150 years*" - Nanako Ishido (2015), Keio University

The opening quote highlights one of the main challenges facing higher education institutions (HEIs) in terms of changing the dominant mode of learning, namely the dominance of what has become known as the 'sage on the stage' approach to teaching. In this approach, learning design is based on a lecturer-led delivery where the students are often passive, rather than active, learners and where the primary mode of information delivery is by lecture. The COVID-19 pandemic exposed this vulnerability and many institutions sought to pivot quickly to an online environment, but struggled with a lack of experience in terms of alternative forms of delivery and challenges around the underpinning learning infrastructures (see, for example, Watermeyer, Crick, Knight, & Goodall, 2021). In several cases, the response was to simply create an online live or pre-recorded lecture (so-called 'voice over PowerPoint), often with no fundamental changes made to the underpinning learning design approach. It is the failure to adapt the underpinning learning design which is seen as the problem with such online provision as students essentially remain passive learners (Lents & Cifuentes, 2009).This paper describes an approach taken to the redesign of learning and teaching that attempts to support student-centred learning by providing a systems-led learning design that incorporates teaching across three disciplinary areas – business and management, psychology, and healthcare – and which integrates visualisation, comics, and animations with more traditional academic materials.

The approach was grounded in the PFMS framework developed by Ison (2017) in which the practitioner (P) is faced with a situation of concern (S) and brings a framework of ideas (F) and methods (M) to bear on that situation. In this case, the situation of concern was that of developing a student-centred, blended set of courses across the three schools in which the author currently teaches. The framework of ideas centred on the potential development of what can be thought of as a 'multiverse of learning' in which the three academic 'worlds' can be transcended by students in any of the worlds as a means of exploring a set of key problems. In this case, the common problems related to the role of risk and uncertainty within organisations, the impact of that uncertainty on decision-making, and the effects of human factors within the potential failure of socio-technical systems (including the role played by intentional and accidental threat actors). Each of those academic disciplines sees these problems through slightly different lenses and each seeks to address issues of control in a systems context where emergent conditions are prevalent, thereby generating what could be seen as a set of wicked problems. The methods used to deliver this learning was through the development of bespoke academic comics and animations, both of which utilised an avatar as the primary deliverer of the academic material which then allowed for a more discursive approach in online or on-campus face-to-face sessions in what is often termed a blended approach.

The notion of 'currents of curiosity' in the title of this paper comes from the work of Eisner (1985, 1996), who is considered to be one of the pioneers of comics theory, and can be seen to relate to two principal elements of a comics approach. The first is the notion of flows (the currents) in which images and words are framed and then combined in a sequential manner to generate 'moments that matter'(McCloud, 1993) in terms of the reader's understanding. The second relates to the development of curiosity as a function of the spaces between those frames in which the reader can fill the gaps with their own insights into how one set of frames relates to another. These spaces are termed 'gutters' within comics theory (Liou et al., 2016; Wallner, 2019) and offer the potential to explore different interpretations of the narrative structure of a set of sequential images.

This paper describes the approach taken to learning design which took place over several years and which is set within the broad context of that PSFM framework. The aim is to provide both a sense of the process of learning design and to highlight some of the main characteristics and benefits of a comics-based approach. However, echoing Checkland (1985), it is important to note the challenge involved in describing any case-based research in terms of capturing the richness of the experience. This paper is no exception to that problem and so it aims to set out the detail of the processes that were used in changing the approach to learning design so that others can adapt and apply the methodology to their own problem space.

LEARNING DESIGN AS A SOCIO-TECHNICAL SYSTEM

There has been considerable debate regarding the benefits and disadvantages of both lecturer- and student-led approaches to learning. Elen et al (2007), for example, advocates for the creation of more powerful learning environments where:

> "…..*students assume full responsibility for the construction of their knowledge… [and].. do so in a comfortable context that offers targeted support from*

teachers to render their activities as effective as possible." (p. 115).

The approach described here was an attempt to create such a powerful learning environment by the creation of an integrated approach to student-centred learning in which comics, storytelling, and animations were used as symbiotic forms of communication within teaching. a common avatar as a means of delivering the learning, thereby providing a foil for the educator when dealing with the face-to-face discursive sessions.

