Determination of Factors Influencing Student Engagement using a Learning Management System in a Tertiary Setting

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Abstract— **Determining the key factors that affect student engagement will assist academics to improve the student motivation. The Quality Indicators for Learning and Teaching (QILT) reports have shown low engagement levels in higher education students [21, 22, 23]. While factors such as online education, lack of attendance and poor design of course content have been attributed to this cause, it is still not clear as to the determination of those factors influencing student engagement in a higher education setting. In the modern tertiary settings, Information and Communication Technology (ICT) plays an essential role in disseminating the course related information with a Learning Management System (LMS) which become the platform to communicate crucial course-related information. Academics can develop course materials on these LMS' to engage students beyond the classrooms and students need to interact with those LMS' to get apprehend the transmitted knowledge. Since LMS' are operated on a computer platform, academics and students require strong ICT skills which are further utilized in preparation of course materials. Their relevance, appropriateness, the way various tasks are prepared, how communication is facilitated, the role and utilization of discussion forums and other social media structures available to students to interact with, and the way in which assessments are conducted, providing a Just in Time (JIT) type of knowledge students require. The investigation into these major factors forms the basis of this study. Thus, understanding how various factors related to LMS' in a tertiary setting influence student engagement and then determining those factors that contribute to this engagement are the main objective of this study. To pursue the main objective of this study, a hybrid method mainly involving a pseudo meta-analysis to unearth additional evidence required for the study, a comprehensive qualitative component to understand the sector factors and perhaps a small quantitative component to confirm the sector views will be employed.**

Keywords—Student engagement, Learning management system, Tertiary education, Social media, Influential factors

I. INTRODUCTION

There are many factors influencing the engagement in tertiary environment. A brief literature review indicates that while many factors may affect student engagement, it is worthwhile focusing on seven key factors, (1) educational resources, (2) social network, (3) material relevance, (4) learning styles, (5) material selection, (6) material usefulness, and (7) preparation by educators [9, 11, 25]. These factors mainly refer to materials provided to students in a form that is comprehensible, accessed, discussed, and prepared to meet various individual needs, its relevance, appropriateness and finally its usefulness. When these factors are applied to an LMS context, then it is also possible to arrive at an informal grouping of these seven factors into (1) competency, (2) knowledge base, (3) capability, (4) active participation, and (5) context. In the scope of this study, the LMS provides the context.

An underpinning assumption of this proposal is that while classroom-based engagement is the model many tertiary studies provide to students, in tertiary contexts, the learning and associated communication between the learner and the expert occurs beyond the classroom. Some academics use LMS' to communicate with students and facilitate their learning. This communication is one of the surrogates of engagement. There is an expectation from students that academics should respond within a reasonable timeframe, in adequate and satisfactory manner. To provide such a response, academics use various tactics. Some use the discussion forums built into the LMS to trigger a discussion among students. Some provide a simple web link so that additional materials can be accessed.

Others use a virtual classroom to answer queries and clear doubts. Just in Time responses are also provided by using social media applications when specific small groups are involved. Real-time feeds are provided to students to keep them abreast of materials. The purpose of utilising these various strategies are to meet different learning needs, and it is still unclear as to the determination of some or all of these in assuring student engagement. In essence, it appears that academics use their base knowledge in a subject to develop the fundamental materials required, then use a range of techniques to provide up-to-date materials to assure currency in the subject domain and use LMS' to constantly communicate and monitor students for their learning needs and performance. In this technological context, academics becomes 'managers' rather than 'teachers'. This is a fundamental shift and reflects in students from learning to assimilating to articulating to the application. So, students also become 'managers' from 'learners' as they are required to understand the gamut of ICTs that facilitate materials and content communication for relevance, rigour and currency of materials. Thus, the context

is changing in modern tertiary settings where the focus is slowly shifting from classroom-based engagement to LMS based engagement.

The change in LMS based engagement also introduced new concepts such as academic engagement, Peer Engagement, Student-Staff Engagement, Intellectual Engagement, Online Engagement, and Beyond-class Engagement. While the focus of the study is on factors to determine these engagement concepts, it is imperative to realise that LMS' facilitate these types and some of these are off-shoots from the traditional classroom model. Similar to changes in types of engagement, students have also changed, the current student generation can be considered a 'connected' generation. They were grown with new technologies, social networks, and video games. To match the connected generation, De Byl and Hooper [9] provide a five-dimension model of the learning environment − playfulness, pedagogy, instrumentalism, status, and performance − as a result of gamification of learning, which could play an important role in the discovery of the factors that impact the student engagement. In the same line, Reading [25] discusses some student engagement indicators, group by behavioural, emotional, and cognitive engagement in the ICT-rich learning environments. Furthermore, ICT integration improves the student engagement by creating dynamic and realistic scenarios regarding the studied topics [32]. These authors have indicated the use of Web 2.0 technologies, mobile applications, iPads, and YouTube as powerful tools to increase the student engagement. Consequently, some factors influencing engagement can be derived as a result of using technologies in the learning space.

