Online Access Patterns and Students' Performance

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ABSTRACT

The paper follows accessing patterns of five cohorts of postgraduate students enrolled in a core unit within a master of business administration (MBA) program. The unit is designed to provide numerous opportunities for student participation in Discussion Boards using Blackboard technology. Discussion Boards create numerous opportunities for interaction amongst online learners to share and exchange their experiences, creating a sense of a virtual community. Relationships between accessing patterns for each week of the semester for each student are explored in relation to their performance using course statistics generated by the Blackboard technology. Close examination of the significant differences in access patterns to the course window and its components of communication, content, and student areas reveal middle of the semester (week 7) as the common critical point that differentiates high achieving students from low achieving students. Identifying critical points provides the faculty staff member an opportunity to introduce intervention strategies in order to improve the learning experience of all the students.

Keywords:
Studying Patterns, Student Performance, Student Learning, Discussion Boards, Online Access.

1. INTRODUCTION

The relationship between online access patterns and student performance is a subject that captures the interest of many researchers. However, most of the focus to date has been on investigating the above relationship at the end of semester. This study follows access patterns of five cohorts of postgraduate students enrolled in a core unit within a master of business administration. It examines students' access to "Course Window" for each week of the semester and for each student to identify accessing patterns that differentiate high achieving students from low achieving students. Course statistics generated by Blackboard technology over a five-year period are used to explore the above argument.

2. VIRTUAL LEARNING COMMUNITY

Creating an online learning community is the result of collaboration between faculty members, students, and the learning institution. The Organisational Behaviour unit was designed to create a class room environment for online learners that combined Chickering and Gamson's seven principles of good educational practice [1 & 2] combined with Astin's "student involvement" [3] and Rowh's "flexible approach" [4]. This resulted in enormous opportunities, throughout the semester, for interaction between participants with emphasise on what later described by Dahl [5] and Shen and Eder [6] as "collaborative learning". The unit design enabled students to share and exchange their experiences in creating a tremendous virtual "community of practice" [7] with purpose using

Blackboard technology as perceived by Bata-Jones and Avery [8].

Unit Design
In order to achieve the unit aims and taking into consideration the online mode, ranges of teaching methodologies have been used. For each topic there were topic objectives, reading material, lecture notes, and group discussions. Announcements were used, during the running of the unit, to further facilitate communication between the instructor and students together with individual and group emails [9]. To encourage more participation among students enrolled in the unit, the Discussion Board number one task was to ask all students to introduce themselves to their fellow students. This was in addition to the development of the individual student and group homepages.

Participants were required to present one seminar (assessment task one) as part of the group discussion during the course. Seminar topics were allocated by the instructor in consultation with all students no later than the end of the first week of the semester and were spread throughout the semester. Other students were invited to engage in discussions and share their experiences, readings, and comment on the presented material. Students' participation in at least eight out of twelve topics via Discussion Boards was the second assessment task in this unit.

To enrich the student learning experience, active learning [10] through problem solving was used. Students were asked, in the final assessment task, to examine and critically analyse an organisation of which they had knowledge or with which they have been closely involved. Using this scrutiny, students were asked to critically analyse and make suggestions for improvement on the major issues identified. This learning task was submitted electronically using the "Student Drop Box". The first two assessment tasks, as part of the unit design, promotes extensive dialogue and collaborative learning that is equally effective to traditional modes of delivery as argued by Horton [11]. This interaction amongst the students and with the faculty member is an essential and critical component of the "Constructivism Learning Philosophy" as described by Hover [12] and Boudourides [13] to which the author subscribes.

3. ACCESS PATTERNS vs. STUDENTS' PERFORMANCE

Students needed to access the main "Course Window" in order to utilise the available content, student, and communication tools within the Blackboard technology. Through the communication area, students accessed Discussion Boards, posted messages, and explored student and group homepages, student rosters, and the virtual chat room. While accessing the content area, students obtained lecture material, additional readings, links, and staff information. Learners needed to access the student areas to access the student tools, edit their homepage, send a file to the instructor, and check receipt of grades.

