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Abstract

During a three-year study, 32% (n=67) in 2015, 16% (n=44) in 2016 and 55% (n=161) of students in 2017 expressed an interest in using digital badges to enhance their learning. But who are these students? This paper explores the features of students who are interested in using digital badges as a motivational reward to prepare for weekly face-to-face classes through engaging with online activities and resources. This paper uses a first-year undergraduate Bachelor of Nursing bioscience topic at an Australian university to report nursing students’ interests around playing games, their digital badge history during the topic, and their self-reported attitudinal interest in using digital badges to enhance and personalise their learning. Overall, the results indicate that some students chose to enhance their learning potential in class by earning digital badges prior to class. The results of this paper are relevant for nursing educators and educational designers seeking to integrate digital badges into motivational teaching practices, by evaluating the role digital badges play as a motivational game-based learning design element.

Keywords: Digital badges; Game elements; Nursing bioscience
1. Introduction

Digital badges have a history entrenched in physical badges, such as those established by Baden-Powell with cub scouts, where individual cub scouts would work towards different cloth badges by performing a task or displaying a skill. Each badge would be displayed on their uniform to help communicate their success amongst peers. More recently, digital badges have been integrated into mobile games and wearable fitness monitors like Apple Watch™ and FitBit™, and achievement structures built into gaming consoles such as the Microsoft XBox™. Relatively unexplored is the individual who is motivated to earn what is essentially a digital image and attached metadata, which can only be displayed in an online environment.

In the educational sector, digital badges are considered by many as an alternative (micro) credentialing tool. However, this paper argues that digital badges have a motivational power associated with the type of learner who is motivated to learn new skills or knowledge which is recognised informally (Foli et al., 2016). This article highlights the potential value of digital badges to help personalise learning when they are purposefully integrated into a nursing university teaching topic, adding to recent published work (White and Shellenbarger, 2018).

1.1 The current state of digital badges in education

Digital forms of badges, or digital badges, have been interchangeably referred to as badges, open badges, educational badges, micro-credentials and digital badges. While there are obvious differences between the assigned nomenclature for those who set up the badging process, the current literature seems to agree that the digital badge is a visual symbol of an accomplishment, skill or recognisable trait that
deserves acknowledgement; contains metadata to explain the context of the award; can be shared digitally across social communities (Fanfarelli et al., 2015; Gibson et al., 2015; Goligoski, 2012); and should be broadly identified as a digital badge (Elliott et al., 2014; Foli et al., 2016; Gibson et al., 2015). In the context of this case study, the digital badge is used for an educational purpose in a university-restricted digital environment. Therefore, it is not able to be shared with others unless the student decides to share and use an external backpack system, a specialised online folder for storing and presenting digital badges in social media tools (Elliott et al., 2014).

This paper describes the use of a digital badge system embedded in the university’s learning platform (Moodle). What is generally acknowledged about digital badges is that they have been implemented in many educational settings to varying levels of success. A study by Davis and Klein (2015) with high school students found that digital badges were recognised as an opportunity for personal empowerment but the students had concerns about the sharing of digital badges online. In the higher education sector, digital badges have been explored as an alternative to grades (micro-credentialing) (Elliott et al., 2014); supporting the process of progressing through research degrees (Mewburn et al., 2014); assessing individual students in collaborative assignments (Mocozzet, 2013); and as an introduction to navigating a physical campus through a scavenger hunt exploration (Koutropoulos, 2012). This wide range of activities identifies that there are highly creative uses of digital badges in the higher education sector. However, the use of digital badges in nursing education is just commencing with explorations in micro-credentials (Elliott et al., 2014); motivating students in an online nursing course (Foli et al., 2016); clinical performance and GPA recognition (Hannas, 2016); and recording achievement for future employers (Thomas, 2014). White and Shellenbarger (2018) supports the
process of adopting digital badges by summarising key educational design considerations for faculty nursing academics who decide to incorporate digital badges. Targeted research to motivate students in a first-year bioscience nursing topic to be prepared for practical classes (without being linked to formative assessment) remains unexplored.

1.2 Bioscience in nursing education
Registered nurses require accurate bioscience knowledge in order to provide safe evidence-based practice. Undergraduate nursing students have for many reasons had difficulty successfully negotiating the large volume of content and the complex concepts in bioscience topics (Choi-Kwon et al., 2002; Gresty and Cotton, 2003; McKee, 2002; Smales, 2010). Practical classes are an important component in nursing topics for developing clinical skills and applying theoretical content knowledge, thereby encouraging students to develop an understanding of the content and complex concepts in bioscience.