At the outset, the approach taken to learning design was grounded in a slightly adapted version of Cherns' (1976, 1987) framework (Fischbacher-Smith, 2016) which incorporates elements of Reason's (1990) notion of source types and Checkland's (1985, 1999) soft systems methodology (SSM) (see figure 1). If we take design as a means of 'making sense of things' (Krippendorff, 1989), then the use of comics and animations to generate 'moments that matter' (McCloud, 1993) is critical. It is important that those moments are, wherever possible, identified at the outset for both the learner and the educator. In terms of the latter, it is important that the learning design process is contextualised in a work-system life-cycle (Alter, 2001, 2008a, b; Fortune & Peters, 2005) as this allows for a consideration of a range of issues around andragogy, CPD and organisational learning to be integrated (Conole, Dyke, Oliver, & Seale, 2004). Within such a holistic setting, the core questions are likely to include: who are the customers of the system; what are their world views; and what transformations are we hoping to achieve? Elen et al (2007) argue that a transition to a student-centred approach to learning design will only be successful if all of those involved in the design process are both committed to, and understand the implications of, the approach. As such, the issue of engagement that is the starting point of the Cherns model has to both identify those with a degree of agency in the process (the actors, owners, and customers of the system) from Checkland's (1985) SSM along with the extent of the various agent's awareness, commitment, and competence (Reason, 1990) in terms of dealing with the task demands associated with the learning design.

Figure 1 – Learning design through a socio-technical system lens
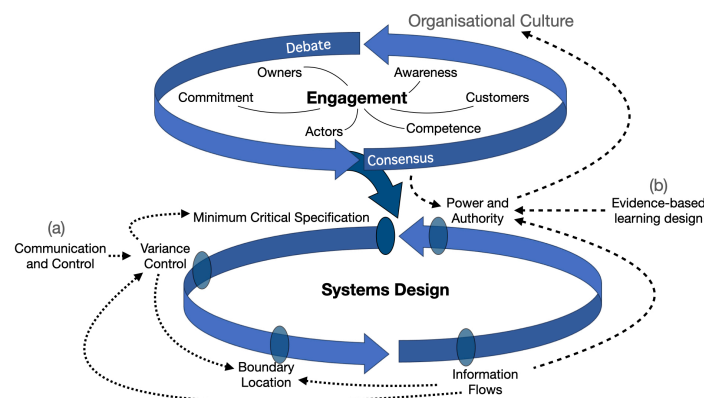

Adapted from Cherns (Cherns, 1976, 1987)

By combining SSM with the notion of source types, it is possible to construct a series of personas for both teaching staff and students that would allow some of the initial assumptions around the vision for the learning design to be surfaced and debated. Key to this process is the development of consensus around the main parameters of the change in approach as this allows for the development of what Chern's terms a minimum critical specification for systems design. Consensus needs to recognise the power of certain agents within the system who can support or resist the proposed changes in approach. In an academic context, this will also include the regulatory (internal) and accreditation (external) processes and these need to be factored into the minimum critical specification at the outset.

There are two aspects of figure 1 that proved to be important within the learning design process. The first related to the processes around communication and the relationships with the control function. Using Reason's (1990) notion of source types, a programme of staff development was developed that addressed the issues of competence and awareness (commitment to change was self-evident). The challenging part was in terms of identifying both the personal training needs associated with the task demands for a new area of work and doing so in a way that reflected best practice in the field. As part of the processes around engagement with stakeholders, a community of practice approach (Wenger, 1998) was used both for testing the assumptions around the vision for the learning design but also in terms of addressing the staff development requirements needed to enact that vision in terms of comics and animation.

The second issue related to the use of an evidence-based approach to learning design and the use of that evidence in ensuring that the regulatory aspects (power and authority) and the customers (that is beneficiaries) of the change were convinced of the validity of the approach. Given that the vision for the learning design was to span undergraduate, through postgraduate to post-experience, then communication of the rationale for the change and its testing was a critical element in the process. A key component of the engagement process was a clear articulation of the vision for the learning design in line with the framework developed by Conole's (2013, 2015) in which seven principles for learning design are articulated (conceptualise, create, communication, collaboration, consideration, combination and consolidation) (figure 2).