Thus, it can be perceived that ICT enable LMS' to play a crucial role in assuring engagement of students in the educational context. While this aspect has been recognised, what is not clear is how prepared are the academics and students in making use of LMS' to transfer the knowledge from one course to another, and what factors influence this transference within the scope of an LMS. While knowledge transferred is beyond the scope of the study, the factors that influence engagement as a result of technology facilitating learning among students has been identified as the major gap in this study.

Despite the many studies regarding the student engagement, few studies have been dedicated to delving into the factors that affect the engagement of higher education students, particularly in the Australia context. Retention and sense of belonging are key indicators of student engagement, which could be improved by motivating students to participate in their extra-curriculum activities and a proper guide of each activity. The goal in active participation is demonstrating one's learning rather than listening [11]. It appears that a lack of engagement among research students is unlikely, hence this study will focus on the engagement of undergraduate and postgraduate by coursework students.

The main objective of this research is to determine those direct and indirect factors that influence student engagement in a tertiary setting. To achieve this objective, the following sub-objectives are carried out in this study:

1. To understand how various ICT driven LMS factors influence engagement in tertiary settings

2. To determine those factors that contribute to this engagement.

An initial literature review reveals direct factors such as learning resources, teaching competency, knowledge base and learning styles, and indirect factors such as social networks, teaching contexts and learning management technology influencing engagement. As indicated in the research objectives, these two sets of factors influence both students and academics Therefore, to properly determine the factors that influence student engagement, it is imperative that these set of factors are examined comprehensively. This notion has culminated in the following initial set of research questions that will be considered to direct this study.

II. LITERITURE REVIEW

A. Student Engagement

Robinson [26] refers student engagement as the active involvement of students, as a collective, regarding matters related to students' experience. Similarly, Coates [7] defines student engagement as the active involvement of students in activities and conditions to produce high-quality learning outcomes. Then, for the purpose of this study, student engagement will be taken as the active student involvement and motivation in the achievement of their learning goal, assessed beyond the course pass marks.

There is a rich history related to student engagement in the Australian higher education sector [2, 3, 14]. However, it is important that old paradigms can be challenged [15, 16] because the way students learn has changed in recent years, with technology playing a crucial role in the overall learning journey. For example, students and teachers are generally 'connected', games are used to learn, information is easily available and accessible through digital journals, videos, blogs, social networks, and HEPs are using several tools such as LMS to provide students with easier ways to be engaged in the learning process. To have a better understanding and approach of this concept, Krause and Coates [17] present seven scales of student engagement for first-year undergraduate students in Australia: Transition Engagement Scale (TES), Academic Engagement Scale (AES), Peer Engagement Scale (PES), Student-Staff Engagement Scale (SES), Intellectual Engagement Scale (IES), Online Engagement Scale (OES), and Beyond-class Engagement Scale (BES). These scales are intended for student engagement monitoring and promotion.

As indicated in an earlier statement, new student generations are considered 'connected' generations. This has enabled a gamification of learning materials to facilitate student engagement for behavioural, emotional, and cognitive aspects of the ICT-rich learning environments. Wilson and Boldeman [31] point out the importance of ICT integration to improve the student engagement by creating dynamic and realistic scenarios regarding the studied topics. They have indicated the use of Web 2.0 technologies, mobile applications, iPads, and YouTube as powerful tools to increase the student engagement. Thus, from these discussions, it is possible to

infer that ICT rich learning environments are emerging as a major game changer in which students are engaging with curriculum and content-based discussions, and these environments play a defining role in student engagement. Further, Wireless Learning Technologies (WLTs) are gradually replacing the traditional methods of information sharing, and this leads to future collaborative multiuser sharing. WLTs used in education include mobile technologies such as smartphones, tablets and laptops as well as systems designed to be used specifically in technology-rich collaborative learning spaces. Such spaces are networked both technologically as well as through student-to-student interactions, expected to realise better student engagement [4].

In the context of a learning journey, students enrol in a course to acquire specific content knowledge. By enrolling, students are provided with access to course content either within a classroom, printed out, or both. In modern tertiary settings, despite the mode of access, ICT plays a key role in facilitating the course content access regardless of the students' location. The course content access leads to their engagement with the content and the person who provides the content, as well as with the peers that access the content. So, to ensure a satisfying learning engagement, competency and preparation are essential. The competency and preparation aspects are elaborated below.