Previous research has shown strong positive relationship between access patterns to any of the course window components (communication, content and student area tools) and

students' performance. However, the strength of the relationships did vary based on students' gender with a stronger relationship for female students compared to their male counterpart as found by Halio [14], and Butrous [15], [16]. This study follows accessing patterns of five cohorts of postgraduate students enrolled in a core unit within a master of business administration (MBA) program between 2000-2004. The aim is to identify critical points in students' access patterns that differentiate high achieving students from low achieving students. Identifying critical points enhances Nguyen's [17] argument in relation to "performance support provided during the training process". This will be accomplished by analysing students' access to "Course Window" for each week of the semester and for each student as explored in the following pages.

Overall Access Patterns to Course Window vs. Students' Performance

The overall access to the course window is calculated using an aggregate count of students' hits to content, communication, and student areas. Figures reveal the average number of hits for the 74 students was 338 hits, ranging from 38 hits as a minimum to 920 hits as a maximum. Student performance is measured by the final grade achieved by students as a consequence of their performance in the three assessment tasks specified for the unit. Students' performance was clustered into three categories: The high achievers cluster (distinction and high distinction) accounted for 55% of the sample population (41 out of 74 students) and their performance ranged from 75 to 100 marks. The middle cluster (pass and credit) represented 31% of the sample (23 students) and their performance ranged from 50 – 74 marks. The least achieving cluster (fail) counted for 14% of the sample (10 students) and their performance ranged between 0-49 marks. Contrasting student performance with total hits reveals positive correlation of $r = 0.39$ with $P>0.001$.

Figure (1) shows students' access patterns to Course Window for each week of the semester and for each performance cluster. Total access to the Course Window averaged 338 hits per student by the end of the semester and ranging from 38 to 920 hits. The high achieving cluster's average total hits per week was the highest throughout each week of the semester ranging from an average of 14 hits (week 11 of the semester) to 43 hits in week 6. The highest achieving cluster's access to the Course Window increased as the semester progressed (an average of 20 hits for week 1) reaching its second peak in week 4 (42 hits) with a sudden decline in week 5 (27 hits) before bouncing back and reaching its peak in week 6 with an average of 43 hits per week. The access pattern started declining, although maintaining its superiority, throughout the remainder of the semester with a big dip in week 9 (18 hits) in comparison to week 8 (36 hits). The access pattern fluctuated during the last 6 weeks of the semester (between weeks 10 and 16) with smaller ups and downs reaching its lowest average hits in week 11 (14 hits) and week 16 (16 hits) was the second lowest average.

In contrast, the lowest achieving cluster's average total hits per week was the lowest throughout most of the semester ranging from an average of 3 hits in weeks 13-16 to 27 hits in week 4 where this average was just above the middle cluster's hits. Figure (1) shows the access pattern to the Course Window started well averaging 19 hits in week 1 putting it above the middle cluster but this started declining in weeks 2 and 3 before suddenly bouncing back in week 4 and reaching its peak weekly average of 27 hits in comparison to 8 hits in week 3. However, the least achieving cluster's access to the Course Window deteriorated gradually starting from week 7 (13 hits) without being able to recover and reaching its lowest average hits between weeks 13 to 16 (3 hits per week).

The middle cluster's average total hits ranged from 9 hits (week 1) to 32 hits in week 8 and maintained its mid way between the other two clusters throughout most weeks of the semester. In spite of its slow start behind the least achievers cluster in week 1, the middle cluster gradually increased its access in week 2 with frequent fluctuations of ups and downs until week 6 when it started climbing reaching its peak average weekly of 32 hits in week 8. The access pattern of the middle cluster experienced its biggest decline in week 9 reaching almost half of the hits in the previous week (17 hits) and then gradually declined in weeks 10 and 11 before a slight improvement in week 12 (19 hits) with continuous fluctuations during the last four weeks of the semester and concluding with an average of 13 hits in week 16.
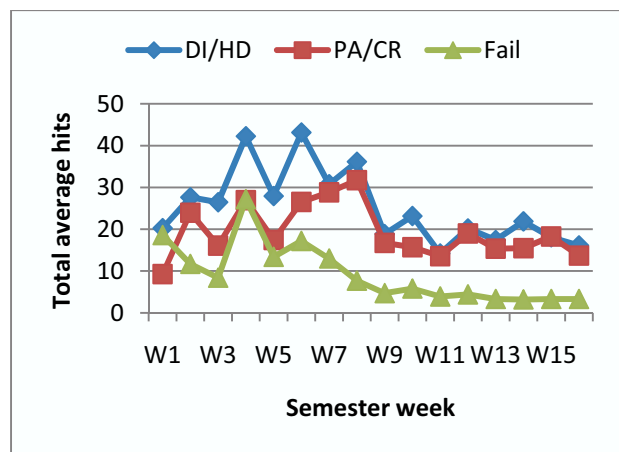

