Team trails, trials and tribulations – rigorously reckoning with requirements

V. Pieterse
Department of Computer Science
School of Information Technology
University of Pretoria
Pretoria, South Africa
e-mail: vreda.pieterse@up.ac.za

C. M. du Toit
Department of Arts, Languages and Human Movement Studies
School for Teacher Training
University of Pretoria
Pretoria, South Africa
e-mail: Cecilia.duToit@up.ac.za

Abstract

A major challenge to the efficacy of student team learning projects occurs when some members of a group are unable to contribute effectively to the collaborative endeavour due to their academic deficits. A graded benchmark for the requisite academic maturity is the setting of admission requirements. Various research studies have shown a positive correlation between student achievement outcomes and prior learning activities. Very few viable solutions, however, have been offered to address the problem of deficient prior learning skills. This empiric study describes an intervention that was designed to furnish at-risk students with the requisite baseline skills to collaborate more effectively with team members who have already attained a higher skills level. The intervention is two-pronged: it involves a close scrutiny of the students' performance in those modules that they are repeating, as well as negotiation between lecturer and students about standards and support in the current module. The structured negotiations resulted in a mutually binding agreement. This article reports on the problems encountered when students lack adequate knowledge and skills upon entering a module. We investigated reasons for this phenomenon in this particular case and describe the process of the design and implementation of our intervention. The findings highlight its overall impact as well as how students experienced the intervention.

INTRODUCTION

The purpose of admission requirements for specific modules is twofold. On the one hand they serve as indicators that students admitted to the module have mastered the requisite knowledge needed to successfully attain the module content. On the other

hand, they can be used to specify the order in which the modules in a programme are expected to be completed. As described by Perlman and McCann (1999), admission requirements allow instructors to assume that students possess a certain degree of background knowledge or prior learning on the subject, and the sequence of the subjects is ordained by the admission requirements structures of the degree programme.

Regarding requisite knowledge, an example is found in a module that requires students to use technologies such as word processing, presentation software, e-mail and the internet for the completion of set assignments. In such a case, it is reasonable to expect that students have completed a computer literacy module in which the use of these technologies is taught prior to enrolling for this module. If a student is not sufficiently computer literate, the pass rate of the module is compromised.

Concerning the order of programme modules, the application of admission requirements to structure a programme occurs when a module is presented later in a programme because it requires a higher degree of academic experience. The requisite so-called intellectual maturity can be underwritten by expecting students to have completed other selected modules that serve as evidence of such maturity although the content need not relate directly to the specific module.

STUDENT BACKGROUND

Positive correlations between compliance with admission requirements for a module or programme and success have been established through empiric research. For example, Von Allmen (1996) found that adequate performance in calculus has a strong influence on achievement in an Intermediate Microeconomics course presented at Moravian College in eastern Pennsylvania. Plutsky and Wilson (2000) found that students who completed the business computer literacy requirements performed significantly better in a business communication course presented at the California State University than those who did not. Potolsky et al. (2003) found a strong correlation between grades achieved in prerequisite courses and the academic performance of students in a baccalaureate nursing programme.

Supporters of a strict application of admission requirements maintain that it can increase the students' overall performance and increase the quality of attainment in the specific module or programme. Potolsky et al. (2003) recommend that the required compulsory grades on the prerequisite courses for entering the baccalaureate nursing program be toughened, and furthermore maintain that it should be considered to deny students further participation in the programme when they have failed and retried the prerequisite courses. Perlman and McCann (1999) found it deplorable that 30 per cent of integrative capstone courses in psychology presented at American colleges require no admission requirements while another 30 per cent only require introductory courses.

The successful completion of the prerequisite courses for a module, does not guarantee that the students retain the necessary prior knowledge and skills. Peper

et al. (1994) point out that students are often insufficiently au fait with the core knowledge of prerequisite modules. This phenomenon necessitates the revision of the content of the previous modules at the beginning of the presentation of the current module.

PROGRAMME STRUCTURE

If an advanced module depends on the application of transferable skills that have to be acquired in prior modules in the programme, the advanced module needs to be presented at a later stage in the programme (Plutsky and Wilson, 2000). In this case it is reasonable to allow students access to the advanced module only if they have passed the prior modules where they should have acquired the transferable skills needed for the advanced module.

