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Laing, Christopher; Robinson, Alan; Johnston, Veronique

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An on-line Spiral Induction Programme

CHRISTOPHER LAING *Northumbria University, UK*

ALAN ROBINSON *Southampton Institute, UK*

VERONIQUE JOHNSTON *Napier University, UK*

ABSTRACT In helping students manage the transition into higher education, there must be (i) an understanding of the needs and expectations of the students, and (ii) a process that inducts the students into the needs and expectations of higher education. This premise underpins the on-line Spiral Induction Programme (onSIP) developed at Southampton Institute. onSIP consists of various on-line activities designed to help students take responsibility for their own learning; feedback from these activities enables both staff and students to identify if and what additional support is required. The intention was to provide a real-time analysis and indication of those students who may be 'at risk', allowing for the appropriate targeting of timely support. Initial results indicate a positive reaction by the students to onSIP. In addition, the predictive feedback from onSIP demonstrates a good correlation with the end-of-year outcomes for a cohort of technology students at Southampton Institute.

KEYWORDS: *higher education transition, student expectations and perceptions, on-line induction, supporting students 'at risk'*

Introduction

Studies undertaken by Lowe and Cook (2003), Cook and Leckey (1999) and Ozga and Sukhnandan (1998) suggest that UK student expectations and skill-sets may not be appropriate for the requirements of successful study in higher education. Student expectations of the teaching and learning environment in higher education are partly driven by their previous educational experiences, their life experiences (Ozga and

Sukhnandan, 1998), and their level of pre-university preparation (Lowe and Cook, 2003). In addition, Cook and Leckey (1999) point out that students will have developed study skills and learning strategies matched to the teaching and learning styles experienced in secondary education, and that these skill-sets are at odds with independent learning styles expected in higher education.

Consequently, the mismatch in expectations and lack of preparation may mean that many prospective students may find the transition from secondary education to higher education difficult, in that they neither have the skills necessary to become independent learners, nor the means of acquiring these skills (Lowe and Cook, 2003; Cook and Leckey, 1999). Retention and progression rates may suffer unless the reality of the student experience can be aligned with their prior expectations and perceptions. As Yorke (1999) points out, for many students it is important that this transition period is managed – and managed well; students must be successfully inducted into the expectations and requirements of higher education – a view echoed by the Select Committee on Education and Employment (2001), who suggested that support at the beginning of a student's academic life was critical to their success. This is especially important, given the diverse range of students now entering higher education, and that nearly two-thirds of those students who withdraw do so during the first year of their course of study (Yorke, 1999).

Does a typical 'Freshers Week' solve this problem?

In the UK, induction is commonly known as 'Freshers Week', and while elements may vary between universities, they share common themes, with presentations on course structure, library and IT systems, Student Associations, and central Student Services. Unfortunately, 'Freshers Week' is often a short period of intensive information exchange, and much of the information is 'dull', particularly when the information exchange is 'passive' (Edward, 2003). Consequently, the effectiveness of these sessions in helping students adjust to higher education may be limited. However, what is perhaps of more importance is that there is also insufficient time to develop social and peer support groups in a more structured manner. Compared to the UK, the majority of US induction (or orientation) programmes are often timetabled into the first semester. The purpose of these orientation programmes is to help students adjust to, and hence participate in, the university environment (Perez, 1998). Perigo and Upcraft (1989) report that such programmes can aid in the retention of students, while Perez (1998) concludes that participation is central to the student 'connecting' with the institution.

Within the UK, various educational commentators (Yorke and Thomas, 2003; Thomas, 2002; Select Committee on Education and Employment, 2001) have suggested that institutions should have a more proactive induction framework, and given that some students are lacking a 'cultural' understanding of higher education (Yorke and Thomas, 2003), this is even more of an imperative. It should be noted that those students whose previous educational experiences have not given them a sufficient understanding of higher education must not be 'blamed'; instead they must be helped to develop the necessary academic study skills (Yorke and Thomas, 2003; Thomas, 2002). Furthermore, induction should be seen not as an event, but as a process that has a more student-centred approach, promoting peer group interaction and academic preparation (Lowe and Cook, 2003), and encouraging social and academic integration (Tinto, 1993).

