

The creation of a nudging protocol to support online student engagement in higher education

ABSTRACT: Combining nudge theory with learning analytics, 'nudge analytics', is a relatively recent phenomenon in the educational context. Used, for example, to address such issues as concerns with student (dis)engagement, nudging students to take certain action, or to change a behaviour towards active learning, can make a difference. However, knowing who to nudge, how to nudge, or when to nudge can be a challenge. Providing students with strategic, sensitive nudges that help to move them forward is almost an art form. It requires not only technical skills to use appropriate software and interpret data, but careful consideration of what to say and how to say it. In this paper, the authors offer a nudge protocol that can be used in online courses to encourage student engagement with key course resources that are integral to supporting their learning and success. Developed through an action research project, the protocol is a result of two years' research and development work.

Keywords: nudge analytics; nudge protocol; student engagement; higher education

Across diverse educational settings, student engagement has long been viewed as a factor that is linked to positive outcomes, including academic achievement, student learning, student satisfaction, persistence, student health and wellbeing, retention, graduation rates, classroom motivation, and institutional success (Bodily et al., 2017; Flynn, 2014; Kuh et al., 2008; Lee, 2014). At the same time, lack of engagement, or non-engagement, has been identified as a contributor to lower completion rates in online learning courses (Kizilcec et al., 2013; Department of Education and Training, 2017). Although engagement is important to any learning experience, it is particularly relevant to online learning because online students have fewer ways to be engaged with the institution and may also have greater demands on their time and attention (Meyer, 2014). In terms of the study behaviours expected and required to achieve academic success, online learning environments can place more demands on learners than traditional contexts (Authors, 2019).

Despite a growing body of research that has addressed the question of how to design courses in a manner that increases students' engagement (for example: Chakraborty and Nafukho, 2014; Czerkawski and Lyman, 2016), the potential of digitally delivered higher education is often still not being realised and many online courses continue to underperform in terms of expected student engagement and learning outcomes (Burton et al., 2015; Wanner, 2014). Too often students report feeling overwhelmed by their online learning experience and the need to rely on themselves. Such students typically express a desire for more structure, guidance, and feedback from the instructor. They also desire packaged material to step them through the learning requirements and are generally unable to self-direct their learning (Burton et al., 2015).

With COVID 19 exacerbating the move to online learning, student engagement with online learning technologies and interfaces in the delivery of higher education has become even more important. Knowing what promotes engagement in the online learning context is key to making online learning productive for higher education institutions but also, more importantly, for ensuring that students are successful as they pursue their qualification. While it is the intention of many institutions to use learning analytics (LA) and the availability of student data and student-facing technology to gain insights into, and influence, student learning, motivation, engagement, and performance (Colvin et al., 2015; Francis et al., 2019; West et al., 2015), the vast field of LA research still lacks practice-orientated approaches that are transferable into everyday teaching practice. Data informed student engagement therefore still remains an 'unrealised buzzword' for many institutions and their practitioners (Blumenstein et al., 2019: 185).

This paper introduces an intervention designed to address the problem of how to engage low or non-engaged students with key online learning materials. Using nudge analytics, the intervention was designed to focus on those students who demonstrate low or non-engagement, but to do so with the limited involvement of staff time and administration. This paper describes how the approach was implemented and refined over three iterations to develop a nudging protocol that can be easily implemented in courses to encourage low or non-engaged students to access course resources key to their success in the course.

Nudge theory

A recent approach for addressing and encouraging student engagement involves the use of 'nudge analytics', combining learning analytics with nudge theory (Blumenstein et al., 2019; Carmean and Mizzi, 2010; Damgaard and Nielsen, 2020; Feild, 2015; Authors, 2019). Nudge theory was popularised by Thaler and Sunstein (2008) who, recognising that people do not always act in ways that serve their own best interests, suggested that in many instances individual decision-making could be improved by using simple 'nudges'. Intersecting the key ideas of 'choice architecture' and 'nudges' in the context of behavioural economics, nudge policies are aimed at "alter[ing] people's behaviours in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler and Sunstein, 2008: 6). They are also actions which occur "in ways that are most likely to help and least likely to inflict harm" (Thaler and Sunstein, 2008: 79). The power of nudges lies in their potential to modify human behaviour without coercion: by appealing to individual psychology, effective nudges increase the likelihood of people making choices that reflect their underlying interests, while still respecting their freedom to choose (Selinger and Whyte, 2011).

Applying the construct of nudge theory to education, instructors can be understood to be 'choice architects' who have "the responsibility for organising the context in which students make decisions" (Blumenstein et al., 2019: 187). As any instructor can attest, most students say they want to earn good grades; yet, realistically, all kinds of behavioural barriers prevent students from fully engaging in their learning in a manner that promotes success (e.g. self-control problems, limited attention and cognitive ability, loss aversion, default bias [when people do not pay adequate attention to other options, because the default is the most salient option], social preferences, or biased beliefs) (Damgaard and Nielsen, 2020; Authors, 2019). Understanding that students do not always take appropriate action to meet their goals, an instructor can 'nudge' students to take certain actions. For example, if the goal is to help students prepare for assignments ahead of time, nudges could be applied by giving smaller, incremental assignments that build toward a larger assignment. Students still have the freedom to not work ahead of time, but the likelihood that they will earn a good grade on the larger assignment improves drastically with a slight 'nudge' in the right direction (Griffin, 2011).

