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Supporting university students’ learning across time and space: A from-scratch, personalised, and mobile-friendly approach

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Design/methodology/approach
This study presents the successes and challenges of introducing a mobile learning resource, Pocket Tutor, to bolster autonomous learning in a supported university learning environment. Pocket Tutor was designed and developed in 2019 and integrated in 2020 and 2021 into a multimedia design class offered at a large university in the Asia-Pacific. The resource’s effectiveness is measured against common technology acceptance factors—including self-efficacy, enthusiasm, and enjoyment in relation to contextual purpose and class learning outcomes—through a multi-pronged approach consisting of a class-wide survey, developed specifically for this purpose, and analysis of usage data. Deeper context was also provided through a small pool of follow-up interviews.

Purpose
The Pocket Tutor learning resource that was designed and evaluated in this study responds to a number of teaching and learning challenges within the tertiary education context. These include those related to the number and type of learning activities that can be offered, class pacing, subject-specific content considerations, and the availability and quality of off-the-shelf learning resources. Educators have to potentially contend with all of these amidst mounting institutional constraints and external pressures. Yet, a supplemental, from-scratch online learning resource can help mitigate some of these challenges.

Findings
Evidence from our data suggests that a bespoke, mobile learning resource can provide greater consistency, more relevance, more flexibility for when and where students learn, and more efficiency with limited opportunities for synchronous interaction. At the same time, a bespoke mobile learning resource represents a significant investment of skill and time to develop and maintain.

Originality/value
The present study responds to calls from scholars who argue that more research (especially that is qualitative and discipline-specific) is needed to investigate students’ willingness to use learning apps on their mobile devices. This study pairs such research about student willingness with actual usage data and student reflections to more concretely address the role of mobile learning resources in higher education contexts. It also, importantly, doesn’t just assess perceptions and attitudes about mobile learning resources in the abstract but assesses attitudes and usage patterns for specific generic and bespoke mobile learning resources available for students in a specific university class (thereby providing discipline-specific insights). It also provides a unique contribution by including multiple years of data and, thus, offers a longitudinal view on how mobile learning resources are perceived and used in a particular higher education context.

Introduction

In a world still reeling from the effects of the COVID-19 pandemic, global society has had to reimagine how to work and learn amidst lockdowns, isolation requirements, and restrictions on gatherings. The world turned online to stay connected and to continue to work and learn remotely, yet, within the higher education context, some instructors tried to replicate online what they do on campus with mixed results. Now more than two years later, some educators have adapted their practice to offer a more purposeful online learning experience while others have returned to their pre-pandemic teaching practices. Regardless of the context, some challenges pervade many tertiary learning experiences across the globe. These are outlined below and it is these challenges that necessitated the need to rethink how student learning is supported when institutional constraints and external pressures limit what can be done in a traditional university classroom.

Various teaching and learning challenges—related to the number and type of learning activities, class pacing, subject-specific content considerations, and extant learning resources—were brought into sharp relief when a newly designed class that launched at the lead author's university in 2019 in an on-campus format was later, due to the pandemic and academic program restructuring, offered in both on-campus and online formats. Though these challenges originate from one class in a particular discipline (Communication), many of them transcend institutions and disciplines.

Limited and/or high-stakes learning opportunities. In any university setting, the number and type of learning activities is limited by institutional constraints or external factors, such as the length of the teaching period, the available teaching budget, the class size and delivery mode, the diversity of the student cohort, the skills and experiences of the teaching team, and the learning resources and tools available. With this particular class, synchronous learning activities were limited to 10-12 tutorials a semester. Unlike lectures, these were not recorded both due to insufficient A/V resources in the teaching spaces as well as due to the nature of the learning opportunities themselves (eg, small-group or one-on-one activities wouldn't be meaningfully captured on a recording and/or the awareness of recording could inhibit student participation). This meant that if students missed a tutorial, either due to avoidable or unavoidable reasons (such as having to self-isolate pending the results of a COVID-19 test or missing a class due to work commitments) their opportunities to meaningfully engage with the aspects presented that day were limited, if not entirely removed.

Class pacing. While some one-on-one feedback is possible, the one-to-many composition of many university classes (as well as the finite duration of each class period) means that pacing is often controlled by the majority at the expense of the minority. If the majority of students "get it" or are happy to continue on, the instructor will often have to progress even if not all students have fully understood a concept or completed an assigned activity. This is a challenge for synchronous teaching regardless of whether it occurs virtually or in person and is potentially exacerbated by the diversity of the student cohort who can hail from many different majors, age groups, and demographic backgrounds.

Subject matter. Unlike discussion-based classes which can be more flexible in their delivery, skills- or equipment-based classes require greater structure and support for the sometimes highly technical nature of the content that is being taught. For example, this class requires students to have a working knowledge of several Adobe Creative Cloud software applications (InDesign, Illustrator, Photoshop, and XD) which have a steep learning curve and involve operations and processes that students report finding difficult to remember.

Availability of extant learning resources. The learning resources that can be used depend on institutional factors like which learning management system (LMS) is supported, the amount of budget or time available to develop new learning resources, and the skills and backgrounds of the teaching team. In this specific context, the teaching team's university provides all students with access to supplemental learning resources, such as LinkedIn Learning (formerly Lynda.com) video tutorials that focus on Adobe Creative Cloud software and associated operations; however, these are generic and often quite expansive in scope (some video tutorials are six-plus hours). This means that students often report being overwhelmed or intimidated by the length, frustrated when having to sift through the content to find parts that are relevant to the unit's learning aims or outcomes, and confused when directions or terminology don't align between the generic resource and those used by the teaching team.

As such, considering the perennial challenges of time, budget and resources, class format and content, and the availability of existing learning resources, in addition to students' short attention spans and desire for high-quality, personalised learning that they can't find on a generic site like YouTube, the teaching team met in late 2019 and began brainstorming how to attend to these challenges for the 2020 iteration of the unit. This would turn into a prescient conversation as the onset of the COVID-19 pandemic the next year would necessitate similar conversations across classes and universities throughout the sector.

The results of these conversations and complementary exploration into the literature on online learning resources resulted in the creation of a from-scratch mobile-first learning resource, Pocket Tutor, designed using the Articulate 360 platform and deployed for this communication design class. Pocket Tutor consists of 23 bite-size lessons organised across 10 weeks and designed to each be completed on a mobile device or laptop in 15 or fewer minutes. The lessons are interactive and consist of a mix of self-assessment activities, definitions and keywords, interactive interfaces that allow students to hover over key tools or software areas and receive guidance about the tool or area's function and how to effectively use it, matching exercises, step-by-step workflows and demonstrations, quizzes, didactic diagrams that provide process-related information and explain the associated relevance, sorting activities, and how-to videos.

