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The blend justifies the means: The relationships between lecturer use of online content in-class, student age, and student self-stated understanding, with students' use of online content out-of-class in a blended commerce course.

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Abstract

With the increasing adoption of blended (flipped/ hybrid) learning year-by-year this century in higher education, the need for research on the learner experience in blended learning courses is an essential emerging body of literature, but it is one particularly under-represented in Asia. Furthermore, the assumptions emergent from a largely Western milieu investigating mostly Western students in Western University settings need to be tested in an Asian context. Therefore, the purpose of this paper is to understand whether relationships exist between three hitherto well-researched factors - lecturer use of online content in teaching, the students' ages and students' understanding of content – and the participation online of working adult students enrolled in a Higher Education Blended course, but crucially one in a Singaporean Higher Education setting. The methodology employs a survey of students (n=1,047) analyzed using the Pearson Chi-Square test of independence. The findings show relationships between all three and student online participation and challenges previously held views that students in high teacher-dependency cultures like Singapore find blended and online learning inferior to traditional modes.

1. Introduction

"I am a complete person; I am not confused; I am not two halves that don't fit together; I am a mixed raced child and I know who I am". Ellen Shaw

Like race in Shaw's poem, face-to-face university courses also suffered prejudice and stigma often born of ignorance and lack of scientific examination when first blended (Rogers, 2001; Heinze & Procter, 2004). Yet, just as Post-Darwinian genetics construed new understandings of mixed race people, hitherto inaccurately portrayed as the product of two diminished halves rather than a new whole, blended learning (flipped/hybrid), the combination of traditional face-to-face with online teaching and learning, may also be coming into a new era of understanding as a method in its own right.

Furthermore, with the increasing adoption of blended learning year-by-year this century (Levy, Dickerson & Teague, 2011), the need for research on the learner experience, learning habits and outcomes of blended learning courses is an essential emerging body of literature, but it is one somewhat under-represented in Asia (Tham & Tham, 2011). In Singapore, in particular, such research is warranted given the increased uptake of blended learning since it was advocated by the Government as one of a package of strategies enabling a diminishing local workforce population to 'earn and learn' rather than study full-time (Ong, 2015; Chan, 2015).

In that vein, this paper seeks to add to the literature on blended learning within an Asian context, by specifically exploring the use habits of Singaporean working adult students and their teachers in the online part of a blended course. The significance of this research is found in the comparisons with Western students and teachers in the literature and, in particular the association of students' participation online with teachers' participation. The instrument used is a quantitative survey of students.

2. Literature Review

Blended Learning and Blended Learners

Blended learning first came about in 1998 as a response to the perceived structural limitations of purely online or elearning in enabling "interaction, context and remediation" (Masie, cited in Bonk & Graham, 2006, p. 8). Once generally defined as the application of mixed modes of teaching within a single course or unit, blended learning has come to represent specifically the use of web-based technology in conjunction with face-to-face teaching. Indeed, whether combining "internet and digital media with established classroom forms" (Friesen, 2012, p. 1) or web-mediated interactions coupled with face-to-face instruction (Bliuc, Goodyear & Ellis, 2007; Garrison & Vaughan, 2008; Garrison & Kanuka, 2004), the internet is vital to constructs of curriculum design deemed to be blended (Rogers, 2001; van de Bunt-Kokhuis & Weir, 2013; Rudolph & Harris, 2016). Therefore, this paper likewise assumes the definition of blended as curriculum combining online or web-based technologies with face-to-face learning.

While it may be argued that the nature of all curricula is one of regular change, the exponential dynamism of adoption, growth, variety, and accessibility of the digital ecosystem and the tools it provides ensures technology-enabled courses and outcomes are in a constant state of flux (Bonk, 2009). Friesen refers to the ever-expanding array of opportunities resulting from this evolution for blended learning designers enticingly as the "range of possibilities presented by digital media" (2012, p. 1). Bonk and Graham (2006) further assert that these possibilities can increase access to, flexibility and cost-effectiveness of blended courses, claims well supported in the literature (van de Bunt-Kokhuis & Weir, 2013; Levy et al., 2011). However, claims to the improvements to pedagogy found in blended learning courses are contested, particularly when compared to purely face-to-face courses, in Asia (Tham & Tham, 2011; Ferguson & Tryjankowski, 2009).