Figure 2 – Principles of Conole's learning design process.
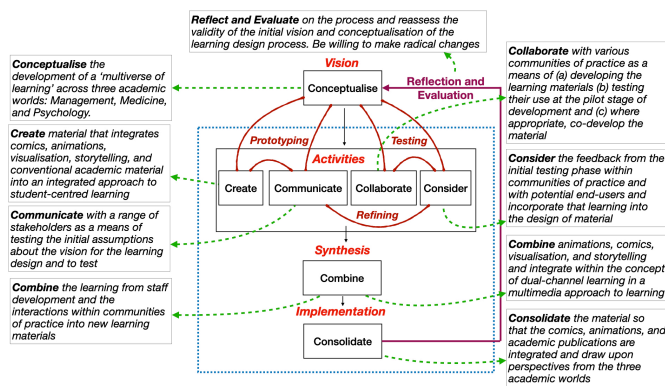
Source: adapted from Conole (2015). P. 247

The starting point in the learning design process is with the vision and conceptualisation of the process and its outcomes. In the case of the multiverse project, this vision was to create a multimedia learning environment that was student-centred, and which transcended the three learning 'worlds'. This vision formed the basis of the engagement process shown in figure 1 and involved extensive discussions with academic colleagues, current students, alumni, professional associations, and practising managers. Consensus was critical in terms of the ensuring a minimum critical specification for the learning design and required an analysis of the views of the various stakeholders (actors, owners, and customers) and an indication of the ease by which the beneficiaries (customers) of the design could use the proposed materials. Early prototyping of materials was an essential element here and one that required the integration of the conceptualisation and creation of materials for evaluation and the communication processes was a key element in this stage of development. Refining the prototypes of learning materials was another important aspect of the core activities and the use of a communities of practice approach was essential in that regard.

The Conole framework also allows for the integration of Mayer's (2014) cognitive approach to multimedia learning into the course ethos and highlights the significance of the cognitive processes that underpin student-centred approaches, thereby providing a basis for learning-design based on cognition rather than a technology-led approach. This is in keeping with the work on learning outlined by Mayer et al (1992), and the four pillars of learning provided by Dehane (2020), namely: attention gaining, active engagement, error feedback (peer review), and consolidation. It is within this context that the comics and animations were developed as part of the activity's component of figure 2. Both of these were tested and developed by using a communities of practice approach (see, for example, Wenger-Trayner & Wenger-Trayner, 2015).

THE NATURE OF A COMICS-BASED APPROACH

The use of academic comics as a pedagogy has attracted considerable attention within the literature (Cohn, 2013; 2021; Kuttner, Weaver-Hightower, & Sousanis, 2020) and its
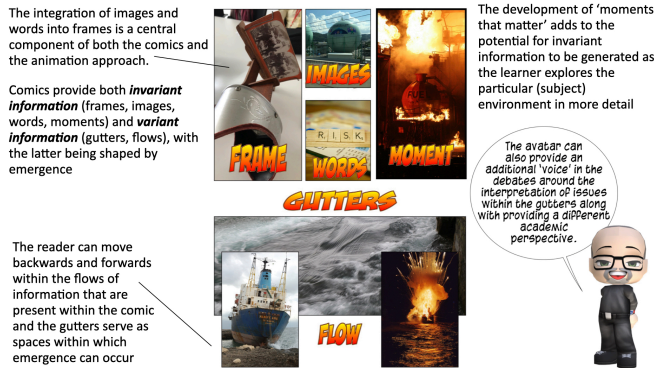
integration of words and images is linked to the cognitivist approaches to learner set out by Mayer (2002; 2014). Here the symbiotic links between the words and images allows for effective recall as one of the words/image pair will serve to prime the recall of the other, thereby allowing for greater recall. This serves to ground the issues of visualisation within the wider context of digitisation and the implications that it generates for student learning.

The use of stories, comics and visual images have also formed part of a wider approach to the development of information literacy through the process of integrating visualisation and information literacy within learning and teaching (ACRL, 2016; Herbst, Chazan, Chen, Chieu, & Weiss, 2011; Jee & Anggoro, 2012). Within that wider context, the comics approach can be seen to have strong links with the processes around visual storytelling as a means of conveying information (Potts, 2013). The advantages of such an approach lies in a range of issues including: helping to make abstract issues more concrete; the provision of insights into the role played by visual approaches to concept development (as a means of reinforcing the textual components of information provision); and the development of emergent ideas through the bringing together of elements that encourages the development of "requisite imagination" (Westrum, 1993) in problem-solving and concept development. Of particular importance in the framing processes is the role of the gutters – the spaces between frames – as a means of developing emergent ideas around the interactions between core elements of these visual and textual frames and the flows that link them together (Berlatsky, 2009; Reutzel, 1986; Robinson & Dicken, 1979). The interpretation of the spaces between the frames facilitated an opportunity to consider a range of outcomes in terms of the 'failure' process and the importance of information flows in determining early warnings of potential problems. It is those relationships between the frames and the gutters that provides for a discussion with students around the role of information literacy in developing understanding and insights into the root cause of failure and the importance of a burden of proof when dealing with complex socio-technical issues. This is especially important where emergent properties impact on management's abilities to control those systems and where the predictive validity associated with information may prove to be challenging.