This empirical study emerged as an attempt to measure the effectiveness (operationalized through use) of Pocket Tutor in contrast to generic, off-the-shelf learning resources, and to identify how students regard the bespoke learning resource as well as illuminate the particular cohorts or attributes that the resource was best suited to. The present study responds to calls from Camilleri & Camilleri (2022), among others, who argue that more research (especially that is qualitative and discipline-specific) is needed to investigate students' willingness to use learning apps on their mobile devices. This study pairs such research about student willingness with actual usage data and student reflections to more concretely address the role of mobile learning resources in higher education contexts. It also, importantly, doesn't just assess perceptions and attitudes about mobile learning resources in the abstract but assesses attitudes and usage patterns for specific generic and bespoke mobile learning resources available for students in a specific university class (thereby providing discipline-specific insights). It also provides a unique contribution by including multiple years of data and, thus, offers a longitudinal view on how mobile learning resources are perceived and used in a particular higher education context. It poses three research questions:

> **RQ1:** How do university students in a skills-heavy communication class *use* a bespoke learning resource that is interactive and not bound by space or time?
> **RQ2:** How do university students in a skills-heavy communication unit *regard* a bespoke learning resource that is interactive and not bound by space or time?
> **RQ3:** What is the relationship between individual attributes (e.g., age, gender, ESL status, enrolment type, or grades) and usage of a bespoke, e-learning resource?

In order to provide a strong foundation upon which to build, the review that follows seeks to evaluate the literature and articulate the rationale for bespoke and personalized learning, provide insight into how the higher education technology acceptance model supports the design of a bespoke model, and provide an evaluation of the affordances of particular learning approaches to facilitate independent learning. We begin by establishing the conceptual frameworks that underpin this study through an analysis of m-learning.

Literature review

E-learning, m-learning (mobile learning), and blended or flipped classrooms are becoming increasingly integrated into a wide variety of learning environments, including from primary school through tertiary education (Camilleri & Camilleri, 2019). The global COVID-19 pandemic has rapidly accelerated the adoption of technology in higher education to bypass location and temporal barriers related to student learning and engagement. While there are key benefits to the use of technology in such situations, teaching staff need to carefully consider and ensure it is being used appropriately for the specific context and that relevant learning and teaching theories inform such use (See figure 1).

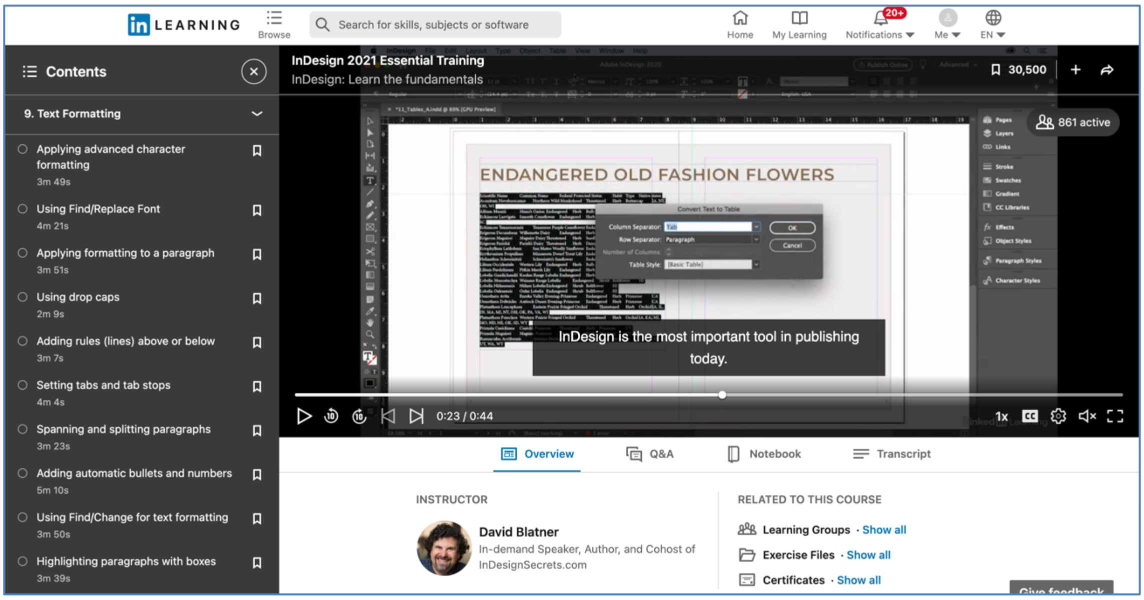

Figure 1. LinkedIn Learning's 'InDesign 2021 Essential Training' video is 5 hours and 11 minutes long and consists of a series of screen recordings that demonstrate various tools, operations, and processes. University teaching staff need to consider whether generic learning resources are sufficient or whether more bespoke materials would serve students' needs better.

Mobile learning or m-learning is an extension of e-learning that utilizes the affordances of mobile technology and delivers learning opportunities to students through their own personal, handheld devices, such as smartphones or tablets (Bruck et al., 2012). Geddes (2004) defines m-learning as "the acquisition of any knowledge and skills through the use of mobile technology, anywhere, and anytime" (p.1). Researchers have used existing, generic mobile applications and programs to enhance learning, particularly in an authentic technology-use sense, however, purpose-built applications can also take advantage of smartphone's affordances to create learning opportunities in a mobile environment. Bruck et al. (2012) makes arguments for the use of micro-content on mobile devices to 1) suit the affordances of the device (smaller screen) and pre-understood media literacies around the device such as micro-blogging, SMS and, social media use, and, 2) create content that is better retained through repetition, computer-assessment, and clear organization.

Both e-learning and m-learning can facilitate a "flipped" or blended approach to learning. Blended learning can be defined as the combination of face-to-face learning and computer-mediated learning (Means et al., 2013). Liu et al (2010) suggests that short- and long- term usefulness has a significant influence on mobile learning adoption. The flipped classroom builds upon this and follows the notion that the student is given materials to consider in preparation for class (He et al., 2019). More class time is then dedicated to constructivist discussion and problem-solving. Academics argue that this has the effect of providing a more engaged and hence, deeper approach to meaningful learning (Khechara & Smith, 2017).