Figure (1) Cross Tabulation between total average hits per week to course window with students' performance

Close examination of Figure (1) shows access patterns of the three clusters to the Course Window is significantly different at many weeks (points) of the semester. Analysis of variance shows statistically significant differences in the average student access to course window in weeks 3, and between weeks 5 to week 11, and again between weeks 13 and 16 at the significant level of $P>.05$ and $P>.001$. Figure (1) also shows an overall trend of decline in the access pattern starting from week 9 (middle of the semester) regardless of the students' performance. However, the level of decline for the least achievers cluster is the highest with very limited to no improvement or recovery in the second half of the semester in comparison to the highest achievers cluster and the middle cluster. The second half of the semester shows some bounce back, with smaller fluctuations, ups and downs, for both high and middle achiever clusters. Thus, making week 9 the critical point in the semester that differentiates the highest achieving students from the lowest achieving students, where each faculty staff member should consider introducing intervention strategies to turn around the access pattern of the least achieving students.

Access to Communication Area vs. Student's Performance

Through the communication area, students accessed Discussion Boards, posted messages, and explored student and group homepages, student rosters, and the virtual chat room. Figure (2) shows that the high achievers cluster's average access to communication area per week was superior to other clusters throughout most weeks of the semester ranging from an average of 6 hits (week 16 of the semester) to 32 hits in week 6. The highest achievers cluster's access to the communication area started with an average of 10.5 hits in week 1 and increased gradually as the semester progressed, reaching its peak in week 6 (32 hits) with a sudden increase from week 5 (21 hits). The access pattern started declining, although maintaining its superiority, throughout the remainder of the semester with a big dip in week 6 (21 hits) followed by a gradual decline, without

any recovery, and reaching its least average of 6.2 hits in week 16.

The least achievers cluster's average hits per week to the communication area continuously fluctuated throughout the semester, and exceeded the middle cluster in a few weeks, ranging from an average of 1.5 hits in week 15 to 18.3 hits in week 4. Figure (2) indicates the access pattern to the communication area for the least achievers cluster started very well and just exceeded the highest achievers cluster averaging 10.9 hits in week 1 but started declining in weeks 2 and 3 (5.3 and 4.6 hits respectively) before suddenly bouncing back in week 4 and reaching its peak weekly average of 18 hits. However, the least achievers cluster's access to the communication area weakened gradually starting from week 5 (an average of 9 hits) with some recovery in week 6 (12 hits). The least achievers cluster's average hits to the communication area continued to fluctuate with small ups and downs, with a stronger improvement in week 13 reaching an average of 7 hits before gradual decline throughout the remainder of the semester reaching its lowest average hits in weeks 15 and 16 (2.1 and 1.5 hits respectively).

