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Evaluation of Contemporary E-Learning Tools and Platforms for Tertiary Education

Aziz Ahmed[a], Grace A.L. Kennedy[b], Robyn Coman[c], Emmanuel B. Boateng[c], Marcella B. Papini[b] and Mehrdad Amirghasemi[b]
School of Civil, Mining and Environmental Engineering[a], SMART Infrastructure Facility[b], School of Health and Society, University of Wollongong
Corresponding Author Email: aziza@uow.edu.au

ABSTRACT

CONTEXT

This paper reports the reflection from a teaching circle involving the authors on ten e-learning tools when applied in the tertiary education context. The teaching circle enabled the authors to collectively trial new technologies for learning and teaching, share experiences and provide a critical review of their applications.

PURPOSE OR GOAL

The abundant availability of technology and the constant arrival of new e-learning tools can be considered both a boon and a bane. Teachers under immense workloads find it hard to keep up with the constantly evolving e-learning technology landscape. Moreover, knowing about a technology does not automatically enable a teacher to use the technology effectively. Learning from the experiences of fellow educators can go a long way in enhancing the educators' digital pedagogy.

APPROACH OR METHODOLOGY/METHODS

This study assessed ten e-learning tools: Moodle, Zoom, Webex, Padlet, Miro, Slido, Quizizz, Kahoot, Doodly, and H5P. The educators adopted them in a total of sixteen subjects delivered online, which involved undergraduate and postgraduate subjects in engineering and business and a few industry workshops. The Rubric for E-Learning Tool Evaluation proposed by Anstey and Watson (2018) was adapted for this study. The evaluation criteria are classified into eight categories, namely functionality, accessibility, technical, mobile design, privacy, data protection and rights, social presence, teaching presence, and cognitive presence. Each category has a set of attributes, and each attribute was evaluated against three standards: works well, minor concerns, or serious concerns.

ACTUAL OR ANTICIPATED OUTCOMES

The tools explored in this study were grouped into five types, namely, Learning management system, video conferencing, workshopping, quizzes, and video or animation development. The findings highlight the relative strengths and weaknesses of each platform within a type. Informative comments regarding each tool are reported based on educators' reflections to provide the readers with further insights into the applicability of these tools. A heat map is also included to provide a general overview of all ten tools' relative strengths and weaknesses.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

The aim of this reflection paper is not to declare any tool as the best. As the selection of the most appropriate e-learning tool for a particular classroom can be highly subjective. Rather, the findings of this paper can be used by the educator community to identify several candidate e-learning tools for further investigation.

KEYWORDS

E-learning-tools evaluation, educator reflection, tertiary education

Introduction

The current generation of students are digitally expectant, meaning they expect that their years of formal schooling will be rich in digital technologies (Howell 2012). They have been labelled as 'Gen C', 'Gen I', 'Net Gen', 'Gen Y', 'Gen Z', 'Internet Generation', 'digital natives', and so on. On the other hand, majority of the teachers fall into Prensky's (2001) digital immigrants' paradigm—they range from someone who have endeavoured to use information and communication technology (ICT) to those who shy away from the use of ICT in the learning and teaching process.

Research has shown that the use of technology changes the learning techniques and knowledge creation significantly from the traditional paradigm of teacher centric learning and teaching (Howell 2012). Technology has enabled a shift towards more independent, student-led inquiry-based learning. Teachers are now taking on the role of co-collaborator or e-Moderator (Howell 2012). As Howell (2012) elegantly summarises,

> *So, technology appears to be more than a mere tool in the classroom: it changes how and what we learn. Throwing a computer into a classroom doesn't make the learning effective: teachers need to understand how to use technology effectively, understand the learning theories behind the practice and know how to select the right technology for the learning outcomes they seek. Teachers need a digital pedagogy. In simple terms, a digital pedagogy is the study of how to teach using digital technologies.*

Clandinin et al. (2017) argues that technology can be an integral part of solving challenges in learning and teaching; however, the use of technology should base on the requirement of the learning topic and students. After studying publicised failures of several large-scale technology projects, Clandinin et al. (2017) concluded,

> *In the context of access, skill, and usage, these cases demonstrate that even when abundant access was available, the absence of skill and usage on the part of teachers limited students' skill and usage.*

However, the abundant availability of technology and constant arrival of new e-learning tools can be considered both a boon and a bane. Teachers under immense workload find it hard to keep up with the constantly evolving e-learning technology landscape. Moreover, just knowing about a technology does not automatically enable a teacher to use the technology effectively in a classroom setting. Learning from the experiences of fellow educators can go a long way in enhancing the educators' skills in using e-learning tools in their subjects.