Providing a more student-centred approach to induction

Southampton Institute, in an attempt to provide a more student-centred approach to induction, initiated a Spiral Induction Programme (Laing and Robinson, 2003a), of which the on-line Spiral Induction Programme (or onSIP) is a particular implementation. The primary purpose of the Programme is to provide an opportunity for students to work on collaborative activities in an informal manner with as many of their fellow students as possible. Robson (1998) suggests that collaborative activities may facilitate levels of peer support and peer learning not offered by teacher-centred approaches. The informal and relaxed manner of the sessions helps students to adjust to the requirements of the university's teaching and learning environment, to deal with change, and to develop those generic communicative and interpersonal skills (e.g. listening, discussing and group working) that are essential in any working environment.

The initial programme runs for the first six weeks, but is extended throughout each academic year with activities at key times to ensure that students receive timely information and support. For example, sessions on: (i) regulations and methods of assessment; (ii) procedures relating to cheating and plagiarism; (iii) mitigating circumstances procedures; and (iv) report writing, standard referencing, etc. are scheduled before assignment hand-in dates. Other sessions on: (i) team working; (ii) study and time management; (iii) personal development; and (iv) skills acquisition are held during the initial six weeks and followed up as required. In some cases, formal sessions may not be needed. The student cohort also has an opportunity to develop additional learning activities for future student intakes. These could be about anything the student cohort considers

important to their learning, as long as the learning activities are designed to help students understand more about their own learning process.

The onSIP provides students with a series of web-based interactive learning activities, designed to encourage the student to take responsibility for his or her own learning, and is primarily concerned with the process of learning rather than content. The activities provide the students with an appropriate challenge from the start of their course, and are developed on the basis that it is 'what the student does' (Biggs, 2003) (or doesn't do) and 'how they perceive' what they are doing that is important.

The onSIP records the student's attempts, which forms part of the evidence that they have participated in the learning activities. If a student does not attempt an activity then they are considered 'at risk'. The interactive nature of the activities provides both staff and student with feedback on if and what additional support may be required.

For each activity students should monitor and record: (i) preparation for the session activity; (ii) attendance and participation in the session activity tasks; (iii) completion of the post-session tasks; and (iv) a rating, on a scale from 0 to 5, of their perception of how well the session outcomes matched their expectations. The academic facilitating the sessions also rates the students from 0 to 5 as follows:

A rating of 3 to 5 (with evidence of the student completing all activities) indicates that the student should be successful if they continue their efforts in their academic subjects.

A rating of 1 to 3 (with evidence of attempting all activities and completion of a majority) indicates that the student may need further assistance in order to achieve success. The two-way feedback provided via the monitoring and rating process, by both the student and tutor, initiates a dialogue centred on the evidence generated from attempting the activities.

All other cases (i.e. lack of evidence of attempting activities, or a difference between the student's and tutor's ratings) may indicate a lack of participation and engagement in the course, or a mismatch between student and Institute expectations. These conditions initiate a more structured intervention strategy.

An important dimension of the onSIP framework is the attempt to bring a student's perceptions and expectations into line with the reality of academic study. The onSIP attempts to initiate the student into a process of learning to learn, in which self-assessment and self-diagnosis are important elements within the whole process, the underlying message being, 'if you recognise the need to obtain new skills, undertake activities needed to acquire those skills, assess your learning needs, and clarify areas of support

needed, then the probability of completing a successful academic career is enhanced' (Robinson and Udall, 2003). By allowing students to take control of their learning, students become empowered and autonomous, from which a sense of learning ownership and hence learning independence can be developed.

In essence, students are encouraged to take responsibility for their own learning within a network of structured support. The onSIP provides a real-time analysis and indication of those students who may be 'at risk'. This early identification of problems (by both staff and student) enables the appropriate targeting of timely support, allowing for rapid implementation of action plans. The automated analysis technique enables the whole cohort to be monitored, reducing the workload overhead in initially identifying those students who may be 'at risk'. The means by which onSIP identifies such students are presented in the following section.

Implementing onSIP

The study cohort consisted of 80 1st year computer science and business information systems students. They were divided into four 20-cohort groups, each with timetabled sessions for the first six weeks. The timetabled sessions were voluntary. The sessions were informal, with no formal teaching structure. During each session, onSIP provided the students with a series on learning activities. These activities included a learning style inventory, skills audit, etc. The student undertook the various activities, and onSIP recorded their attempts. After each attempt, onSIP provided each student with automated feedback. Apart from recording the students' attempts, onSIP also used a Napier questionnaire (Johnston, 2001) and attendance at onSIP sessions to identify those students who may have been 'at risk'.