The middle cluster's average hits to the communication area ranged from an average of 4.3 hits (week 1) to 17.9 hits in week 6 and maintained its mid way throughout most weeks of the semester. In spite of its slowest start, compared to other clusters, the middle cluster suddenly increased its access in week 2 reaching its second peak average of 14.2 hits. The access pattern of the middle cluster declined in week 3 (9.7 hits) before gradually increasing to its peak average hits in the communication area in week 6 (18 hits). In spite this, the access pattern for the middle cluster experienced its biggest drop in week 7 (10.4 hits) followed by steady hits in weeks 8-9 before another sudden dip in week 10 averaging 7.2 hits. Access pattern of the middle cluster experienced gradual recovery reaching 11 hits in week 12 before deteriorating throughout the remainder of the semester reaching its lowest average weekly hits in weeks 15 and 16 (5.3 and 4.6 hits respectively).
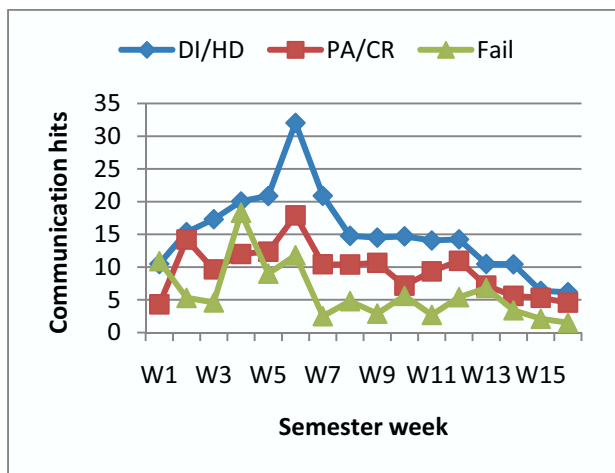

Figure (2) Cross Tabulation between average hits per week to communication area with students' performance

Analysing Figure (2) shows access patterns of the three clusters to the communication area is significantly different at many weeks (points) of the semester. Analysis of variance shows statistical significant differences in the average student access to the communication area in weeks 2 and 3, and between week 5 to week 11, and again in week 14 at the significant level of $P>.05$ and $P>.001$. Figure (2) also reveals an overall trend of decline in the access pattern starting from week 6 (just before the middle of the semester) regardless of the students'

performance. Although, the level of decline for the least achievers cluster is the highest, the extent of recovery in the second half of the semester is higher in comparison to the highest achievers cluster and the middle cluster. The second half of the semester shows a surge for the least achievers cluster, with smaller fluctuations, ups and downs. Thus, making week 7 as the critical point in the semester that differentiates the access to the communication area, by the highest achievers students from the least achievers, that the faculty staff member should consider introducing intervention strategies in order to improve the learning experience of the students.

Access to Content Area vs. Student's Performance
Students need to access the content area to obtain lecture material, additional readings, links, and the staff information. Figure (3) demonstrates the high achievers cluster average access per week to the content area was superior to other clusters throughout most weeks of the semester, except for week 4, ranging from an average of 4.6 hits (week 13) to 10 hits in week 6. The highest achievers' cluster access to content area started with an average of 6.1 hits in week 1 and increased suddenly to its second peak in week 2 averaging 9.9 hits before another unexpected dip to an average of 7.1 hits in weeks 3 and 4. The high achievers cluster's average hits gained its momentum in week 5 and reaching its peak average of 10 hits in week 6. The access pattern started declining, although maintained its superiority, throughout the remainder of the semester with another big dip in week 7 (averaging 7.5 hits). The access pattern experienced a gradual decline, with a small bounce in weeks 10 and 12 (6.6 and 5.5 hits respectively) and reached its least average hits of 4.6 in week 13 with a gradual increase during the last three weeks of the semester reaching an average of 5.4 hits in week 16.
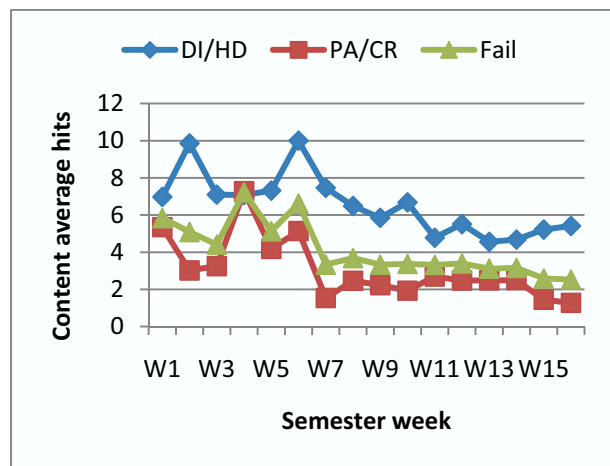