The literature provides a substantial case for more testing of the application of blended learning within the Asian context along the lines of cultural preferences. As Fang's study on Singaporean polytechnic students in a blended course argued, "culture at national, ethnic, and cyber levels might influence what they find useful, enjoyable and effective" (2007, p. 1). An example of this is the way in which the "high teacher dependency" cultures of China, South Korea and Singapore (Tham & Tham, 2011, p. 139) explained Miliszewska's finding from a Singapore transnational course that students preferred blended to purely online, but still preferred fully face-to-face to the other two modes (2007). Of course, the influence of culture on learning is not the preserve of blended courses alone and scholars have often held that teaching methodologies appropriate in the West may be "ineffective in Eastern cultures" (Marquardt & Kearsely, 1998, p. 250). Cheng (1999) goes further to give one example from a study of institutional collaboration across borders that found challenges because of the cultural preference of Asian students to withhold their analysis of subject matter rather than exchanging views, which was found to make them uncomfortable.

Cultural nuances such as these should not be underestimated in their impacts on learning; imagine, for example, if a class full of non-disclosing students was to be present within a course designed with an online discussion board or an opinion piece to camera. Yet neither should such differences be assumed to be necessarily consistent values when students approach online or blended courses in Asia. In one example, Malaysian hospitality students were reported by their teachers to have 'spoken more' on a closed course Facebook Group than in the physical training environment (Harris, 2012). Therefore, gaps in the research are to do with testing how these cultural assumptions bear out in the online habits of Asian students in blended learning courses, in-country, in Asia.

Aside from cultural impacts, the age of students can influence their persistence to learn, particularly when engaging in fully online courses and online components of blended learning courses, where it is argued there is more of a need

for students to be self-reliant and "self-regulated" (Hood, 2013, p. 762). A study of 40 000 community and technical college students in the USA found that older students were "more likely than younger students to persist" with online learning (Xu & Jaggars, 2014, p. 647). Again, while utilizing a multicultural sample, these are Western studies. By contrast, in research on blended learning coming out of the public-funded polytechnics and autonomous universities in Singapore (Cheng, 2007; Tham & Tham, 2011; Menkhoff, Thang & Wong, 2007; Latchem & Jung, 2009), the testing of age is lacking, most likely because it was not a variable given the students in these institutions are born in the same year (Singaporean Educational Landscape, 2016). That said, with the diverse student populations of the Private Education Institutions in the tertiary sector (Lee, 2015) and with the previously mentioned changes to the educational landscape in Singapore (Harris, 2016), any differences in the performance and e-learning habits of students in demographic categories such as these may offer insights for myriad stakeholders as student profiles change.

Singapore and Drivers for Blended Learning

Singaporean industry has long been classified an early adopter and creator of technology and the Education sector is no different. As early as 2007, Singapore was ranked 6th in the World in terms of 'elearning readiness' (Tham & Tham, 2011). More recently, Singapore has moved unilaterally to a lifelong learning, skills-centred model, known as SkillsFuture, that is disrupting traditional temporal and sectorial models of delivery affecting all levels of public education from the pre-tertiary Institutes of Technical Education and Polytechnics to the under and post-graduate preserves of the autonomous Universities (Ong, 2015). Furthermore, the movement is directly and indirectly impacting the private education sector with implications for the so-called Private Education Institutions (Harris, 2016).

The main drivers of this systemic change to Singapore education are, firstly, a declining number of new entrants to the workforce year-on-year, which will become acute in 2020 when it is expected that only 20 000 new local entrants will come into the employment marketplace, compared to 90 000 in 2015 (Tay, 2015). Secondly, a more protectionist policy born out of the 2015 election promise season, will concurrently mean less foreign labour is being imported (Lee, 2015). These two policies combined create a labour crunch, with worrying consequences for employers. Thirdly, and further exacerbating employers, the much-heralded and academically-driven Singaporean education system has come under criticism for not providing skills needed in a rapidly changing world (Tay, 2015). When combined, these drivers have resulted in a bold 'SkillsFuture' policy tying the two pertinent Ministries of Manpower and Education together to make learning lifelong and more open to all, but at the same time, "more modular, more flexible, online and with deeper ties to industry" (Chan, 2015) to free up students to work and workers to study.

The drivers for change have not only prescribed but have driven organic growth in opportunities for online and blended modes of delivery to prosper (Chan, 2015; Ong, 2015; Harris & Fu, 2016; Harris, 2016). In fact, the advocacy for blended learning in the newly formed SkillsFuture Singapore is made explicit through the 'iN.LEARN 2020' channel on its parent website (iN.LEARN 2020, 2016). Furthermore, the Continuing Education and Training Sector has been mandated to have 30% of its content adapted to Blended learning modes.