With this critical need in mind, this paper presents the reflections by the authors on ten e-learning tools when applied in the tertiary education context. The reflections stem from a teaching circle that enabled the authors to collectively trial new technologies for learning and teaching, to share experiences and to provide critical review on their applications. It is not the aim of this paper to prescribe one or more tools as the best. As the selection of the most appropriate e-learning for a particular classroom can be highly subjective. Rather, the objective findings of this paper can be used by the educator community to identify several candidate e-learning tools for further exploration.

Background

The Wollongong Academy of Tertiary Teaching & Learning Excellence (WATTLE) brings together communities of educators across the University of Wollongong (UOW) to enhance student learning experiences and provide opportunities for teaching development. The disruption caused by the shift to online teaching meant that educators needed to rapidly adapt and translate both materials and the mechanisms. However, the quality of the online learning resources and teaching mechanisms were heavily constrained by time, teacher's skills, and available technologies. In NSW, lockdowns from March-July 2020 and July-October 2021 necessitated the move to wholly online delivery. An international study of tertiary STEM educators found that the top three challenges to teaching online during the pandemic were pedagogical concern, assessment and evaluation, and adapting to new technologies (Sedaghatou, 2021), they also found qualitatively that judging engagement of students was 'extremely' difficult. This latter point resonated with the circle members' experiences during the first NSW lockdown, where the mode of teaching was mostly online and the feeling that students may be 'falling through the cracks'. Each member of the circle had independently adopted third-party novel technologies and tools to support their own teaching practices and were working on evolving

and improving their online teaching. The teaching circle was an opportunity to share our experiences with each other (and to support others in trialling technologies they may not be as familiar with), then at the completion of the teaching circle to objectively evaluate the trials within the contexts under which they had been applied.

Scope of the Study

In 2021, WATTLE launched a new 'Teaching Circles' initiative where individuals could propose areas of interest and find others at the university with similar interests to work on a passion or exploratory project during Spring Semester (August – November 2021). The 'Novel Technologies for Teaching & Learning Circle' consisted of seven educators from the SMART Infrastructure Facility (4), School of Civil, Mining and Environmental Engineering (2) and the School of Health & Society (1). The roles and levels of experience in teaching and using online tools varied between individuals; from tutors to short course teaching to industry, to lecturer/module coordinators at both undergraduate and post-graduate level. The purpose of the teaching circle was to enable the members to trial new technologies for teaching and learning in their courses, to share their experiences (both prior to the circle, and during the circle) and to provide critical review in applications of use.

These seven educators from three different faculties, (Engineering and Information Sciences (EIS), Arts, Social Sciences and Humanities (ASSH) and Business and Law (BAL) reflected on their use of the selected tools on a total of sixteen different subjects ranging from standard thirteen weeks long subjects to day-long industry short courses. In some instances, the educators reflected on their personal use experience as well. Each member selected tools from the candidate set, then brainstormed and trialled them (in this study the definition of trial is quite broad as it could be anything from a one-off trial to part of a series of applications). Ten tools were selected to be explored this year, these tools can be further grouped into five types, Learning Management System (Moodle), Video Conferencing tools (Zoom, Webex), Workshopping tools (Padlet, Miro), Quiz platform (Kahoot, Slido, Quizizz) and Video or animation Development tool (Doodly, H5P).