In the educational context, nudge analytics has only been explored relatively recently. For example, one experiment that sent students personalised daily nudges via text message or through a specially designed iPhone app found that using data analytics to power behavioural nudges positively affected student success (Frankfort et al., 2012). In this study the nudges were designed to encourage certain academic behaviours and attitudes associated with student achievement, persistence, and retention, for example by promoting helpful behaviours such as taking advantage of free campus tutoring or offering relevant strategies provided by recent graduates. Others have used LA data from course Learning Management Systems (LMS) to identify students who had no or low engagement. Those students were then sent an email reminding them of the importance of certain resources on the LMS, or the 'stakes at play' from missing certain course activities (Blumenstein et al., 2019; Authors, 2019). Using nudge analytics in such a way enabled instructors to use LA data to identify and support, through a nudge, students at risk of course failure. Research has also found a positive correlation between the provision of encouraging email or SMS nudges aimed at specific student groups based on predicted performance drawn from log data behaviour (Feild, 2015; Frankfort et al., 2012; Corrigan et al., 2015).

In these examples, the nudges did not push students towards particular decisions, but instead subtly attempted to influence students' decision-making processes. They also adhered to the 'rules' of nudging, altering students' behaviours in a predictable way without forbidding any options, while also proving actions or interventions that were most likely to help and least likely to inflict harm. As recognised by Blumenstein et al. (2019), with nudges in education becoming more commonplace and data-driven, it is critical to remember that beneficence/non-maleficence is also a key LA ethical principle. In the context of student engagement, there are various aspects of students' choice architecture that teachers can alter to help promote student engagement and success.

Proxies for engagement

Student engagement is complex and multifaceted (Kahu, 2013), which limits the ability to fully describe and impact it (Blumenstein et al., 2019). While frameworks and protocols cannot capture the full complexity of student engagement and the factors affecting it, they are useful for designing interventions based on LA that are intended to impact on and modify students' learning and engagement behaviours. To demonstrate data-informed nudges in practice in this paper, student engagement has been operationalised as it is understood by the instructors in their specific contexts

in an online learning environment. These proxies for engagement are aligned with Authors (2018) cognitive and behavioural measures that elicit academic outcomes in an online learning environment; that is, the educators used an objective measure of behavioural engagement (online access – or lack thereof – to key course resources in the learning management system) to infer a lack of cognitive engagement (such as low value given to some resources that may actually be key to a student's success in the course). Activity in the learning management system (LMS) has been used in other studies as a proxy for student engagement (for example: Beer et al., 2010; Blumenstein et al., 2019; Chaka and Nkhobo, 2019; Fritz, 2013; Henrie et al., 2018; Macfadyen and Dawson, 2010) as activity in the LMS has been found to contribute to better outcomes as measured by final grade (Macfadyen and Dawson, 2010; Fritz, 2013).

The measures and interventions described in this paper have been developed from actual online classroom occurrences (log data) and interventions (nudges) triggered by pre-determined criteria and at predetermined time points in a semester. As research has highlighted the crucial nature of early engagement in supporting the probability of student success and retention (Authors, 2018) the intervention was designed to be implemented in the first five weeks of semester. Messages, via the course online platform (LMS), were used by the instructors as an attempt to alter students' learning behaviour to help promote student engagement; thus applying the nudge principle of providing deadlines, goal setting or reminders to entice people to utilise these behavioural tools in a specific situation where they may otherwise fail to use them sufficiently to self-regulate their own behaviour (Damgaard and Nielsen, 2020). Students may not connect their choice made (disengagement) with the impact on lived experiences (Blumenstein et al., 2019), which in this case could have a potential negative impact on academic performance later during the course of study. Nudges that utilise deadline, goal setting or reminder interventions, alter the decision-making environment by exogenously imposing use of already available tools and, as a result, may help to change student behaviour through better active or passive decision-making.

Methodology

Action research is widely used in education as it is a model of professional development that promotes collaborative inquiry, reflection, and dialogue. Within the action research process, educators study student learning related to their own teaching (Lesh, 2014). "What is specific to action research as a form of inquiry is that it uses the experience of being committed to trying to improve some practical aspect of a practical situation as a means of developing our understanding of it" (Winter, 1998: 362). The aim, therefore, is to improve student learning practices through reflexive research that investigates the effectiveness of research-based instructional practices currently used in classrooms.

In this research, the action research approach enabled an alignment with teaching practice so that the team's research could inform their teaching practice and their teaching practice could inform the research synergistically (Avison et al., 1999). The research team, who were concomitantly researchers and practitioners, combined theory and practice through change and reflection to address and respond to the identified problem of low student engagement with key course resources crucial to student success. As characteristic of action research, the research was an iterative process that involved the research team collaboratively developing a nudge intervention which was designed to respond to the identified problems related to low engagement, followed by action intervention, and then reflective learning. Figure 1 illustrates the action research process undertaken to develop the nudge protocol being offered in this paper. Insert Figure 1 here

The research was conducted across three semesters (S1, 2018; S1, 2019; S2, 2019). The first trial was implemented across two disciplines, a third-year education course and a first-year engineering course. The researchers engaged in reflexive practice to evaluate the impact of the intervention and thus make required changes to the approach taken in future course offerings. In semester 1, 2019, the intervention was then implemented across three disciplines (Education, Accounting, and Science) in eight courses. Again, this was followed by reflexive practice before the intervention was implemented for a third time in semester 2, 2019, this time in eleven courses across four disciplines (Education, Accounting, Science, and Engineering).