It can however be decided to present an advanced module later in a programme merely because it requires a higher degree of intellectual maturity. In this case the decision concerning the admission requirements for the advanced module is not as straightforward as in the case where identifiable skills or knowledge are required. It is desirable to apply suitable admission requirement rules to ensure that the students who are allowed to register for the advanced module, have attained the required academic maturity. Perlman and McCann (1999), for example, recommend that lecturers should systematically and sequentially increase the complexity and nature of their core materials. Students will fare better if lecturers sensibly strategise their psychology programme and rigourously apply a prerequisite structure.

SCENARIO

The article describes the case of a software engineering module, here called Module 3, which is presented in the final year of the three-year B.Sc. Computer Science programme at the University of Pretoria. In this module the students are required to apply and integrate the knowledge and skills they have acquired in many of the modules in the programme, including modules that are presented in conjunction with Module 3 in their final year. At the core of the module is a team project. The knowledge and skills needed to complete the project are tapped from the knowledge base of the team as a whole. It is therefore not essential for all students to have acquired the full spectrum of assumed prior knowledge and skills because other members of the team may be able to compensate for some individual's incompetencies. It is, however, imperative that each individual entering the module has attained adequate academic maturity. If a student's academic achievement is questionable, he or she will not be able to contribute sufficiently to the team effort. It is not fair to expect other students to 'carry' students who lack core knowledge and skills. For this reason it is expected that students must complete some core modules in the programme in the prescribed sequence as shown in Figure 1.

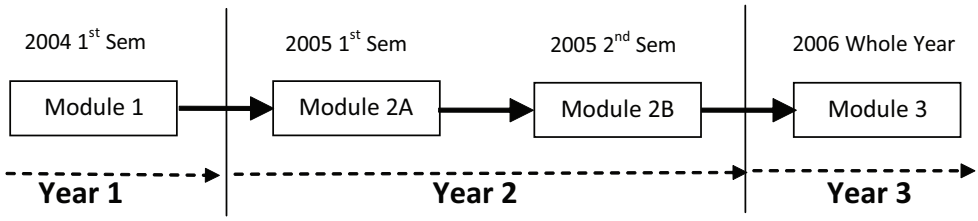

Figure 1: Published requirement route

RESEARCH PROBLEM

When Module 3 was presented in 2005 the lecturers noticed that a substantial number of students seemed to lack the academic maturity to manage the expectations of the module. As a result, the more able students had to work harder than would fairly be expected from a student to pass the module. Likewise, some less capable students passed the module despite the fact that they did not contribute satisfactorily to the team effort.

The questions that have to be answered are:

1. How can the academic maturity of students entering the course be improved?
2. What can be done to minimise the negative effects of having to accommodate students who are unable to contribute sufficiently to the team effort?

ANALYSIS OF THE PROBLEM

The logical place to look for possible reasons for the apparent lack of academic maturity was in the application (or the absence) of the admission requirements for Module 3. We calculated the percentage of students who were allowed to register for Module 3 without prior completion of a module, here called Module 2B, which is considered a standard to validate the academic maturity of the students.

In 2005, 29 students (26.1% of the class) were granted permission to enrol for Module 3 although they had not yet passed Module 2B. All but one of them passed Module 3 but only 22 of them passed Module 2B in 2005. There were seven students who passed Module 3 without complying with its prerequisites.

Although not stated, it is furthermore implied that students should previously have passed a course, here called Module 2A, in order to be allowed to Module 3. An investigation revealed that 28 students (25.3%) of the class of 2005 had not yet passed Module 2A when they registered for Module 3. All but two of them passed Module 3 and eighteen (16.2%) of those who passed Module 3, again failed Module 2A.

Our concern is that this phenomenon results in the lowering of the value of Module 3 since these cases illustrate that the ability to pass Module 3 does not necessary mean that the individual who passes the module is able to apply his or her knowledge and skills to a project. It is possible that a number of individuals did not have the

background to be of value to their teams and were carried by the other students in their teams.

CAUSE AND EFFECT

A closer investigation of how students succeeded to enrol for Module 3 despite their poor academic history revealed that it could mostly be attributed to the fact that the admission requirements are not consistent. Each year the requirements and credits for all modules of a degree are stipulated in the yearbook. These vary from year to year.

