

PROFILING ONLINE LEARNERS: INSIGHTS GAINED FROM LEARNING INDICATORS, LEARNER BEHAVIORS AND LEARNER PERCEPTIONS

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ABSTRACT

This study constructs a learner profile for online learners using the Walkabout Ubiquitous Learning Environment. The learner profile is constructed from data collected on learning indicators, learner behaviors and learner perceptions of the environment. The constructed profile indicates that learners are content to work independently, without any great need to interact with teaching staff or other students, perform as well as learners with access to lectures and tutorials, adopt a traditional study pattern even though they are using a flexible environment. They like the flexibility offered, but also look for some imposed time based structures as an aid to learning. This study also compares these findings to those of other researchers.

KEY WORDS

Online learning, ubiquitous learning, learning indicators, learner behaviours and learner perceptions.

1. Introduction

The flexibility offered by online learning environments is suited to tertiary students' increasingly diverse life styles and learning modes. The traditional, full time, on campus learning mode has begun to fracture, due to factors such as students needing to undertake paid employment. Krause, Hartley, James and McInnis [1] noted that 54.9% of full-time, commencing Australian university students were engaged in paid employment, and that students reported more demands on their time for activities such as family commitments and household duties. Tertiary institutions can address these realities by developing more flexible teaching models, including online subject delivery. However, online learning environments need to be attuned to the needs, behaviors and perceptions of online learners. Zemsky and Massy [2] note that 'assumptions about online learning environments need to be modified by the actual experience'.

This study profiles online learners, through the gathering of data on 'learning indicators' (measures of student performance, for example assessment scores), 'learner behaviors' (such as times and durations of periods spent

engaged in online learning) and 'learner perceptions' (student perceptions of the learning experience). This data is used to delineate a 'learner profile' for a particular online learning environment. An understanding of such learner profiles can inform the development and deployment of online learning environments.

This paper, following a review of relevant literature, describes the Walkabout u-Learning environment, and data gathered from cohorts of students using this environment. An analysis of the data then suggests some online learner profile characteristics.

2. Literature Review

Previous researchers have collected data in the areas of learning indicators, learner behaviors and learner perceptions. Breen, Cohen and Chang [3] and Shannon [16] examined learning indicators: retention rates and subject achievement marks. Both marks and retention rates were lower for online subjects than for comparable units, delivered in traditional mode.

McSporran [4] and Choy, McNickle and Clayton [5] collected learner perceptions of online learning facilities, including quizzes, discussion groups and assignment submission. Highly ranked features included access to lecture materials and assignment requirements, and timely feedback from teachers. Online text based discussions were not well ranked, with high participation rates only occurring when participation was either assessable or a hurdle requirement. Muilenburg and Berge [6], Duff and Quinn [7], and Cashion and Palmieri [8] all found that students valued the flexibility offered by online learning environments. Students also indicated that more self-discipline and motivation is required for successful online learning than for traditional learning modes.

Petrova and Sinclair [9] and Wells, Fieger and de Lange [10] considered learner behaviors, including online access times and days. Both of these studies found that most accesses occurred on weekdays between 8am and 7pm, suggesting students stay within the traditional learning

times even in a flexible environment. Some researchers such as Blocher, de Montes, Willis and Tucker [11] and Wojciechowski and Bierlein Palmer [12] have looked at learner characteristics that proved to be predictors of success with online learning.

Researchers, such as those noted above, have used their data to predict learner success, evaluate online environments or identify student preferences. This study focuses on delineating learner profiles, which can then inform the development and deployment of online learning environments.

3. The Study

The study was conducted jointly by the Faculty of Information Technology and the Centre for the Advancement of Learning and Teaching at Monash University, a multi-campus university with six campuses in Melbourne, Australia, campuses in Kuala Lumpur and Johannesburg, and centres in London and Prato, Italy.

The research cohort of 84 Australian students included 31 students taking a first year, one semester, undergraduate university web development subject (subject code FIT1011), and 53 students taking a composite second/third year web development subject (subject code FIT3043). These subjects are largely factual in nature: students are required to assimilate a body of information on web development techniques, and to develop associated skills. Students work individually, with no group work required. All students completed the subjects using the Walkabout Ubiquitous Learning (u-Learning) Environment (URL: <http://walkabout.netcomp.monash.edu.au>. Access via username '12345678' and password 'access'). There were no formal on campus lectures or tutorials, but weekly on campus and bi-weekly online help sessions were held. Some forty of the students completed an online questionnaire. Some students also took part in structured interviews, reported in Murphy, Casey, and Fraser [13]. Some data were also collected from the cohort of students (n=71) which took the same subjects in the prior semester (the prior cohort). Both cohorts had the same access to the Walkabout environment and undertook the same assessment. The prior cohort also had access to traditional, weekly, lectures and tutorials.