Action research: the development of the nudge protocol

First iteration

Key steps in the nudging process included: 1) the identification of weekly critical StudyDesk (LMS) resources/activities (over the first five weeks of semester) that were important to student success (note that in this first iteration the team may have identified several resources for each week to target); 2) the use of StudyDesk course learning analytics (CLA) data to identify non/low engaged students; and 3) the delivery of a 'nudge' communication for each of the targeted weekly resources, designed to try and foster engagement (Authors, 2019). The researchers used CLA data to identify, on a weekly basis, those students who had not accessed one or more of the key weekly resources. These students were then nudged to encourage their use of the resource and highlight the key role the resource played in supporting their learning and course success. In addition to the targeted nudges, broader, promotional messages were also sent at the beginning of each week for the first five weeks of the semester to all students enrolled in the course via the general LMS 'NEWS announcement' system. The aim of these communications was to reinforce course expectations, the benefits of online engagement and to highlight the importance of the weekly critical resources and course activities and successful learning outcomes linked to assessment.

The intervention was evaluated in three ways: 1) using LA data, student click counts (the number of times students clicked on resources on a course StudyDesk) were used to compare student access patterns for the year the intervention was implemented against the baseline data from the previous year when the intervention was not implemented; 2) students were asked to participate in a post-study survey to determine the perceived impact of the nudging; and 3) the research team held weekly research meetings to critically reflect on the how/when/what to nudge, as well as the successes and challenges of the intervention.

The first evaluation tested the success of the intervention by comparing the student click data for 2018 against 2017 in both the engineering and the education courses' StudyDesks in the year of the nudge intervention. As online engagement behaviours were the concern of the intervention, the 'clicks' were considered evidence of an 'engagement behaviour'. Figures 2 and 3 show this comparison. Visually, the diagrams highlight the increases in student engagement across the two courses, as evident from student click counts. Two-sample independent t-tests, excluding the outliers (shown in Figures 2 and 3), were performed to test the hypothesis that mean click counts were significantly different from 2017 to 2018. This was the case for the engineering course ($t = -6.99$, $df = 155.49$, $p < 0.001$, $n = 108$ for 2017 and $n = 95$ for 2018) and the education course ($t = -3.23$, $df = 148.03$, $p\text{-value} = 0.001$, $n = 135$ for 2017 and $n = 79$ for 2018). On average the student click data were greater in 2018 for both the engineering course (2017: mean=415, sd = 257.79; 2018: mean=778, sd=457.05) and the education course (2017: mean=304, sd=230.35; 2018: mean=446, sd=328.68). This supports the hypothesis and lends support for the contention that the nudge intervention influenced the student engagement with critical resources. Of note also is the greater variation as captured visually in the box plots and measured via the standard deviation. This observed variation suggests that the nudge intervention was not effective for all enrolled students and this finding was considered in the evaluation process that influenced the next iteration of the action research project. Insert Figure 2 and 3 here

A post-intervention survey was used to gauge students' perceptions of the usefulness of the intervention. In this survey students were asked to answer a mix of qualitative and quantitative questions. Quantitative questions asked students to indicate on a 5-point Likert scale (where 1 = not helpful; 2 = slightly helpful; 3 = moderately helpful; 4 = helpful; and 5 = very helpful) how helpful they found the nudges generally (average Likert response rating was 3.8, $n=38$). It also asked students to consider how helpful they found different types of nudges, including: prompts early in the semester with study suggestions and tips (average Likert response rating 3.9); early prompts and communication by teaching staff to access key resources (4.1); prompts encouraging participation in forums (3.6); prompts encouraging participation in an online zoom tutorial or lecture (3.6); tips for addressing assessment pieces (4.4); reminders about key weekly tasks and activities on which to focus (3.9); and prompts that shared % of students who had already engaged with key resources to "motivate your engagement" (3.4). These responses showed that students were most receptive to nudges that prompted them to access key resources or gave them information about the value of the resource in supporting their assessment pieces.

Qualitative questions asked students to comment on how helpful the nudge intervention was for their learning in the course they were enrolled. Student feedback collected was largely positive, showing

the intervention was useful for keeping students focused, providing a sense of support and reminding students to access key resources. Negative comments related to the tone, length, or frequency of receiving multiple nudges (some students receiving a nudge for each of the separate critical resources in the same week) and showed that some students felt there was too many nudges from the educators (referred to as over-nudging), or the tone of the communication was too 'big brotherish' and thus lead to increased feelings of stress. In this paper over-nudging, or where the language adopted for a nudge was discouraging, punitive or coercive, being referred to as a 'nag' (Authors, 2019).

Following their experiences, the researchers spent time reflecting on the intervention's success, as well as its limitations. While CLA data were not consistently recorded in relation to how many students had accessed a key course resource pre-nudge compared to post-nudge, the researchers did review their efforts to record CLA data of, and anecdotally noticed, student access to nudged resources did increase as a result of the various nudges. The researchers also noted that while there was an increase in the percentage of students who had accessed a resource because of an initial nudge, students who received multiple nudges in the same week (due to not accessing several key resources), seemed to have less impact.