In a recent systematic review of pre-registration bioscience curriculum, McVicar, Andrew, and Kemble (2014) found that while there have been innovative changes to support student learning, the effectiveness of these changes has not been evaluated. Indeed, nurse academics are also aware of the challenges of teaching bioscience to large student groups and have expressed concern regarding the lack of time provided for students to be adequately educated and assessed in current curriculums (Taylor et al., 2015). This paper provides nurse academics with evidence about which type of nursing student is motivated to learn foundational bioscience concepts in a first-year topic using weekly digital badges to acknowledge individual preparedness for practical classes.

1.3 Digital badges and preparation for classroom learning
The paper focuses explicitly on using digital badges in an educational setting, via the university’s Moodle learning platform. Moodle is a widely used learning management platform that provides students with access to learning materials (readings and media) and activities (forums, quizzes, assessments) in a secure online environment. The results of this research help to build our current understanding of how digital badges can be used successfully to enhance students’ learning potential in the classroom by encouraging them to come to class prepared. Digital badges were earned through an automated process following the successful completion of key learning activities that do not have summative reward but that were important for building knowledge. Interestingly, the digital badges employed a narrative technique, referred to as a ‘build a body’ approach, which encouraged students to collect all ten body system parts associated with the main themes in the topic. When all badges had been collected, students were awarded a ‘super prepared body badge’. This approach intrinsically encouraged students to engage with the expected learning process and to come to class with a foundational understanding before being asked to apply their knowledge in a practical setting.

Digital badges were integrated throughout the design of the ten-week topic to motivate and focus students on the importance of being prepared for laboratory and clinical practicals. Being prepared for face-to-face classes, especially laboratory practical classes where there are high costs to run certain classes, is important for science-based learning. Chittleborough et al. (2007) stated that “pre-laboratory preparation is crucial considering that what students already know determines what they will learn” (p. 884). There is also a concern that the technical language often used in bioscience and laboratory manuals puts additional requirements on the short-term memory of a student during the practical. By motivating students to come
to class prepared through using digital badges, nurse educators are ultimately enhancing their students’ learning potential in class.

### 1.4 Using digital badges to motivate students to be prepared for class

Being motivated to be prepared for class is a personal experience. However, the steps taken can be the same for many students, including using motivational achievements. Glover (2013) defined motivational achievements, such as digital badges, as icons which “highlight activities completed by the person, and allow an individual to keep track of what they have done and potentially ‘shown off’ to third parties” (p. 2001). More recent research on the role of digital badges in motivating students by Reid et al. (2015) indicates that students’ level of expectation of their studies influences the motivational appeal of digital badges. Yet according to Hartnett (2012), measuring students’ motivation in an online environment needs to be done cautiously, as the online activity is only part of the “gauge for assessing student motivation in online contexts” (p. 28). This applies to an online, blended or flipped classroom, where students complete either all or a component of their studies using digital resources and online activities, which include videos, discussion forums and quizzes.

In a study by Abramovich et al. (2013), high school children were motivated by digital badges in relation to their background, including prior knowledge and ability, and the type of accomplishment provided by the badge’s system. For example, participatory badges, defined as external motivators, had minimal connection to individual measures of skill. Skill badges that were awarded for a student’s performance were defined as an internal motivator. This finding is reiterated by the work of Foli et al. (2016) who found that online nursing students were encouraged to learn with the aid of educational digital badges, but success was dependent on the type of learner and
the individual’s performance and expectations (p. 641). In a study by Royse and Newton (2007), the innovative approach of gamification for nursing students is an affirmed technique to enhance students’ ability to retain knowledge and motivate them to learn. This finding is supported by McCurry and Martins (2010) who acknowledge that nursing academics should consider innovative approaches to teaching undergraduate nursing students in ways which appeal to millennial learners. For the purpose of this article, millennial leaners belong to the generation born between 1978 and 2001 (DiLullo et al., 2011).

As the research presented in our study used a combined type of digital badge, one that measured preparatory knowledge along with participation, the level of motivation was not determined on a measurable scale. No formal assessment was connected to the digital badges, so they provided a measure of motivation to complete online preparation activities thereby enhancing students’ learning potential by being prepared in class. This informal use of digital badges in a nursing degree will assist educators to empirically discover who is interested in earning digital badges and therefore which students are likely to be better prepared to participate in face-to-face learning activities and assessable tasks. By using the students’ demographic characteristics and self-reported attitudes, this paper explores if digital badges can be used as a motivational tool for class preparation in nursing education.

