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EDUCATIONAL EFFECTIVENESS OF 100% ONLINE I.T. COURSES

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Abstract

This project started with the observation that our 100% online I.T. courses were producing a higher percentage of distinction students than the equivalent on-campus courses. In search of an explanation, we first attempted to eliminate factors such as incoming student qualifications, staff-student interaction time, and assessment standards. We also considered our online course development and delivery processes. As a result, we hypothesised that our online course delivery processes are the main factor to explain the higher learning outcomes for our online students.

We designed an evaluation study to address the broad realisation above and answer specific questions. Our methodology combined pre and post confidence logs submitted by students, qualitative information gathering based on emails between students and their tutors, a survey of students, a focus group of staff who deliver online courses, interviews of staff who deliver the equivalent courses on campus, and a nominal group comprised of randomly selected students who successfully completed either an online or equivalent on-campus course.

Our findings confirm that the most important determinant of online student learning outcomes is frequent student / staff interaction. Further, we identify the most important types of interaction. For instance, frequent problem / solution email between students and staff can benefit learning more than weekly one (staff) to many (students) tutorial classes.

Finally, we list the characteristics of online staff / student interactions that contribute to successful online student learning outcomes.

Keywords

Online, student-centred, objective-based, cost-effective, evaluated teaching and learning

1. Introduction

We have previously described how 20 university level, 100% online I.T courses were cost effectively developed and delivered to over 7000 students since 1998 (Zuluaga, Morris, Fernandez, 2002). Here we focus on the educational effectiveness of these online courses. In particular, we evaluate two courses: Programming Principles 1A, and its sequel, 1B. PP1A and PP1B constitute the 1st of 3 years of programming courses in the Bachelor of Applied Science (Computer Science). PP1A and PP1B are also delivered 100% online to Open Learning Australia (OLA) students, who may complete 2 years of programming and attain a Bachelor of Applied Science (I.T).

In section 2 we report that our online PP1A and PP1B courses produce a higher percentage of distinction students than the equivalent on-campus PP1A and PP1B courses. In search of an explanation, we analyse factors such as incoming student qualifications, staff-student interaction time, and assessment standards.

We also consider the effects of our online course development and delivery processes. As a result, we hypothesise that among these factors, our online course delivery processes are the main factor to explain the higher learning outcomes for our online students. In section 3 we report an evaluation study designed to identify how and why the online delivery of our PP1A and PP1B courses produces a higher percentage of distinction students than the on-campus delivery of these courses. Our findings confirm that the most important determinant of online student learning outcomes is frequent student / staff interaction. Further, we identify the most important types of interaction. Finally, in section 4 we list the characteristics of successful online staff / student interactions, as recorded in the online courses producing a higher percentage of distinctions than the equivalent on-campus courses.

2. Comparing online and on-campus courses

Our online PP1A and PP1B courses each produce a higher percentage of distinction students than the equivalent on-campus courses. Each online course has far less fails too, but many more deferrals as a result of different enrolment regulations (Zuluaga, Morris, Fernandez, 2002). These students are not counted in Table 1 where percentages are only in terms of students who sat the final exam.

		PP1A online A	PP1A online B	PP1A on-campus	PP1B online A	PP1B online B	PP1B on-campus
2000	HD	51	45	25	67	57	25
2000	DI	12	22	19	6	5	13
		= 63	= 67	= 44	= 73	= 62	= 38
2001	HD	43	40	37	59	81	28
2001	DI	25	28	16	24	12	15
		= 68	= 68	= 53	= 83	= 93	= 43
2002	HD	47	40	41	67	46	32
2002	DI	21	22	19	7	15	17
		= 68	= 62	= 60	= 74	= 61	= 49

HD : 80-100% (high distinction)
 DI : 70-79% (distinction)
 PP1A online : 4 deliveries per year, 2 outliers discarded (A, B)
 PP1B online : 2 deliveries per year (A, B)
 on-campus : 1 delivery per year

Table 1: Percentage of distinction students online and on-campus

After averaging over the 3 years, and 2 or 4 online deliveries per year, the online PP1A course produces 66% distinction students (ie. DI and HD) whereas the on-campus PP1A course produces 52%. [Aside: we believe the on-campus distinction percentage has been rising each year as a result of increased resourcing, eg. help-desk, intensive fortnightly testing, more lab instructors]. Similarly, the online PP1B course produces on average 74% distinction students, versus 43% on-campus. We assert this disparity is significant, given the large number of students involved over numerous course deliveries during 3 years.