Another observation was that, from a teaching perspective, the task of communicating several nudges per week (one nudge for each of the identified critical weekly resources) was onerous. From a student perspective, there was the potential for communication overload as some students received multiple nudges in one week. So, a key point of reflection for future iterations was the importance of reducing the number of weekly critical resources to one or two per week, so that students only received a maximum of one nudge per week for the first five weeks of the semester.

Further, in the redevelopment of the nudge protocol the researchers decided that it was important to formally include a 'promotional communication' at the beginning of each week to explicitly highlight to the entire course cohort the tasks and focus for the week, as well as 'upselling' the importance and value of the critical resource or activity. This promotional communication was sent out at the beginning of the week as a NEWS announcement, or message via the course LMS. It was decided that nudges would only be sent out to students who had not accessed the promoted critical resource. This change was important as the promotion of the resource was of value to all students, not just those 'at risk' (Blumenstein et al., 2019). The use of both promotions and nudges as part of the intervention's nudge communication was furthermore integral to distinguishing it from the relatively well-established early warning message systems (Jayaprakash et al., 2014).

Second iteration

Due to the largely positive student feedback, as well as the positive results of the LA data collected in terms of increase in course click counts that was observed in the first iteration, the researchers decided to extend the intervention and trial it in a larger number of disciplines and courses. The second iteration also included a larger number of team members, and the value of the first intervention meant the team was successful in receiving further funding for the second iteration. The project was implemented across three disciplines (Education, Accounting, and Science) in eight courses. As research has highlighted the crucial nature of early engagement in supporting the probability of student success and retention (Authors, 2018) and because feedback collected from students after the first iteration indicated that they were receptive to nudges that prompted them to access key course resources, the focus of the nudge protocol in its second iteration was on encouraging students to access these key resources. The protocol informing the implementation of the nudge intervention used in the second iteration was as follows:

- 1) the project team identified 1-2 (max) key resource/week deemed critical for student success during the *first five weeks* of semester;
- 2) this key resource/s was promoted to all students enrolled in a course;
- 3) using course CLA data, the researchers identified, on a weekly basis, those students who had not accessed one or more of the key resources. These students were then provided a nudge (a message sent via the CLA learning management system) that encouraged their use of the resource/s and highlighted the key role the resource played in achieving course success. The targeted students received one nudge/week related to the identified critical resource/s. In the second iteration, data was also collected in a more targeted, consistent and strategic manner. While the LA data recorded in the first iteration were StudyDesk click counts for a course (to capture whether the nudging had prompted students to increase their online engagement with the course over the semester), in the second iteration the team used CLA data (easily accessible within the LMS) to specifically record the percentage of student engagement with

key resource/s. Data for each of resource/s were recorded at two different times for each resource. These were: 1) pre-nudge – data for a resource were recorded one week after the key resource/s had been promoted to students and just before the course educator provided the nudge communication to those students who had not engaged with the resource; and 2) post-nudge – data for that resource was recorded one week after non-engaged students had been nudged to access the resource.

On average, nine key resources were promoted to all students in each course using the nudge protocol during the second iteration. In total, 92 nudges were given to students across the eight courses, with an average of 11.5 nudges provided per course (the highest number of nudges provided in a course was 20 in the nursing course and the least was 6 in an education course). Analysis of the pre-and post-nudge LA data showed that the nudge intervention had been marginally successful in increasing student access to the nudged resources: on average, one week after a nudge, the percentage of the cohort who had accessed each key resource increased by 6.14%. It was agreed by the researchers it was difficult to attribute the small observed increase to the nudging intervention as this increase could have been a result of the natural increase in student access to a resource that occurs week-by-week as the semester progresses.

Reflecting further on the intervention, the researchers also used the data collected to investigate whether the anecdotal observations made in relation to the decreasing impact of nudges when a resource was nudged multiple times in the first iteration were indeed reflected in the data. Twenty-two of the resources were nudged multiple times; that is, for 22 of the resources students who had not engaged with these resources may have received a second nudge encouraging them to access the resource (on five occasions a third nudge was also given). Figure 4 shows the declining overall increase in students' access to the nudged resource for each subsequent nudge provided (measured by percentage of the cohort who had accessed the resource). The first nudge led to an average 7.26% increase in the percentage of the cohort who had accessed the resource post-nudge; the second nudge only led to an average increase of 3.98%; and the third nudge led to a 1.64% increase. While this declining impact is perhaps not surprising given fewer students would have had to have been nudged each time, it does show that the effectiveness of nudging students into action declines when multiple nudges are used for a single resource. Potentially, when students receive too many nudges for a single resource, the nudges instead become 'nags' which may lead to students 'tuning out' from any further communications from an instructor, thus eroding the potential effectiveness of the intervention. Insert Figure 4 here

The researchers also reflected on the number of nudges sent in each course to consider whether too many resources were nudged or too many nudges to the same resource had been given, which may have eroded the potential impact of the intervention and, in doing so, have become a nag. While it is difficult to make conclusions based on observations from only eight courses, it is worth noting that the course in which the least number of nudges were given (6 in total) recorded the highest average increase in cohort access to a resource following a nudge (average increase was 13.9%). However, this observation is not a result of a clear trend and would need to be tested further across different cohorts and disciplines. Figure 5 shows that the number of nudges provided in a course against the average increase in cohort access to the nudged resources for the course, demonstrates a general decrease in access to a resource with number of nudges. It is important to note that the data trend line highlights the potential decreasing effectiveness that may result when too many nudges are provided. Insert Figure 5 here

Iteration 3

The team's reflections from the first and second iterations, as well as observations from the student engagement data (i.e. LA data for student access to the resources that were nudged) collected in the second iteration, were used to further refine the intervention. For example, while the first nudge was often effective in prompting an overall increase in students' engagement in the nudged resource (measured by percentage of the cohort who had accessed the resource), any subsequent nudges led to only minor increases in overall engagement. These reflections led to the development of a more strategic approach in this iteration. Agreed guidelines defined how many resources should be nudged (no more than eight overall), as well as how many times that resource should be nudged (only once).