A simple example will illustrate how the onSIP uses a Bayesian method to incorporate information, and thereby identify those students who may be 'at risk'. Readers should note the following assumptions:

Student B has some academic ability x, this ability can be represented as a distribution, and this distribution reflects the current 'belief' in their possible academic success.

This *prior* distribution can have the form (Hays, 1980):

$$p(x \in A_j) \tag{1}$$

Additional information (relevant to student B) will have some bearing on their possible academic success.

For example, let this new evidence be the results y from the Napier questionnaire. Results from previous Napier questionnaires can be used to

define a distribution of y scores, given possible levels of x, and this conditional distribution of $y \mid x$ can be of the form $p(y \mid x \in A_j)$ (Hays, 1980).

Applying Bayes' theorem we arrive at a new distribution (Hays, 1980):

$$p(x \mid y \in A_j) = \frac{p(y \mid x)p'(x)}{\sum_{j=1} p(y \mid x \in A_j)p'(x \in A_j)} \quad (2)$$

This new distribution reflects an updated (based on information from the questionnaire) belief about student B's academic ability, and represents a *posterior* distribution. If even more evidence is obtained – for example, information from the attendance at onSIP sessions – then this can also be added in a similar manner. Applying Bayes' theorem again will result in another distribution, reflecting a further updated belief about student B's possible academic performance. In this way onSIP continuously reflects the possible academic performance of all those students who underwent the on-line induction programme.

Feedback from onSIP is based on the three regions of academic performance identified by Robinson and Udall (2003), namely:

Region 1 students are participating fully in the teaching and learning process; they should progress into the following year in good standing if they keep this level of work up in their academic studies.

Region 2 students are participating in the teaching and learning process, but may need additional support to progress into the following year.

Region 3 students are not participating fully in the teaching and learning process, and need support in understanding the requirements of academic study in their chosen course.

This feedback (generated from a Bayesian approach) may be viewed as a conditional statement, which allows students and staff to make judgements about whether additional support is needed. An example of a conditional statement resulting from the real-time analysis is presented in Table 1.

Predicting student achievement: the results

Results from the initial implementation indicate a positive reaction by the students to onSIP, with greater student involvement and collaborative learning. In addition, the predictive feedback from onSIP has a good correlation with the end-of-year outcomes for the cohort of computer science and business information systems students who took part in this study.

In the context of this study, student achievement is defined as progressing into the following year. In the majority of cases, students normally pass

Table 1 **Conditional statement of academic performance**

Tutor *A. Non*

Student *1abc03*
Student ID *123456*

You have a Napier score of *62*: *you have a sound foundation for a successful first year, but remember that a high score doesn't guarantee success unless you continue to fully engage with all of your academic studies.*

Your attendance is *less than 41%*, *which is low, and could hinder your studies.*

Region *2*, you *are participating in the teaching and learning process, but may need additional support to progress into the following year.*

What can I do? *With your Support Tutor, have another look at the questionnaire to identify where you scored low and in which areas the Institute does not match your expectations. Some of these things can be changed and some can't. Are there any you could reasonably change? What would you like the Institute to change? Your Support Tutor will help you put together an Action Plan and where necessary point you to other sources of help. Being proactive in seeking out appropriate help and support is an important part of a successful first year.*

and proceed into the following year without a deficit (Region 1 students). However, some students who proceed, do so carrying a deficit (Region 2 students). This deficit (according to the Institute's assessment regulations), must be cleared at the earliest opportunity, which usually means attempting the referral during the September re-sit period. Some students will clear their deficit and proceed as Region 1 students, while others will clear sufficient units to proceed with the remaining deficit as Region 2 students. Region 3 students are those who are unable to proceed to the next year.

During this longitudinal study the system identified at *week* 6 of the academic session:

83% of Region 1 (PASS – Proceed) and Region 2 (REFER – Proceed with Deficit) students, i.e. those students who progressed with no or some deficit into the following year.

