Considerations for Designing H5P Online Interactive Activities

4 authors, including:

Sonia Wilkie
Queen Mary, University of London
33 PUBLICATIONS   **19** CITATIONS

SEE PROFILE

Ghaith Zakaria
Victoria University Melbourne
27 PUBLICATIONS   **18** CITATIONS

SEE PROFILE

Tania Mcdonald
RMIT University
14 PUBLICATIONS   **15** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Innovation in Education Portfolio View project

Learning Design View project

Considerations for designing H5P online interactive activities

Sonia Wilkie
Victoria University,
Australia

Ghaith Zakaria
Victoria University,
Australia

Tania McDonald
Victoria University,
Australia

Rosemary Borland
Victoria University,
Australia

Online Interactive Activities are becoming increasingly popular at many universities as a method for introducing Blended Active Learning experiences. The advancement of technology has meant that the toolkits no longer require experienced multimedia designers to create content. Teachers and Educational Support Staff have been given the power to design and develop their own activities. Whilst many people understand that the technical parameters of the tools need to be understood, elements of design also need to be considered and appreciated for the development of quality learning experiences. In this paper we consider design principles to prompt active learning and encourage student engagement.

Keywords: Online Interactive Activities, H5P, Design Principles,

Introduction

Victoria University, similar to many other universities is currently engaged in a large-scale project to implement blended modes of delivery (Wilkie, Zakaria & McDonald, 2017). Blended learning provides a more flexible learning approach, enabling students to balance their studies with commitments outside of education, than is available by the traditional face-to-face lecture mode of delivery. Furthermore, Martinenz-Caro and Campuzan-Bolarin (2011) found that student satisfaction was significantly greater in courses taught via a blended learning method than those taught via face-to-face lectures. Instructors also report that including Online Interactive Activities as part of their subject's delivery increased learners' success with an improvement in grades, increased student engagement with their own learning, and maintained the student retention rate (evaluating the all, in McKenzie / Ballard, 2015).

In addition to providing the benefits associated with Blended Learning, Online Interactive Activities provide the opportunity for instructors to teach using active learning methods for delivery, with activities that can be undertaken both in-class, and pre-/post-class. This is an attractive teaching option for many universities.
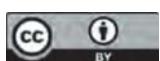
At Victoria University, we identified that H5P (with its large suit of activities) was a suitable toolkit to meet this purpose of providing Blended Active Learning experiences.

Examples of the variety of activities that were developed to facilitate blended active learning includes Interactive multimedia with guest speakers, case study scenarios, interactive technical demonstrations, 360° virtual lab tours (both videos and still images, that include hotspots, roll-over information, animated .gifs, quizzes), Interactive diagrams with clickable hotspots and drag & drop activities; templated note-taking study guides; and check your knowledge quizzes.

In addition to implementing Blended Active Learning via the H5P toolkit, another of Victoria University's aims was to upskill staff (both academics and support staff) in their ability to develop Online Interactive Activities – in effect to become their own content creators. The project has been a success with staff at the university having built over 6000 Online Interactive Activities of which more than 2000 have been shared across the University for other Staff to use and adapt for their own teaching purposes.

The initial stages of professional development training often focus' on learners comprehending the technical parameters of the toolkit, such as learning how to use the wide range of tools, to build different activities, modifying technical parameters for different outcomes, and developing an overall increase staff digital literacy skills.

However, another equally important factor is considering elements of design to ensure the activities are engaging, user friendly, visually pleasant, that the information is easy to read and comprehend, and promotes active learning

Teaching basic design skills and developing an appreciation for good design can be a challenge. Besides learning the technical parameters of building the activities, content itself is often viewed as king. However, anyone who has watched a lecture recording knows that video lectures can at times just be a bad lecture on video. The medium itself, whilst having made the presentation and the information presented therein easily and widely accessible has not improved the viewing experience or improved comprehension of the information. It is important to shift the focus away from the belief of *Content is King*, as if the information is not presented in an easily digestible method, the information itself will not be understood.