Personalized and bespoke learning

Past research suggests that the thoughtful application of e-learning, m-learning, and a flipped approach to learning can be beneficial (Means et al. 2013; Khechara & Smith, 2017; Cochrane et al., 2017, Bruck et. al., 2012). Authors list the benefits of these modes of delivery as: 1) a facilitator for up-to-date content due to dynamic real-time editing capabilities, 2) more cost-effective to institutions, 3) flexible in delivery to support students regardless of whether they are bound by time or location, 4) a more interactive environment where students can receive synchronous feedback through applications rather than waiting for feedback from facilitators, and, 5) the ability to tap into devices that are already integrated into student's life and media consumption habits.

This paper proposes a bespoke design model as a way to deliver learning for a specific context and this can be seen to contradict the availability of open e-learning support courses such as MOOCs (Massive Open Online Courses) and databases of generic educational content such as LinkedIn Learning. We suggest that while these resources can provide additional support for students, in the context of specialist knowledge and just-in-time learning, bespoke design is more personalized, and leads to a better uptake of the tools and sets expectations for use. This is not to suggest that a well-designed MOOC is not a fruitful learning experience; however, we are suggesting that e-learning for specific contexts requires bespoke solutions. Delivering a bespoke solution can mitigate barriers such as age, gender, motivation and self-efficacy identified by Rabin et al. (2020) and can improve student satisfaction (He et al, 2019). Baker & Goodboy (2018) suggest that an autonomy-supportive teaching style allows students to be more intrinsically motivated which in turn keeps their attention, improves feedback and improves effort. Colvin Clark & Mayer (2016) suggest that learner control of the navigation and pace of the content is fundamental for success of any given tool when it relates to student engagement and motivation. In short, course material needs to align with learning outcomes, specific learners, their behaviour, and known motivations (Garrison, 2011; Laurillard, 2002). As such, it can be argued that planning bespoke content with bespoke navigation can provide a more satisfying and autonomous learning experience.

Technology use and motivations (the Higher Education technology acceptance model)

One of the key issues of introducing e-learning successfully in higher education is to ensure that tools and technologies are purposeful for the learner. The Technology Acceptance Model (TAM) is an information system, behaviour-based, theoretical framework that considers how users accept and engage with technologies. Fred Davis, an MIT Scholar, initially proposed that technology use boils down to three factors: perceived ease of use (PEU), perceived usefulness (PU) and the attitude towards use (Davis, 1989; Granić & Marangunić, 2019; Pinadito et al, 2020). Over time, TAM has been further extended to include additional relationships, for example, social influence and trustworthiness (Abdullah & Ward, 2016; Bannajee & Day, 2013; Granić & Marangunić, 2019; Venkatesh & Davis, 2000). In higher education, TAM has been adapted by education communities as the "most common ground theory" in the acceptance of e-learning literature (Abdullah & Ward, 2016; Granić & Marangunić, 2019, p. 2575).

When Abdullah & Ward (2016) undertook an extended review of e-learning adoption in higher education, it led them to create an adapted TAM framework. Known as GETAMEL (general extended technology acceptance model for e-learning) (Abdullah & Ward, 2016, p. 238) it breaks down the common factors of PU and PEU into what they consider to be best predictors for student engagement with e-learning.

Identifying what influences learners to use a new e-learning tool enables the designer to ensure the learning outcomes are more purposeful (Abdullah & Ward, 2016) and the GETAMEL predictors (below) align well with the concept of contextual (personalized) design and intrinsic motivation that we explored for the successful application of e-learning and are considered in relation to student perceptions of Pocket Tutor as an embedded e-learning technology critical to their coursework.

- For perceived usefulness (PU), the key factors for acceptance include enjoyment, expectations of use that comes from peers and tutors (subjective norm), self-efficacy (confidence in being able to use the tool) and experience with other online interfaces.
- For perceived ease of use (PEU) the key factors for acceptance include self-efficacy, enjoyment, experience and a lack of fearfulness or computer anxiety and expectation for use (the subjective norm) (Abdullah & Ward, 2016).

Pocket Tutor aims to engage a mostly younger, first-year cohort through a vertical interface (when used on an upright mobile device) common to this group of students. This supports prior experience and mitigates against fear of the new, as Biaggi (2014) notes, diverse learning resources, including animation, images, videos, and other graphics content, should be included to cater to younger students who are growing up in a saturated environment of rich, multi-modal content.

The affordances of self-directed and autonomous learning

The aim of Pocket Tutor is to create an e-learning tool (see figure 2) that students can interact with in a flipped model. While the researchers aim to meet factors for PU and PEU, Pocket Tutor is also an e-learning technology that requires learners to engage in self-directed learning regardless of their status as wholly online or face-to-face students. In this model, learners are required to identify their educational needs and take responsibility for their own learning (Picciano, 2009, p. 2). Self-directed learning is a process in which individuals "take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material resources, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1975, p. 18). It has been studied extensively in a tertiary education context and is also regarded as a significant component in the development of lifelong learning (Geduld, 2019).

