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Innovative digital tools in EBP and information literacy education for undergraduate nursing students

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Abstract

Background: Information literacy (IL) skills are essential for the translation of current knowledge into evidence-based practice (EBP) in healthcare, which in turn improves patient outcomes. However, students enter pre-registration nursing programs with variable IL skills, which can present challenges when preparing research-literate nursing graduates.

Objectives: To develop an online module for nursing students to learn the IL skills they require to effectively implement EBP.

Project design: A self-paced, interactive online module was developed for final year pre-registration nursing students at an Australian university and launched in late January 2019. Four different digital tools, including screen-capture videos, split-screen tutorials, e-portfolio/learning journey platforms, and digital badges, were integrated to create an interactive module on database searching and systematic reviews. A student feedback survey was added to collect information on the students' learning experience.

Results: Students reported the online module was challenging but engaging and that its self-paced interactive nature assisted their learning. Digital badges were reported as a motivating factor by students, and their attitudes toward EBP were positive. Students were able to complete the module on their own, but a handful required face-to-face assistance.

Conclusion: This project successfully integrated screen-capture videos, split-screen tutorials, e-portfolios and micro-credentialing into one online learning module to assist nursing students with developing the IL skills required for effective EBP.

Keywords

database searching; e-learning; evidence-based practice; information literacy; micro credentialing; nursing education;

1. Background

Evidence based practice (EBP) in healthcare combines clinical expertise, patient values, and the best evidence available (Straus et al., 2019) to provide safe, high quality health care that ensures the best possible patient outcomes. Information literacy (IL) is the ability to find, evaluate and apply evidence (Association of College & Research Libraries, 1989). These two concepts are closely linked (Skiba, 2005), and health practitioners (such as nurses) must

possess IL skills to 'gather, use, manage, synthesise and create information and data in an ethical manner' (Society of College, National and University Libraries [SCONUL], 2011, p.3) in order to provide EBP effectively.

Nurses form the largest component of any health care system, and EBP has become one of the dominant paradigms in nursing education. However, nursing students face several barriers when implementing EBP, including a lack of IL knowledge and skills, and a lack of confidence in using databases and appraising the quality of the evidence (Ryan, 2016; Sadoughi et al., 2017). These limitations indicate a need for more effective IL programs to support the skills and knowledge required to research and apply EBP (Wadson & Phillips, 2018).

A variety of educational strategies have been used to teach EBP and IL, including traditional classroom teaching methods such as lectures, workshops and tutorials (Kiss et al., 2010; Sciarra, 2011; Varnell et al., 2008). However, the growing emphasis on EBP is placing a strain on libraries to provide IL instruction, and face-to-face delivery modes are unable to keep pace with the need. With the rapid development of the internet and web-based technologies, and the need for more flexible learning opportunities for students, there is now a shift away from traditional classroom teaching to online learning.

Online learning has been widely adopted as a strategy to address IL challenges experienced by university students, but there are some conflicting findings in the literature as to the best approach for its implementation. Mollon et al. (2012) developed a self-paced, self-directed online learning module to influence practice, attitudes, knowledge and skills regarding EBP in multidisciplinary health care providers but found no statistically significant improvements. A later study did find a weak but positive relationship between completion of online modules and higher marks in assessments (Russell et al., 2018). It is possible that this success could be attributed to higher-quality materials (Matlin & Lantzy, 2017), or simply to the time spent on tasks. More specifically, in relation to nursing education, web-based interventions can have a significant positive effect on knowledge and clinical performance, especially when delivered over a short period of time and combined with traditional teaching methods (Kang & Seomun, 2018). Another study, evaluating the effectiveness of programs for teaching EBP to nurses, also found that combining self-directed learning with teacher guidance would be the best approach (Melender et al. (2016). To date, there is no recommended standard in developing web-based learning strategies to enhance student learning related to EBP.