The protocol informing the implementation of the nudge intervention used in the third iteration included:

- 1) identification of (5-8 key resources) - deemed critical for student success during the *first*

- five weeks* of semester;
- 2) the identified resource being 'promoted' to all students enrolled in a course in the relevant week;
 - 3) using course CLA data, on a weekly basis, students who had not accessed the key resource were identified and sent a targeted nudge that encouraged their use of the resource, with the value the resource played in achieving course success highlighted in the nudge.

Again, CLA data was collected specifically in relation to the key resources that were promoted and nudged with data recorded at two different times for each resource. These were: 1) pre-nudge – data for a resource was recorded one week after the key resource had been promoted to students and just before the course educator provided the nudge communication to those students who had not engaged with the resource; and 2) post-nudge – data for that resources was recorded one week after non-engaged students had been nudged to access the resource.

The project was implemented across four disciplines (Education, Accounting, Science, and Engineering) in eleven courses. On average, six key resources were promoted to students in each course using the nudge protocol; and a total of 67 nudges were given to students across the eleven courses (an average of six nudges per course). Analysis of the pre-and post-nudge LA data showed that the nudge intervention was much more successful in increasing student access to the nudged resources: on average, one week after a nudge, the percentage of a cohort who had accessed each key resource increased by almost 20% (average increase was 18.77%). Further analysis of the evidence of the positive impact of the nudge intervention can be found in (Authors, 2020) which, using LA data, compares student access for key resources in the year the intervention was implemented against a year in which the intervention was not implemented. Authors (2020) show that in the year students were nudged, the percentage of the cohort who accessed those nudged resources was consistently higher compared to the year in which there was no nudge intervention. The researchers believe the much more targeted approach was key to the success of the intervention.

A protocol for nudging students to engage with key online course resources

The team's experience and learning across the three iterations contributed to a nudge protocol (Figure 6) to illustrate how to design and implement a nudge communication strategy. The protocol provides educators of online courses with a set of steps that articulate *how* to implement a nudge strategy. The four-step process includes determining *what* to nudge, planning *when* to nudge, identifying *who* to nudge, and lastly considering the style (or wording) of the nudges. The intent behind the development of this protocol was to provide others that wish to implement a nudge strategy with a step-by-step process that was a simple, non-onerous, non-time-consuming task in efforts to address low levels of online engagement. It is envisaged that the protocol has the potential to become 'business as usual' in its use as a strategy that can be easily implemented by online teachers in their courses. Insert Figure 6 here

In developing a nudge strategy, it is important to first determine *what* to nudge. A suggested approach is to identify 4-5 key resources or learning activities that are essential to student success. CLA data can then be used to determine who to nudge, as well as which resources/ activities need to be nudged to a targeted group of students. This can be achieved by monitoring students who have engaged, or not engaged (in this study determined by student 'accessing' a resource or activity via the LMS).

Another important decision is determining *when* to nudge. Nudging early in the semester, when student engagement with critical resources are most important for early success, can help to develop early momentum and motivation for online study. In addition, communication using nudges may also occur at timely intervals, such as prior to drop dates/census and assessment dates, or to draw attention and remind students of other critical resources. The style or tone of the nudge communication is informal, similar that of a 'concerned friend'. It is also important to use a strengths-based, educative discourse that is persuasive and promotes the benefits that gained from a resource or activity, rather than adopting a deficit approach that nags about not engaging with a resource.

Finally, there are several important points to framing and structuring a nudge. Not all strategies need to be employed with every nudge, but several could make up particular nudges. An effective overall strategy is to: i) frame the nudge in a way that promotes the value and importance of the resource/activity to successful student learning; ii) reinforce engagement expectations and time requirements with respect to accessing the resource; iii) include tips for success and strategies that

scaffold student learning; and finally iv) reinforce that you care and are there to support their learning and course success.

Conclusion

Many students are time poor and/or do not use their study time effectively or in a manner that leads to student success. To help students improve their chances of success, nudges can direct students to actively engage in key course materials. While research has shown that nudging can make a difference to student engagement and therefore success (for example: Blumenstein et al., 2019; Damgaard and Nielsen, 2020; Authors, 2019), knowing when to use nudging —and when enough is enough — can be a challenge (Desouza and Smith, 2016). As acknowledged by Blumenstein et al. (2019), sending sensitive nudges that move students forward is almost an art form. It requires not only technical skills to use appropriate software and understand what the data is saying, but careful consideration of what to say and how to say it. If nudging is to be used effectively to achieve better online student engagement, then research, such as this current paper, needs to be undertaken to show how this can be achieved.