Furthermore, Design elements can be subjective - many people have not received any formal training in regards to design principles and simply rely on their own opinion as to what looks good to them, or how they are used to seeing information presented (usually text heavy PowerPoint presentations which are many slides long).

Here we identify a number of Design Principles for content creators to consider when designing and developing the Online Interactive Activities:

- Management of Cognitive Load
- Design Principles for Maximising engagement (chunking, self-checking, presenting the information via a variety of methods and modalities, reducing mind wandering)
- Active Learning

Design Principles

Management of Cognitive Load

Cognitive Load theory (Sweller 1994, 2011) proposes a model whereby memory is comprised of three components, namely Sensory Memory, Working Memory, and Long-term Memory. Further explanations of the theory is detailed in Sweller's research, however to summarise the processes Sensory Memory acquires information from our surrounding environment, it is transient and information may be temporarily stored or processed in Working Memory. Working Memory is a pre-requisite for encoding information into the long-term memory, however as working memory has limited capacity, our minds are selective about what information is incorporated from Sensory Memory.

Cognitive load theory also proposes that a learning experience is affected by three factors, namely Intrinsic Load, Extraneous Load, and Germane Load. Again, further information about these models is can be read in Sweller's research but to summarise, Intrinsic Load (and the amount of load) is the level of difficulty associated with instructional processes; Extraneous Load (and the amount of load) is generated by the method used to present the information or a task; and Germane Load is the amount of cognitive effort required to achieve the learning outcome / schema.

An example relating to the development of H5P online interactive activities for the unit psychology, would be learning the anatomical terminology structure and functionality of the brain (see Figure 1).

Learning the names of the lobes and their regions would have lower intrinsic load, than understanding how these regions function and interact with each other. By placing the lobe terminology on a diagram with the different coloured regions reduces the amount of extraneous load – the amount of cognitive effort generated by the presentation of the concepts, than, for example, having purely textual definitions as was originally provided on the lecture PowerPoint slides (see Figure 2). The presentation also reduces the amount of Germane Load – the amount of cognitive effort required to understand the concepts.
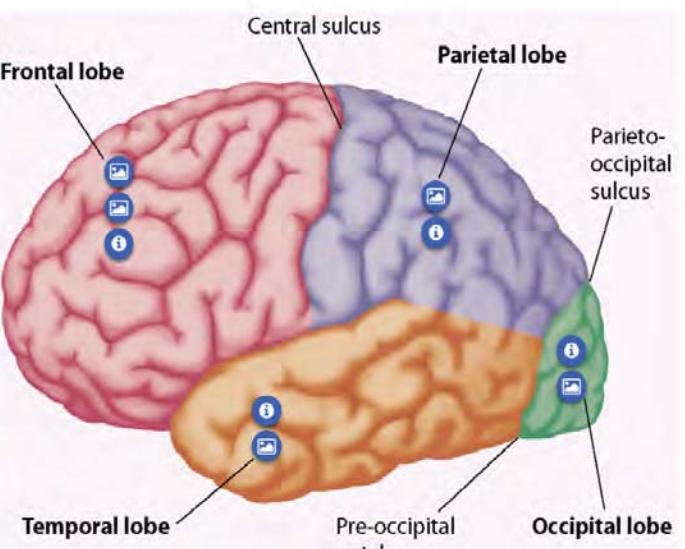
Furthermore, by embedding further information as Hotspots in introduces active learning instructional strategies to reinforce the theoretical concepts, and assists from encoding the information from Sensory to Working Memory, and into Long-Term Memory.

Figure 1 Course Presentation Online Interactive Activity for Neuropsychology. Originally segmented into a 22 slide powerpoint presentation it was reduced and condensed to a 6 slide 'H5P Course Presentation' with clickable hotspots that provide further detailed information, diagrams, and demonstratiion videos. It turned the passive learning into active learning.

By taking these factors into consideration when designing and developing the Online Interactive Activities, content creators can reduce cognitive load so that learning is clearer and simpler.