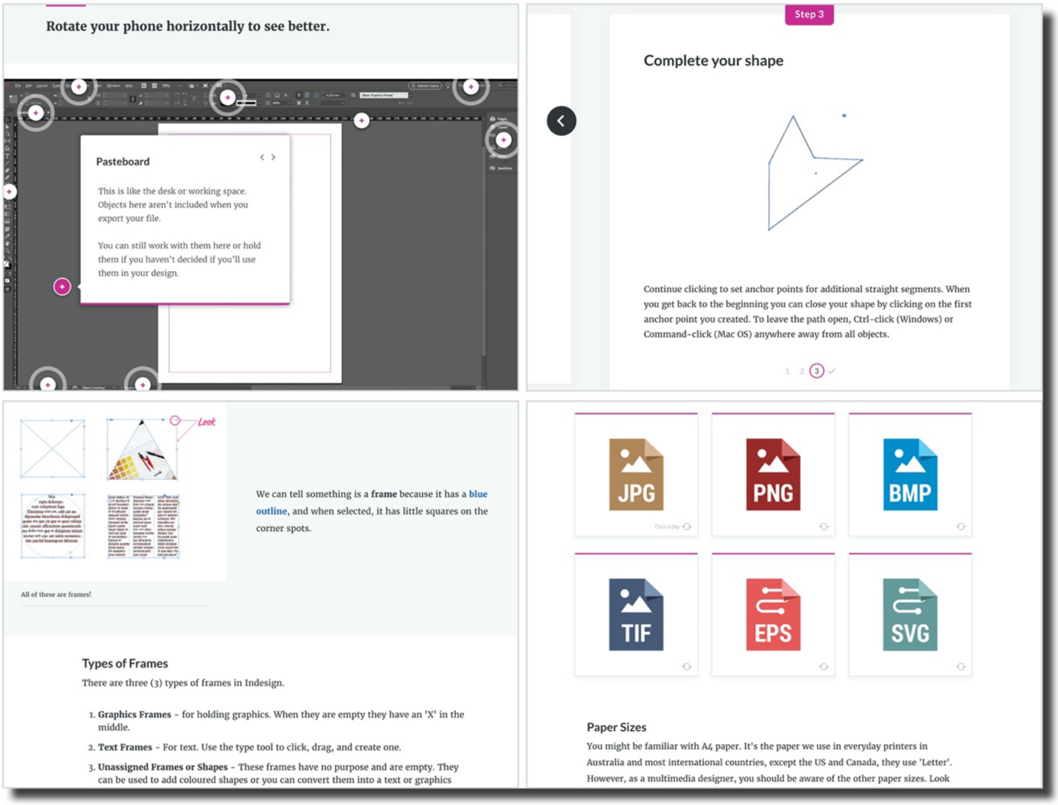

Figure 2. Rather than a linear and passive video that students watch and might get less or more than what they need to accomplish a specific task, Pocket Tutor was designed to be more interactive, self-paced, and streamlined and to complement the processes and terminologies used by the teaching team to ensure a consistent and more harmonious learning experience.

The process of self-directed learning in higher education environments occurs in four phases: 1) defining tasks, 2) setting goals and planning, 3) enacting study tactics and strategies, and 4) metacognitive adaptations to studying (Knowles, 1975). Knowles also identifies an array of self-directed learning skills, including identifying learning needs, creating appropriate goals, assessing performance, identifying appropriate resources, and employing relevant learning strategies.

Developing strategies for self-directed learning in higher education is important, particularly for communication students, because it supports a range of learning outcomes including 1) A supported sense of self-belief, 2) a supported motivation to learn, 3) an articulation of goals, and 4) organized course content (Boling, et al., 2012, Santhanam, et al, 2008). It is, however, important to note that other studies have found that, in addition to the above four factors, English language proficiency (for educational institutions in which English is the language of instruction) and technological skills can also impact the success of self-directed learning approaches (Geduld, 2014, 2019; Bharuthram & Lies, 2012). This, in turn, can impact on learner satisfaction and engagement with an e-learning resource.

Previous studies have found that self-directed learning skills can be absent or under-developed in many e-learning environments and, as such, there is a recommendation that the design be adapted to enable learner control, self-discipline, self-motivation, and self-regulation (Santhanam, et al, 2008; Chen, Chen, & Chen, 2015). Choice in a self-directed learning environment regarding what to learn and how, is essential (Bergamin, Werlen, & Bochud, 2017). Without it, learners may remain "only passive if they are not given genuine choices with regards to what, when, and how they learn" (Amponsah, Obodai, Badu-Nyrako, & Amane, 2019, p. 88). When provided with choice, "scaffolding" (defined as tools, strategies, and guides) has been found to be beneficial. Regular, prompt, and meaningful feedback is also essential for the development of independent self-directed learning (Geduld, 2019). Furthermore, the affordances of time and space in an online learning environment promotes in-depth independent learning (Chen, et al., 2015; Moore, et al., 2011) and while independent learning is not exclusive to online and distance learning environments, it is more prevalent in them. Past studies (Yeoh, 2018) that have studied the effectiveness of integrating an online module into a teaching and learning environment found that students generally viewed e-learning positively and demonstrated a high level of acceptance toward the integration of online modules; however, they are less in favour of e-learning when it replaced rather than supplemented face-to-face learning.

It is clear from the literature that e-learning design can engage students, encourage them to work independently and to problem-solve and in turn, can bring more satisfaction to the class and raise learner motivation. It is also clear that this is not necessarily achieved by directing students to off-the-shelf solutions but requires a more bespoke and personalized approach connected to the learning outcomes and scaffolded within learning activities. The higher education technology acceptance model implies learners need to enjoy using the technology, feel confident about use, and consider it an accepted part of learning amongst peers and members of the teaching team, in order for them to become motivated to use it. Once we have addressed these core motivations, it is clear that we can develop a model for self-directed, autonomous learning, scaffolded within the learning activities and linked to the learning outcomes. This approach appears the most likely to meet the emerging criteria for effective e-learning particularly when supporting students in a flipped learning model. However, questions remain on whether designing bespoke for the majority works for all learners: particularly those working solely online, those with English as a second language and those from different age groups.

Methods

In order to empirically test the effectiveness of the Pocket Tutor resource on tertiary students' learning, and to contrast it against generic, off-the-shelf learning resources like those provided by LinkedIn Learning, a multi-method approach was adopted. This began in 2019 with a subject-wide survey that was designed and piloted and that informed the creation of a second survey that was launched in 2020 and 2021 with a cohort of students enrolled in a multimedia design class.

Survey research is designed for acquiring trends, attitudes, or opinions of a population (Creswell, 2014), most often by studying a sample of that population. They are ideal for gathering larger amounts of data in a relatively narrow timeframe, such as within the time constraints of an academic semester, and also complement the other methods used that are described more below. The survey in this study was designed with best practice principles articulated in key research methods texts (Babbie, 2007; Creswell, 2012; and Fink, 2002). The survey was launched online in week 10 (of 12) in the semester. This was late enough in the semester that enrolment had settled and had adequate opportunity to experience the learning resource and to provide feedback on it.

The second method employed was analysis of student usage data for the mobile learning resource. This included data on the number of times accessed, time, day of the week, and date accessed. These two methods were then supplemented by a small group of interviews with nine students to contextualize their use and explore their perceptions in greater depth. These interviews were open to any student in the unit who could participate in exchange for a modest gift card. These interviews were qualitatively analysed using qualitative thematic analysis best practices (Boyatzis, 1998). The interview transcripts were explored initially through an open coding process (Strauss & Corbin, 1990) where categories such as barriers to learning or benefits of a bespoke learning resource, were created for coding category purposes. After this initial open coding phase, transcripts were then subjected to an axial coding process where the data were examined in new ways by, for example, looking for connections between categories. This included, for example, exploring the relationship between those who were brand-new to the software and how they perceived the bespoke learning resource. Lastly, the transcripts were also coded in a deductive fashion based on previous literature in the online learning domain. A copy of the semi-structured interview questions can be found in Appendix B.

Taken together, the survey results are enriched by the analysis of usage data and this understanding is further supplemented by interview data that complements the former.