This paper outlines a project undertaken at an Australian university to develop an interactive, self-paced online module, combining four different technologies, to enhance nursing students' IL knowledge and skills for evidence-based practice—specifically the ability to search health databases and conduct systematic reviews.

2. Project design

2.1 Development of the online module

A problem-based teaching approach was used, where students were given a case study and asked to present evidence-based solutions through conducting database searches. The following databases were selected for the module:

- Cochrane Library, a major publisher of health evidence, for locating previously published systematic reviews
- CINAHL, the key nursing database, for both keyword and thesaurus searching

- Scopus, a multidisciplinary citation database, for revising keyword searching and introducing citation searching.

The project integrated screen capture videos, split-screen tutorials, e-portfolios/learning journeys and micro-credentialing into a single digital learning object, which is described below.

2.1.1 Screen capture videos

Videos were developed using Camtasia (<https://www.techsmith.com/video-editor.html>), which is a screen capture and video editing application that has been in common use for approximately 20 years (TechSmith, 2019, "Our History"), particularly in higher education. At the authors' university, the nursing program used Camtasia to create demonstration and other instructional videos, while the library has built a suite of digital learning objects that include a mix of screencasts and animations. The video created for this online module follows the latter format.

Video tutorials are well-established and popular with students, although a recent study has shown there is no positive correlation between viewing video tutorials and assessed learning outcomes (Fontane, 2017). Consequently more interactive methods may be required to build higher-order skills for evidence-based practice (Petty, 2006), which require additional digital tools.

2.1.2 Split-screen tutorials

LibWizard (<https://www.springshare.com/libwizard/>) is one of the newer offerings by SpringShare, well-known in the library sector as the creators of the ubiquitous LibGuides. It is composed of four modules: forms, surveys, quizzes and tutorials. The tutorials module uses a split screen layout that incorporates a variety of media including embedded web content, which allows students to conduct live database searches while completing the tutorial, without flicking between screens. This has been found to be more effective than screen capture videos in supporting diverse learner needs (Thomas & Gosling, 2009).

A similar technology developed by the University of Arizona (Sult et al., 2013, p. 127), is the open source Guide on the Side (<https://ualibraries.github.io/Guide-on-the-Side/about.html>). A comparison between Guide on the Side (GotS) and LibWizard was conducted by Sherriff (2017), which highlighted the key differences between them. For the authors, the key issue was that GotS requires installation on a local server and in-house technical support (neither of which the library has access to), whereas LibWizard is a software-as-a-service (SaaS) solution that was easily added to existing SpringShare subscriptions. For this reason, LibWizard was adopted.

However, LibWizard uses <iframe> HTML elements to embed the web content. This technical limitation meant that Scopus and Cochrane Library databases (which did not allow iframes) would not work in LibWizard, and text-based instruction had to be used instead. On the other hand, CINAHL does work with LibWizard, which allowed the first author to build an interactive tutorial to guide students through the rich features of this key nursing resource.

It should also be noted that the university's licence for CINAHL has a restricted number of simultaneous users, and the library made a special arrangement with EBSCO for unlimited access over the required period, so that students would be able to complete the tutorial.

2.1.3 e-Portfolio/Learning journey platform

PebblePad (<https://www.pebblepad.co.uk/>) is a personal learning platform that allows students to access learning activities and build evidence of their learning throughout the three years of the nursing program (Murdoch University, 2019). By the time they graduate, students will have a record of their learning journey and a professional e-portfolio that demonstrates their competencies. One of the key benefits of PebblePad is that students will have continual access as alumni, thus supporting their lifelong professional learning.

PebblePad has been implemented across the Bachelor of Nursing curriculum at the authors' university since 2014. As the students were familiar with the technology, PebblePad was chosen as the delivery platform for the full online module (of which the CINAHL LibWizard tutorial was a part).