2. Methods

2.1 Background context

This paper reflects one part of a whole study using gamification techniques to motivate first-year nursing students to prepare for bioscience practical classes, specifically practical laboratories and health assessment tutorials. The teaching topic
used for this study incorporated digital badges into the online learning platform (Moodle) to be offered as a reward for completing pre-class activities. Following the redesign of the topic, a pre/post-topic survey was developed and piloted in 2014 before being revised and delivered for three consecutive years (2015 to 2017). This study wanted to determine which first-year students self-reported an interest in digital badges as motivational achievement for engaging with online preparation activities prior to face-to-face class.

2.2 Participants and ethics
A large (2015 n=408; 2016 n=420; 2017 n=418), first-year nursing bioscience topic was selected for this study. The topic employs a flipped classroom approach, requiring students to watch pre-recorded lectures online, complete assigned readings, and participate in a range of online activities such as quizzes and collaborative glossary building, all delivered through the university’s learning platform. These activities are required as preparation learning prior to attending four hours of face-to-face practical class time each week over the topic duration (10 weeks). All participants for the survey were volunteers and the research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee.

2.3 Gamifying the topic: a design challenge
During late 2013, the first-year bioscience topic underwent a major redesign process, where an educational designer and nurse academic worked together to redesign the topic within the university’s Moodle learning platform. Once the content and learning activities were set up and the activity completion setting turned on for all activities,
the Moodle digital badges feature was turned on and linked to the identified preparation activities, using the activity set conditions for automatically determining successful completion of an activity.

Each of the 10 modules requested five items to be accessed/completed to a pre-set expectation using the activity completion feature, which needed to be completed before the end of each week. The preparation learning activities were typically to download two laboratory practical reports, successfully complete a five-question revision quiz and/or participate in a collaborative glossary-building task. To complete the activities successfully, students were encouraged to read relevant textbook chapter(s) and watch the lecture video to gather the content knowledge required for the practical classes. In addition, students clicked a weekly trigger link to indicate they wished to earn the digital badge. This feature meant digital badges were not accidentally earned by students who had no interest in earning one just because they had completed the preparation activities.

The physical appearance of the digital badges was an important motivating feature. A series of digital badges were designed and created using Adobe Illustrator to showcase the ten different human systems covered in the topic, one for each week. The selection of these digital badge images added a narrative encouragement and was a purposeful motivator for students to collect all body parts to build an entire body, represented by the final body badge awarded if all digital badges were collected. These digital badges are displayed in Figure 1 below in greyscale.

Figure 1: The digital badges ‘build a body’ series
2.4 Data collection and validation

The researchers designed and used an online gamification survey at the beginning and end of the topic delivery (pre-topic and post-topic) that anonymously identified the students’ interest in playing games (online, console, mobile, board and cards) and identified if digital badges (as a game element) were a best fit for enhancing their learning. Additional demographic data, including gender and age, was collected at this time. As the survey information was collected anonymously, there was no connection between the individual completing a survey and their final badge count and grade. However, following the distribution of final grades to students, the number of digital badges earned by a student was matched against their final academic result.

The online gamification survey was designed and validated in 2014 by the researchers, and statistically tested for reliability using the responses from a pilot group of students (n=386) in 2014. An internal consistency test was completed to validate the pre-topic survey using Cronbach’s alpha, resulting at 0.760. A content validity index test was completed using a scale-level content validity index average (S-CVI/Ave), resulting at 0.93.

3. Results

3.1 Earning digital badges within a Moodle learning platform

The total number of individuals purposefully earning digital badges through the Moodle automated badge system in 2015 was 245 (60% of the cohort). In 2016 this increased to 305 (73% of the cohort), and in 2017 it increased again to 318 (76% of the cohort). Figure 2 presents the trend for the total number of digital badges earned
by students per module/week of the topic. As students could only earn digital badges if they opted into the weekly feature, involving a ‘click here’ to trigger collection in the automated system, these numbers are an accurate indicator of how many individuals were interested in earning digital badges for being prepared for class across the ten-week topic.