Sample population

The population in the study was 364 students enrolled in a multimedia design class at a communication school in the Asia-Pacific over a two-year period (2020 and 2021). A single-stage sampling procedure was used where every enrolled student was notified of the survey through either a unit-wide email announcement, a mention by tutors in the weekly tutorials, or a combination. In all, 80 individuals (or 42.3 percent) decided to participate in the survey during the 2020 iteration and 62 (or 34.2 percent) in the 2021 iteration, which is an above-average response compared to past published research in this field that reported response rates of around 29 percent (Asch, as cited in Schonlau et al., 2002; Everingham, as cited in Schonlau, et al., 2002; and Reinardy, 2006 & 2011). Worthy of mentioning, too, is that the more homogenous the sample, the smaller the sample size required to acquire meaningful results (Vasileiou, et al., 2018). Key demographic, psychographic, and behavioural attributes of the sample population are provided in figure 3.

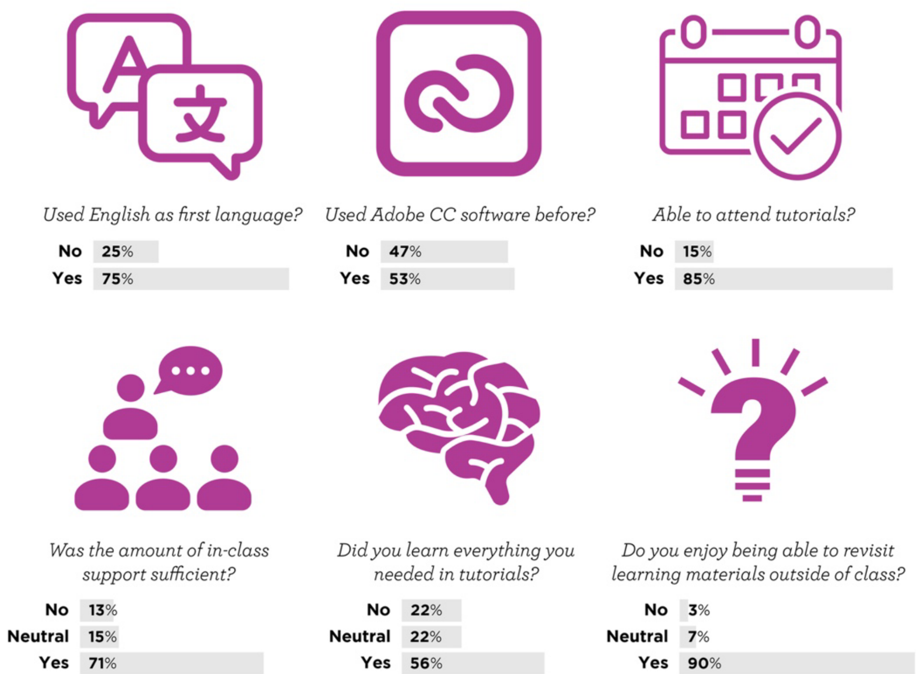

Figure 3. The student cohort included a relatively even mix of those with and without prior experience using Adobe Creative Cloud software.

Instrumentation

The instrument deployed for this study began with an online cover sheet that provided information on why the survey was being conducted, the extent of participation, risks/benefits, information about privacy and confidentiality, and contact details for participants desiring more information or who had questions. These details and the entire research approach were approved through the university's ethics review process before data collection started. The survey. administered using Key Survey software, consisted of six demographic questions and 10 Likert-type scale questions related to the unit in general and to students' self-perceptions. Then, depending on whether they had used either the generic learning resources or the bespoke one, students were presented with an additional 10 Likert-type scale questions and two open-ended response questions. These Likert-type scale questions were based on valid measures from the Technology Acceptance Model and the General Extended Technology Acceptance Model (Camilleri.& Camilleri, 2017; Cheung & Vogel, 2013; Davis, 1989; Abdullah & Ward, 2016). A full copy of the survey instrument can be found in Appendix A.

Findings

RQ1

The first research question explores how university students use a bespoke learning resource that is interactive and not bound by space or time. It does this by observing student usage over time on both a micro (through the week) and a macro level (throughout the semester) and through examining average use per student. It also supplements these insights, when possible, through insights gleaned through the supplementary student interviews.

Usage across the week. Over the two years and two semesters observed, students' use of the bespoke learning resource coincided most often with days on which synchronous learning activities were scheduled. Indeed, 57.5 percent of use happened before, during, or after tutorials on these days when students were either preparing for these tutorials, consulting the resource during them, or refreshing what had been covered after these tutorials.

Students said they were particularly likely to use the resource before or after class as they wanted to be present during the tutorial itself and rely on the live instructor as much as possible. However, before or after class, when this direct connection with the teacher was no longer possible, they reported relying on Pocket Tutor as a supplemental learning source. In the words of one 22-year-old student who had never used Adobe software before:

> I would mainly use it [Pocket Tutor] before the tutorials so I was able to prep myself and expect what was going to happen in the tutorials. But then soon at the end of the unit, I would use it afterwards because it's more like refreshing my memory for the [final] assignment.

Regarding time of day of use, the students accessed Pocket Tutor mostly during typical business hours (9 am to 5 pm). Sixty-eight percent of use happened within these hours in 2020 and 73 percent happened within these hours in 2021.

Usage across the semester. The semester ran across 12 weeks in both 2020 and 2021 with assignments due at the end of week 5 and week 12. Across both years, students generally relied on the bespoke learning resource more heavily during the first half of the semester. Sixty-five percent of all access happened during the first six weeks in 2020 and 69-nine percent of all access happened during the same period in 2021. Students also used the resource more heavily in the week before assignments were due.

Pocket Tutor consisted of 23 lessons, distributed over each of the first 10 weeks of the semester, so the dip in use during the semester's final weeks makes sense. In addition, students weren't barred from working ahead or waiting until certain points of the semester to access content nominally allocated for later weeks. This meant that students could work flexibly and at their own pace. One student, a 20-year-old with prior Adobe software experience, said she completed the entire suite of Pocket Tutor lessons the week before the semester began. In her words:

> I like to start things straight away at university in the week before the semester starts. I usually try to do as much as I can so that I don't fall behind 'cause it feels like a constant rat race, so I remember when the Pocket Tutor lessons first came out I literally did the whole thing in like 2 days or a day and a half.

Average use per student. In both 2020 and 2021, an overwhelming majority (92 percent) of students accessed Pocket Tutor at least once. In both years, students used Pocket Tutor on average 1-2 times per week. In the first half of the semester Pocket Tutor was used at least twice a week, however in the last half of semester, students on average only used it once a week.