In search of an explanation, we first analyse factors such as incoming student qualifications, staff-student interaction time, and assessment standards.

2.1 Incoming student qualifications

The on-campus student intake is 50% local and 50% international. The local students have high ENTER scores (around 90) and at least year 12 math and English. The international students are similarly qualified, but with IELTS 6.5.

The online students are typically less qualified. Some may have missed out on university entry. Others are mature age, seeking a career change. A significant number have a disability, or other difficulty attending a

campus. Frequent flyers, military personnel, and ex-pat Australians are also numerous. Math background is typically inferior, but English experience (in Australia) is often longer.

In general, the specially selected on-campus students would be expected to perform better in PP1A and PP1B than the self-selecting online students. Their qualifications are better. The prevailing assumption is that the on-campus course materials and overall educational experience are better. Nevertheless, 20% fail. Some of these repeat the course online, and our records show that most succeed.

This student cohort (repeating a course online, after failing it on campus) is significant to our evaluation study in section 3. The majority of these repeating students are international, not because they fail more than the local students do, but because the online course can get them back on track quicker, as it runs more often. This “repeat” cohort comprises ~5% of the online intake, where the rest are as described above.

2.2 Staff-Student interaction

Each 13 week on-campus course has over 100 enrolments and is delivered with traditional lectures (2 hr / week), tutorials (1 hr / week) and laboratory classes (1 hr / week plus unsupervised time). Students are divided into less than 20 per tutorial with one (1) tutor and 40 per lab class with two (2) demonstrators. Assignment deadlines are non-negotiable unless a medical certificate is tendered. A final 3-hour exam constitutes 50% of the overall assessment.

The equivalent 13 week online course has over 100 enrolments. It is nominally divided into one (1) lecture and one (1) tutorial “class” or online session per week, but students can study flexibly, 24/7. Assignment deadlines are also flexible without penalty, provided the final deadline is met. During the 100% online course each student receives on average 1 to 1.5 hours of staff generated email responses, 1 to 1.5 hours of assignment marking feedback, and 0.5 hours exam marking feedback (Zuluaga, Morris, Fernandez, 2002).

Comparing staff-student interaction time - per individual student - over the 13 week duration of a course, each on-campus student receives on average 40 minutes individual interaction in tutorials and 40 minutes in labs. Each online student receives a total of 60 to 90 minutes individual interaction on average. So there is little difference in staff-student interaction time online versus on campus.

2.3 Assessment standards

In one delivery of PP1B, on-campus and online, we used the same assessments, both assignments and exam. In the next PP1B delivery, on-campus and online, we used different assessments, both assignments and exam. Varying the assessments in both PP1A and PP1B made no significant difference to the results disparity reported above.

As assignments are submitted online in both on-campus and online courses, submissions are randomly checked for plagiarism using the same methods and anti-plagiarism software. Assignment plagiarism in online courses is less than in on-campus courses, perhaps because there are fewer opportunities due to reduced face-to-face contact between fellow students.

On-campus exams are rigorously invigilated. We ran on-campus exams for our online students studying an online course in addition to their other courses on campus. All other online students sit their exams online, under the local supervision of an authorised invigilator. A central online exam supervisor responds to exam related email within 5-10 minutes. This remote supervisor also has a phone hotline. This allows examinees and invigilators to be contacted too.

We are confident these checks secure the assessment processes in our online courses, especially when technical tools such as cookies allow us to detect unusual IP addresses, internet routes, ISP connections, etc. Hence we believe there is no significant difference between the standards of assessment in our online and on-campus courses.

2.4 Online course development

Our online course materials have been built to a budget (Zuluaga, Morris, Fernandez, 2002). They are largely developed from the on-campus materials delivered in lectures (level 1) and in printed notes (level 2). We rely more on students interacting with staff during the delivery of an online course than in building interactivity into the course during its development. Each of our online courses includes on average 4 short multi-media supplements such as Flash animations, voice overs and video clips. The same text books are prescribed for each online and equivalent on-campus course. Formal quality assurance reviews ensure the depth of each topic is equivalent online as on-campus. Hence, we assert there is no significant difference in the quality of our online and on-campus course materials.