A comics approach does, however, require a fundamental shift in learning design to ensure that the principles of comics theory are integrated into the overall design process (see Figure 3). Comics are seen as important in developing understanding through the *framing* (integration) of *words* and *images* into "*moments that matter*" (McCloud, 1993), and this is validated by research on the role of cognitive theory in learning (Mayer, 2017). Comics are seen as a composite art that doesn't rely on a single communication channel but uses a multi-channel approach (Pedri, 2015) and as a result are deemed to be more accessible than text-based provisions, by developing narratives that are accessible to the reader at a pace which suits them (Thomas, 2012). The integration of animations, which have transcripts provided, adds to that

narrative structure and the use of a common guide (avatar) across the comics and video and the use of visualisation throughout enhances engagement (Pocock et al., 2016), especially when considering future systems states around failure modes and effects .

Figure 3 – Comics elements and the provision of information

The integration of images and words into frames is a central component of both the comics and the animation approach.

Comics provide both *invariant information* (frames, images, words, moments) and *variant information* (gutters, flows), with the latter being shaped by emergence

The reader can move backwards and forwards within the flows of information that are present within the comic and the gutters serve as spaces within which emergence can occur

The development of 'moments that matter' adds to the potential for invariant information to be generated as the learner explores the particular (subject) environment in more detail

The avatar can also provide an additional 'voice' in the debates around the interpretation of issues within the gutters along with providing a different academic perspective.

Comics are seen to provide considerable affordances within a learning environment and do so across a number of academic disciplines (Chute, 2016; Vassilikopoulou, Retalis, Nezi, & Boloudakis, 2011). They are adaptable to both print and digital formats and potentially scalable in the latter. They can also be set within an Open format using open-source images as a means of integrating visual elements into the written form. By using QR codes, it is also possible to integrate video directly into the comic itself and this begins to address the context issue in which comics are used. By bringing together images and words to generate "moments that matter" a comics-based approach would allow for clearly identified issues to serve as discussion points within student networks and the use of the gutters would enable a consideration of the emergence that can occur in the spaces between the frames (Berlatsky, 2009; Wallner, 2019).

One challenge with more complex learning technologies is that the underlying psychology of the learner may remain largely unchanged and this will impact on the effectiveness of those more advanced forms of technology through the generation of additional cognitive load (Hui-Chun, 2014). In contrast, the simplicity associated with a comics approach, where the integration of linked animations and supporting academic papers, allows for the students to work at their own pace by using the three modalities of delivery (comics, animations, and academic articles). Once the core technologies to be used in the learning design approach had been finalised, it was important to set them within a learning design cycle to ensure that the production of the learning materials was adequately tested with the intended beneficiaries.

THE DESIGN CYCLE

Once the issues relating to engagement were addressed, the emphasis shifted to the detail of the design process in a process of what Checkland (1985) terms 'purposeful action' in which the goal is to address the complexity in the situation of concern. Within the context of the frameworks provided by Cherns and Conole, the approach adopted here was shaped by a series of short courses undertaken on the FutureLearn platform in the UK. Figure 4 provides additional insights into the activities undertaken within the plan-design-build-run-review framework.