69% of Region 3 (REFER – Cannot Proceed until Deficit reduced) students, i.e. those students who were unable to progress into the following year.

It should be noted that this identification is based on the voluntary onSIP sessions and not the academic units of study.

Discussion

Feedback from the students indicated a positive attitude to onSIP, expressing a view that the sessions provided an opportunity for students to work in a collaborative and informal manner. Students also felt more integrated into the teaching and learning environment of Southampton Institute, with the majority of students being classified as active participants. The focused activities allowed for a rapid pace – students undertaking individual on-line activities, with the immediate feedback provided by onSIP being used in subsequent group activities and discussions. Overall, this immediate feedback led to higher levels of student participation. The students appreciated the use of a structured framework for the session activities, supported by onSIP.

As onSIP activities were undertaken on-line, students did not need to make any hardcopies. However, students were expected to maintain a logbook (portfolio) to record their reflections on the activities and the discussion thereafter. However, many of the logbooks only contained a minimum of reflective writing. The use of logbooks was not well supported, and the reason for this needs further investigation.

Napier questionnaire

The Napier questionnaire is a diagnostic test, developed by Johnston (2001). This questionnaire is based on a paper survey of first year students at Napier University. It was distributed from November 1996 until January 1997, and completed by students during class time. An additional telephone survey of 43 non-responders to the paper survey was undertaken. This was used to identify the characteristics of these non-responders, and to ascertain whether they were critically different from the responders. A postal survey of 77 students who withdrew during the 96/97 academic year was also undertaken.

In order to provide a 'richer' student-specific data set, each survey response was linked to the appropriate student record. A 'hot-decking' technique was used to 'generate' any missing data in the survey returns. This technique uses a range of known characteristics to group similar records; from which a likely value (given those characteristics) for the missing data can be identified.

The derived questionnaire was based on 756 survey returns from a possible total of 1456 students – a response of 52%. An initial analysis indicated that those students who ultimately progressed were also more likely to undertake the student survey. To compensate for these differences in the response rates, a logistic regression procedure re-weighted the data to resemble the original population. This logistic regression identified 20

student characteristics that were found to be jointly influential over the likelihood of academic success in the first year. The results of this research indicate that early identification of students at risk is possible, and that the diagnostic questionnaire could aid in this identification.

Attendance monitoring

Evidence (Devadoss and Foltz, 1996; Durden and Ellis, 1995; Park and Kerr, 1990; Romer, 1993; Schmidt, 1983) would appear to suggest a link between attendance and academic performance, while Eaton and Bean (1995) point out that those students who are 'at risk' may be those very same students who are the 'least visible'. Indeed, the question arises: do students leave 'quietly', testing the institution through non-attendance to see if the institution notices or cares?

The authors accept that studies by Devadoss and Foltz (1996), Durden and Ellis (1995), Park and Kerr (1990), Romer (1993) and Schmidt (1983), do not imply a causal relationship. Moreover, the majority of such studies are from a US perspective, and the cultural and educational differences may negate the findings. However, the evidence appears to indicate that some form of correlation exists, supporting the hypothesis that students benefit from attending teaching sessions, and that more attendance is better than less attendance. From a UK perspective, this view is shared by Gatherer and Manning (1998), their studies suggest the existence of a weak but positive correlation between lecture attendance and exam performance, while for ethnic minority students there is a high correlation between lecture attendance and exam performance. In light of such studies, the authors believe that the influence attendance plays in academic performance should be included within the Bayesian model.

A Bayesian approach

Bayesian methods allow for the disciplined assimilation of information from differing sources and may be viewed as an extension of classical probability (Hays, 1980). However, the idea of prior and posterior distributions may present difficulties for some conventional statisticians, and probably some educationalists. This is especially so, where these prior and posterior distributions represent individual beliefs. These beliefs will be personal and subjective, and will influence the determination of the posterior distribution. In this study, the initial prior distribution is derived from the academic performance of past Napier University students. The problem with this approach is the implication of similarity; is the past academic performance of Napier students the same as the current academic performance of Southampton students? However, since onSIP is an attempt at continuous monitoring (from which the identification of students at risk

will be undertaken), the data mass will continue to grow, and the original distribution will become irrelevant; this initial prior will be swamped by the accumulated data (Hays, 1980). It should be noted that the biggest advantage of using a Bayesian methodology is that the inferences try to include all the available information (MacKay, 2003). With this mind it is the intention of the authors to extend onSIP by capturing additional characteristics of the teaching and learning environment.