The rules in the yearbook of the year that the student first registers for their degree in Computer Science at the University of Pretoria are applied to the academic record of each individual. Prior to 2004, the admission requirement for Module 3 was stated to be a core first year module, here called Module 1, plus a certain number of second year modules, without stating any specific second year modules. As a result students who have been in the programme for longer than the expected time, are not specifically required to have passed Module 2B to enrol for Module 3. Furthermore, the admission requirements are not strictly applied. Sometimes individual students are granted permission to enrol without completely complying with the prerequisites of the module. Often admission requirements are relaxed if the impact of not completing Module 3 in the current year would unnecessary prolong the remainder of the student's personal study plan. We are concerned that students who qualify for exemptions of this kind, may not be academically mature enough to grasp the concepts that are learnt in this module and be of little value to their teams.

LOOKING FOR ANSWERS

A survey was conducted involving 21 students who had completed Module 3 before 2006 but still had to pass Module 2A. An invitation to participate in an online survey was e-mailed to these students. The participating students were guaranteed anonymity. With this survey we intended to unravel the factors that might have contributed to their failure to pass Module 2A.

The questionnaire consisted of two sectors. The first sector commenced with questions of a biographical nature, after which the following two questions were asked:

- In retrospect, do you think it would have been easier for you if you had postponed COS301 rather than trying to complete COS212 and COS301 in the same year? (Y/N)
- What can be done to support students to be able to complete both modules in the same year? (If you have no suggestions you may leave this answer blank)

The second sector questions were open-ended, and answering them was not compulsory:

- What factors can contribute to success in COS301?
- What factors can contribute to failure in COS301?
- What factors can contribute to success in COS212?
- What factors can contribute to failure in COS212?
- What can be said to encourage students who struggle?

Eleven (52%) of the students responded.

The responses to the first question indicated that about half the students thought that it would not have made a difference if they had first completed Module 2A before Module 3. This was contrary to the expectation that more students would have realised that it would have helped them to complete their degree.

Content analysis of the rest of the answers revealed that the students blamed the heavy workload and their lack of commitment for their failure. The candour with which they analysed their problem with successfully completing the programme was remarkable.

One of the seven respondents who indicated that completing Module 2A before attempting Module 3 did not matter, motivated his opinion as follows: 'I did not need any of the work covered in it (Module 2A) in order to successfully complete the project'.

The students who realised that it was better to complete Module 2A first offered three reasons for their stance:

- They argued that the knowledge and skills were useful: " … passing data structures first will give students a better chance to do well in the project"
- They said that the workload required to do both modules simultaneously was overwhelming "One shouldn't take to (sic) many other modules along with data structures (Module 2A)"
- They pointed out that having students who had not completed Module 2A on a team resulted in unbalanced contribution. It led to "an overload of work on one group member". It also resulted in the withdrawal of a student, forcing the others to work on his behalf: "they end up giving other students to work on the project alone (sic)".

It became evident that students who lack academic maturity while doing Module 3 need high quality guidance and support to enable them to persevere with their academic responsibilities beyond Module 3. One student, for instance, stated that if a student was enrolled for Module 3 he or she 'should get Honours /Masters mentors to give them guidance to master data structures (Module 2A)'. The pressure, imposed by the moral obligation students feel towards their teams, needs to be lessened.

We further investigated why there were so many students enrolled for Module 3 in 2006 despite the fact that they have failed Module 2A. We found that it was a consequence of the fact that the programme was not presented to the students as it was published in the yearbook when they registered. Figure 1 shows a simplified

version of the requirement graph of the courses concerned as they appeared in the 2004 yearbook. This is relevant because the majority of the students, who enrolled for Module 3 in 2006, first registered for their degree in 2004.

Figure 2 shows how these modules were presented to the majority of the 2006 Module 3 students and which requirements were applied. As can be seen, it was decided to switch the presentation of Modules 2A and 2B. The reasons for the substitution are irrelevant here. Notice that the switching of the order of presentation prevented the department to apply the published entry requirements. Thus, the requirements for Modules 2B as contained in the yearbook could no longer have been applied. Instead of regarding Module 2A as a prerequisite for Module 2B, the successful completion of Module 1 became the admission requirement. This made perfect sense since Module 2A could not be used as a requirement if it had not yet been presented to the students. The unfortunate result was that it left Module 2A dangling. Consequently some students appeared to be less serious about passing Module 2A. What they failed to realise is that although Module 2A is technically not a requirement for Module 3, it is assumed that students registering for Module 3 have already acquired the knowledge and skills associated with the outcomes of that module.