Figure 4 – the design cycle approach
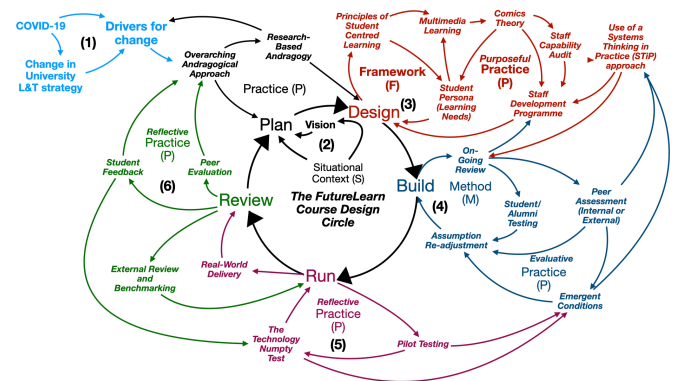
The initial drivers for the change in learning design was prompted initially by the author's interest in the potential for storytelling within management education (Fischbacher-Smith, 2020; Fischbacher-Smith & Fischbacher-Smith, 2012). This led to the development of bespoke academic comics as a form of delivering the core material to students that would normally be applied within a traditional lecture but in a non-traditional format. The design of the comics adopted a Mode 2 (co-production) approach (Gibbons, 2000; Nowotny, Scott, & Gibbons, 2003) in which the early prototypes of the material was tested with practicing managers (in the human factors and security field), medics, and university alumni. The approach took an agility perspective – trial early, fail early – as a means of developing the learning materials. This approach has much in common with the Japanese notion of *Wabi Sabi* which recognises that imperfection exists but that it can ultimately be a positive process, especially in terms of learning and continuous improvement (see, for example, Suzuki, 2021; Tsaknaki & Fernaeus, 2016). The influence of Japanese philosophy on the design of the comics was the result of the present author's experience of living and teaching in Japan and the exposure to the popularity of *Manga*. The early comics were not seen, therefore, as finished entities but as learning technologies in development in which subsequent comics would build on the imperfections of the earlier outputs. This allowed for the rapid prototyping of comic outputs and the incorporation of feedback into subsequent designs whilst still using the 'imperfect' early outputs where appropriate. Pilot testing was carried out with a range of users, who had different levels of experience with the use of online learning materials.

The approach adopted here is supported by Mayer's (2017; Mayer, Dow, & Mayer, 2003) work on cognitive processes within multimedia learning and the approach uses images and words within the comics and videos to integrate visual

imagery into the course material. Table 1 provides an overview of the overall approach and shows how the FutureLearn and Conole-based approaches integrate to generate the various activities that were used in the learning design process. This shift in the approach taken generates several issues which need to be taken account of in learning design.

Table 1 – Integrating the elements of the design approach.

CONOLE'S ELEMENTS OF LEARNING DESIGN		FUTURELEARN ELEMENTS	ACTIVITIES
VISION	*Conceptualise*	Plan	Reviewing the theory and practices around comics, animations, and visualisation. Assessment of the training needs required to implement the vision and an initial evaluation of the institution's acceptability of the approach.
ACTIVITIES	*Create*	Design	Production of prototype comics and animations. Developing communities of practice (CoPs) around the use of comics and animations. Engagement in staff development and training
	Communicate	Build	Engagement with CoPs as a means of determining user needs and suitability of the approach. Addressing internal stakeholders around the approach and ensuring compliance.
	Collaborate	Build/Run	Early testing and feedback from pilot users (alumni, existing students, CoPs, academic networks). Academic and practice-based presentations on the approach and incorporation of feedback.
	Consider	Review	Test the approach via external (education and training) bodies and incorporate feedback. Benchmark against considered best practice in the education area.
SYNTHESIS	*Combine*	Build/Run/Review	Integration of the feedback into the development and refinement of 'final' production materials set within a "wabi sabi" approach to production. Use of a keiretsu approach to building production capability by establishing companies to manage the process.
IMPLEMENTATION	*Consolidate*	Build/Run	Register production companies to maintain control over the process and use those companies as an additional teaching vehicle for students.

The first of these concerns the personas of the potential learners and learning design will need to pay more attention to personality characteristics than has previously been the case in face-to-face teaching where observations around student responses can be obvious. In support of this approach, Lytras et al (2020) see the learner as possibly the most important element in the future development of learning design and this raises issues around the psychological processes that are at work as Technology Enhance Learning (TEL) develops. Secondly, the ways in which information is presented and mediated though web-based delivery can also impact on the learning process. Mayer (2017) argues that by allowing the learner to build connections between words and pictures, it is possible to generate deeper forms of understanding compared to conventional text-based approaches. Finally, Mayer (2020) sets out several criteria that are deemed to be essential in assessing the role of TEL within learning design. These are:

- The development of a clear focus on the learning outcomes associated with the use of TEL in learning.
- A shift away from the specifics of the technology itself towards a consideration of the ways in which it can support and enhance the methods of teaching used within the learning design.
- The generation of information around the use of the technology that would allow for an evidence-based approach to assessing the effectiveness of the new approach.
- Evaluation should adopt a neutral perspective when assessing TEL rather than starting from an advocacy-based exposition of the TEL itself.