2.5 Online course delivery

Once an online course has been developed for use in a learning management system such as Blackboard, SERF or WebCT, the success of the course depends largely on its delivery. Under an Online Operations Manager (OPS), our online staff have evolved the following modus operandi (Zuluaga, Morris, Fernandez, 2002):

The main communication channel between online staff and students is email, supplemented by online discussion forums. Online chat sessions are organised by student groups. Staff do not participate unless invited. Staff do not take telephone calls as a rule, unless a student is temporarily offline. Staff do phone students when this can be more effective, eg. when a student has trouble installing a compiler. This prioritising of communication channels ensures an orderly queue of student requests and staff responses.

The instructor for an online course is generally assisted by one (1) tutor per 50 students. Student email is directed to the staff via an email alias for academic learning support services. (Other aliases connect students with technical and administrative support services.) The learn-support alias for an online course provides students with one point of contact, without depending on individual staff availability. A response will come from the most appropriate staff member, depending on the student query, and who is on duty at the time. To ensure consistency, and allow responses to be re-used where appropriate, all responses are broadcast to all staff by CC'ing the email alias. During local business hours, email turnaround averages 15 minutes. Overall, email turnaround averages 4 hours, all day, every day (24/7).

Instructors typically answer only new queries, while tutors monitor the instructors' responses and re-use them where appropriate. Tutors also provide more detailed follow-ups and formulate broadcasts for an online discussion forum. The class discussion forum not only reduces the need for individual emails, but it also provides material for a Frequently Asked Questions (FAQ) bulletin board. FAQs are carried over between delivery cycles whereas discussion forums are archived and emptied at the start of each delivery cycle.

Clearly, our online course delivery is significantly different from delivery on campus, and could contribute to the disparity between online and on-campus student learning outcomes.

3. Evaluation study

The above comparison between our online and on-campus courses leads us to hypothesise that of the factors considered (2.1-2.5), only our online course delivery processes (2.5) may sufficiently explain the higher learning outcomes for our online students. We assert that our analysis (above) reasonably diminishes each of the other explanations (factors 2.1-2.4). We acknowledge that it is not scientifically valid to eliminate these other factors completely, as we can neither isolate them individually, or control their interrelationships. And there are additional factors that we have not addressed, eg. teacher motivation / involvement online versus on campus. Nevertheless, we believe our hypothesis, the evaluation study designed to test it (3.1), and our findings (3.2) are worth reporting. As stated by Draper, even if an evaluation study cannot be sufficiently controlled to be repeatable, "it is possible to gather useful information by studying how a piece of CAL is used in a real course and what the outcomes were. Although this does not guarantee the same outcomes for another purchaser, it is obviously useful to

them to know that the CAL has been used successfully one or more times, and how it was used on those occasions” (Draper, 1997). Furthermore, reporting our study allows other researchers to confirm, qualify or refute our claims (Wills, McNaught, 1996), especially as a higher percentage of distinctions would probably be expected from on-campus face-to-face delivery than 100% online delivery.

3.1 Methodology and Framework

During 2001, at the start of the next 4 delivery cycles of the online PP1A course and 2 delivery cycles of the online PP1B course we asked the students who had previously failed the equivalent on-campus course (repeat cohort) to complete a *confidence log* (Morris, 2003a). This established their confidence with key concepts introduced in the course. The same confidence log was given again at the end of the course. In effect we performed pre and post testing for each online PP1A and PP1B course in 2001, but only with the repeat cohort. The total number of repeat students was 20 in the online PP1A and 10 in the online PP1B. Notably, less than 10% of these students failed the repeated course.

The same confidence log was given to a sample of students completing the equivalent on-campus courses in 2001. Most of these students were not repeating the course. Around 20% failed. In effect we only performed post testing for the on-campus courses. The total sample size was 20 in on-campus PP1A and 10 in on-campus PP1B.

In both courses the post confidence logs for both cohorts differed markedly, as detailed in section 3.2. To investigate the reasons we designed the following evaluation study, based on the Learning-centred Evaluation Framework of Phillips et al (Phillips, 2000).

In 2002, during the next 4 delivery cycles of the online PP1A course and 2 delivery cycles of the online PP1B course we collected over 3,000 emails between the students and their tutors as the basis for a *qualitative information gathering study* (Cohen, Manion, 1994). We looked for evidence to explain from the student perspective any positive or negative difference in any of the following 3 aspects of learning online versus on campus:

- a) the learning environment (where students learn),
- b) the learning process (how students learn),
- c) the learning outcome (what students learn).