Methodology

This study assessed ten e-learning tools: Moodle, Zoom, Webex, Padlet, Miro, Slido, Quizizz, Kahoot, Doodly, and H5P. To evaluate these tools, the educators adopted them in total of sixteen subjects delivered online at UOW in the 2021 Spring Session. The subjects were offered to undergraduate and postgraduate students in engineering and business. A few subject also involved industry workshops. The class size ranged from 12 to 390 students. The Rubric for E-Learning Tool Evaluation proposed by Anstey and Watson (2018) was adapted to assess e-learning tools. Anstey and Watson's framework was designed to help teachers evaluate the suitability of an e-learning tool for their learning objectives and learners' needs through a multidimensional evaluation of functional, technical, and pedagogical aspects. The evaluation criteria included in the framework are classified into eight categories, namely functionality, accessibility, technical, mobile design, privacy, data protection and rights, social presence, teaching presence, and cognitive presence. Each category has a set of attributes, and each attribute is evaluated against three standards: works well, minor concerns, *or* serious concerns. Table 1 presents the criteria categories and the attributes of each category. Each attribute was scored between a maximum value of 5 for working well and a minimum value of -5 for having serious concerns. Minor concerns were given a score of 2.5 and if the attribute did not apply a score of 0 was given. All seven educators scored all the attributes using this approach. The results presented in this paper base on the average of each attribute added up for each criterion.

Table 1: Criteria categories, and their attributes, in the Rubric for E-learning Tool Evaluation (adapted from Anstey and Watson, 2018)

Criteria	Attribute	Description
Functionality	Scale	Evaluates the tool's capacity to accommodate the size and nature of the classroom context

	Ease of Use	Evaluates the tool's design characteristics that provide user-friendliness and intuitive use
	Tech Support / Help Availability	Points to whether help/support is localised, current, responsive to users' needs, and timely
	Hypermediality	Points to whether the tool's functions enable and encourage educators and students to engage and communicate through different forms of media
Accessibility	Accessibility standards	Focus on the tool's ability to meet accessibility standards
	User-focused participation	Focus on the tool's capacity to address the needs of diverse users
	Required Equipment	Considers the tool's environmental requirements for usage (e.g. speakers and mobile phone)
	Cost of Use	Evaluates the financial costs of a tool
Technical	Integration/ Embedding within a Learning Management System (LMS)	Points to whether the tool can be integrated within a LMS
	Desktop / Laptop Operating Systems and Browser	Evaluates if learners can effectively use the tool on a desktop or laptop if it has a standard, up-to-date operating system and/or browser
	Additional Downloads	Points to whether the tool depends on another piece of software to function
Mobile design	Access	Assesses whether the tool can be accessed using a mobile device
	Functionality	Considers how the functions of the tool work in the mobile version compared to the desktop version
	Offline Access	Points to whether the tool offers an offline mode
Privacy, data protection and rights	Sign Up/ Sign In	Measures on the tool's ability to ensure that the collection of student data by a third-party group is being protected
	Data Privacy and Ownership	Assesses whether the tool follows intellectual property policies and allows user's control over how content is shared
	Archiving, Saving, and Exporting Data	Evaluates how data/content can be migrated back and forth between the tool and its user
Social presence	Collaboration	Measures the tool's capacity to provide students with frequent and varied opportunities to interact/collaborate with their peers
	User Accountability	Points to whether the tool allows educators to identify students, even when they use pseudonyms
	Diffusion	Assesses whether the tool provides a sense of familiarity to the students

Teaching presence	Facilitation	Focus on whether the tool promotes instructor's ability to engage in facilitation activities
	Customization	Considers the tool's flexibility to be customise how students will engage with it
	Learning Analytics	Assesses the availability, quality, and user-friendliness of the analytics offered by the tool
Cognitive presence	Enhancement of Cognitive Task(s)	Measures the tool's ability to enhance students' cognitive tasks
	Higher Order Thinking	Considers a tool's ability to help students integrate, rearrange, or extend new and existing information
	Metacognitive Engagement	Points to how the tool prompts understanding, regulation, and reflection of students' own cognitive activities