As Figure 2 shows, the interest in earning digital badges each week generally decreased as the topic continued. When compared to the cohort differences, in 2015 (n=408) digital badge interest began at 40% (165 earned the Intro to body badge) and declined to 8% (39 earned the Respiratory system badge) by the end of the topic. The cohort in 2016 (n=420) went from an interest of 66% (275 earned the Intro to body badge) and declined to 15% (64 earned the Respiratory system badge) by the end of the topic. In 2017 (n=418), the interest went from 58% who earned the Intro to body badge (241) to 17% who earned the Respiratory system badge (72).

![Digital badges earned per module/week](image)

*Figure 2: Graph illustrating total number of digital badges earned by students per module*

### 3.2 Self-reported interest in digital badges for learning

To narrow the focus of digital badges earned by an individual student by year of study (cohort) reported in section 3.1, we can report results from individuals who
self-reported an interest in earning digital badges to enhance their learning. In 2015, 208 students self-reported an interest in game elements generally, but only 67 (32%) of these students self-reported an interest specifically in digital badges as a learning enhancing tool. All 67 students nominated that they play games, selecting from the list provided (online, console, mobile, board and cards). Importantly, these same 67 students also report positively (agree-strongly agree) about the potential of digital badges to help them prepare for class. In the 2016 pre-topic survey, of the 269 students who nominated a strong interest in using game elements to enhance their learning, 44 (16%) reported an interest in earning digital badges as a learning enhancing tool. All 44 students reported that they play games (online, console, mobile, board and cards). In 2017, 323 students nominated an interest in using game elements as a learning enhancing tool, of which 161 (50%) reported an interest in earning digital badges. All 161 students reported that they played games such as online, console, mobile, board and cards. The following results focus on identifying individuals by their gender and age who expressed an interest in earning digital badges by being prepared for class.

3.2.1 Who are they?

Table 1 summarises the 2015-2017 topic cohort statistics and Table 2 summarises the survey and digital badge respondents, as identified in the pre-topic survey. The difference between the number of students in the topic (Table 1) and those that responded to the survey and collected badges (Table 2) are presented for three consecutive years.

| Table 1: Demographics of topic cohort |
### Topic cohort statistics

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=408 (%)</td>
<td>n=420 (%)</td>
<td>n=418 (%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>77 (19)</td>
<td>67 (16)</td>
<td>71 (17)</td>
</tr>
<tr>
<td>Female</td>
<td>331 (81)</td>
<td>353 (84)</td>
<td>347 (83)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-19</td>
<td>142 (35)</td>
<td>177 (42)</td>
<td>166 (40)</td>
</tr>
<tr>
<td>20-24</td>
<td>174 (43)</td>
<td>160 (38)</td>
<td>163 (39)</td>
</tr>
<tr>
<td>25-29</td>
<td>38 (9)</td>
<td>42 (10)</td>
<td>42 (10)</td>
</tr>
<tr>
<td>30+</td>
<td>54 (13)</td>
<td>41 (10)</td>
<td>47 (11)</td>
</tr>
</tbody>
</table>

#### Table 2: Demographics of survey participants

<table>
<thead>
<tr>
<th></th>
<th>Survey participants</th>
<th>Badge participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2015 n=208 (%)</td>
<td>2016 n=269 (%)</td>
</tr>
<tr>
<td>Gender</td>
<td>Badge participants</td>
<td>2015 n=67</td>
</tr>
<tr>
<td>Male</td>
<td>40 (19)</td>
<td>37 (14)</td>
</tr>
<tr>
<td>Female</td>
<td>127 (61)</td>
<td>231 (86)</td>
</tr>
<tr>
<td>Not provided</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-19</td>
<td>71 (34)</td>
<td>46 (17)</td>
</tr>
<tr>
<td>20-24</td>
<td>83 (40)</td>
<td>75 (28)</td>
</tr>
<tr>
<td>25-29</td>
<td>28 (14)</td>
<td>13 (5)</td>
</tr>
<tr>
<td>30+</td>
<td>25 (12)</td>
<td>22 (8)</td>
</tr>
<tr>
<td>Not provided</td>
<td>71 (34)</td>
<td>46 (17)</td>
</tr>
</tbody>
</table>