We asked the successful repeat cohort students to complete a *survey* (Morris, 2003b). It asked what they attributed their success to, by ranking options in a list. It also asked what should be improved most in the on-campus course and in the online course. The total number of successful repeat students surveyed was 15 in the online PP1A and 7 in the online PP1B.

We formed a *focus group* of 4 staff who deliver the online PP1A and PP1B courses. We asked the following questions:

- 1) Why do students who failed the course on-campus succeed when repeating the course online?
- 2) Why is the percentage of students achieving distinction higher online than on-campus?

We conducted an *interview* of 2 staff who deliver the PP1A and PP1B courses on-campus but not online. We asked the above 2 questions, and compared the responses with those of the focus group.

We formed a *nominal group* from a random sample of 12 students who successfully completed either the on-campus or online PP1A or PP1B courses. We asked them the above 2 questions, and compared the responses with those of the focus group and the interviewed staff.

In this eclectic *evaluation study*, we employed the above range of methods to overcome their individual weaknesses by combining their strengths (Hervey, 1998). We also hoped to improve the internal consistency of our results and the findings based on them.

3.2 Findings

Confidence logs: At the start of the online PP1A and PP1B courses we gave the students who had previously failed the equivalent on-campus course a confidence log. The response rate was typically low, but we believe the results confirm low levels of understanding, as expected. The post confidence log response rate was higher. The results confirmed vastly improved levels of understanding.

The same confidence log was given to a sample of students completing the on-campus PP1A and PP1B courses. Although most of these students were not repeating the course, and 80% pass, it was still interesting that their confidence was substantially lower than for the online cohort of mostly repeating students.

Could this difference be attributed to simply repeating the course, whether on-campus or online? No, because the majority of students who repeat PP1A or PP1B on campus fail again. Less than 10% fail again online. So, could students learn more from the online course than from the equivalent on-campus course? Our evaluation study attempts to answer this question below.

Qualitative information gathering: Apart from student email interactions with staff on very specific points, we found the remainder (over 3,000 emails in 2002) could be largely classified into the following 5 categories:

- 1) Students often ask aside questions, not pertinent to the current assignment task or directly related to the learning material overall. The intention appears to be to broaden knowledge or experience beyond the immediate case, example or assignment. We note that the online learning environment makes aside interactions convenient via email, whereas they are more difficult in classes on campus, and when staff have limited consultation time. So email affects how students learn in a broader context. With each interaction, what they learn may be wider, if shallow; or it may be narrower, but in depth. The online student has the flexibility to choose.
- 2) Before an assignment deadline, many student emails to staff indicate the students feel they are collaborating with staff, or being mentored by staff, rather than interacting with tutors more conventionally. The traditional teacher / pupil relationship disappears when there is no face-to-face reinforcement. The informality in email interactions encourages students to ask “what would you do?” or “how about this?”. Staff reply with “if I were you” or “here’s a tip”. We note that the online learning environment encourages informal collaborative interactions between students and staff via email, whereas interactions are more constrained by tradition in classes on campus. So email affects how students learn via (asynchronous) informal discussion. What they learn may stem from one-to-one interaction, or benefit from interaction with several staff. After one staff member responds to a student query, another staff member on the email alias may contribute a further suggestion because they have dealt with a similar problem previously. The online student benefits from more than one teacher.
- 3) After an assignment deadline, students often thank staff for the email interactions that contributed to the final product. It also appears these students feel a need to conclude an assignment by tying together any loose ends to consolidate their knowledge and understanding. We note that the online learning environment makes post-mortem interactions possible via email, whereas they are more difficult in classes on campus, and when staff have limited consultation time. So email affects how students learn in an extended time-frame. What they learn may be likened to the benefits of finality or closure.
- 4) Students often report via email when they have accomplished a step they feel significant, eg. compiling a program without bugs, successfully outputting data previously input. Although it is not necessary to lodge such reports, they appear to be the spontaneous result of wanting to share even a minor achievement. Certainly students are not slow to report frustration when something does not work. Perhaps reporting success is a welcome corollary. We note that the online learning environment makes incidental reports and congratulations possible via email, whereas delayed airing in the next on-campus class will be ignored for higher priorities. So email affects how students learn in a social

context. What they learn may be similar to praise and positive reinforcement for a task well done. And staff receive well earned gratitude, which contributes to their morale in a positive way.