Results and Discussion

Figure 1 shows the results after educators engaged quizzing platforms (i.e., Slido, Quizizz, and Kahoot) with students. As shown in Figure 1, the highest score for Slido was 75% in the category of technical capability. This was examined in terms of how well Slido can effectively be used on a desktop/laptop computer if they have a standard operating system and/or browser. Slido also fulfilled requirements relating to the installation of additional software or plug-in. The educators commented that "Slido has potential applications in face-to-face teaching". The least scored category for Slido (17%) was in the areas of mobile design. Slido was known to work well regardless of the kind of mobile device, and the easy of accessing and interacting with the tool through an application or browser. There were minor concerns with functionality in terms of mobile design, as the mobile version had few differences from the desktop version. Serious concerns were attributed to offline access as Slido was restricted in expanding access where there was limited connectivity. The educators noted that "students enjoyed using their phones to join the Slido game in the lecture hall. But some got distracted and played games! The word cloud is really good!". On the other hand, Quizizz platform was highly rated in terms of accessibility (100%) and the least rated was social presence (17%). The high score of accessibility when using Quizizz can be attributed to the tool adhering to legislative accessibility standards, addressing the needs of different users and comprehension of student capability. The educators mention that "A very effective tool for encouraging students to read and prepare before coming to the lecture and engage during the lecture through a fun and playful activity". The social presence score was low since there were concerns with its diffusion as it was viewed as less readily used than foreign tools. Kahoot scored 91% in the technical category and 29% in accessibility. The technical high score was due mainly due to the tool's capacity to run effectively in a standard browser or operating system. Kahoot was also viewed as being institutionally-backed to be integrated into the LMS, hence has the support needed for teaching and learning in the subjects. The educators stated that "Students enjoyed the gaming and engaging colours/animations". The low accessibility score is also attributed to the minimum adherence of Kahoot to mandated requirements for accessibility and serious concerns about not addressing the needs of diverse users and comprehension of literacies. The educators suggested that "Some enjoyed and engaged, but not everyone signed in. Can add quite a bit of time to the lecture time and transitioning between different windows can be challenging for both students and lecturer".

Figure 2 shows the results after educators engaged workshop/brainstorming platforms (i.e. Miro, Padlet) with students. Padlet had 97% for the technical category. The educators supported this with observations such as "Padlet is good for creating interactive lessons that follow a structured format", "Students enjoyed the "likes" feature (bit like social media)". Padlet had a least score of 14% for

cognitive presence. According to the educators “Not useful when you have a lot of people adding notes at the same time, hard to control the layout, cannot zoom in or out, so must scroll a lot, difficult for more than one subgroup to use at same time (unless creating more Padlets)”, “Care must be taken to avoid a repetitive vibe from using the same format in all lectures”, “'Not very interactive”, and “Free version only allow three Padlet at a time”. On the other hand, Miro scored 92% in the technical category. From the study, educators stated that “Works very well for workshop style activities, great to be able to embed other sources into Miro so everything Is in one place (e.g. slides, reports, weblinks)”, “Miro has significantly more capability than Padlet. Its free-form-nature can lead to large number of possibilities”, “The students also get up to 10 free Miro Boards using their student email. Encouraging the students to use this platform for their team projects can help them become more familiar with its capabilities”, and “Workshops worked exceptionally well and got good participation”. Miro scored low on mobile design (11%). According to the educators, “Information difficult to manage if there are numerous people adding at same time - Don't forget to turn off the cursors of those on the board if there are hundreds of people online at the same time it can be distracting - Absolute beginners need time to become familiar with how to navigate and use the tool”, and “Make sure to lock the boards to stop users inadvertently moving them”.

Figure 3 shows the results after educators engaged online meeting platforms (i.e. Webex, Zoom) with students. Zoom had a high rating of 84% for the accessibility criteria. According to the educators, “Zoom poll quite useful to keep the students engaged”, “Students are used to using zoom”, “Can use integrated polling and reactions for interaction”, and “easy to use”. Zoom also had a poor score (-32%) for cognitive presence. Feedbacks from the educators suggested that “Can be technology problems with bandwidth, annotation is poor (you can use it, but it is not integrated into the slides, so you need to screengrab and then delete everything when you want to move on), hard to tell whether students are engaged (or even sometimes really there!!)”, and “subtitles are not accurate”. On the other hand, Webex had a fairly high score of 63% for accessibility and an exceptionally low score (-75%) in cognitive presence. These low ratings were due to suggestions by educators such as “Not as convenient as Zoom from a Classroom perspective. However, it does come with a lot of additional capabilities that Microsoft offers” and “Integrating other apps and features in WebEx meeting takes time, practice and patience. Best to start using them in team meetings before using them in lessons”.