#### 3.2.2 Student interest in playing games

To assist in understanding the value of game elements within the student cohort, the students who expressed an interest in digital badges (identified as ‘badge participants’ in Table 2) were asked to identify what types of games they play by selecting from a list of provided categories for both digital and traditional games. These types of games use similar game elements to those included in the study to motivate players. The information from Figure 3 can be explored by cohorts (years) and compared by gender (Figure 4) and age (Figure 5).
In Figure 3, the games being played by digital badge interested students indicated that students reported a higher interest (2015: 33%, 2016: 44% and 2017: 33%) in mobile games over other games. Interestingly, the 2015 cohort of students indicated a higher interest in online (33%) and console games (21%) compared to the 2016 student cohort who had the highest mobile game interest (44%). As online, console and mobile games commonly use digital badges as motivational rewards, it was assumed these would be the most commonly played games by students who declared an interest in digital badges when compared to the non-digital board games and cards (acknowledging that cards could be played digitally). The results indicate that board and card games are still played by students, sometimes as much as digital games but occasionally slightly less than some digital games. However, in 2017, students indicated a higher interest in board (19%) and card (18%) games than previous student cohorts.

*Figure 3: Game play interest overall*
When the results of interest in playing games is explored by gender (Figure 4) we find that 50% of males in 2015 played online and console games, compared to 26% (online) and 32% (console) of females. Interestingly, 71% of males played mobile games in 2015 compared to 53% of females. This is in contrast to 50% of males (mobile) compared to 70% of females (mobile) in 2016. As identified in the 2017 cohort, board and card games were of higher interest compared to 2015 and 2016 cohorts. When gender is considered with this data, we see the interest in the 2017 cohort is higher for females with board games (34%) and card games (35%) than males (27% and 12%). This is in contrast to the 2017 cohort where females have a lower interest in online games (30%) and console games (16%) than their male peers who have a higher interest in online games (51%) and console games (30%). These results indicate that male students are more interested in digital games, especially online and console games, than female students, which may influence their interest to earn digital badges for their study. This divide overall (2015-2017) has a ratio of 2:1 (49 males: 22 females) students interested in console games and 1.5:1 (36 males: 22 females) interested in online games. Mobile games are more equal at 1:1 (57 males: 60 females). The average ratio of males to females in the studied nursing program is 1:5 (see Table 1 for 2015-2017 demographics). This is different to the expected ratio of practising male to female nurses in Australia (1:10) (Australian Bureau of Statistics, 2013).
When the results of interest in playing games are explored in relation to the age of the student (Figure 5) we find that mobile games are a highly popular form of gaming amongst all students, regardless of age. However, a closer look indicates that students who are <19 and 20-24 have a higher interest in playing mobile games than the 25-29 and 30> age categories, all of which are millennial learners.

**Figure 4**: Games played by gender

**Figure 5**: Games played by age
3.3 The ‘super prepared students’

The last measurable element was to evaluate the individual students who collected all 10 body-themed digital badges to earn the Super Prepared Body Badge and were reviewed based on their final (provisional) grade. The results indicated that digital badge earners in their cohort were also academically motivated achievers (Figure 6). This level of achievement is reinforced by Reid et al. (2015) who stated that students who have a high expectancy of learning are intrinsically motivated. To put this into perspective, the class average grade for 2015 was 61%, for 2016 it was 56%, and in 2017 it was 60%. All grades are listed as passing grades, whereas the final super prepared body badge students had an average grade of 75% which equates to a distinction grade.

![Figure 6: Final grades for top digital badge earners](image_url)

4. Discussion

4.1 Characteristics of students who earned digital badges

According to the findings of the three-year study, there was an increase in the number of students who indicated they were interested in earning digital badges to
enhance their learning. It was noted, however, that the frequency of earning digital badges across the 10 weeks of the topic continued to decline. This was evident in each year of the study (Figure 2). This finding is reinforced by studies in gamification such as Koivisto and Hamari (2014) who found that the use of game elements as a motivation declined with use, suggesting a potential novelty effect. Specifically, Hamari (2017) explored badges and theorised that their participants showed curiosity towards the badges, reinforcing the novelty of the game element in participants’ behaviour. However, when the novelty wore off this affected the participants’ behaviour. In our study, a declining motivation to use digital badges to be prepared because of a novelty effect is theorised. Further studies to target the direct effect of novelty on learning when using gamification techniques is required in the education field. This is an important step, as to use relevant teaching and learning techniques for the millennial generations requires innovative thinking. This is reinforced by Royse and Newton (2007) who promote the innovative approach of gamification for nursing students as a way to enhance students’ ability to retain knowledge and to motivate them to learn. McCurry and Martins (2010) additionally support innovative approaches to teaching undergraduate nursing students in ways which appeal to millennial learners. Mobile games are a primary area where digital badges specifically are found to motivate players, and may be considered an innovative and targeted approach for some students who report an interest in mobile games, the most popular type of game recorded in Figures 4 and 5. For example, male students who completed the online gamification survey reported a stronger interest in playing online and console games than their female peers. This result is supported by Veltri et al. (2014) who found that males engaged with online gaming because of the competitive aspect,
while females who engaged in online games saw it more as a vehicle for social engagement. As online and console games employ a range of game elements to motivate their players, such as levelling up and progress bars, digital badges are just one component that may be used in some games. This is in contrast to mobile games which, in this study were commonly played by both males and females respectfully at 71% and 53% in 2015, at 50% and 70% in 2016, and at 49% and 58% in 2017. Further information on specific games students play in these modes would be of interest to future research in order to identify whether there is a correlation between the type of game and their interest in digital badges for motivating learning.