Furthermore, understanding how Cognitive Load affect learners of different levels (e.g. the novice learner versus the experienced learner) can also have an impact on ease of comprehension. For example the addition of instructional cues (icons or instructional text) such as those provided by the red and white 'Play; icon in Figure 1 placed directly beside the instructional text of "Watch this short video till 3:55 min" are essential instructions for the novice learner who has limited experience with active learning via Online Interactive Activities. However, for the experienced learner who does have experience with Online Interactive Activities, these instructional cues would act as a distraction away from the key information, unnecessarily increasing extraneous load. As Ibrahim et al. (2012) states "It is important to prompt working memory to accept, process, and send to long term memory only the most crucial information". Therefore, we would recommend only including the instructional icons in only the first few activities.
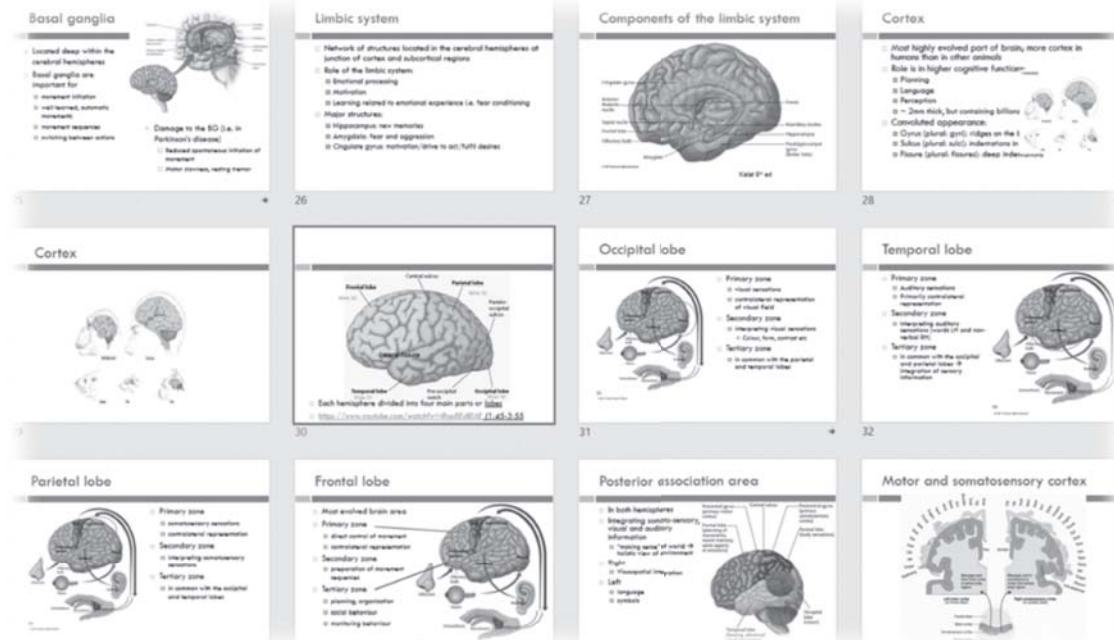
Figure 2 Powerpoint Slides illustrating how Neuroscience was previously taught. Text heavy Powerpoint slides that were originally 66 slides long, before being segmented and further condensed.

Design principles to prompt engagement

Highlights and Hotspots

Using text or symbols to highlight key information, a change in colour or contrast, or a symbol / icon to draw attention to a key feature on the activity. For example, arrow icons to remind novice learners to click on the hotspots to reveal further information; play bar icons remind learners to watch a video presenting more information (see Figure 1).

Presentation Methods and Modality Appropriateness

Considering the different methods and modalities available to present information, for example, many people's experience with PowerPoint is of a visual text method for presenting information. However, certain concepts may be more easily understood if presented via a different method. For example, technical explanations may be more clearly presented and understood if presented as a visual diagram containing interactive hotspots that reveal further information, and research suggests that students find the inclusion of demonstration videos as a more engaging mode of delivery (Stockwell et. al, 2015).