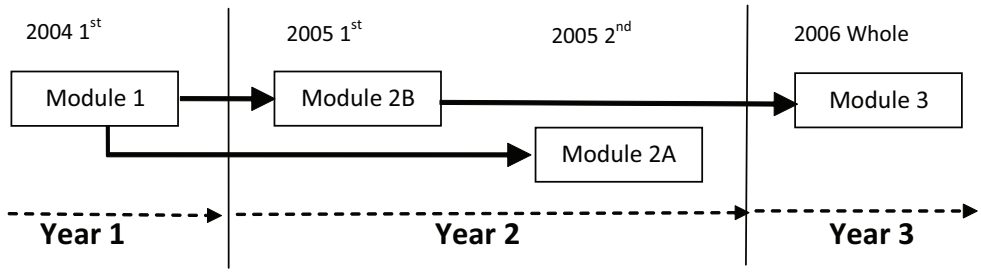

Figure 2: Implemented requirement route

A strategy to rectify the problem in future would be to have both Module 2A and Module 2B as requirements for Module 3. If both these modules have Module 1 as their requirement, the order in which they are presented will not have any impact on the preparation required when reaching Module 3.

Unfortunately, we will only be able to implement such a decision for students who start the programme after the decision has been approved by the university's senate. In the meantime, we are faced with the problem of ensuring academic maturity using other methods than the application of more appropriate admission requirements for the module. Due to our commitment to students who have previously registered for the programme and our associated obligation to allow them to Module 3 according to the identified flawed prerequisite structure, we are responsible for accommodating these academically immature students in Module 3. We strongly feel that this implies that we have to ensure that these students reach the assumed maturity while

completing Module 3. Students who are unable to contribute adequately to the team effort should not be abided indefinitely.

ENHANCEMENT OF ACADEMIC MATURITY

The following actions were taken to enhance the academic maturity of students who register for Module 3 in 2006:

Convince at-risk candidates not to register

We propagated the viewpoint that too heavy a workload had a negative effect on overall success. For many students who had previously failed some modules it would be better to spread their current remaining modules evenly over two years rather than trying to attempt an extremely heavy workload. Only a few students were convinced by the argument and did not register for Module 3.

Apply admission requirements strictly

We decided to apply the current prerequisites to the module as strictly as possible. As a result ten students who managed to register while strictly not complying with the written prerequisites were deregistered. However, we were in a position in which we could not deny admission to Module 3 for another ten students (9.26% of the class) although they had not yet passed Module 2B. We also noticed that 38 of the students who enrolled for Module 3 in 2006 (35.2% of the class) had not yet passed Module 2A.

Settle an agreement with the students

Students were encouraged to sign an agreement to devote equal attention to their academic responsibilities regarding Module 3 as well as possible outstanding modules. This option aims to bolster the academic maturity of students while participating in Module 3 with a view to attaining a sufficient standard. In exchange, the lecturer commits to giving the students who comply with the minimal norms of Module 3 a pass mark provided that they meet the specified goals regarding the outstanding modules. In effect, the standard for Module 3 is lowered to transfer some of the total student effort from Module 3 into the outstanding modules.

NORMATIVE ASSESSMENT

The norms for the assessment of Module 3 firstly entail individual assessment of the theory component of the module. Secondly, the practical application of the theory is done by teams. Its assessment is divided into two components, namely implementation and documentation. Since marks for the latter two components are only awarded to teams, it is implied that a student has to be a member of a team to acquire marks for these components. To pass the module, students must acquire a

sub-minimum of 40 per cent for the three components as well as a minimum of 50 per cent average for all three components.

To develop the requisite academic maturity, it was decided that 'adequate' in this case would be equal to the sub-minimums stipulated for the different components of Module 3 as well as a pass mark for the first semester test of Module 2A and passing Module 2B. The students were thus asked to agree to deregister for Module 3 when it became evident that they could not comply with this academic standard. The possibility that some members of a team might be expected to deregister as a result of not complying with the set norm, made the students nervous. The possibility of having to lose too many members from their teams and consequently not being able to complete the module due to the failure of others were real concerns.