- 5) Students often remark with surprise about prompt feedback from staff. It is as if students find it unusual for a service agreement to be honoured, but there is little evidence to suggest they have previously had a bad experience online. It may be that timely personal responses from staff are good for the students' self-esteem. We note that the online learning environment makes timely feedback via email possible, whereas feedback on campus would be necessarily delayed to the next class. So email affects how students learn in a timely ongoing context. What they learn may benefit from more spontaneous reinforcement, and online students appreciate it.

Survey: Very few repeat cohort students ranked “gaining from another attempt at the same course material” as important to successful completion. This surprised us (see staff focus group below), but may be explained by student comments indicating they just needed to work harder on the course, which they apparently did on repeating it online. This may be reinforced by responses indicating few students gained from being able to work online at their own pace. If anything, repeat cohort students wanted a structured work plan. Indeed, most repeat cohort students felt they gained most from immediate feedback from staff to their queries about course content and assignments. Perhaps the frequency of this interaction is a regular prompt to maintain a work regime. Further evidence to support this conclusion came from responses to “what needs to be improved most in the online course” - more task deadlines.

Of even more interest were the responses to “what needs to be improved most in the on-campus course”. Over 50% of the repeat cohort students suggested frequent email interaction with their face-to-face tutors would be highly beneficial. Several responses even suggested immediate feedback from a tutor via email would be better than weekly face-to-face tutorials with one tutor and up to 20 students for one hour. On-campus students often complain that it is difficult to contact tutors even via email in between tutorials.

Staff focus group: Staff who deliver the online courses gave very similar responses to the following two (2) questions:

- 1) Why do students who failed the course on-campus succeed when repeating the course online? Staff expected that repeating the course would be the most significant factor in eventual success. They also indicated that immediate feedback via email is beneficial, but they inferred it is the next best alternative to face-to-face teaching. Further discussion clarified that the online staff preference is one-to-one, face-to-face teaching, then email, and lastly one (staff) to many (students) tutorials.
- 2) Why is the percentage of students achieving distinction higher online than on-campus? Staff clearly stated that immediate feedback via frequent email between staff and students contributes to better student performance as well as successful completion. However, there are indications that few of these staff would have believed this until after their online teaching experience.

Staff interview: Staff who deliver the courses on-campus but not online also gave very similar responses to the same two (2) questions, but their responses are notably different to the online staff (above):

- 1) Why do students who failed the course on-campus succeed when repeating the course online? These staff also expected that repeating the course would be the most significant factor in eventual success. They felt that immediate feedback via email must benefit students, but they doubted it could match face-to-face teaching, either one-to-one or one-to-many. However, a couple of staff commented to the effect that less proficient English speaking students, and students who do not participate in tutorials, could benefit from interaction via email.
- 2) Why is the percentage of students achieving distinction higher online than on-campus? Staff who do not teach online found this difficult to believe, even after all the variables accounted for in section 2 (above) were explained. Each of these staff wanted time to see if they could think of other reasons to explain the improved performance of online students. To date there have not been any new hypotheses.

Student nominal group: A random sample of students who successfully completed either the on-campus or online PP1A or PP1B courses gave very different responses to the same two (2) questions. The online student responses were mainly similar to those of the online staff, as captured in the staff focus group. The on-campus student responses were mainly similar to those of the interviewed staff who teach on campus but not online. However, the online and on-campus student opinions diverged further than the online and on-campus staff views respectively. Students who had not done an online course had difficulty understanding how it ‘worked’. Several comments indicated they found incredible the possibility that an online course could elicit better student performance than an equivalent on-campus course. This raises the question, what type of student chooses an online course rather than its on-campus equivalent. Is this type of student likely to perform better? We do not know. But we do think they are likely to be more motivated, having actively chosen to do a course online. Nevertheless, many on-campus students are also motivated to do well, so we conclude that motivation is at most a partial contributor to the performance difference between online and on-campus students in PP1A and PP1B.