One aspect that is missing from onSIP is the student's perceptions of the teaching and learning process. Prosser and Trigwell (1999) have argued that the quality of a student's learning is related to the student's perception of the teaching and learning environment. The authors believe that a student's perceptions are also central when trying to understand, and hence explain a student's decision to withdraw. Laing and Robinson (2002; 2003b) have previously argued that, in attending to the explanations of withdrawal, consideration must be given to discovering the manner in which a student's perceptions of the teaching and learning environment may influence their decision to withdraw. Laing and Robinson (2003b) provide an explanation of the teaching and learning environment as it relates to the student's beliefs, student/staff actions and the intentions of the institution. There are indications that the use of this additional information may improve the predictive properties of the model, and future work will attempt to incorporate this 'grounded' study into onSIP.

It should be noted that onSIP, while having a high success rate at predicting Region 1 (PASS – Proceed) and Region 2 (REFER – Proceed with Deficit) students, has a slightly lower success rate at predicting Region 3 (REFER – Cannot Proceed until Deficit reduced) students. Region 3 students are by definition not fully participating, resulting in fewer data on which to base the prediction. However, does such a tool have to be completely accurate? How good a predictor does a tool need to be before it is fair to use it on students? If the tool is so good at identifying Region 1 and Region 2 students, is it appropriate to assume that the remainder are Region 3 students, and plan accordingly?

Conclusions

The aim of the onSIP is to provide a real-time analysis and indication of those students who may be 'at risk'. The use of onSIP enables a measure of risk to be generated for each student automatically. However, making the assessment is merely the first part of a process of negotiation – a process that will help in identifying the tensions that sometimes exist between the expectations the student has of the institution, and the expectations the institution has of the student. Consequently, this negotiation becomes part

of the educational team building, in which both parties (student and institution) share common goals. The automatic nature of this assessment reduces the staff workload, and provides timely analysis and information, thereby allowing staff to formulate an appropriate intervention strategy before the student's performance is irretrievably affected.

These findings appear to suggest that the Bayesian feedback from the online Spiral Induction Programme enables an improved prediction of the end-of-year outcomes for a group of technology students at Southampton Institute. This prediction was made at only week 6 in the academic year, and in a series of voluntary activities. However, there are some caveats, which require further consideration. Firstly, just how 'universal' is this model? This approach may be applicable to the Technology Faculty at Southampton Institute, but what of other institutions? This approach needs to be further validated in other higher education establishments. Secondly, the number of students in this initial study was low (when compared to the overall first year student cohort). Therefore the level of confidence that can be assigned to the dependability of the predictions made by onSIP requires careful consideration.

With an ever-increasingly diverse student population entering higher education, the 'one size fits all' model of induction and subsequent support is no longer satisfactory. This initial study has shown that automated techniques can provide an efficient predictive system to identify 'at risk' students. This early warning allows for more targeted and personalized support in a proactive rather than a reactive manner.

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Biographical notes

CHRISTOPHER LAING is a Senior Lecturer at Northumbria University. He is currently developing the supporting website for the School of Informatics 1st year Study Skills Programme. He is also Module Tutor for the Object Oriented Design 2nd year undergraduate module.

Address: School of Informatics, Engineering & Technology, Ellison Building, Northumbria University, Newcastle upon Tyne NE1 8ST, UK. [email: christopher.laing@unn.ac.uk]

ALAN ROBINSON is Associate Dean (Operations), Technology Faculty, Southampton Institute. Research includes promoting student learning: the transition to HE, identifying students 'at risk', intervention strategies, and developing the independent learner.

Address: Faculty of Technology, Southampton Institute, East Park Terrace, Southampton SO14 0RD, UK. [email: alan.robinson@solent.ac.uk]

VERONIQUE JOHNSTON is an Academic Development Adviser and Teaching Fellow at Napier University, Edinburgh. She has led Napier's Student Retention Project since 1994 and her research interests include student participation and success.

Address: Quality Enhancement Services, Bevan Villa, Napier University, Craighouse Road, Edinburgh EH10 5LG, UK. [email: v.johnston@napier.ac.uk]