On average, students accessed the application 19.3 times over the semester period in 2020 and 15.3 times in 2021. The difference in these figures can likely be explained through a change in the duration of tutorial activities. In 2020, tutorials were 60 minutes long. In 2021, tutorials were 90 minutes long. This additional time (360 minutes) in tutorials with teaching staff could affect the students' need for supplemental learning resources.

RQ2

The second research question explored how students regard the bespoke learning resource designed and deployed for this class. The first part of this section unpacks how students perceived the helpfulness of the generic and bespoke learning resources, respectively, and of having access to learning materials that weren't bound by time or place. The second part of this section explores how students perceived the bespoke learning resource compared to the generic learning resources on offer. Quantitative overviews of use, frequency of use, perceived helpfulness, and perceived engagement of generic (LinkedIn Learning) and bespoke (Pocket Tutor) learning resources are provided in Table 1.

Rating helpfulness and flexibility. When asked directly if they found the resource helpful, 76 percent agreed that Pocket Tutor was helpful to their learning. Twenty-one percent said they felt indifferent towards the tool while only 3 percent said it was not helpful. Of those who used the LinkedIn Learning video resources, a slightly higher number (82 percent) of them found the resources helpful; however, fewer than half of students surveyed (45 percent) used these generic resources, which is a significantly different percentage to those (92 percent) who reported using the bespoke resource.

Additionally, 93 percent of students agreed that being able to revisit materials helped their learning. And 81 percent of students agreed that being able to work at their own pace helped their learning. A total of 90 percent of students surveyed agreed that they enjoyed having access to the resource outside of class times, which responded to the issue identified in the introduction during the first iteration of the class in 2019 when students had to be present for synchronous learning activities and when no recording of these was made.

Bespoke versus generic learning resources. The second part of this section compares students' perceptions of how the bespoke and generic learning resources compared. Students in the sample said the bespoke learning resource's primary benefit was that it was more relevant, cohesive, and consistent compared to generic learning resources, such as those on subscription-only sites like LinkedIn Learning or free ones like YouTube. Regarding the relevance aspect, students acknowledged that generic resources often covered too much or different content than what was specifically being addressed in the class through its learning aims and objectives. This lack of focus and, in some cases, potential for information overload, was a turn-off for students. In the word of a 20-year-old in the class:

> I was quite put off by the LinkedIn videos just as soon as I saw how long they went for as I was like, oh God, I don't have time for that. Whereas, the Pocket Tutor, you don't have to do the whole thing. You can see what you want to get out of it. In contrast, with the LinkedIn ones, you have to watch the whole broad video and then from that, you might only get like two things that you actually wanted to ask about. Yeah, so you're just not wasting your time I think, with Pocket Tutor.

Students said they didn't necessarily need to know the location and function of every tool in a dense software interface like those provided in Adobe InDesign or Illustrator. They acknowledged the high production quality of generic resources, like LinkedIn Learning, but found them "a bit overwhelming" because of their comprehensiveness.

Students also praised the cohesiveness of having access to bespoke learning resources. Students found Pocket Tutor "complemented" the other learning activities in the class well and this cohesiveness, in term, helped boost repetition and information retention. This was especially true for concepts, terms, or processes that are known by various names in industry or in geographic locations but were consistent and easier to understand due to the tight fit between lectures/tutorials and the content in the bespoke learning resource. Interestingly, students also paid attention to who was creating the resources and the impact this had on perceived credibility. In the words of a 19-year-old student without prior Adobe software experience:

> I think I sort of trusted it [the bespoke learning resource] a bit more because it felt like it was made by you for me as opposed to very general random videos that might be on the subject area, but perhaps not all of it's necessary to the assignments we're doing. I felt like the Pocket Tutor was all just necessary information and because it was necessary information, that's going to motivate me to actually listen to that properly and know that all of what I'm listening to and reading here is vital.

Students next praised the bespoke learning resource's navigability (thanks to an intuitive interface) and its more interactive nature compared to generic learning resources. Students said it was hard to anticipate exactly what would be in the LinkedIn videos and also that they were more passive compared to the bespoke learning resource. In one 25-year-old student's words: "LinkedIn is OK, like watching video, but I don't find it very interactive. Pocket Tutor is more interactive. There're games in there and then you can click here and there learning it." Another student, this one 19 years old, appreciated the task-oriented nature of the resource. She said:

> I found it [the bespoke learning resource] a lot more helpful than I found LinkedIn learning videos and resources like that. It's got those little diagrams and stuff in it [see figure 4] and it sets out what you need to do. I'm very task-oriented when I do stuff. So the way the Pocket Tutor was set out was sort of like these are all the things that you need to do for this week. And these are all the steps you need to take and it helped set it out for me really clearly. And I really liked that and the practical aspect of going through it and then practicing it while I was going through. As opposed to like learning from a video and then having to go back through the video when I encountered certain problems again.

Unlike a linear video where content is unpacked in a set order, the bespoke learning resource offered students control about what to explore and when. This autonomy increased engagement and the perceived usefulness of the tool.

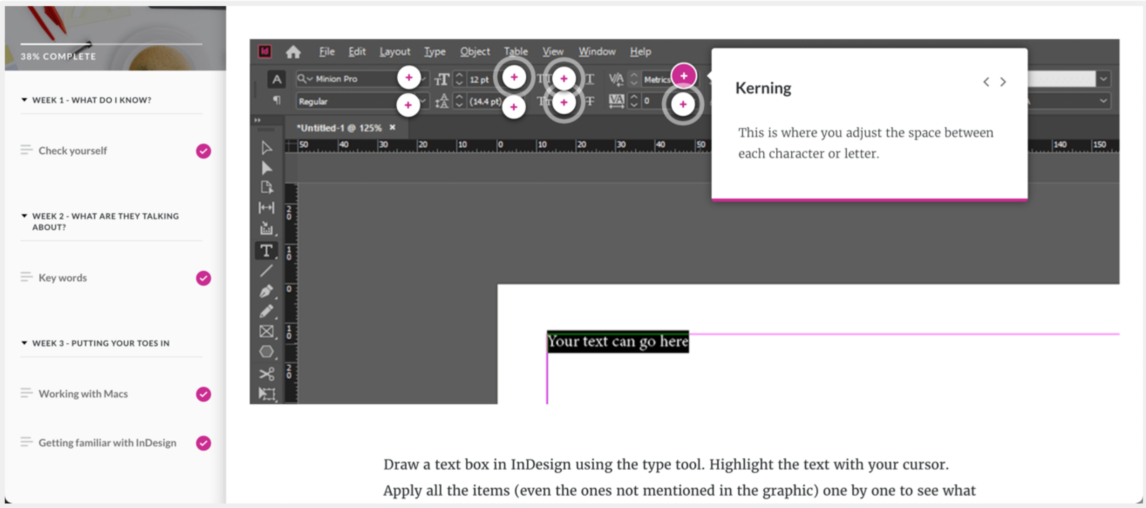

Figure 4. Rather than try to explain each button in the interface to students, Pocket Tutor was designed to highlight the most important buttons in the interface and allow the students to explore these in the order they chose and with the amount of time they needed to digest each function and try it out on their own lab computer or laptop.