This study utilizes the questionnaire data, students' results for the subjects, server logs of student access to the Walkabout web site, and logs of questions asked by students during the online and on campus help sessions. Data were gathered for the research cohort on learner behaviors and learner perceptions. Data were gathered for both cohorts on learning indicators.

4. The Walkabout u-Learning Environment

Figure 1 shows the components of the online environment used by both cohorts.

- **Learning objects:** the media objects containing the content, (text, graphics and other media).
- **Learning tasks:** the tasks undertaken to gain an understanding of the content, (taking personal notes, for example).
- **Learning exposition:** the method used to explain the content, (for example, students listening to streamed audio explanations).
- **Learning communications:** the methods used for communication between students and teachers, and between students.
- **Administrative functions:** administrative tasks (logins, for example).

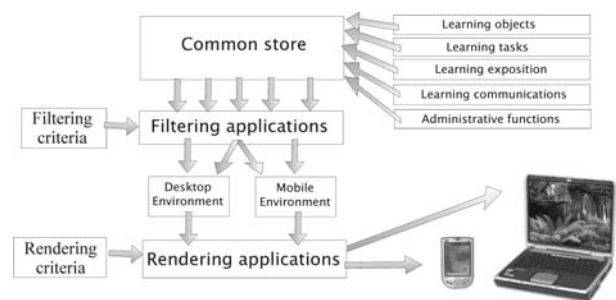


Figure 1: The Walkabout u-Learning Environment Architecture

The elements listed above are contained in a common store. The system filters objects from the common store according to whether the object is technically feasible on a particular desktop or mobile device, and whether the object is educationally useful for the learner in a mobile or desktop context. Objects are deemed technically feasible and educationally suitable in either the e-learning (desktop) environment, or the m-learning (mobile) environment, or both (u-learning environment). After filtering, the system renders each object according to its e-learning, m-learning or u-learning requirements, taking into account the output device's technical capabilities.

Figure 2 shows part of typical content output for the e-learning environment. The material is broken up into topics and sub-topics (as 'Topic 4.2' is shown in Figure 2), and then further divided into parts ('Part 1 Pixels' in Figure 2). This structuring of the content helps students to structure their learning into manageable portions and study time slices. Each part includes a streamed, on demand, audio lecture, lasting some three to five minutes. The student notes editor enables students to add personal notes. Not shown in Figure 2 are accompanying exercises and quizzes. As well as completing exercises and quizzes, students construct new exercises and quizzes which are then made available to other students. There are also more

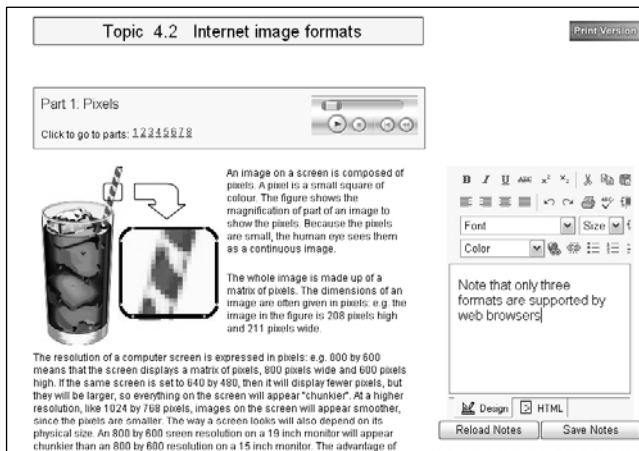


Figure 2: Part of a typical Walkabout content page

formal assignments to give students opportunities to apply their knowledge and skills more broadly. Various other functions are also provided, a subject calendar, frequently asked questions, the subject handbook, references, staff contact details, a download centre from which students can download a pdf copy of the unit material (about 500 pages) for use off line, a search engine to search both the learning materials and the student's own notes, and various administrative functions. The m-learning environment makes the educationally useful and technical feasible features of the e-learning system available to mobile devices. Figures 3 and 4 show the m-learning equivalents to the e-learning output shown in Figure 2.