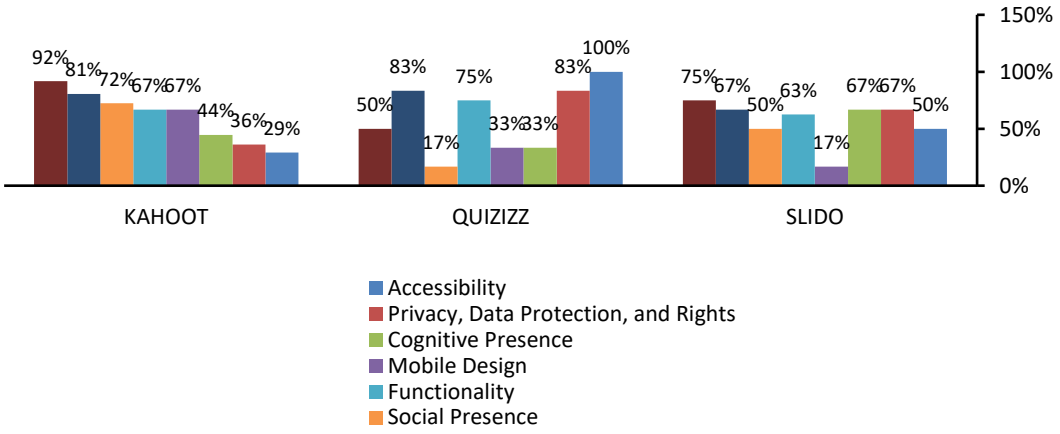

Figure 1. Comparison of aggregated score in percentage for Quizzing platforms

Overall, as shown in Figure 4, Moodle had a 98% score in the category of functionality and Doodly had the least score (-13%) in the same category. For Doodly, educators had a serious concern with its ease and a minor concern in the areas of technical support for the tool. As mentioned by the educators, “It takes quite some time to create the videos and voice over is an issue. Needs practice to make it feel natural”. In terms of accessibility, Quizizz scored the highest score (100%) and Kahoot has 29%. The high score of Quizizz is evident in the educator’s feedback that “A very effective tool

for encouraging students to read and prepare before coming to the lecture and engage during the lecture through a fun and playful activity".

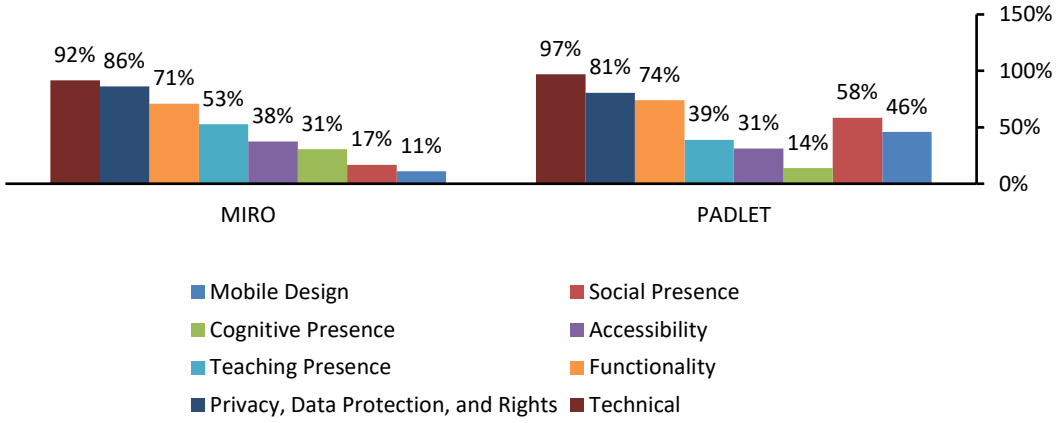

Figure 2. Comparison of aggregated score in percentage for Workshop/brainstorming platforms

Low score of Kahoot in this category can be attributed to concerns educators had surrounding accessibility standards, user-focused participation, and cost of use. Moodle had the highest score in the technical category and Doodly in mobile design. Doodly further had the highest score in privacy, data protection, and rights. H5P (-17%) and Webex (-6%) had the lowest score in this category. The primary concerns relating to the use of H5P were in the sign up/sign in as it required students to disclose personal and sensitive information. Other serious concerns were also revealed in the areas of data privacy and ownership. Moodle (100%) ranked highest in social presence, whereas Doodly (-33%) was the least. The main concern for Doodly low score was lack of readiness to use the tool is compared to other substitutes. Quizizz (83%) had the biggest score in the teaching presence category as it was easy to facilitate and customise.