2.1.4 Micro-credentialing

A key feature of e-portfolio learning is collecting evidence of learning (see bottom of Fig. 1), and digital badges were introduced in the program for this purpose. Badges originated in the gamification movement, and are quite popular with students, particularly undergraduates, being an effective means of motivating self-paced and self-directed active learning (Rizvi, 2016, pp. 91–92). Libraries have begun using digital badges, also known as micro-credentialing, as granular evidence of learning for IL (Boyer, 2018; Rizvi, 2016).

The CINAHL Searching badge is the third micro-credential to be introduced in the nursing curriculum. It was implemented as a way for students to show they had completed the CINAHL module, while also promoting self-directed learning.

2.1.5 Building the module

PebblePad was used as the delivery platform, and content was added in the form of text, links, images, embedded video and web forms, using a scaffolded learning approach. Students were presented with a case study and required to develop their research question and search the Cochrane, CINAHL and Scopus databases. Content on systematic reviews was also presented.

The section on CINAHL database searching consists of a PebblePad page where the Camtasia video, LibWizard module and digital badges are all featured (Fig. 1).

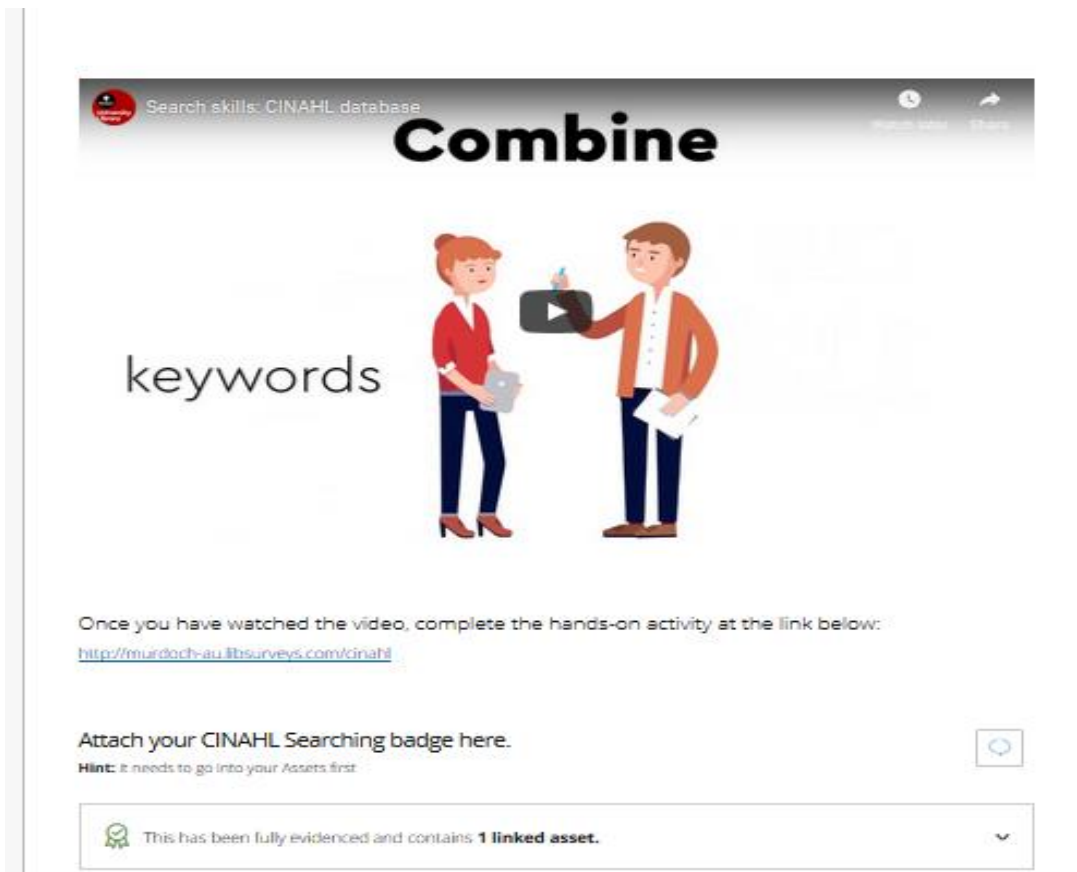


Figure 1: Camtasia video, LibWizard module and digital badge attachment box integrated into a PebblePad page