Figure 3: Mobile view of Figure 2 (i)



Figure 4: Mobile view of Figure 2 (ii)

With the absence of formal classes in online learning, it is important that interaction between teachers and students is still available to those students who want it. Walkabout uses a subject newsgroup for asynchronous text based interaction, a bulk emailer, podcasts and live video and audio help sessions which enable lecturers and students to interact. These live sessions are implemented using the Marratech system which uses a specialised server and client to deliver multiple live audio and video feeds to users (<http://www.marratech.com>). The Walkabout environment also includes a staff administrative site, for

managing student groups, submitted work and content development.

5. Study Results: Learning Indicators

Several learning indicators were considered and compared between the research and prior cohorts: assignment marks, final examination marks; subject marks and subject drop out rates. Assignments required students to write web applications. The null hypothesis is that there is no difference in performance between the prior and research cohorts. Table 1 shows t-test results, indicating that the null hypothesis is accepted for FIT1011 students, but rejected for FIT3043 students.

Table 1: T- test for assignment marks

Values of n: Prior chrt: 41 Research cohort: 31	means	Significance (equal variances not assumed)	accept/reject hypothesis
FIT1011 cohorts	Prior: 27.6 (n=41) Research: 29.3 (n=31)	.443	accept
FIT3043 students	Prior: 30.0 (n=30) Research: 34.4 (n=53)	.001	reject

Both cohorts undertook the same, end of semester, examination. The null hypothesis is that the research cohort scored no better than the prior cohort. As Table 2 shows, this hypothesis is rejected.

Table 2: T- test for final examination marks

Values of n for cohorts.	means	Significance (equal variances not assumed)	accept/ reject hypothesis
FIT1011 Prior: 41 Research: 31	Prior: 29.8 Research: 35.2	.048	reject
FIT3043 Prior: 29 Research: 53	Prior: 33.9 Research: 43.7	.000	reject

Final marks are determined by aggregating weighted assignment and examination marks. The null hypothesis is that the research cohort scored no better than the prior cohort. T-test results indicated that the hypothesis is rejected for the FIT3043 group, but accepted for FIT1011.

Various factors prompt students to discontinue subjects: for example, work or social pressures or dissatisfaction with the subject. There was an average of a 6% decline in drop out rates, from the prior to the research cohorts. This trend may indicate a decline in subject dissatisfaction, on

the assumption that other causes of student drop out remained constant.

6. Study results: learner behaviours

Learner behaviors include the ways students interacted with the learning environment during their learning: getting help through personal interaction, study locations and times and learning activities undertaken. The following results refer to the research cohort.

A number of authors, Cashion et al. [8], McInnerney and Roberts [14] and Muirhead [15], have noted the importance of maintaining personal interaction as part of a successful online learning environment. Students in this study did not see any great need for personal interaction through online and on campus help sessions, with most students attending zero or one session only.

Logs were kept of the types of questions or observations students made during help sessions. Questions were categorised as: 'site' (about installing or using the Walkabout u-Learning Environment), 'assign' (about the requirements for the assignments), 'admin' (general administrative matters), 'content' (about the actual learning materials) or 'social' (general greetings or social chat). Figure 5 shows the distribution of question types, indicating that students were mainly concerned with assignment requirements.

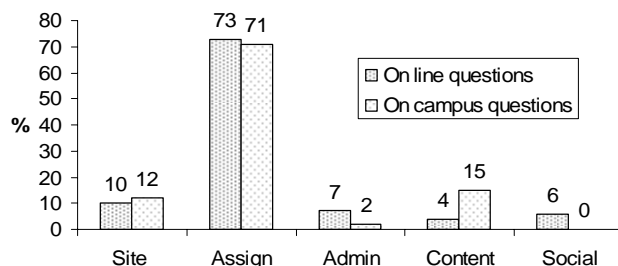


Figure 5: Types of student questions during help sessions.

Related to Figure 6, are the responses (shown in Table 3) to a questionnaire item asking students where they sought assistance. Table 4 shows that students, for the most part, tended to work independently, preferring to work things out for themselves with help from the Internet.

Table 3: Preferred sources of student assistance.