4. Characteristics of successful online staff / student interaction

Apart from proficiency in the course material, successful online staff, as measured by student learning outcomes, require highly refined communication skills. They must also know how to best utilise the online communication channels at their disposal. In addition, staff must learn the fine line between informality, familiarity, and professionalism in their online communications with students. Due to the diverse range of students and staff in the online environment, what some may deem disrespectful or rude may be viewed by others as friendly and informal. Socio economic status, culture, age, religion, gender, ethnicity are all factors that affect the way staff and students react to one another. Successful online staff adapt their style of communication to their individual students.

4.1 Using an online communication channel most effectively

Online students email a specific query as soon as they encounter difficulty with a concept in the learning material, tutorial exercises, self-test quiz questions, or assignment. In accordance with our delivery modus operandi (section 2.3), each student receives a timely response via the most appropriate channel. On campus, such queries often wait days until the next tutorial class, and then may not be addressed directly or individually.

We interviewed our online staff and asked the following questions about using online communication channels most effectively:

- 1) How important are the following particular email communication skills - ability to quickly grasp a student’s problem, ability to concisely explain a concept, ability to phrase an explanation to suit an individual student?
- 2) How important are discussion forums, FAQs, online chat and phone conversations?
- 3) What other criteria make an online tutor successful - re-usable examples and explanations, motivation skills, friendly demeanor, etc?
- 4) How important is it to form a close professional relationship with an individual student?
- 5) How important is a pool of tutors in servicing a student’s needs?
- 6) How important is timely feedback?

A summary of responses to each question follows:

- 1) Grasping the correct problem quickly is very important. For example, students often ask about program code that is faulty in a number of ways. It is easy to explain the first or major fault and accidentally ignore their original concern. The best explanation is a more casual, practical style of expression. If students want a formalised account of how things work, they already have lecture notes and textbooks, and references to these can still be included in the response.
- 2) Although discussion forums allow staff to conveniently broadcast a message, discussion forums seem most useful for students to discuss among themselves. Most web forums do not facilitate staff copying and pasting code or other sources of explanation. Small text input windows, and inability

to see the post being replied to frustrate staff more than students. Also, if staff provide detailed assistance in public, it can lead to student plagiarism issues. Chat sessions are even more restrictive for staff input because there is no time to use prepared material. Discussion forums are valuable to staff for collecting FAQ material, but only for broadcasting FAQs in the next delivery cycle. Phone conversations cannot address technical material adequately (eg. program code), but staff initiated phone calls are effective to discuss course advice, study habits, and progress issues with students.

- 3) Re-usable examples and explanations generally need to be customised for individual students. Otherwise they appear automated, and risk missing the student's particular problem. Learning materials (in the learning management system) should include lots of examples so students can address their issues in terms of them, rather than by referring to a problem with material that staff may not be as familiar with. The latter risks ambiguity and misinterpretation. Online staff believe motivating students is important. Expressing it informally and with a friendly demeanour is key.
- 4) The more a student is struggling, or in frequent contact with staff, the more a close professional relationship is important. Often a particular staff member on the email alias will "click" with a particular student - a further reason to pool staff able to respond to students. A close staff-student relationship is typically expressed informally, and may even risk misinterpretation of humour on occasion. Experienced staff tend to follow the student's lead when it comes to the level of informality and familiarity in interactions.
- 5) A pool of staff is essential to timely turnaround of student email queries. The smaller the pool to meet the turnaround target specified in the student service agreement (average 4 hr in our case), the more consistent the responses. However, a larger pool is generally needed for timely turnaround of assignment marking (average 3-4 days in our case). Within turnaround constraints, a self-regulating pool works well in our experience. A staff member on occasion tells the pool that s/he will be offline for a period, so the others pick up the load. Sometimes a staff member will offer to mark more than their batch of assignments on one occasion, and less on another occasion. If a batch is not marked on time, it is urgently re-distributed among the pool. Managing these deadline driven processes is generally the instructor's responsibility. Fortunately, automated utilities built onto an online assignment submission facility take care of formalities (see (6) below). Staff are prompted to upload marks. Missing marks are flagged, and students notified if their submissions were corrupted etc. Detailed individual student feedback is emailed automatically after all marks are uploaded and checked.
- 6) Timely student feedback is critical, as evidenced above. Hence the importance of an online assignment submission and marking facility. We use an in-house product, WebLearn (Fernandez, G., 2001), plus small scripting language utilities (forthcoming publication). With our flexible deadline policy, it is essential to be able to track late submissions to ensure they are marked within reasonable turnaround time. It is also important to detect trends in late submissions, as these often indicate students falling behind or struggling. Timely intervention is then possible (eg. deferment as a last resort), even if the student has not contacted the learn-support email alias.