NEGOTIATING EDUCATIONALLY

According to the online Oxford Dictionary negotiate means 'to communicate or confer (with another or others) for the purpose of arranging some matter by mutual agreement; to discuss a matter with a view to some compromise or settlement'. This is a good description of the process that was followed. The main features of the agreement were the following:

Negotiation with at-risk students

The lecturer had numerous discussions with at-risk students in which concern with each individual's overall academic progress was expressed. The objective of these negotiations was mostly to persuade the students to arrange the balance of modules they still need to complete for their degree in digestible chunks and to assist them in the formation of teams with members in a similar predicament. The rationale behind this was that if all members are in the same situation, they can agree to undertake a less ambitious project to allow them enough time to devote to Module 2A.

Negotiation to comply with admission requirements

Negotiating with students who technically complied with the prerequisites and encouraging them to agree to achieve stricter requirements were a challenging endeavour. Most students initially felt strongly that they were unfairly treated by the inclusion of satisfactory performance standards in Module 2A in the agreement.

We finally agreed to only use the first semester test as a norm. We reasoned that in order to achieve this, they had to apply proper time management, to keep up with the heavy workload imposed by Module 3 while performing adequately in their outstanding modules. For students who had previously struggled with the prerequisite modules, this could be overwhelming. We reasoned that if they passed the first semester test it would build their self-confidence and bolster their motivation to complete it. Increased pressure to work hard would be imposed on them through an agreement. If the hard work paid off, they might be encouraged to maintain the pace to the end of the year.

Negotiating to comply with minimum standards

Two of the norms for assessment of Module 3 were waived for students who agreed to engage in the challenge. Firstly, it was not required to achieve an overall average of 50 per cent. Apart from having to comply with the sub-minimums for the different aspects that were assessed, no other minimum was required. This means that a student, who succeeded in achieving exactly 40 per cent for each of the aspects, would pass Module 3 although his or her final average was only 40 per cent. The fact that it was only required to maintain the sub-minimums for Module 3 took away some of the pressure to which these students were subjected within Module 3.

Secondly, the requirement to stay in a team was also dropped. We hoped that if the requirement to deal with unbearable team pressure had been removed, the students at risk would be more relaxed and able to perform better in general. To accommodate students not in teams, provision was made for individuals to earn project marks outside their teams. This allowed stronger students to earn their own marks without having to carry weaker students. It also provided for students whose teams had disintegrated due to the failure of fellow students.

The INANE Agreement

As a result of the negotiations with students that were conducted mostly during team meetings, the so-called INANE agreement was designed. The name of the agreement was originally **nane**, which is an acronym for '**N**ormative **a**ssessment: **n**egotiating **e**ducationally'. Inane usually means 'empty' or 'void', or worse, namely 'silly', 'ridiculous', 'frivolous' or 'mindless'. The meanings of 'inane' are eminently suitable for this agreement, since in essence the agreement contains only clauses that are in accordance with the written standard rules and regulations of the University of Pretoria and their application. The agreement involves two parties. On the one hand, the student signing the agreement agrees to comply partly with the neglected implied admission requirement of Module 3 as well as with the sub-minimums for the module. On the other hand, the lecturer agrees to pass the student if he or she has complied with his or her part of the agreement.

The sub-minimums were delineated with clear benchmarks at the end of every term. This enabled the students to monitor their own progress.

All students who signed the INANE agreement did so voluntarily. The administering of the agreement posed some challenges to the lecturer presenting the course. Its application is the responsibility of the student, but it needed some additional monitoring to ensure its educational success. It also required some ingenious shuffling of stranded members into teams at risk during the course of the presentation of the module. This is a new concept in student teamwork since it necessitates the possibility of a new member joining a team whose members have worked on their project for some time. Although it might become an administrative nightmare, it is educationally sound since it simulates the real world more closely

than the traditional way of trying to keep members in the same team regardless of the functionality of the team.

THE IMPACT OF THE INANE AGREEMENT

Student perspectives

A survey involving all 106 of the students in the class was conducted to determine how the students experienced the INANE agreement. The students were asked to complete a printed questionnaire. Completion of the questionnaire was optional. Although team names were known, participation was conducted on an anonymous basis. The questionnaire included questions to rate their perception of the influence of the INANE agreement. They also had the option to write general comments. The following remark was made by a student who felt positively about the impact of the agreement:

> The inane contract is a generous offer to those who does (sic) not have the requirements to officially take COS301.