In the preceding pages, the students would have developed their research question based on the case study. They can then watch the video before opening the LibWizard module. All questions are compulsory, so that the student would need to complete the entire activity to earn the badge. When the module is completed, the student is redirected to the Moodle learning management system. This would authenticate the student's identity, and he or she would then need to agree to a declaration of completion to receive the badge. The student can then return to PebblePad and attach the badge as evidence of learning (see Fig. 2).

Note: The LibWizard module was built in version 1, as version 2 had not yet been released.

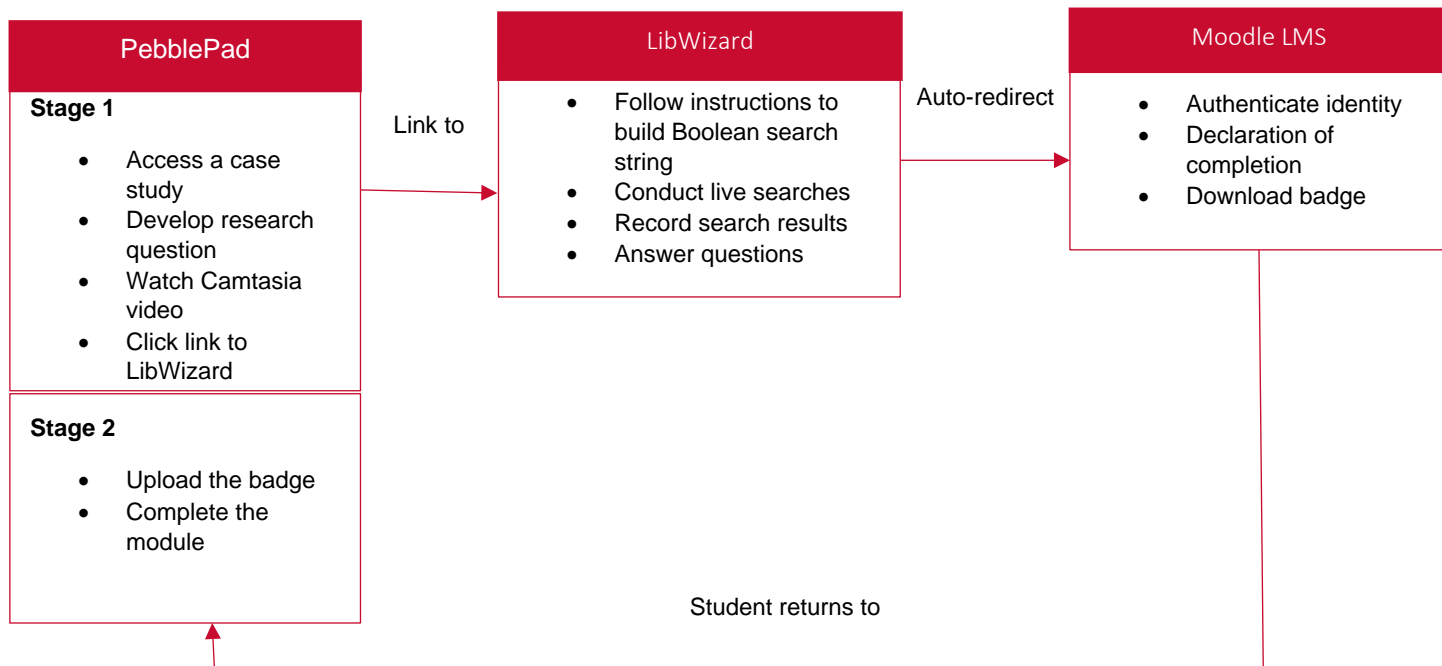


Figure 2: Process map for the CINAHL tutorial across the different applications

A LibWizard tutorial page is divided into two sections (Fig. 3). On the left is the ‘question column’ where instructions, questions and answer fields can be added. On the right is the ‘slide content’ window, which takes up most of the screen. In this case, it contains the embedded EBSCOhost CINAHL database. Students would read the instructions and conduct live searches in the database to answer the questions.