Figure (3) Cross Tabulation between average hits per week to content area with students' performance

The least achievers cluster's average hits per week to the content area was unexpectedly higher than the mid cluster's average throughout the semester indicating that obtaining lecture material, additional readings, links, and the staff information was not an issue. The least achievers cluster started reasonably well with an average of 5.8 hits in week 1 but declined in weeks 2 and 3 (an average of 5.1 and 4.4 respectively) before an increase and reaching its peak weekly average of 7.2 hits in week 4. The least achievers cluster's average hits to the content area fluctuated in weeks 5 to 7 reaching its highest dip of an average 3.3 hits in week 7. Figure (3) highlights the access pattern to the content area for the least achievers cluster which continued its steady decline throughout the remainder of the semester but still maintained its superiority to the middle cluster

reaching its lowest weekly average of 2.6 and 2.5 hits in weeks 15 and 16 respectively.

Figure (3) exposes an overall trend of decline in the access pattern to the content area starting from week 6 (just before the middle of the semester) regardless of the students' performance. However, the level of decline varies amongst the students based on their performance with the least achievers cluster maintaining its middle way through the highest and the middle achievers' cluster. None of the clusters managed to really recover in the second half of the semester although the highest achievers' cluster managed to recover better than other clusters. Analysis of variance shows statistically significant differences in the average student access to the content area in weeks 2, 6, 10, 15, and 16 at the significant level of $P > .05$ and $P > .001$. Thus, making week 6 the critical point in the semester that differentiates the access to the content area, by the highest achieving students from the least achieving students, providing the faculty staff member with an opportunity to introduce intervention strategies in order to improve the learning experience of all the students.

Access to Student Area vs. Student's Performance

Learners needed to access the student area to acquire the student tools, edit their homepage, send a file to the instructor, and check receipt of grades. Figure (4) exhibits similar access patterns per week by all the clusters to the student area with continuous fluctuations during the first half of the semester where the high and middle achievers' cluster shared the highest average hits in different weeks. The high achievers cluster's access to the student area ranged from an average of 1.1 hits in week 11 to 7.2 hits in week 14. The highest achievers' cluster access to the student area started with an average of 3 hits in week 1 and declined gradually to reach its second lowest average of 1.5 hits in week 4 before climbing up to an average of 2.6 hits in week 6. The access pattern continued its fluctuations reaching its lowest average of 1.1 hits in week 11 before bouncing back and reaching its highest average of 7.2 hits in week 14. This could be related to the third assessment task due date. The pattern then declined slightly and finished the semester with an average of 5.8 hits in week 16.
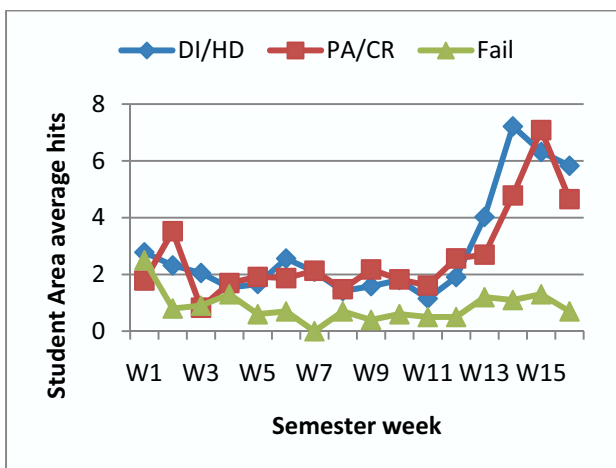

Figure (4) Cross Tabulation between average hits per week to student area with students' performance

In contrast, the least achievers cluster's average access hits to the student area per week was the lowest throughout most of the semester ranging from an average of 0 hit in week 7 to 2.5 hits in week 1 where this average was above the middle cluster's hits. Figure (4) confirms the access pattern to the student area started well averaging 2.5 hits in week 1 putting it above the middle cluster but then started declining in week 2, increasing slightly in week 3 and 4 reaching an average of 1.3 hits in week 4 before a gradual decline to no access in week 7. The least

achievers cluster's average access to the student area bounced back slightly with small ups and downs until week 13 experiencing a big increase to an average of 1.2 hits and 1.3 hits in weeks 14 and 15 respectively, before declining to an average of 0.7 hits in week 16.