Another example related to Case Studies as learning activities. A case study that was previously presented to students as text-based scenario, could be presented as a video or a podcast which provides how these examples would be experienced in the real world (and rarely as a text document).

Consideration of the different modalities used to gain the information also impacts on Germane load and how easily information is acquired. Presenting information via a video employs multiple modalities (both the audio and visual sensory systems). It is appropriate that the auditory and visual sensory systems are used to gain information presented as a case study as that is how the information would be acquired in real-life scenarios.

Selective about which information is presented

As we discussed in the Section 0 Management of Cognitive Load, selecting information which is important for learners' level is important for reducing cognitive load, and encoding information into the Long-term memory. Including text, icons, or information that is beneficial to a novice learner may actually be an already understood concept that causes a distraction for advanced learners. The information (whether it be icons, images, or text) will occupy valuable space on the slides, space which could better be used as 'white space' so other key information is not missed, or disregarded by the amount of information which is presented on the slide.

Segmenting Content into Bite Sized Pieces
Presenting the information in bite-sized portions not only increases sustainability of the modules as the small portions are easily transferred and adapted across different subjects, but also allows the learners to engage with the content with minimal distraction from external factors. For example, a greater proportion (if not all) of a chunked learning activity could be completed without the distraction of email notifications, phone calls, messages, and conversations. Having completed a learning activity the learner feels rewarded and it is easier to progress on to the next bite-sized portion, rather than finding the exact location of a larger learning module in which to resume their learning before another distraction ensues, and reward for completion is delayed.

People are also more motivated to undertake their learning at free moments. For example, a learning activity may consist of an Interactive Video that is 4 minutes long. Learners would be able to successfully complete this activity on their commute, between classes, or wherever they can find 5 minutes to dedicate to their learning. This in turn provides control for the learner to scaffold their learning with regular points of success.

Size of the chunks?
For video material, research suggests that clips are presented at a maximum duration of ≤ 6 minutes (Gui et al., 2014) as students tend to view the entire content for clips at shorter durations than longer. Gui's study demonstrates that as the duration of the video clip increased, student engagement decreased, with only 50% of students viewing entire clips which were a duration of 9-12 minutes. Studies also indicate that students report greater mind wandering and retain less information when presented with longer clips (Risko et. al, 2012). For slide show presentations (eg, using the Course Presentation tool) we aim to have a maximum number of slides in a Presentation at approximately 15 slide chunks.

Active Learning Strategies

Interactivity
Interactivity can be created by using many of H5P's tools. This includes incorporating hotspots that when clicked reveal further information which could be text, an image, a diagram, weblink or a video.

Exportable text and document builder tools provide opportunities for learners to make notes, compile their thoughts, reflect on their learning and prior knowledge, and structure their writing.

The Incorporation of video clips such as demonstration videos, case studies, guest speakers, instructional videos, introduction videos, virtual tours, has been popular. However, requiring learners to simply watch a video clip is still considered as passive learning. By adding hotspot interactivity to highlight key information, activities, and quizzes for learners to check their understanding, it is turning a passive learning experience into an active learning experience. Furthermore, research by Lawson et al. (2006) have found that by providing learners with guiding questions to think about whilst viewing the clip improved students results when quizzed on the information.

Student check your knowledge activities
Bjork et. al (2013) demonstrated that novice learners do not accurately judge their understanding of a topic and tend to overestimate their comprehension. By providing activities (such as single / multiple choice quizzes, fill in the blanks, true / false) at regular points where learners can check their understanding will assist learners in gauging their comprehension. This in turn will allow them to scaffold their own learning and prompting revision of concepts which they have not yet grasped. Check your knowledge activities also prepares learners for any larger exams and assessments which they may be working towards in the future, reducing any elements of surprise at crucial moments.