CINAHL tutorial (IATUL 2019)

The screenshot shows the CINAHL tutorial interface. On the left, a sidebar titled 'Using CINAHL Headings' provides instructions on how to use CINAHL headings in searches. The main area displays a search results page from EBSCOhost. The search criteria are: 'student nurse*' OR 'nursing student*' AND ... The results show two articles: 1. 'Resilience enhancement among student nurses during clinical practices: A participatory action research study.' and 2. 'Predictors of evidence-based practice knowledge, skills, and attitudes among nursing students.' The interface includes navigation options like 'Refine Results', 'Limit To', and 'Source Types'.

Figure 3: LibWizard split-screen tutorial (student view)

LibWizard tutorials are typically built as a series of 'slides', which can contain PowerPoint slides, web content, videos, images, or even entire LibGuides. Then content is added to the question column for each slide, using separators to create 'pages' (notice the 'Next' button in Fig. 3). Because all other content was in PebblePad, this project only used one slide that featured the embedded CINAHL database (Fig. 4).

CINAHL tutorial - Tutorial/Assessment

Use the left column (Settings) to control the behavior and settings. Add content by adding 'slides' in the Workpad-Content. After adding a slide, click on the slide name to associate/add questions to it. Use the blue 'Save Changes' frequently to avoid losing work.

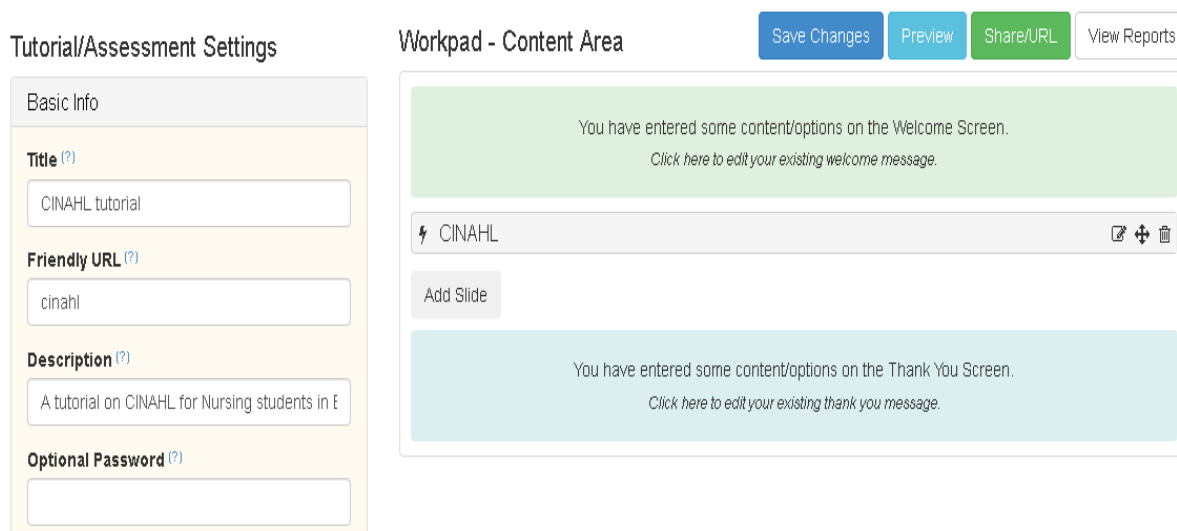


Figure 4: Backend of LibWizard tutorial

Welcome and Thank You screens are provided as standard, which are customisable. In this case, the Thank You screen was set to redirect to Moodle.