To incorporate these criteria, the evaluation of the approach was undertaken by a specialist from the University's learning and development unit who worked with the students in terms of evaluating the impact of the comics and animations. This involved an extensive process of interviewing groups of
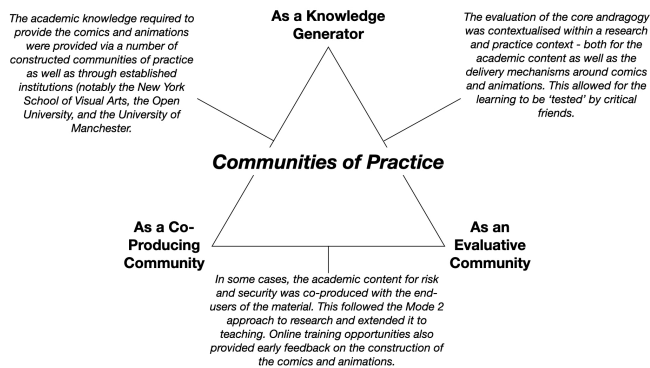
students who had used the comics and animations within their course. The resultant feedback was provided anonymously to the course lead and was subsequently incorporated into the design process. In addition, early evaluations were made by members of the various communities of practice that were developed in parallel with the course redesign. In particular, the views of practicing managers were sought as to the potential viability of the approach within their organisations. Again, this feedback was often provided anonymously, especially when dealing with formal associations and groups.

COMMUNITIES OF PRACTICE

In addition to the core of the design process a supporting staff development process was needed which incorporated a communities of practice approach. The challenge with the project was that there was a lack of expertise within the host institution around the use of comics and the development of animations. As a result, it was necessary to look elsewhere for groups of expertise that could be used as critical friends for the work. One of the positive elements that arose from the COVID-19 lock downs was that several international and UK based training opportunities were available which could be accessed online. These provided the starting point for the development of CoPs that were constructed around specific themes as network links were established via the initial training institution.

Figure 5 highlights the three strands of the CoPs approach that was used in this study. The first of these was to use the communities as knowledge generators. The initial contact for the development of many of these CoPs came from formal training programmes at the New York School of Visual Arts (USA), the Open University, and the University of Manchester (both UK). Each of these institutions offered online courses that could be accessed, and this was particularly important during the period of lockdown in the UK. The second use of CoPs was as an evaluative community. Again, lockdown provided opportunities to pilot test both comics and animations within several professional bodies who had moved their activities into an online setting. It was possible to use early-stage comics and animations to present to these groups who were also helpful in providing critical feedback. Finally, the CoPs were also used in a co-producing capacity as certain groups asked for material to be produced that met their requirements and would provide specific feedback on the approach used.

Figure 5 – key elements of the communities of practice approach

The academic knowledge required to provide the comics and animations were provided via a number of constructed communities of practice as well as through established institutions (notably the New York School of Visual Arts, the Open University, and the University of Manchester.

As a Knowledge Generator

The evaluation of the core andragogy was contextualised within a research and practice context - both for the academic content as well as the delivery mechanisms around comics and animations. This allowed for the learning to be 'tested' by critical friends.

Communities of Practice

As a Co-Producing Community

As an Evaluative Community

In some cases, the academic content for risk and security was co-produced with the end-users of the material. This followed the Mode 2 approach to research and extended it to teaching. Online training opportunities also provided early feedback on the construction of the comics and animations.

The benefits of the CoP approach was based on the arguments that they help to drive the strategy process and can generate innovation (Wenger & Snyder, 2000). Wenger and Snyder (2000) also argue that CoPs are important in the problem-solving process, the development of professional skills that some participants may not have but others do, and the transferring of best practice across individuals and organisations. The appeal of such an approach was obvious, the challenge was in finding and entry point to start engaging with the process.

CONCLUSIONS

The move away from the so-called 'sage on the stage' approach towards a student-centred perspective brought on by the challenges presented by the COVID-19 pandemic provided an opportunity to fundamentally reconsider the ways in which we deliver learning across the range of undergraduate, postgraduate, and post-experience groups. The challenge in terms of learning design requires a re-thinking of the approach taken to facilitating learning and the experience of integrating comics and supporting animations into a multimedia learning environment has the potential to drive that change process. A comics approach has the potential to generate new forms of learning activity within the context of a student-centred framework and has implications for training and development beyond the university classroom and into executive education programmes.

This paper has sought to set out the main elements of comics as a learning technology and has grounded the redesign process within a systems-based approach. The paper has argued that it is important to see learning design in a holistic way in which staff development is also considered as a key component of the process. The need for ongoing professional development is often a neglected aspect of changes in learning design. In this context, communities of practice offer considerable potential for both the development of the skills and competencies needed to change learning delivery as well as to test the assumptions that underpin the approach to learning design.

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