B.   Competency

Competency in this context includes the pre-requisite knowledge, the ability to quickly navigate through the materials, and comprehend the materials independently. This requires preparation, planning, scheduling, and interaction. The lack of competency in academics is considered as a problem in influencing engagement. Since the competency of academics is related to their preparation, it impacts directly students' engagement. In fact, this lack of competency may lead the students' intellectual helplessness, although the real problem is not recognising this 'incompetence'[5]. In addition, Vincent Tinto, cited on [24], states that many students do not continue with their undergraduate studies in the same institution due to the lack of connection with 'peers, professors, and administrators at the institution'. That means, academics that are not adequately prepared in their areas, do not have proper tools to maintain the students engaged with the course and enforce the teacher-student relation. On the other hand, students' needs vary over time, and the educational methods of last decade might not be currently useful. Academics that have updated their knowledge and teaching methods can feel they are prepared and their productivity may increase. Novice teachers may increment their preparation by having mentoring practices [28]. Moreover, certified teachers feel better prepared than non-certified teachers [8]. That is why the enthusiasm of academics, their commitment, and their capacity to keep students motivated can be directly related to their preparation and their sense of efficacy and productivity. Therefore, the lack of competency can be considered as a problem that impact the student engagement.

Academics' competency is related to the set of abilities, knowledge, and skills that make a person suitable for the job of teaching. Robertson [26] explains that teachers require a set of knowledge involved in the teaching activity that provides a point of reference about the capabilities that a teacher should have. According to Christenson et al. [6], student engagement is affected by different contexts, including the school context, where teachers play a significant role to provide clear expectations and maintain a good teacher-student relationship.

C.   Material preparation

Student engagement is also affected by the way in which educational materials are prepared. While in a traditional context, this pertains to answering student queries, in alternative methods of teaching, this also includes the handling of various tools provided in LMS'. A primary challenge in the modern teaching context is that students' needs may include the time of communication exchange as this can be beyond the traditional hours, individual learning characteristics and supporting these with appropriate additional content, leading students to advanced levels with additional content. A study by Vogt and Rogalla [30] demonstrated that using a high Adaptive Teaching Competency approach, which involves preparation, planning, and topic knowledge, may increase students' learning and engagement. Thus, new technological tools can assist in a better preparation of educational materials. This will also be explored in the scope of this study.

Not all modern learning resources are appropriate for all learning environments. The Internet age has made possible the approaching of new learning resources in the education arena. Several studies have investigated the use of social networks for educational purposes, which in some cases have resulted in success [1, 10, 12, 18, 19, 27, 32]. YouTube is an example of a learning resource that has assisted students in their educational process. While students use social media for communication and engagement in course content, not all social networks are considered suitable for this purpose. Some researchers [29] pointed out the worrying gradual acceptance that some social networks, such as YouTube and Wikipedia, may gain in education as valid reference sources. Social Media could divert a student's attention, since a lot of information are channelled together, such as messages, advertising, or more interesting news. Manca and Ranieri [19] state that Facebook could not be suitable for some educational purposes since it is not a good environment to create a productive argumentation and discussion.

A proper educational resource selection may lead a better student engagement and can be key to increasing their motivation. Hämäläinen and De Wever [13] revealed that using a 3D game, academics were able to provide a better guide to young adult students (between 16 to 18 years old), achieving a good engagement from them. That means an impact of compatible resources on students' engagement. In the same way, using modern technologies may improve students' perception by catching their attention, especially on the 'connected' student generation, through the use of technological resources that support their learning.

D.   Summary

From the above discussion, it is possible to discern many factors that influence student engagement directly and indirectly. The direct factors are those that aid learning as a

result of engagement. This could be course materials, academics' skills, or the approach to supporting learning styles of students. On the other hand, the indirect factors are those that facilitate engagement. These could be technology platform, LMS, and the delivery mode. These factors have been identified loosely as an initial point in this study based on the literature review and shown below so that further investigation can be conducted.

While the literature is able to provide us with the distinction between the direct and indirect factors, what is unclear in the literature is the application of these to the seven key factors that influence student engagement in a course, namely, (1) educational resources, (2) social network, (3) material relevance, (4) learning styles, (5) material selection, (6) material usefulness, and (7) preparation by educators.