The research described in this paper developed a practical method for implementing a nudge intervention that could be used to alter students' learning behaviour to help promote engagement. A nudge protocol was developed for use in online courses to encourage student engagement with key resources during the first five weeks of the semester – a period that is crucial to student success in a course (Authors 2018). The protocol provides educators with a set of steps that articulate *how* to implement a nudge strategy. As discovered by the educators involved in the research, the implementation of such a strategy does not need to be an onerous, nor time-consuming task. Instead, they found that was something simple that could be used to help encourage students to utilise those key course resources that would be integral to their success.

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Figure 1: The action research process undertaken to develop the nudge protocol

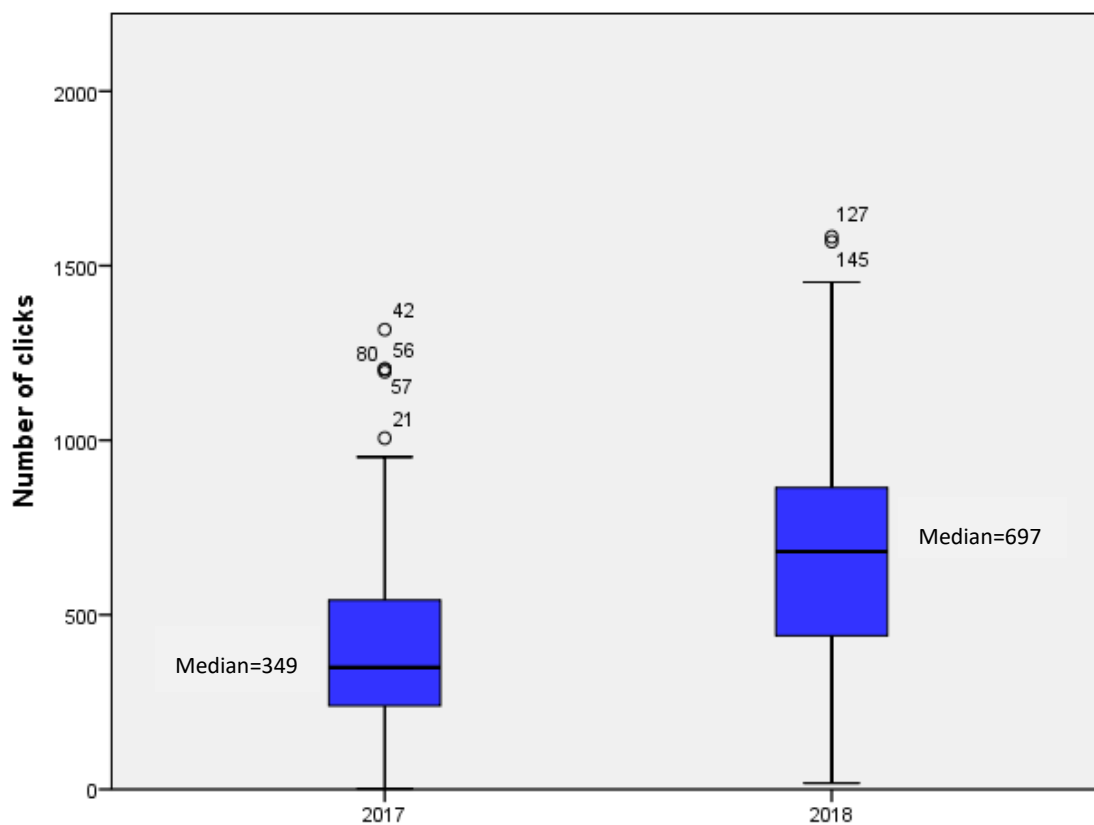
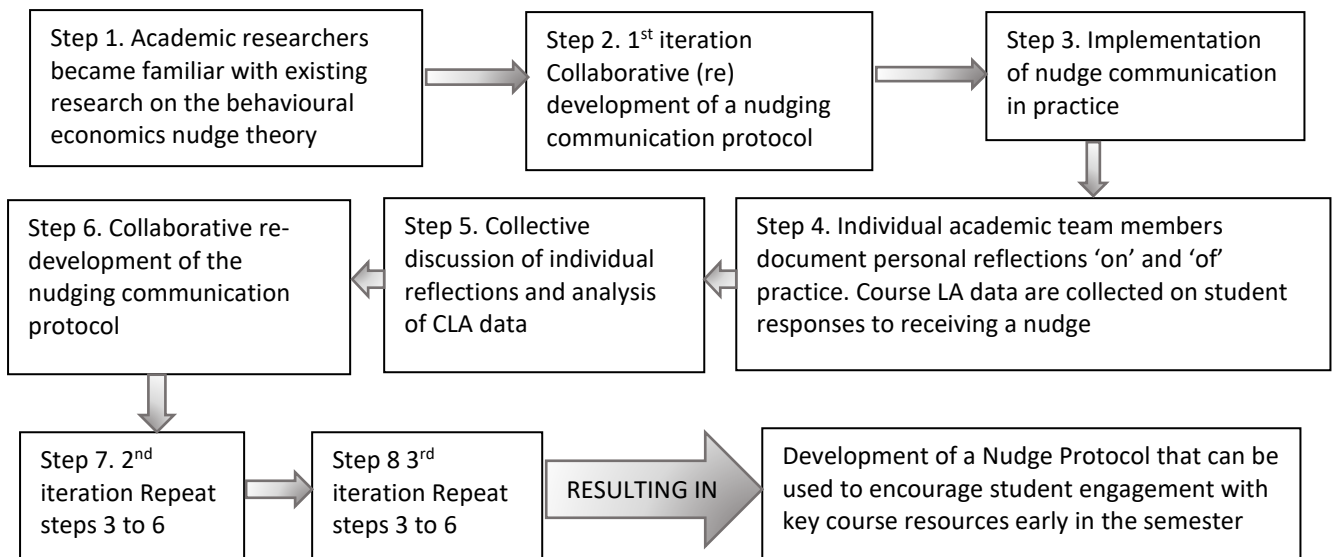


Figure 2 - A comparison between 2017 and 2018 student click counts for the Engineering course.