The gap in the literature, therefore, concerns studies on the user habits of Singaporean working adults studying in blended learning courses. The importance of such research is in the benefit it will give to training managers, educators, learning designers, administrators and policy makers in Singapore and other developed nations, trying to drive economic growth in the face of both a currently ageing workforce and a declining number of new entrants, while not forsaking education and training. The significance of this research is found in the comparisons with Western students and teachers found in the literature and, in particular the association of students' participation online

3. Methodology

Hypothesis Development

Given the research gaps explained above, the thrust of this research is on exploring online learning habits of working adults in a Singaporean part-time blended learning course. The hypotheses are based on testing general assumptions found in the literature of learning habits being a product of cultural norms against general blended learning habits hitherto largely discovered in Western studies. There are three hypotheses in total and this section will show how they were arrived at.

The high "teacher dependency culture" (Tham & Tham, 2011, p. 139) highlighted in studies on various groups of Asian students, including Singaporean students (Miliszewska, 2007), suggests that both the agency and presence of the teacher are important in students' perceptions of what is required for their own learning. Therefore, the first hypothesis supposes whether the use of LMS content (the online learning part of the 'blend') by the lecturer corresponds with the LMS usage stated by students. That is, the aim is to see if the student does as the lecturer does by discovering whether or not:

$H_0 1$. Students' stated average weekly usage of the LMS content and lecturer usage of the LMS content in class are independent.

Given the increasing popularity of blended learning courses entering the Singaporean and broader Asian sectors (Yuen, 2011), as well as the concurrent opening up of lifelong learning to diverse demographics through the "SkillsFuture" programme in Singapore (Ong, 2015), there is an urgent need to look at how the age of students might relate to their use of the LMS content. American studies suggest older students are "slightly more persistent" for purely online courses (Xu & Jaggars, 2014, p. 647), but little exists about blended courses despite theorists arguing blended may require even more student maturity and self-regulation

(Hood, 2013). Therefore, the aim is to see whether or not:

$H_0$2. Students' stated average weekly usage of the LMS content and their age bracket are independent.

Critically, while the age of the student and the approach of lecturers towards the blended course are important variables, the question remains whether students perceive the LMS content to enhance their understanding of the course as a whole. Indeed, as research shows above (Miliszewska, 2007), online and blended courses are often rated by students as inferior to completely face-to-face courses, but there is little research that tests if belief translates to a student's understanding of subject matter. To limit the ambiguity of looking across a course in which students may have varied opinions on each course (unit/subject), the third and final hypothesis explores understanding of a single course by asking if:

$H_0$3. Students' stated average weekly usage of the LMS content and their perceived understanding of the course are independent.

Method

Given the hypotheses seek to establish whether or not an association exists between LMS (online) usage and three other variables, the methodology employs a survey of students (n=1,047) analyzed using the Pearson Chi-Square test of independence.

The justification for the use of Pearson Chi-Square test is as a test of independence (Franke, Ho & Christie, 2011). The use of Chi-Square as a test of independence has extensive applications in the literature of education and the social sciences (Delucchi, 1993; Wickens, 1989; Stigler, 1999). Indeed, Onchiri maintains that the test of independence resides within the first of the two main applications, which "include test of frequencies (test the goodness of fit, the homogeneity of a number of frequency distributions, or a test of independence) and test of population variance (single sample variance)" (2013, p. 1235). Researchers agree that the tests, computationally rudimentary, are often used but more often abused.

The misuses of the Pearson Chi-Square are problems of situational application and the over interpretation of results (Delucchi, 1993; Onchiri, 2013; Franke et al., 2011). The Chi-Square tests of homogeneity, independence and population variance require very different approaches to sampling, analyses and care with interpretation of results. There is a tendency for some researchers "to over interpret or incorrectly interpret the results, leading them to make statements that may have limited or no statistical support based on the analyses performed" (Franke et al., 2011, p. 449). To guard against these abuses, statisticians advise, and this paper heeds, that the notion that the test of independence requires a large, random sample, and a regard for the limitations of the findings not to be interpreted incorrectly as a measure of the degree or type of relationship, but instead as a way of "assessing the significance of the association between two attributes" (Onchiri, 2013, p. 1237). Of course, these attributes must be taken from a single sample and are categorical.

The formula used for computing the chi square statistics is as follows:

$$X^2 = \sum_{1=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

Where n is the number of respondents, O is the observed frequency and E is the expected frequency.

Participants and Context

The participants are all part-time students studying a higher education Diploma in Commerce course with nine diverse specialisations, equivalent to the first year of a Bachelor Degree, in a Singapore Private Education Institution. The students are at the end of the first half of this blended learning course, for which the four modules (units) are in a blended format, requiring students to attend 24 hours of face-to-face classes combined with eight hours online learning time for each module.