Members of one team felt that it united the team, while members in another team stated that it had the opposite effect:

> Met die kontrak was dit sleg vir ons groep, maar ter selfde tyd het dit ons groep verenig op die saak wat ons oor saamstem. (Having the contract was unpleasant for our team, but at the same time it united us because we agreed about the matter)

> Those that still need to do COS212 fear the contract (at least 1). Those that do not owe COS212 want to sign the contract. This splits our group a little bit.

The following remarks were made by students who are opposed to it:

> The inane contract is a good idea, but I feel that it is a bit extreme.

> It is unfair that the students are not the one's (sic) to suffer the consequence

They were also asked to rate their perception of the influence of the INANE agreement on the motivation on the individuals who still owed Module 2A as well as on the team morale using a five-point scale ranging from negative to positive with the middle option meaning that the agreement has no impact. Eighty-two students (77.3%) responded to the question probing their opinion regarding its influence on personal motivation, while 87 students (82%) rated their opinion about its influence on the team morale. Figure 3 shows the results.

As can be seen, slightly more students indicated that they experienced it positively. There is, however, a large section of the class who maintained that it had no influence or that it had a negative impact on them.

An interesting observation is that none of the students, who were in favour of the agreement, nor those opposed to it, had any concern about the lowering of the standards of Module 3.