Students made an additional two comparisons between the bespoke learning resource and generic ones. First, some students said using Pocket Tutor felt rewarding to use. This "gamification" of learning made the process more active and entertaining, which promoted engagement. In a 19-year-old student's words: "We can tell that it's the journey of your learning and you can see what percentage you've done and that can motivate you to keep on going as opposed to the other ones where you just drop off."

Lastly, students said Pocket Tutor, because of its close link with the other synchronous learning activities and with the class assignments, helped students manage expectations. This, in turn, reduced stress around the unknown and increased student's responsibility for their learning.

The only learning barrier or challenge that students mentioned for a bespoke learning resource designed for their mobile devices was the potential for distractions on a multi-function device like a smartphone (see figure 5). Students said unintended distractions, including news alerts, message notifications, and phone calls, can interrupt their use of the resource and can distract them from the learning task at hand.

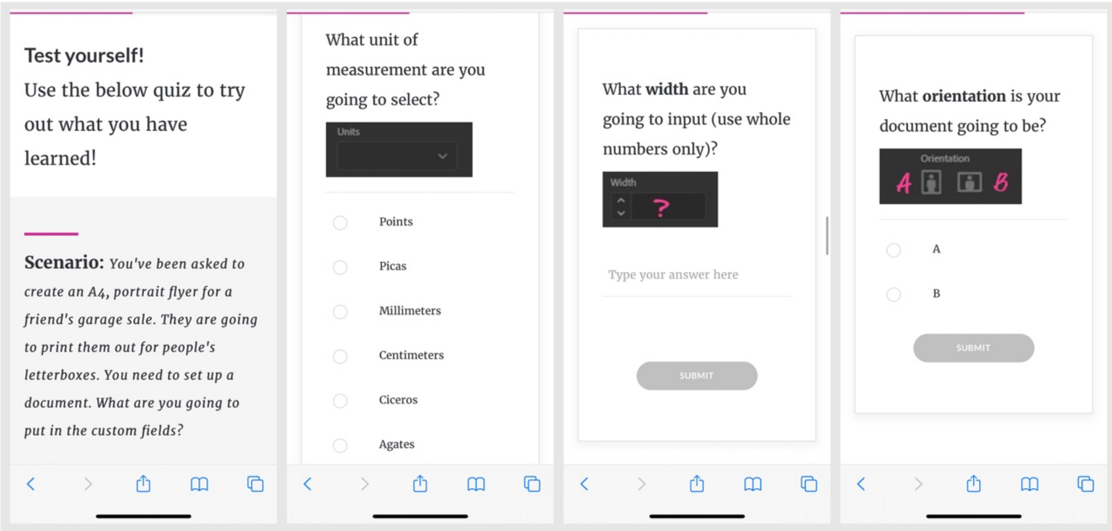

Figure 5. Students praised the layout and design of Pocket Tutor for being mobile-optimised, responsive, and easy-to-use but the downside to a smartphone-enabled learning resource is the chance of disruptions from other notifications, alerts, phone calls, and the like.

RQ3

The final research question identifies the types of students those who were interviewed think are best suited to using a bespoke mobile learning resource like Pocket Tutor. It also explores relationships between individual attributes, such as age, gender, ESL status, and software proficiency, and the usage of a bespoke, e-learning resource.

Ideal users of a bespoke learning resource. Students identified three types of students who they thought would particularly benefit from the use of a bespoke learning resource like Pocket Tutor. The first of these cohorts is specific to Pocket Tutor but the remaining two cohorts are more broadly applicable to bespoke learning resources, in general.

Students overwhelmingly said the target audience for Pocket Tutor was those who were brand-new to the software or those who hadn't used the software in some time and needed a refresher. This extended to students who had missed tutorials and would otherwise be behind or confused without a resource like Pocket Tutor. In one 20-year-old student's words:

> I think it's best suited for those who don't turn up to the tutorials, I think if you were kind of a couple weeks behind you haven't really gone to that many tutorials and you weren't really watching the lectures and you know you need to get pass the class and you need to just use software and do it quickly. I think that's probably who it would really suit.

Students valued Pocket Tutor as a way of ensuring valuable synchronous time with the teaching team was used appropriately to address basic questions and demonstrate functionality so that synchronous class time could be reserved for higher-order learning concepts like analysing decision choices or using the software to create new work.

The second type of user students said bespoke learning resources were well-suited to were those with short attention spans. In one 19-year-old student's words:

> Pocket Tutor is great for students who maybe can't always pay attention in the lectures. Sometimes I'll miss what he [the professor] says. I'm not always present in the lectures, all the way through, and that’s why Pocket Tutor is good. I like the short ways to learn. The short videos are good. I can’t concentrate for a whole lecture.

Because of the way Pocket Tutor was designed in digestible “chunks” of information, students said they found that helpful in avoiding information overload.

The third and final cohort students identified as being ideal users of a bespoke learning resource like Pocket Tutor were those who are shy. The resource provided these students with a low-stakes environment in which to explore, feel more comfortable with, and get initial questions answered without having to risk asking questions in class or have one’s learning and comprehension spotlighted for the class to see (and potentially judge). In the words of a 20-year-old student in her second year of university:

> I think [Pocket Tutor is ideal] if you didn't like the in-person style. If you were an introvert or classes were too overwhelming for you. Maybe if you had social learning difficulties as well. I can imagine not everyone feels as comfortable talking to their tutors. So I think that [Pocket Tutor] would probably be really good for them 'cause they don't have to go through that awkward interaction in person.

Relationships between student attributes and use. The relatively homogenous sample size from an age perspective meant that there was insufficient data to measure how people in different age cohorts perceived and used the tool. Likewise, no non-native English speakers responded to the interview invitation so the data on ESL status and perceptions of the tool are also limited. However, a relationship did exist between students who identified as being anxious about the technical requirements of the class and use of the bespoke learning resource. Seventy-one percent of students who said they experienced anxiety around the technical requirements of the unit used Pocket Tutor. This contrasts with the lower percentage of students (53 percent) who said they did not have this anxiety but still used the tool. This approximate 20 percent difference was reflected in the LinkedIn Learning usage with 49 percent of students with self-reported anxiety using the resource and only 29 percent of students without self-reported anxiety using the resource. As previously noted, students without previous exposure to the Adobe software were also more likely to use both tools but to use the Pocket Tutor one with greater frequency.