Design of activities across the unit:

Another factor for consideration is how the activities are scaffolded across the subject, and on a broader level across the course. Whilst it is important to provide a level of consistency with the learning experience across the course, we have found that once online interactive activities have been introduced in a particular unit, students often request for the activities to be provided for other units within the course. The students found that the activities assisted them to learn the concepts.

The transferability of the resources between units also means that the activities can be included in a unit as a revision tool for topics studied in a previous subject, and provide a foundation for bridging into now topics.

It is also important to consider which activities and tools from the H5P toolkit are being used across the unit (and across the course). It is easy to slip into a habit of using the same preferred tools to design activities, for example to consistently use the drag and drop tool as an activity to match key terminology with descriptions. However, as the research by Rekhari and Sinnayah (2018) demonstrate, using a variety of activities across the delivery provides novelty, and maintains student engagement, more than consistently using a favoured tool or activity.

Looking into the distribution of activities across the colleges provides a broad overview of which activities are favoured, and perhaps where content creators can consider including greater diversity with the activities. In the evaluation of H5P activities developed in 2017, Anonymised authors explored the distribution of activities across the university, and found that while the Course Presentation tool (which not only presents information but includes many types of activities) was the most popular, a wide variety of tools was also being employed.
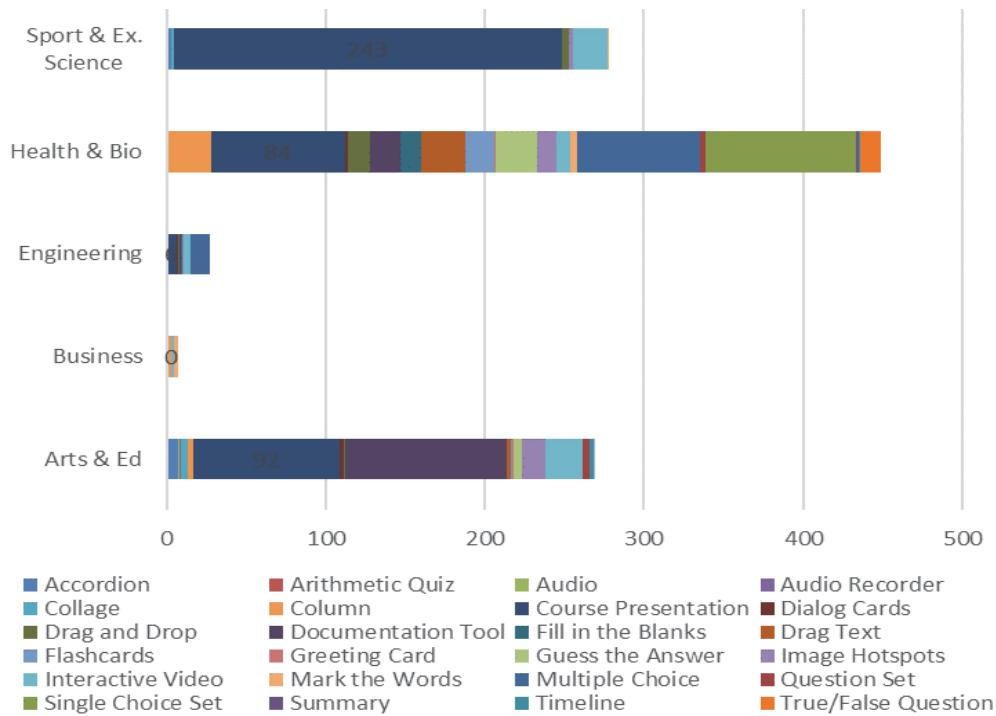

Figure 3. The range of different H5P activities per department

Many academics would also like to use the activities for summative assessments as the variety of tools within the H5P toolkit is broader or more engaging than many of the LMS tools. At this stage however, we discourage the use of the activities for summative assessments. This is partly based on technical reasons related to the current integration within our LMS, how marks are sent to the gradebook, and the technical parameters on how H5P calculates the results.