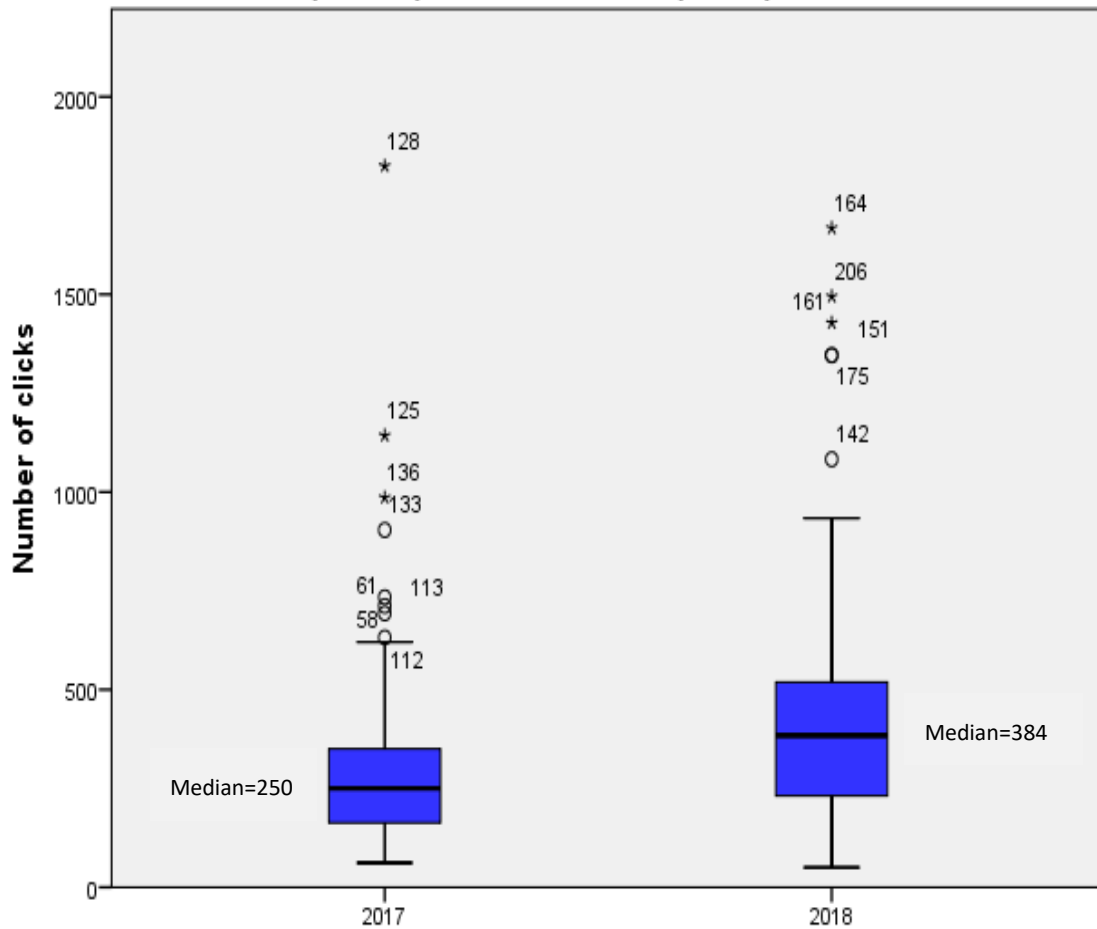


Figure 3 - A comparison between 2017 and 2018 student click counts for the Education course.

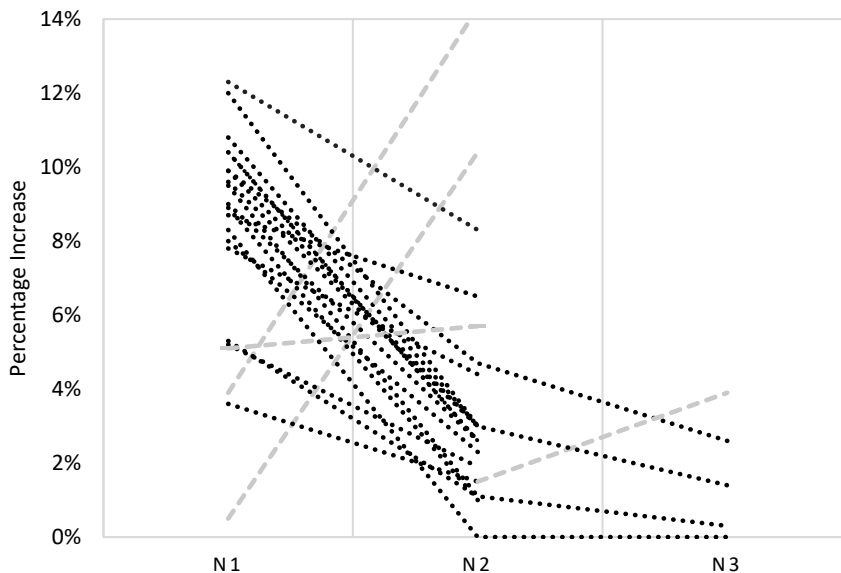


Figure 4 - Mapping the percentage increase in student cohort access to a single resource observed for each subsequent nudge of that resource for nudge 1 (N1), nudge 2 (N2), and nudge 3 (N3). Black broken lines represent successive decrease in access to resource, where grey broken lines represent increase in access to resource.