Table 1 Direct and Indirect Students' Engagement Factors

Direct Factors	Indirect Factors
a. Learning resources (preparation, selection, usefulness, and relevance)	a. Teaching context (Institution and delivery mode)
b. Teaching competency	b. Social network
c. Knowledge base	c. Technology (LMS)
d. Learning style	

While these seven factors appear to be 'direct' factors, it is unclear as to how these factors influence the indirect factors identified in the scope of this study. The teaching context, as explained before, plays a crucial role since it may involve ICT technologies such as LMS' plus the appropriate selection of the educational materials and the way these can be accessed, discussed and delivered to meet the various individual needs. These influences needed to be investigated to ascertain the teaching context and its technology so that the indirect factors and any influence that these factors demonstrate in terms of student engagement can be determined. Further, the literature is unclear as to how these factors can be grouped to determine the dimensions of (1) competency, (2) knowledge base, (3) capability, (4) active participation by students, and (5) context. Therefore, further thought is required to ensure the appropriate measurement of these factors and dimensions so as to arrive at the determination of engagement in an LMS environment.

III. METHODOLOGY

A. Hypotheses

Based on the literature review and field experience, the following initial hypotheses can be formulated (see Figure 1):

H1: The lack of competency of academics in developing and adapting materials to LMS' environments impact negatively the student's engagement.

H2: A proper selection of study materials that can be widely discussed on LMS environments influence positively students' engagement.

H3: The absence of an LMS affects the engagement of students beyond the classrooms.

B. Conceptual framework

As a result of an initial literature review, it is also possible to extend the notion presented in the above section to accommodate certain initial factors. For example, we were able to identify factors such as material preparation, their usefulness in the teaching context, the selection of materials and the processes that go into the selection and establishing the relevance of materials as the initial set of factors that influence student engagement. Based on this initial concept, we have shown the factors that influence student engagement in the following diagram (Fig 1).
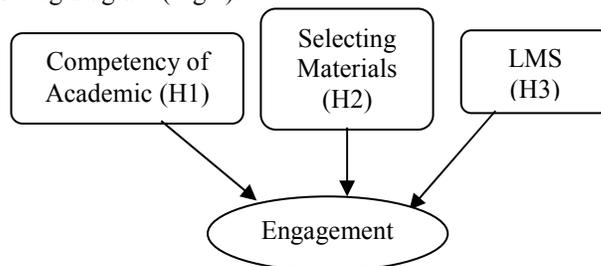

Fig. 1. Hypothesis - student engagement

Despite this identification, we are not able to find appropriate materials in the literature as to how these factors contribute to Transition Engagement, Academic Engagement, Peer Engagement, Student-Staff Engagement, Intellectual Engagement, Online Engagement and Beyond-class Engagement. While an LMS provide certain tools such as the forum discussions to identify the level of online engagement (using analytics within LMS), it is unclear as to the association between the direct factors and this type of engagement. For instance, it is still unclear whether a conversation thread has occurred because of the direct factors identified in this study or as a result of someone starting a conversation, and others responding to the conversation. Similarly, we were not able to find how to demonstrate 'intellectual' engagement and what measures could be used to demonstrate this aspect. Therefore, it is felt that the details that could be extracted from traditional literature review appear to be limited and that we have to employ a different approach.

To comprehensively identify various factors that influence student engagement and how they are measured, we felt that a meta-analysis would be a suitable approach instead of a traditional literature review. This is because, in a meta-analysis, the search strategies are very rigorous, and 'evidence' can be presented as to the materials searched and their suitability in a given context. A meta-analysis considered to be robust because of the validation of the search strategy that includes an exclusion of materials based on their relevance. As a result of this direction, we are not posting any propositions or research questions other than the overarching research aim. The study will explore these factors in depth using a variety of approaches so that those factors influencing student engagement using an LMS can be determined scientifically.

C. Research methodology

In this research, a sequential mixed method design is implemented in three phases. The first phase is a pseudo meta-

analysis, the second phase is a comprehensive qualitative study and the third phase is a small scale quantitative study.