Data Design and Collection

The survey instrument consisted of 15 questions and utilized a four-point Likert Scale (Strongly Agree, Agree, Disagree, Strongly Disagree) in the main. Exceptions to the interval scale were for demographic and usage categories which stated actual numbers rather than levels of agreement. An example of the questions used, pertinent to the variable concerned with the self-stated level of understanding of the module, was: "The eLearn LMS Blended Learning helps me to understand the module clearly." The phrase, "eLearn LMS Blended", is a proxy term for online content and this phrase was employed on the survey as that is how the online content is referred to throughout the institution.

The survey was distributed using systematic sampling (Creswell, 2014) to every second student on the relevant blended course. In total, 1,512 students were surveyed, which represented 53% of the target population. From this we received 1,489 responses, of which 1,047 could be used. The host institution imposed a condition that the survey had to be administered in conjunction with the standard institutional student evaluation, which is distributed prior to the main, summative examination for the course.

Limitations

The limitation on the number of respondents was the institution's condition that the survey had to be administered in conjunction with the standard institutional student evaluation, which is distributed prior to the main, summative examination for the course. Given this timing, we shared Garland's (1999) concern for five- and seven-point Likert scale mid-points increasing the likelihood of a "social desirability bias" (p. 70), defined here as the

participant's desire not to offend (socially undesirable) the lecturer before the examination. With an increasing likelihood by the subjects towards selections of a "neutral" (3 or 4 respectively), a 4-point Likert scale was used with no Neutral/ Neither Agree nor Disagree selection available.

Other limitations on this research include not being able to set-up completely face-to-face and completely blended courses as control and experimental groups, which makes causality of one variable on another impossible to ascertain. Of course, this does not disqualify the Chi-Square test for independence. To the contrary, as was shown, the test looks purely at the significance of the association only compared to chance. Furthermore, the survey relies on the subject students' self-selection of usage times and habits, and these are not triangulated with Google or other analytics data for same at this stage, a methodological approach unfortunately lacking throughout studies of educational technology (Bulfin, Henderson, Johnson, & Selwyn, 2014).

4. Results

The three Hypotheses - $H_0$1, $H_0$2, and $H_0$3 - are necessarily expressed as Null Hypotheses and make an assumption of independence between the students' stated average weekly LMS usage and another variable; these are, thus, tests of "no association" (Diener-West, 2008, p. 4). Therefore, the Chi-Square statistic compares the observed count in each table cell to the count which would be expected under the assumption of no relationship between the row and column classifications derived from the survey (i.e. Strongly Disagree, Disagree, Agree, and Strongly Agree for both row and column).

The results demonstrate in all three cases that the null hypotheses can be rejected; the teachers' use of the content in class, the age of the students and the students' perception of their understanding of the course are dependent on the students' LMS content use.

$H_0$1 states that students' stated average weekly usage of the LMS content and Lecturer usage of LMS content in class are independent. The table below shows the results of the Chi-Squared test for independence. From the table, for the Pearson Chi-Square Statistic, $X^2 = 42.451$ and $p < 0.01$; the null hypothesis is rejected as $p < 0.05$. Therefore, the students' stated average weekly usage of the LMS content and the lecturers' usage of the LMS content are dependent.

The Association Between Students' Stated Average Weekly Usage of the LMS Online Content and Lecturers' In-class usage of the LMS Online Content

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-Sided)
Pearson Chi-Square	42.451[a]	12	.000
Likelihood Ratio	36.519	12	.000
Linear-by-Linear Association	5.701	1	.017
N of Valid Cases	1047		

[a]. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.09

Table 1.

For the Pearson Chi-Square Statistic, $\chi^2 = 42.451$ and $p < 0.01$. Therefore, the null hypothesis is rejected as $p < 0.05$, and students' stated average weekly usage of the LMS content and the lecturers' usage of the LMS content are dependent.

This result suggests the importance of the agency of the lecturer in modelling the online learning behaviours for students to emulate, and is consistent with the literature concerning the high dependency Asian students place on teachers (Tham & Tham, 2011; Miliszewska, 2007). However, to prove that teacher use of online in-class (the cause) directly results in greater student use of online out-of-class (the effect), would require substantiation by "localised interventions of this classroom, with these students" (Abeysekera & Dawson, 2015, p. 12; Ward, De-Silva, & Weil, 2014). Notwithstanding the necessity for these kinds of exploration, previous studies of blended and broader constructivist theory agree teacher actions and choices of media are vital components in any learning (Jonassen, Davidson, Collins, Campbell & Haag, 1995; Garrison & Anderson, 2003; Bliuc et al., 2007; Meyer & Land, 2003), but further research could test the strength of that relationship specifically for eliciting the online participation of students.