	<i>Never</i>	<i>Occasionally</i>	<i>Often</i>
Contact tutor	35%	48%	18%
Contact other students	36%	44%	21%
Use subject newsgroup	95%	5%	0%
Attend online session	65%	25%	10%
Attend on campus session	53%	33%	15%
Search the Internet	8%	38%	55%
Work it out for myself	5%	20%	75%

Table 4: Preferred location of study

	<i>Never</i>	<i>Occasionally</i>	<i>Often</i>
Campus	24%	61%	16%
Home	3%	8%	90%
Work	79%	15%	6%
While traveling	88%	9%	3%
Other (Park, mall etc)	97%	3%	0%

Online environments enable study independent of designated times and places. Table 4 shows preferred study places, as reported in the questionnaire. Students studied mostly at home, with some on campus study. Given the lack of general student use of mobile devices, it is to be expected that 'Traveling' and 'Other' would not rate well. The Walkabout servers tracked student log-ins: 72% came from computers situated off-campus.

The times of study, as reported by the questionnaire, indicate a fairly even distribution of study times, mornings being the least favored of mornings, afternoons evenings or late nights .

The Walkabout learning materials are divided into topics, sub-topics and then parts (see Figure 2) to enable students to study in small time periods. Students, in fact, preferred to spend relatively long time spans in studying the subject, with only 8% studying in blocks of less than one hour, 44% between one and two hours, and 48% more than two hours at a time.

Monash University recommends that students spend twelve hours of study per week per subject, including class time and private study time. These students were clearly not following the university's suggested regime of study, with only 18% approaching the recommended study time.

Table 5: Frequency of learning activities

	<i>Never</i>	<i>Occasionally</i>	<i>Often</i>
Read materials on PC	3%	13%	85%
Read materials on PDA	90%	5%	5%
Print materials for reading	45%	43%	13%
Listen to lectures	30%	33%	38%
Attempt exercises	5%	63%	33%
Attempt quizzes	13%	65%	23%
Create separate notes	30 %	45 %	25 %
Use the search engine	45%	33%	23%
Attend on-line sessions	58%	30%	13%
Listen to podcasts	28%	40%	33%
Attend on-campus sessions	43%	43%	15%
Use subject newsgroup	83%	15%	3%

The Walkabout environment provided students with various learning activities. Table 5 lists these activities and shows their usage distributions. The first two items in Table 8 confirm that students are using traditional PCs for

this subject, rather than any mobile devices. The item “Use subject newsgroup” indicates that students did not see much use for the subject newsgroup. Other items in the table do not show any marked deviations from approximately normal distributions.

7. Study results: learner perceptions

The questionnaire included items on learner perceptions of the learning they experienced: usefulness of various Walkabout features, statements on learning features, problems encountered, best features and ways to improve the subject

Students rated the usefulness of the main features of the Walkabout environment as shown in Table 6. The distributions are mostly normal or positively skewed, indicating a general satisfaction with the Walkabout environment’s main features. Online and on campus help sessions do not rate particularly positively. The subject newsgroup is not valued. The positive skew for email reminders is consistent with several student comments indicating a need for some time based help with their learning, possibly ‘where should I be now’ type of email reminders.

Table 6: Usefulness of learning activities.

	<i>Not useful</i>	<i>Not much use</i>	<i>Unsure</i>	<i>Some-what useful</i>	<i>Useful</i>
Web site overall	3%	10%	5%	35%	47%
Topic content	3%	5%	8%	40%	44%
Pre-recorded lectures	8%	10%	27%	27%	28%
Exercises	0%	10%	13%	48%	29%
Quizzes	5%	13%	15%	39%	28%
Notes editor	15%	10%	45%	20%	10%
Search engine	10%	13%	37%	22%	18%
Online sessions	15%	5%	47%	13%	20%
Email reminders	3%	0%	15%	35%	47%
On campus help	5%	10%	20%	42%	23%
Subject newsgroup	18%	15%	46%	18%	3%

Table 7 shows the distributions of responses to a series of statements, to which students responded using a five point Likert scale. Three items dealing with the Walkabout environment are skewed positively. However, there are marked bi-modal distributions for experiencing problems with the technology, and preference for online learning over face to face classes. The questionnaire asked students to identify significant problems encountered, and 41 problems were identified. While six students experienced no problems, eight had problems installing the local version of the site. In fact, 57% of the problems were technology based (web access, Marratech, web site and software installation problems). Apart from problems with the assignments, the other noteworthy problem was with students managing their time properly.