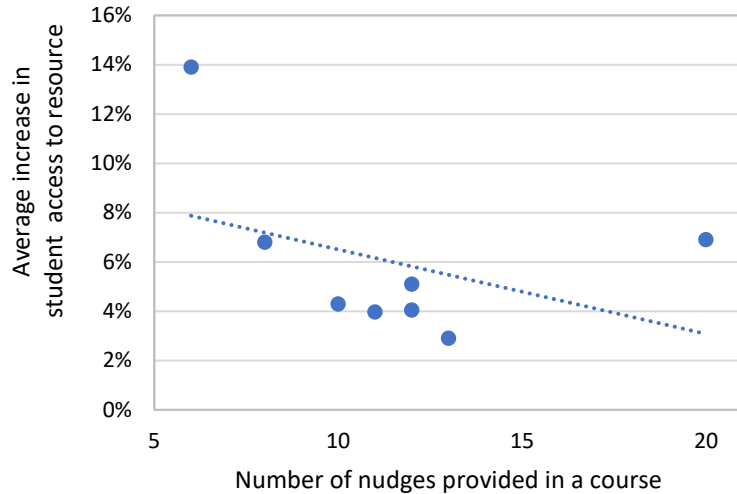


Figure 5: Mapping the number of nudges provided in a course against the average increase in student access the nudged resources for the course, to highlight the decreasing effectiveness of nudging when too many resources are nudged.

NUDGING: A 'how-to' guide to encourage student engagement with key course resources

STEP 1. Determine WHAT to nudge

Identify 4-5 key resources (KRs)

The aim here is to identify those KRs (or activities) that will improve student success early in the semester (during the first 5 weeks). We know many students have limited time to study, so these are the KRs that you, as the course examiner, really want your students to focus on to improve their chances for success in your course in the early weeks. Nudging these resources reinforces and helps students to prioritise what is most important if they have limited time.

KRs that students might access early in the semester include, for example, course introductions, study guides or welcome videos that outline course expectations, videos linking course theory to 'real world' contexts, activities related to the first module of study and/or assessment booklets or instructions.

STEP 2. Plan WHEN to promote and nudge these key resources

To highlight the importance of a KR to students, first the resource/activity is *promoted* to all students and then if students have not accessed the KR, they receive a *nudge* encouraging them to access it.

The promotion of a KR is a communication that is sent to the entire class to highlight the importance of a resource. The focus of the promotion is to bring the resource to the students' attention and reinforce its importance to their success in the course. Promotions can be sent via NEWS announcement or other forms of communication.

A nudge is a communication that normally occurs one week after the promotion. The nudge is sent only to those students who have not engaged with the KR and it reiterates the importance of that resource to their learning.

It is important to plan in advance when to promote and nudge so the process becomes 'business-as-usual' during your teaching semester.

You may like to promote a KR on a Monday as part of a course announcement and then nudge on the Friday of the same week, or, as in the plan below, you may want to allocate a certain day of the week (such as a Monday or Friday) as the day you post a promotion of a KR and send out nudges to those students who have not accessed the previously promoted KR.

Example of a promotion-nudge plan for the semester:

Week 0	Week 1	Week 2	Week 3	Week 4 (Census Date Week)	Week 5
Friday • Promote KR 1	Friday • Nudge KR1 AND • Promote KR2	Friday • Nudge KR2 AND • Promote KR3	Friday • Nudge KR3 AND • Promote KR4 AND • Promote census date	Tuesday • Nudge the census date**	Friday • Nudge KR5

***Nudge only those students with no or little engagement on StudyDesk

STEP 3. Identify WHO to nudge

Nudges are sent only to those students who have not accessed a KR. These students are identified using the USQ analytics report, which shows students that have accessed (green) or not accessed (yellow) a resource, or not accessed to the full course (black). In the example below, 61.1% of students have not accessed

Key Resource 1

38.9% 50% 11.1%

The nudge is a personal message sent individually to the student. While promotions may mention multiple resources, nudges need to focus on only one resource. That is, a nudge needs to identify one resource that the student has not accessed and highlight the importance of that resource to their learning. The nudge is written in a positive, informal, caring communication style where the intent is to 'touch base', 'hope their semester is going well', and then reinforce the importance of engaging with that KR.

STEP 4. Plan the wording and style of communication you will use in your promotions and nudges

The wording of your communications is entirely personal, however, here are a few hints and examples to help get you started.

- Try to adopt a friendly/supportive tone to promotion and nudge communications – starting off with a casual introduction is useful.
- Be inclusive – the "Hi to all" in promotion makes it clear the communication is for everyone.
- Avoid being too formal – use your name rather than your title.
- Be sensitive – some remarks that are intended to lighten the atmosphere may be offensive to certain students. For examples - see next page.

Figure 6 – Example of the nudging protocol developed to provide to educators new to the nudging process.