$H_0$2 holds that students' stated average weekly usage of the LMS content and their Age bracket are independent. The table below shows that for the Pearson Chi-Square Test, $X^2 = 33.592$ and 0.05 ; the null hypothesis is rejected as $p < 0.05$. Therefore, the students' stated average weekly usage of the LMS content and their age bracket are dependent.

The Association Between Students' Stated Average Weekly Usage of the LMS Online Content and Their Age

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-Sided)
Pearson Chi-Square	33.592[a]	12	.001
Likelihood Ratio	32.072	12	.001
Linear-by-Linear Association	7.934	1	.005
N of Valid Cases	1047		

[a]. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.83

Table 2.

For the Pearson Chi-Square Statistic, $\chi^2 = 33.592$ and $p < 0.05$. Therefore, the null hypothesis is rejected as $p < 0.05$, and students' stated average weekly usage of the LMS content and their age are dependent.

Like teacher adoption as a potential catalyst for student use, the higher persistence of older students in previous studies of online student behaviour (Xu & Jaggars, 2014) was expected to manifest in the blended learning context where it is argued self-reliance, also known to increase with age, is even more acutely needed for success (Hood, 2013). The results suggest a relationship rarely tested in Singaporean contexts where there is often close to homogeneity of age in participants is often a given (Menkhoff et al., 2007; Latchem & Jung, 2009).

While the first two independent variables, teacher use and students' age are concepts well researched in terms of the effect they have on learner behaviour, it remains to be seen whether the blended content and experience itself contributes to a better learning outcome in the opinion of the student. $H_0$3 supposes that students' stated average weekly usage of the LMS content and their perceived understanding of the course are independent. From the table below, for the Pearson Chi-Square Test, $X^2 = 139.362$ and $p < 0.01$; this marks the third time the null hypothesis can be rejected as $p < 0.05$. Therefore, the students' stated average weekly usage of the LMS content and their

perceived understanding of the course are dependent.

The Association Between Students' Stated Average Weekly Usage of the LMS and Their Perceived Understanding of the Course

Chi-Square Tests

	Value	df	Asymptotic Significance (2-Sided)
Pearson Chi-Square	139.362[a]	12	.000
Likelihood Ratio	130.898	12	.000
Linear-by-Linear Association	.253	1	.615
N of Valid Cases	1047		

[a] 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.16

Table 3.

For the Pearson Chi-Square Test, χ^2=139.362 and p<0.01; the null hypothesis is rejected as p<0.05, and students' stated average weekly usage of the LMS content and their perceived understanding of the course are dependent.

Previous studies had found that students have perceptions of blended as inferior to face-to-face modes (Tham & Tham, 2011), which made the finding of an association between perceptions of improved understanding with use of the blended content arguably the most original of the three results. Again, there is clear impetus for more localized work to try and prove cause and effect and comparative research on this

5. Discussion

This paper started with an extract from the Shaw poem, which expressed the desire for mixed race children to be seen not as the product of 'two halves that don't fit together'; but as a complete person. Likewise, this research hopes to move blended learning research in Asia away from cultural assumptions at worst and theoretical debates at best and towards a search for more complete combinations, better fits of learning modes, and provides a clear launching pad for further experimentation on other blended course designs and actual learner experiences. In terms of these experiences, the research finds clear associations between variously students' age, self-perception of understanding of the course, and the lecturers' use of online materials in the physical class, with the students' stated use of the online content. Of course, to test if the association is causal, the need now exists to experiment with control groups.

Culturally, the findings that the age of the student and the in-class actions of the lecturer are associated with the students' online activity are uncontroversial in high teacher-dependency, age-hierarchical cultures (Tham & Tham, 2011). However, for the same reason the third hypothesis, that there is an association between how students perceive they understand the module better with more work online, is original and surprising. This is because the literature from Singapore and the South-East Asian region generally shows students and teachers believe blended to be inferior to purely face-to-face learning (Miliszewska, 2007; Tham & Tham, 2011; Ferguson & Tryjankowski, 2009).

Given Singapore is embarking on a comprehensive shake-up to be more online, more modular, and less temporally constrained (Chan, 2015), these findings, if they are able to be proven to be causal, could give rise to models of education that challenge the traditional lecturer-led, synchronous, face-to-face preference of its institutions in the main.

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