5. Conclusions

This project started with the observation that our 100% online delivered courses introducing computer programming at 1st year university level (PP1A and PP1B) were producing a higher percentage of distinction students than the equivalent on-campus delivered courses. After analysing factors such as incoming student qualifications, staff-student interaction time, assessment standards, online course development and online delivery processes, we hypothesised that our online delivery processes are the main factor to explain the higher learning outcomes for our online students.

An evaluation study to determine how and why our 100% online delivery of PP1A and PP1B courses produces a higher percentage of distinction students than the on-campus delivery of these courses arrived at the following reasons (section 3.2):

- 1) One staff member to many students on campus can become several staff to one student online.
- 2) Online students perceive online staff more as mentors than traditional tutors.
- 3) Online staff-student interaction facilitates post mortem assignment discussion more than on-campus staff-student interaction does.
- 4) Learning in an online social context includes positive reinforcement (congratulations for succeeding, praise for trying) more than is practical on campus
- 5) Timely feedback is more readily available online than on-campus, and this enables spontaneous reinforcement.

We assert that these reasons also hold for our other online courses that produce higher percentages of distinction students than the equivalent on-campus courses. Our evaluation study not only confirms the general principle that appropriate and timely feedback is crucial to a successful educational experience; it also shows how and why the online learning experience can leverage this principle to advantage over a typical on-campus higher education learning experience (via the traditional lecture / tutorial / laboratory model).

We also listed the characteristics of successful online staff / student interactions (section 4), as recorded in the online courses producing a higher percentage of distinctions than the equivalent on-campus courses. These most desirable characteristics include :

- 1) Staff grasp the correct problem in each student email,
- 2) Staff explain the problem / solution in terms of casual, practical expression, and
- 3) Staff exude a friendly demeanour, but only following the student's lead.

In conclusion, we have found that not only can 100% online I. T. courses at university level be more educationally effective than the equivalent on-campus courses, but also online delivery processes are more important to that effectiveness than online course development. Showcase online courses with high production values, multi-media content, numerous animations and other special effects contribute, but cannot overcome poor online delivery services. Successful online delivery can make even low budget online course development educationally effective. This accords with the principle that the (online) teacher is mightier than the (online) text book.

References

- Cohen, L., Manion, L. (1994). *Research Methods in Education*. MacMillan ISBN: 0415102359.
- Draper, S. W. (1997). The prospects for summative evaluation of CAL in HE. *Association of Learning Technology Journal*, 5(1), pp. 33-39.
- Fernandez, G. (2001). WebLearn: A CGI-Based Environment for Interactive Learning. *Journal of Interactive Learning Research*, Vol 12, Numbers 2/3, 2001, (pp. 265-280).
- Hervey, J. (Ed) (1998). *Evaluation Cookbook*. ISBN 0 9528731 6 8 [Online]. Available: <http://www.icbl.hw.ac.uk/ltdi>
- Morris, E.J.S. (2003a) *Confidence log* [Online]. Available: <http://serf.cs.rmit.edu.au:8000/OLA/Addendum1.doc> [20th July 2003]
- Morris, E.J.S. (2003b) *Survey* [Online]. Available: <http://serf.cs.rmit.edu.au:8000/OLA/Addendum2.txt> [20th July 2003]
- Phillips, R. A. (Ed) (2000) *Handbook for Learning-centred Evaluation of Computer-facilitated Learning Projects in Higher Education*, Murdoch University.
- Wills, S., McNaught, C. (1996). Evaluation of Computer Based Learning in Higher Education. *Journal of Computing in Higher Education*, 7(2), pp. 106-128. ISSN 1042-1726.
- Zuluaga, C.P., Morris, E.J.S., Fernandez, G. (2002). Cost-Effective Development and Delivery of 100% Online I.T. Courses. In A. Williamson, C. Gunn, A. Young and T. Clear (Eds), *Winds of Change in the Sea of Learning: Proceedings of the 19th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education*, pp. 759-766. Auckland, New Zealand: UNITEC Institute of Technology. <http://www.ascilite.org.au/conferences/auckland02/proceedings/papers/109.pdf>

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