Discussion

Introducing the H5P online interactive activities for Blended Active Learning has been a success at Anonymised university. The anecdotal evidence from both staff and students has been positive, with verbal feedback from students including: "They are great – I like the interactive nature", "They are good for breaking up learning compared to full lecture", and "Great flexibility, thanks!".

The success of the uptake of the tool is evident by the number of activities that have been built, by the number which have been shared across the university, and the community of enquiry that has been formed as a result.

REFERENCES

Bjork, R. A., Dunlosky, J., & Kornell, N. (2013). Self-regulated learning: Beliefs, techniques, and illusions. *Annual review of psychology*, *64*, 417-444.

Borland, R. & Wilkie, S. (2017) Improving staff capacity to support student learning in the digital age. *Proceedings from the Association for Academic Learning and Language.*

Dean, A., & Lima, A. (2017). Student Experience of E-Learning Tools in HE: An Integrated Learning Framework. European Journal of Social Sciences Education and Research, 11(2), 39-51.

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23), 8410-8415.

Guo, P. J., Kim, J., & Rubin, R. (2014, March). How video production affects student engagement: an empirical study of MOOC videos. In *Proceedings of the first ACM conference on Learning@ scale conference* (pp. 41-50). ACM.

Ibrahim, M., Antonenko, P. D., Greenwood, C. M., & Wheeler, D. (2012). Effects of segmenting, signalling, and weeding on learning from educational video. *Learning, Media and Technology*, 37(3), 220-235.

Lawson, T. J., Bodle, J. H., Houlette, M. A., & Haubner, R. R. (2006). Guiding questions enhance student learning from educational videos. *Teaching of Psychology*, 33(1), 31-33.

MacKenzie, L., & Ballard, K. (2015). Can using individual online interactive activities enhance exam results. *Journal of Online Learning and Teaching*, *11*(2), 262-266.

Martínez-Caro, E., & Campuzano-Bolarín, F. (2011). Factors affecting students' satisfaction in engineering disciplines: traditional vs. blended approaches. European Journal of Engineering Education, 36(5), 473483.

Sweller, J. (1994). Cognitive load theory, learning difficulty, and instructional design. *Learning and instruction*, 4(4, 295-312.

Sweller, J. (2011). Cognitive load theory. In *Psychology of learning and motivation* (Vol. 55, pp. 37-76). Academic Press.

Rekhari, S., & Sinnayah, P. (2018) H5P and Innovation in Anatomy & Physiology Teaching in the *Proceedings of the Higher Education Research and Develoopment Society of Australiasia (HERDSA) Conference*. Adelaide, Australia.241.

Risko, E. F., Anderson, N., Sarwal, A., Engelhardt, M., & Kingstone, A. (2012). Everyday attention: Variation in mind wandering and memory in a lecture. *Applied Cognitive Psychology*, *26*(2), 234-242.

Wilkie, Zakaria & McDonald. H5P Online Interactive Activities Provide An Alternative To Lectures. *Proceedings of the Improving University Teaching Conference*, 2018.

Wilkie,S., Zakaria, G., McDonald. T, (2017).   Integration of H5P Online Learning Activities to Increase Student Success, in the *Proceedings of the Higher Education Research and Development Society of Australasia (HERDSA) Conference*, Sydney, Australia.

Zakaria, G., Wilkie,S., McDonald. T, (2018). '3D Printing Innovations: Human Anatomy' in the Proceedings of the *Improving University Teaching (IUT) International Conference*, Port Macquarie, Australia.

Zakaria, G., Wilkie,S., McDonald. T, (2018). 'Educational Applications for 3D-Printing: Human Anatomy' in the in the *Proceedings of the Higher Education Research and Development Society of Australasia (HERDSA) Conference*, Adelaide, Australia.

Zakaria, G., Wilkie,S., McDonald. T, (2018). 'Transforming Lectures to Online Interactive Activities' in the *Proceedings of the Higher Education Research and Development Society of Australasia (HERDSA) Conference*, Adelaide, Australia.