Discussion and conclusion

Overall, the integration of a bespoke learning resource can be seen as useful and warranted in a skills-based and technology heavy university class. While the tool itself is not a replacement for synchronous learning activities or content, students are using it to enhance their learning experience and mitigate anxiety around technology and assignments. The chief contributions of a from-scratch online learning resource compared to an off-the-shelf one include:

Greater consistency between unit learning aims and learning resources. This extends to the way operations are demonstrated in the learning resource and during synchronous interactions with the teaching team and further extends to consistent vocabulary and terminologies that are industry- or discipline-specific, which are not always possible with generic learning resources.

More relevance to the learners’ specific contexts. This can manifest itself subtly in the spellings, punctuation styles, or date conventions that are used, which can differ across cultural contexts and can be especially confusing to speakers who learned one type of English (British, for example) compared to another type. It can also manifest itself more dramatically in terms of the specific examples that are used in the learning resources and how unique and localised (or generic and universal) they are. Bespoke learning resources can provide additional opportunities to ensure the learning resource examples mirror the diversity of the student cohort and, when students see themselves in their learning materials, they're more likely to be engaged in them. This relevance was illustrated by the high number of students (92 percent) accessing the resource as opposed to under half the cohort utilizing the other off-the-shelf product (LinkedIn Learning videos).

More flexibility for *when* and *where* students learn. The university's default learning management system (LMS), Blackboard, in this case, was poorly suited for mobile learning and presented a clunky and hard-to-navigate user interface on mobile devices. The bespoke learning resource, in contrast, was designed to be responsive across different screen sizes and orientations which allowed students to use more familiar and present tools, such as their smartphones, as learning devices, rather than relying on larger and bulkier equipment that isn't as mobile or flexible and that they use less frequently. Likewise, the bespoke learning resource provided additional flexibility for *when* students could learn. Analysis of the usage data revealed that students used the learning resource before and after class and in the evenings or on weekends when members of the teaching team weren't available. (25 to 32 percent of use occurred beyond business hours or on weekends when teaching teams were otherwise unavailable for email or other consultation.) In this way, it helped prime students for learning encounters, helped reinforce learnings, and helped increase students' autonomy and self-directed learning potential (Baker & Goodboy, 2018). The bespoke learning resource particularly benefited students who were unable to attend all tutorials due to work commitments, sickness, or for other reasons (which is particularly important during COVID-19 times when students might be joining remotely from different time zones or might have to isolate or quarantine when waiting for test results or in the case of a positive result). Without a supplementary resource like Pocket Tutor, students are presented with high-stakes learning opportunities and are disadvantaged if they don't (or can't) attend them. (Mandatory class attendance policies are prohibited at the university where this study took place.)

More efficiency with precious time for synchronous interactions. By outsourcing lower-order learning to the bespoke learning resource, the teaching team helped ensure a consistent baseline understanding across the student cohort that resulted in less time spent in class getting everyone on the same page and, instead, allowed the teaching team to prioritise higher-order learning. Thus, the bespoke learning resource also helped address the issue of class pacing that students previously raised and allowed additional unpacking and reflection to occur outside the classroom, which made classroom activities more manageable and efficient.

Enjoyment, as one of the key factors of the technology acceptance model, was explicitly mentioned by students in the supplemental interviews that accompanied the survey results. This "gamification" of learning deserves further exploration and if, for example, it would still yield positive results if it were integrated in less of an individualized activity and instead more of a social or competitive one with other classmates. For example, if students received points for their engagement with Pocket Tutor and could see how they compared to their peers in terms of engagement and knowledge mastery or if they received virtual trophies or badges for various accomplishments, such as frequency of engagement or improved memory recall over the course of the semester.

Practical and theoretical significance

This study contributes to the wider literature about student's willingness to use learning apps on mobile devices. Specifically, this study demonstrates that students are willing to engage with learning technologies when they recognise the added value the technology provides them. In this study, students found the technology to be intuitively designed (ease of use), personalised (bespoke) and appropriately timed (expectations of use). Additionally, the perceived usefulness of the tool in this study comes not just from expected acceptance factors of ease of use and expectations of use but also the ability to learn when unable to attend face to face classes (self-efficacy). We believe these key factors—ease of use, expectation of use and bespoke design—determines student motivation to engage with learning on mobile devices. This, we believe, has implications for the design of blended education in post-covid higher education, where we are seeing a significant rise in demand for flexible learning.

Limitations and future directions

Although this study contributes to the literature through its discipline-specific, qualitative, and comparative nature, it is not without its limitations. Embedding the Pocket Tutor learning resource within Blackboard rather than linking to an external site meant that the usage data didn't include as many variables as it could have if the resource wasn't embedded internally. Despite making open to all students the invitation to participate in the study's interview component, the students who responded to this call all had English in common as their first language. Further studies in this vein would do well to recruit specifically English as an additional language speakers as participants to examine if or how engagement, use, and perceptions differed relative to this cohort. Further studies would also do well to more precisely measure students' prior knowledge of and competency with the Adobe Creative Cloud software. This study used a simple dichotomous 'have you used the Adobe Creative Cloud software before this class' question; however, unpacking which particular software programs and the students' competence in them would help put in greater perspective how useful supplemental learning resources are to students of varying skill levels. That being said, the students who responded to the interview call did represent a mix of students with no prior Adobe software experience and also a mix of students from various years in their degree program, which helps illuminate how effective the bespoke learning resource is to students who are brand-new to the software and to their university studies, more broadly, and also allows it to be contrasted against generic, off-the-shelf learning resources.

Lastly, it is worthwhile to note that the first author developed the bespoke learning resource as part of a learning design-focused graduate certificate course they were enrolled in at the time. The development, testing, and refinement of such a tool is a significant endeavour, as is its ongoing maintenance and upkeep (which is outsourced to third-parties when generic learning resources like LinkedIn Learning are used). While it might be beyond the teaching team's workload allocation to develop and maintain such a resource, the two years of usage and survey data, coupled with complementary interviews to contextualize use and perceptions, offers a compelling argument for creating and maintaining such a tool to instil additional confidence in students with tech-heavy and skills-based university classes and to allow them to take more ownership over and responsibility for their learning. Ultimately, a bespoke tool is not cheap from a labour, expertise, or time perspective; however, its potential rewards are worthwhile from a relevance, cohesiveness, engagement, and retention perspective.

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