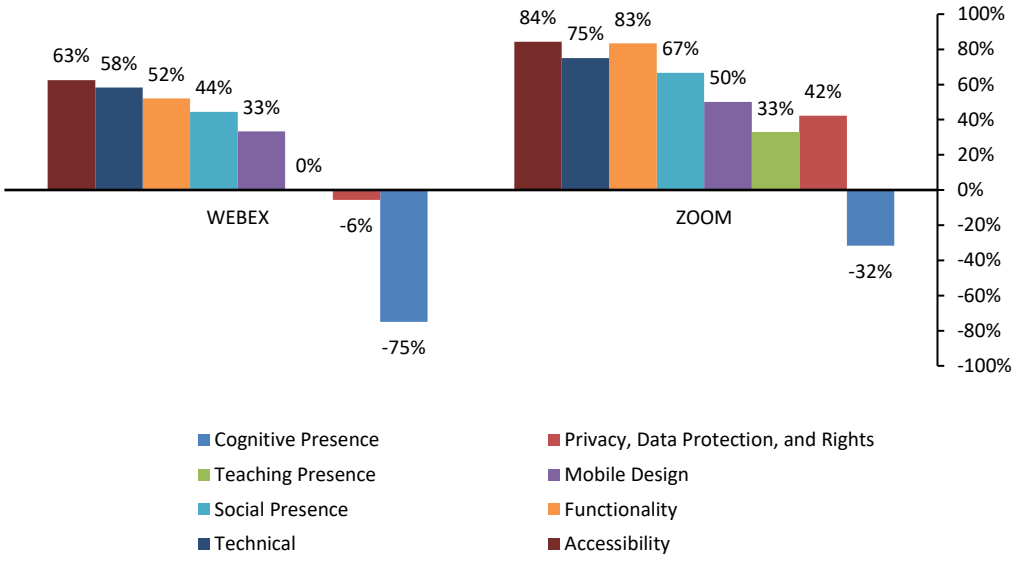

Figure 3. Comparison of aggregated score in percentage for Online meeting platforms

Doodly had the lowest score of -33% in this category, as there was a serious concern with the lack of learning analytics in the tool such as collecting, connecting, combining, and interpretating data to comprehend learner capabilities to support students and course design. In the final category, which is cognitive presence, two tools, Moodle and H5P had the highest score of 100% while Zoom (-31%) and Webex (-75%) had the least. Both Zoom and Webex were seen to have a toll on users' cognitive

engagement. That is, they significantly lack in the areas of enhancing learning, high order thinking and metacognitive engagement.