Table 7: Likert scale statements

	<i>Dis-agree</i>	<i>Dis-agree some-what</i>	<i>Unsure</i>	<i>Agree some-what</i>	<i>Agree</i>
Sufficient guidance was provided for the Walkabout environment	10%	10%	5%	48%	28%
I experienced problems with the technology	23%	30%	3%	33%	13%
I prefer this type of unit to face to face classes	28%	25%	3%	15%	30%
When I first logged on, I quickly worked out what to do	5%	8%	5%	43%	40%
The unit website is easy to navigate	8%	3%	8%	43%	40%
I prefer printed materials to online materials	15%	30%	5%	13%	38%
I wish all the units were taught online	40%	15%	10%	18%	18%
I need more reminders to keep up with my study in this unit	10%	18%	0%	28%	45%
I learn more studying this way than with face to face classes	18%	20%	25%	23%	15%

Students were asked to identify the best features of the experience. The flexibility and the Walkabout environment itself were seen as the most significant positive features. Students were also asked to identify ways to improve the unit. The 34 responses received had no dominant suggestions, with a spread of opinions.

8. Towards an online learner profile

Looking over the study’s findings, some characteristics of our online learner, working in this context, begin to appear.

- Our learner is content to work independently, relying on the online environment for learning resources, supplemented by other web based information.
- Our learner does not see any great need to interact with teaching staff or other students, either online or on campus, apart from clarifying points of procedure, for example with assignment specifications. This differs from the findings of Cashion et al. [8], McInnerney et al. [14] and Muirhead [15]. This study and those of McSporrán [4] and Shannon [16] all found that text based interaction is not valued by students.

- Our learner performs as well as, if not better, in assignments and exams than do learners with access to lectures and tutorials, a finding at odds with Breen et al. [3] and Shannon [16]. This study's finding may indicate that our online learner realises that the motivation to work must come principally from within the individual. Duff et al. [7], Blocher et al. [11] and Cashion et al. [8] reported that online students realised the need for self motivated learning.
- Our learner may drop out a little less frequently than did learners with access to lectures and tutorials. Breen et al. [3] and Shannon [16] reported the opposite.
- Despite fractured life styles, our learner still tends to study in the traditional places of home and campus, and during the traditional study hours, for traditionally long periods of study, using traditional PC equipment. Petrova et al. [9] and Wells et al. [10] similarly reported that online students studied at traditional times, typically on weekdays. The dynamically multi-tasking learner, welded to a mobile device, learning on a bus in the small hours of the morning, does not yet seem to be with us.
- Our student does not meet university expectations of total study time per week.
- Consistent with most research reports, our learner likes the flexibility afforded by on-line learning.
- However, our learner is conscious of the loss of the temporal help of regular lectures and tutorials, and would like some time based help, such as regular email reminders. Duff et al. [7] and Blocher et al. [11] also found that students wanted temporal reminders. Wojciechowski et al. [12] reported that the students who attended an initial orientation session performed better in the course.
- Our learner generally embraces a variety of learning tasks provided by an online system, finding them useful for learning.
- Consistent with Wells et al. [10] and Cashion et al. [8], our learner is of two minds on several issues: whether there should be more online learning and whether more is learned online than face to face. Breen et al [3], Cashion et al [8] and Wells et al [10] found that students prefer a combination of online and face-to-face to just online learning. Muilenburg et al [6] and Shannon [16] similarly found a mix of student opinion on how well they thought they could learn online.
- Our learner sometimes has difficulties coping with the technical aspects of using the learning environment.

9. Conclusion

Within the context of the particular subjects and online environment used in this study, our online learner emerges as a basically confident learner, achieving

success, without the need for much human interaction. This learner disdain for human interaction is in contrast to the findings of many, but not all, researchers. In this case it may be due to the factual nature of the subject content material (web applications development).

Without the widespread availability of networked mobile devices, our learner is following a traditional regime of study in both time and place. Our learner embraces the flexibility afforded, but also wants some time based structures on which to base steady progress.

This initial profile is more of a pencil sketch than a full portrait of the online learner. However, even a sketch such as this provides insights to inform future development and deployment of an online system such as Walkabout. Future research will seek to discover the factors which will explain the discrepancies between some of this study's findings and those of some other researchers.

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