4.2 Not all students wanted to earn digital badges

Results summarised in Table 2 indicate that not all students wanted to earn digital badges. Furdu et al. (2017) and Glover (2016) both agree, if students are not naturally competitive then the use of digital badges will lose their attraction and participation will decrease. However, the study did find that for other students digital badges can be meaningful and motivate those who are interested in using game elements to enhance their learning (Abramovich et al., 2013; Foli et al., 2016). Reid et al. (2015) suggested that the higher the number of digital badges earned, greater the value of the digital badge to the student. So it is no surprise that some high-achieving students are motivated to learn with digital badges, as displayed in Figure 5.

Motivating pre-registered nurses to acquire foundational bioscience knowledge in their first year of study is important so they can provide safe evidence-based practice as registered nurses. Undergraduate nursing students have an acknowledged difficulty in processing the large volume of content and complex concepts in bioscience topics (Choi-Kwon et al., 2002; Gresty and Cotton, 2003; McKee, 2002;
Smales, 2010). Therefore, being prepared for learning in practical classes is an important component in nursing topics for developing clinical skills and applying theoretical content knowledge that is required in their profession. By learning how to use innovative teaching approaches such as adding game elements, including digital badges, to motivate some students (McCurry and Martins, 2010; White and Shellenbarger, 2018), nurse educators can encourage their students to develop an understanding of the content and complex concepts in bioscience during their first year of study. The use of digital badges is one approach to help establish good preparation skills that can be carried forward in their future years of study, strengthening their learning potential and, ultimately, their success as practising nurses.

5. Future research

Further studies tracking individual students’ experience would be a valuable method to determine what barriers exist in a student’s life which may make them less likely to use digital badges in their studies and potentially prevent them from being motivated to prepare for practical classes. Ideally, connecting survey respondents to their digital badge earnings and final grade would strengthen the value of determining who is most likely to engage with digital badges as a method to support their learning. As this level of analysis requires identification and permission across survey responses, badge history and grades, a revised ethics application would be required. Further studies to target the direct novelty effect badges have on users and explore what games students play would be of interest in future research to build on the work of previous research.
6. Conclusions

This paper has reviewed information provided by self-reported digital badgers, supported by demographics (gender and age) and attitudinal responses to a survey on gamification. This study reports the findings of ‘who’ is motivated to prepare for face-to-face practical classes at university if digital badges are available to earn and collect in a first-year bioscience topic in a three-year undergraduate degree. The analysis, from a range of collected data, identified that students who self-report an interest in digital badges as a motivational tool to help them prepare for class, may enhance their learning potential during class by earning digital badges prior to class. Whilst the results do not indicate that learning in class is enhanced, as this was not measured during this study, the implication is that students who are motivated by digital badges have the potential improve their learning by being well prepared prior to entering the classroom. This paper provides evidence for nurse academics and educational designers who are considering digital badges as one online tool to provide additional motivation to support student engagement with preparation activities prior to practical classes. While the results presented provide just a snapshot of the cohort in a first-year nursing degree for three consecutive years, there is potential to explore the effectiveness of digital badges as a learning motivator in other years, cohorts and fields of study.
References


Thomas, A., 2014. Nursing faculty and students implement Passport badges to measure learning, achievement. Purdue University Informaion Technology, Purdue University Information Technology.


Highlights

- Students who use digital badges as a motivational tool to assist them to be prepared for class, can enhance their learning in class by earning digital badges prior to class.
- Some high-achieving students are motivated to learn with digital badges.
- Over the course of the topic, the value of digital badges as a motivational tool decline with use, suggesting a potential novelty effect.
**Conflict of interest**  
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