The entire tutorial was designed to be student-directed, without the need for tutoring or marking. But with such a large cohort of students (N = 236), it was expected that some of them would have difficulty using CINAHL, so a Camtasia video was recorded that walked through the process of searching the database, following the same steps as the tutorial (but using a different example), showing where to find various functions and features. This was uploaded to YouTube and embedded in PebblePad.

2.2 Online module delivery

The online module was launched in late January 2019, as part of a three-week intensive research unit that nursing students undertook at the commencement of their final year, just prior to a work integrated learning placement.

Despite the instructional scaffolding and Camtasia demonstration video, there were a small number of students who requested face-to-face assistance from the first author (a librarian) to complete the online module. This was not unexpected, as the nursing cohort is large and includes students with different learning styles, digital skills and educational backgrounds. Technical difficulties also arose when trying to download the badge, due to an incorrect setting in the Moodle learning management system, which affected the majority of students.

3. Evaluation of the online module

A student feedback form was developed and built into the module, which consisted of 11 questions regarding the teaching approach used:

- Eight questions used a 5-scale Likert rating (where 1 = strongly disagree and 5 = strongly agree) to collect responses on the teaching strategy and the specific technologies used.
- One Yes/No question asked whether students would recommend that the online tools continue to be used in future.
- Two open-ended questions collected feedback on their learning experience and difficulties encountered.

3.1 Feedback on the teaching approach

The median for most of the Likert questions was four, apart from the question about whether the digital badges motivated learning, which had a median of three.

Modes for each of these questions were mostly three or four, matching or slightly below the medians. The outlier was a five for the question of whether the LibWizard tutorial was helpful.

Most of the means reflected the difference between the modes and medians, and generally hovered between three and four. The highest, exceeding 4.0, was that the content met stated objectives. The lowest, at just above 3.1, was about the digital badges motivating learning.

68.2% of students would recommend using the online module in future teaching.

3.2 Feedback on learning experience

Two open-ended questions were used to explore the students' learning experience, the difficulties they faced in the online module, and the benefits they derived from it. Many students commented that they found the interactive module engaging and helpful:

The module was interactive which made it more interesting and engaging.

... [It] had videos, together with written information and also an interactive database search. This improved my understanding as the information was presented in many formats.

Getting the badge and feeling accomplished.

Although students found the badges motivating, technical problems related to downloading the badges led to dissatisfaction:

I could not download the CINAHL badge

Obtaining a badge in CINAHL was very challenging and time consuming, I attempted to do this twice taking over half an hour.

Unable to download the CINAHL badge after completing the task multiple times.

The lack of face-to-face interaction and support was reported as below:

Some of the concepts require physical guidance, especially when you don't seem to understand what you need to do because you have exhausted all searches possible and do not get a result, and you cannot pinpoint where the mistake or problem is.

I would prefer to be taught in class rather than have to try and figure out on my own what is to be expected.

I do prefer the in-person teaching style as opposed to online I found this teaching style a little problematic and stressful when it can be made a little simpler.

Students enjoyed the interactive database searching process:

I liked doing the activities for the CINAHL database. It really helped guide and make me actually learn how to use the database properly.

I quite enjoyed the step by step walk through of researching techniques using databases such as CINAHL or SCOPUS, it is something that I did not know ... The content covered was really beneficial and I feel like I took many different and new skills on board.

The module was interactive with the databases like CINAHL and Cochrane Library. Having Murdoch teach me how to use them has definitely helped. I feel like before I was just typing in long sentences and either coming up with 0 searches, or like 10,000 searches!

Overall, the online module was challenging, but students found it to be a positive experience:

It challenged me to [do] things I have not yet completed on databases and it is a good refresher to what I've done in previous years.