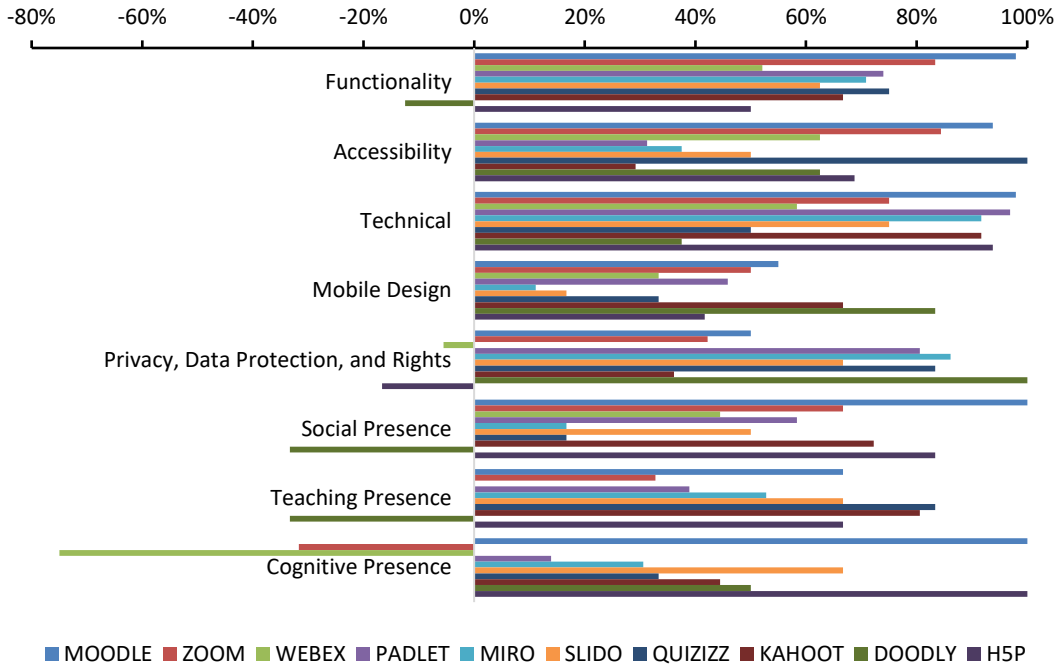

Figure 4. Overall evaluation of contemporary e-learning tools and platforms

Figure 5 contains a heat map showing the final aggregated scorings from our assessments. The heat map is not intended to decide which tools are best, but more a general overview of where the relative strengths and weaknesses lie for each tool. A traffic light system was used, with dark green showing relative strength, and red showing weaknesses.

e-Tool Assessment Rubric	Max.	Tools:	LMS	Meetings		Workshop/Brainstorm		Quizzes			Video Production	
			MOODLE	ZOOM	WEBEX	PADLET	MIRO	SLIDO	QUIZIZZ	KAHOOT	DOODLY	H5P
Functionality	20	Scale	98%	83%	52%	74%	71%	63%	75%	67%	-13%	50%
		Ease of Use										
		Tech Support / Help Availability										
		Hypermediality										
Accessibility	20	Accessibility standards	94%	84%	63%	31%	38%	50%	100%	29%	63%	69%
		User-focused participation										
		Required Equipment										
		Cost of Use										
Technical	20	Integration/ Embedding within a Learning Management System (LMS)	98%	75%	58%	97%	92%	75%	50%	92%	38%	94%
		Desktop / Laptop Operating Systems										
		Browser										
		Additional Downloads										
Mobile Design	15	Access	55%	50%	33%	46%	11%	17%	33%	67%	83%	42%
		Functionality										
		Offline Access										
Privacy, Data Protection, and Rights	15	Sign Up/ Sign In	50%	42%	-6%	81%	86%	67%	83%	36%	100%	-17%
		Data Privacy and Ownership										
		Archiving, Saving, and Exporting Data										
Social Presence	15	Collaboration	100%	67%	44%	58%	17%	50%	17%	72%	-33%	83%
		User Accountability										
		Diffusion										
Teaching Presence	15	Facilitation	67%	33%	0%	39%	53%	67%	83%	81%	-33%	67%
		Customization										
		Learning Analytics										
Cognitive Presence	15	Enhancement of Cognitive Task(s)	100%	-32%	-75%	14%	31%	67%	33%	44%	50%	100%
		Higher Order Thinking										
		Metacognitive Engagement										
		TOTALS:	84%	54%	25%	56%	52%	57%	61%	61%	31%	62%

Figure 5. A heat map showing the final aggregated score in percentage from the evaluation

Future Study

The next stage of this study will focus on investigating the student experiences with a few novel technologies for learning and teaching, which were identified in the first version of the teaching circle. A standard set of tasks will be developed utilizing the selected novel technologies for uniform

assessment across different subjects to enable student evaluations of the identified technologies in several subjects across several faculties.

Conclusion and Recommendations

Comparing e-learning tools is not straight forward as it is very much an "apples and pears" exercise. Nevertheless, the authors identified an e-Assessment for Online Learning Tools rubric developed by Western University (https://teaching.uwo.ca/pdf/elearning/Rubric-for-eLearning-Tool-Evaluation.pdf) to measure the tools' performance against eight criteria covering twenty-seven attributes. Ten tools were explored in this study (grouped into five types), Learning management system, video conferencing, workshopping, quizzes, and video or animation development. Seven educators from three faculties trialled these tools in a total of sixteen subjects comprising of first year undergraduate, final year undergraduate, post-graduate subjects and day-long industry workshops. The presented results include comparisons among similar groups as well as overall comparison. The aim of this reflection paper is not to declare any tool as the best. As the selection of the most appropriate e-learning tool for a particular classroom can be highly subjective. Rather, the findings of this paper can be used by the educator community to identify several candidate e-learning tools for further investigation.

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