The middle cluster's average total hits ranged from 0.8 hits (week 3) to 7.1 hits in week 15 and exceeded the high achievers cluster hits in half of the semester weeks (weeks 2, 4, 7, 8, 9, 11, 12, and 15) as Figure (4) indicates. As with the other clusters, the middle cluster's access to the student area remained low in the first half of the semester until week 11 when it started climbing reaching its peak weekly average of 7.1 hits in week 15 before ending the semester with an average of 4.7 hits in week 16.

Close examination of Figure (4) reveals access patterns of the three clusters to the student area are similar during the first 6 weeks with all clusters fluctuating. Although the overall trend of access to the student area has increased in the second half of the semester regardless of the student performance, the increase access of the high and middle achievers cluster's average was higher. Analysis of variance shows statistically significant differences in the average access to the student area in weeks 7, 14 and 16 at the significant level of $P > .05$ and $P > .001$. Thus, making week 7 the most critical point in the semester that differentiates the highest achieving students from the lowest achieving students which the faculty staff member could utilise to introduce intervention strategies to improve the access patterns of the least achieving students.

4. DISCUSSIONS

Previous research has shown strong positive relationships between access patterns to any of the Course Window components (communication, content and student area tools) and students' performance. This study follows accessing patterns of five cohorts of postgraduate students enrolled in a core unit within a master of business administration (MBA) program between 2000-2004. The unit is designed to provide numerous opportunities for student participation in Discussion Boards using Blackboard technology. Discussion Boards create numerous opportunities for interaction amongst online learners to share and exchange their experiences, creating a sense of a virtual community that is equally effective to traditional modes of delivery.

The analysis shows an overall trend of decline in the access pattern to the Course Window starting from week 9 and to the communication and content areas starting from week 6 regardless of the students' performance. However, the level of decline to the total course window and to the communication area for the least achievers cluster is the highest with very limited to no improvement at the second half of the semester in comparison to the highest achievers cluster and the middle cluster. This could be partially explained by the fact that students were required to participate in only 8 out of 12 Discussion Boards. As to the access patterns to the content area, the level of decline varies amongst the students based on their performance with the least achievers cluster maintaining its middle way through the highest and the middle achievers' cluster that is unexpected. In relation to access patterns to the student area, figures demonstrate an overall increased trend in the second half of the semester regardless of the student performance where the increase access of the high and middle achievers cluster's average was higher. Analysis of variance shows statistically significant differences in the average student access to the course window in week 3, and between weeks 5 and 11, and again between weeks 13 and 16. Significant differences were also found in the average student access to the

communication area in weeks 2 and 3, and between weeks 5 and 11, and again in week 14. In addition, significant differences were also found in the average student access to the content area in weeks 2, 6, 10 15, and 16. Differences were also revealed in the access to the student area in weeks 7, 14 and 16.

Close examination of the significant differences in access patterns to the Course Window and its components of communication, content, and student areas reveals week 7 as the common critical point that differentiates high achieving students from low achieving students. This is similar to the face-to-face disengaged point adding to Horton's [18] list of similarities between the two modes of delivery. Identifying critical points provides the faculty staff member an opportunity to introduce intervention strategies in order to improve the learning experience of all the students.

There are some limitations of this research related to the sample size. Having a very small sample meant that limited analysis could be performed and results could not be generalised. Another limitation is related to the fact that teacher's quality and its impact on students' performance being not investigated in this study [19]. Further research with a larger sample incorporating business programs in Australian universities is needed. This research would enable drawing conclusions and generalising results regarding the relationships between access patterns and student's performance. Linking access patterns of high and low achieving students with their learning style would facilitates personalized online learning argued by Zajac [20] and Johnson [21]. Further research is also needed to investigate gender differences related to the access patterns of males and females and relate this to their performance.

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