Phase I: Meta-Analysis

During this phase, using a meta-analysis, available and suitable literature will be searched for factors that impact student engagement in an LMS environment. The meta-analysis in this study will consist of the following:
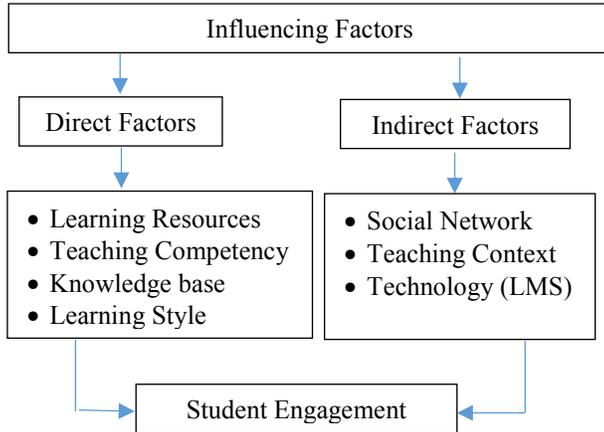

Fig. 2. Factors influencing student engagement

Developing specific questions for search using a PICO method. The PICO is Problem – Intervention – Comparison – Outcome method, and this is predominantly used in healthcare studies. In this study, the meta-analysis will have a problem specification for search – for example, 'Does student engagement in an LMS leads to better study outcomes?'. The intervention then will be an analysis of outcomes based on students that have engaged in the course and students' that haven't. This forms the basis for comparison as it is possible to analyze the data by splitting the cohort on these criteria. Finally, how does the outcome look like? This approach is expected to provide comprehensive information in unearthing various factors that influence student engagement in an LMS environment, leading to the development of a conceptual framework.

Phase II: Qualitative

The qualitative study will define the main data gathering exercise in this study. The study will employ three specific aspects of qualitative study, namely, brainstorming, focus group discussions, and in-depth interviews. The purpose of brainstorming is to identify a set of keywords to pursue in the study domain, and these will be extracted from experts working in the domain. Then a focus group study will be conducted to elaborate those keywords so that it is possible to identify the full range of influences of these keywords and then to rank them. Again, a different set of experts will be involved in this activity. In-depth interviews will collect key information by talking to a set of experts in the study domain to comprehensively understand various elements that influence student engagement in an LMS environment.

These three techniques within the qualitative approach are expected to provide detailed information about the various factors identified through the meta-analysis and establish their suitability to the given context.

Phase III – Quantitative

The qualitative data collected in the previous phase will be used to develop an instrument for this phase. The material available through the meta-analysis will be mixed with the qualitative data to arrive at an instrument for a survey so that the relevance of the instrument can be assured to the given context. We believe that such an approach will return a high instrument validity.

IV.   DISCUSSION

Student engagement is a serious topic in the Australian Higher Education sector, in fact, the Commonwealth Department of Education and Training requests a revision on the Learner Engagement Scale (LES), particularly focused on the external students due to their lower engagement compared to the internal students [20]. The report presents an important variation in the results obtained previously versus the ones obtained by introducing new measuring elements. Basically, the initial results were 63.1% for internal and 24.2% for external students, while the new pilot scores were 68.4% for internal students and 51.5% for external students. Still, the student engagement scores are lower and present a slight decrease of 2% compared with last year. It also contrasts with the results of other developed countries, such as USA and UK. Talking about the quality of entire educational experience for final year undergraduate students, while USA scores were 85%, the Australia ones were 75% (2008-2017). Similarly, UK scores were 84% versus 78% of Australia scores, regarding the overall satisfaction rating (2011-2017). Thus, Australia Higher Education sector are under the expected student engagement levels, reason why every contribution toward solving this issue will be more than relevant.

This research will provide tangible and intangible benefits for the higher education sector in Australia. The research outcomes, in our view will have the following specific significance:

1.   Governmental institutions may have a set of constructs that could aid the policy development to benefit domestic and international students, Higher Education Providers (HEP), industry, and community in general, as the policy framework is in need for assertion of such determinants.

2.   Current international students may find some reasons as to their own engagement levels and may take a decision towards the improvement of their weaknesses.

3.   HEP may do the same, take decisions to address their weaknesses.

4.   Further, in the industry, the improvement of future students will increase private operator's profits since students will be better prepared and probably more engaged in their profession.

5.   Intangible benefits can be derived in terms of better quality of lives, as a strong engagement results in a strong workforce, hence productivity in employment.

6. Finally, in the academic field, based on the outcome of this study, future studies could design strategies and frameworks to improve the student environment in classrooms and its engagement.

V. CONCLUSION

We proposed a new methodology which mixed a meta-analysis, an exploratory qualitative and a confirmatory quantitative approaches to identify factors that influence engagements and how, both academics and students, perceive these. While there is no specific use of a theoretical framework posited in this study, the meta-analysis will lead us to the consideration of theoretical foundations used in the educational technology domain. The methodology proposed in this study is a different approach to the traditional mixed methods, thus providing a valuable contribution to others to mimic such a methodology. The meta-analysis will provide an indication as the outcome will asset a direction, and this approach is heavily used in health studies to provide evidence. So, the evidence-based approach is a new dimension in this study.

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