... the [second year EBP] unit ... was a while ago, so maybe having like a quick five minute video at the start of the online module ... connecting the dots, will be so much [less] overwhelming than "here is a case study, write your question and conduct a systematic review!" It's like ... Wait what!?! But at the same time, this did encourage me to go over my old learning materials... so maybe the panic is good.

I liked how the module described step by step ... how to complete the tasks, this really helped me as I am not great with technology and now I have a thorough understanding on how to search and complete systematic reviews. The ... "Search skills: CINAHL database" [video] was also very helpful as a detailed explanation along with a visual demonstration made it easier for me to navigate the CINAHL database as I find that visual learning styles really help me.

4. Discussion

4.1 Tools for online education

The literature shows that web-based instruction can be effective, and this is supported by the student feedback, with a mean above four (out of five) that the interactive tutorial met the stated learning objectives. Furthermore, student responses highlighted the value of the LibWizard

module in their learning, which also supports research that interactive online tutorials are better than videos at engaging active learning (Fontane, 2017).

At the same time, there are limits to purely online delivery of learning. The lack of assistance from a tutor was a difficulty some students reported, which is why some of them arranged to meet with the first author for guidance. This indicates that in any cohort there will be students who would either experience difficulties in the online environment or prefer face-to-face instruction. Options for such guidance in the form of webinars and helpdesk sessions will be considered in future.

For many years Guide on the Side was the key player in this technological space, such that when LibWizard was released Sherriff (2017) made a direct comparison between the two. Until recently, LibWizard was the only turnkey cloud solution available, but after this project was presented at a conference (Chan et al., 2019), a delegate informed the first author about Sidecar Learning (<https://www.sidecarlearning.com/>), a commercial SaaS version of GotS that could potentially resolve the technical issue of databases not working in iframes.

Version 2 of LibWizard was also released in March 2019, after this project was completed. While this version has not fully solved the iframe issue, workarounds have been implemented to address it. The primary author subsequently initiated a project to trial Sidecar and compare it against LibWizard 2.0.

4.2 Digital badges

Micro-credentialing is another rising trend in education, as it provides evidence of learning while also motivating students with a 'tangible' reward for completing a task. However, digital badges may "lack sufficient value as standalone certification of employability skills" (Rizvi, 2016, p. 89), and so should be "linked to improving pedagogy and ... student success" (p.92). In other words, the badges are just one component of a larger learning system: videos engage visual and auditory learners, LibWizard modules support active hands-on instruction, and PebblePad further develops these skills over the student/practitioner's career.

But as with all innovations, there were teething problems. Technical issues resulting from incorrect settings in Moodle caused frustration for students, as reflected in the teaching survey. It is interesting that the most established of the technologies used was the one that created problems in this implementation and may have limited to some degree what could have been a highly motivating learning strategy for students if implemented correctly.

4.3 Developing students' IL skills

The feedback from students showed that learning to use databases was the most beneficial aspect of the module. Efficient and effective searching of databases is a core skill of both IL and EBP, and students were given the opportunity to familiarise themselves with three key databases that would be useful for their nursing careers.

Student attitudes toward evidence-based practice were also very positive, in line with the findings of Ryan (2016). This is important because the EBP process is complex and iterative, and can sometimes be discouraging. But if these future practitioners understand the importance and value of evidence, they will persevere in improving their IL skills.

The limitation of this project was that it did not directly measure student learning of IL and EBP skills. A well-formulated research project will be required to better answer this question.

5. Conclusion

Evidence-based practice and digital literacy are important skills for both professional practice and lifelong learning. This project successfully integrated screen-capture videos, split-screen tutorials, e-portfolios and micro-credentialing into one online module to assist nursing students in developing the confidence and IL skills required for successful EBP. While it was not without problems in execution, the project has yielded important lessons around technological improvements and support for students, which will help improve future iterations.

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