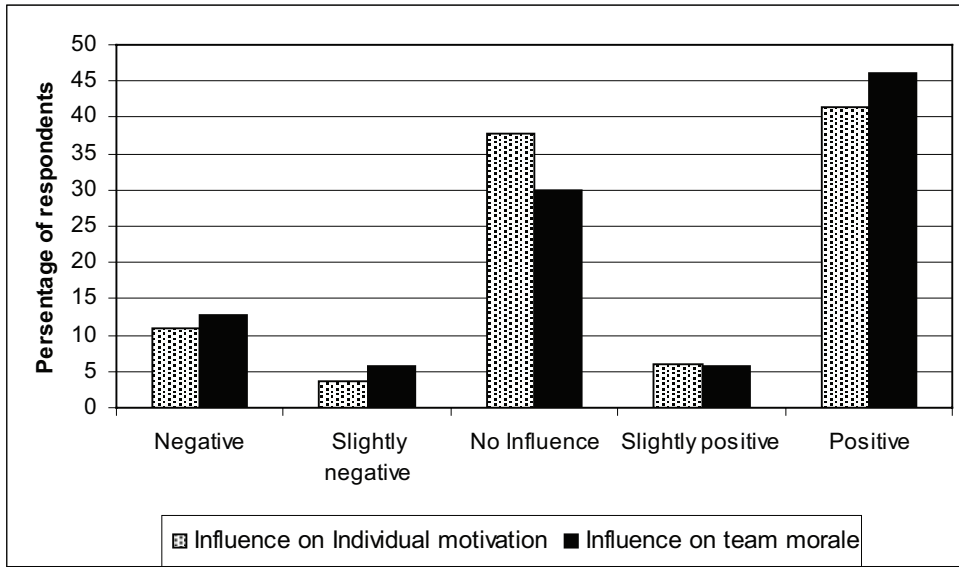

Figure 3: The influence of the INANE agreement on the team

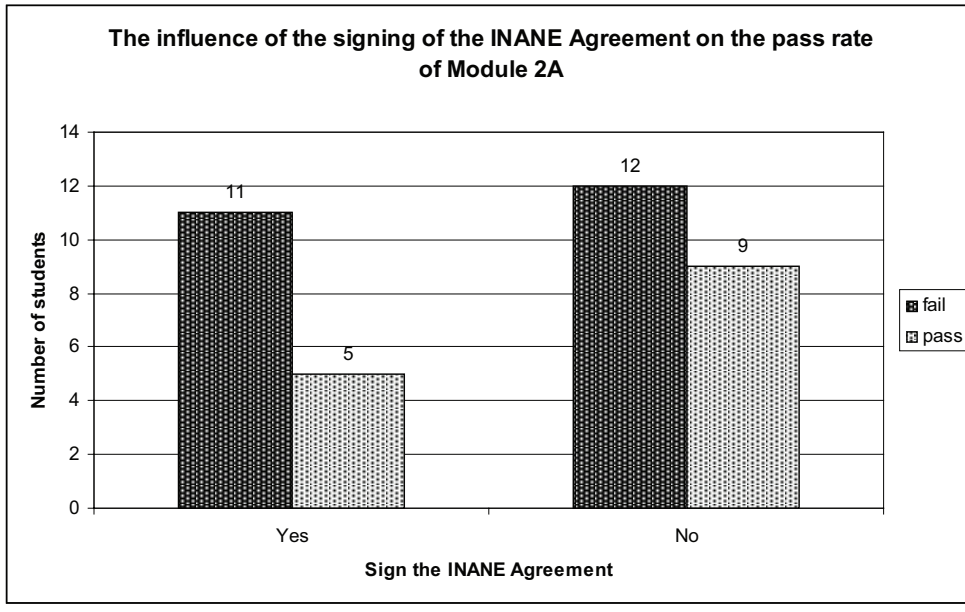

Figure 4: The influence of the signing of the INANE Agreement on the pass rate of Module 2A

Effect on student performance

Not all registered students participated in this action. During the first semester the students were closely monitored. An encouraging observation was that all the students who owed Module 2B, and had signed the INANE agreement, passed Module 2B at the end of the first semester, while those who did not sign, failed. It can be attributed to a more focused motivation to pass Module 2B or it can indicate that those who were uncertain simply did not sign.

Unfortunately it was not possible to monitor students during the second semester with regard to their performance in Module 2A. The students were aware of that. As a result, the students ignored the INANE agreement. Of the 37 students who owed Module 2A, 14 passed and 23 failed the module. As can be seen in Figure 4 the relation between pass and failure in the group who did not sign the INANE agreement was better than the group who did sign. It can be concluded that the agreement had a negative effect in certain respects. If the INANE contract had been applied, it would have resulted in 11 students de-registering for the module, impacting negatively on five teams. This would have had a devastating effect on the students remaining in the course.

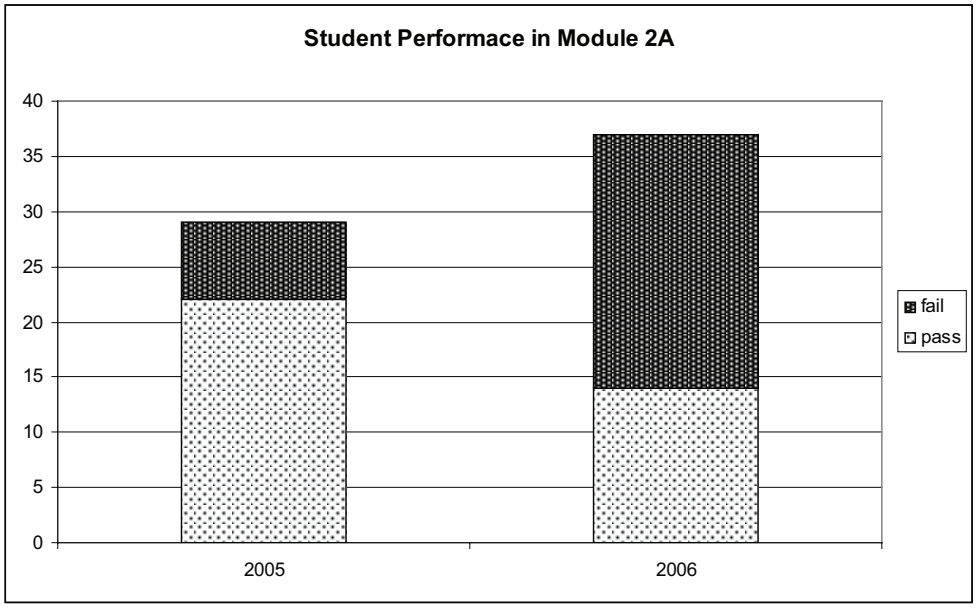

Figure 5: Student performance in Module 2A in 2005 and 2006

Figure 5 shows the performance of students in Module 2A in 2006 compared with the results of 2005. Despite the result that many students felt that the INANE agreement had a positive effect on their personal motivation, their performance showed the contrary.

CONCLUSION

The fact that two thirds of the marks for Module 3 were allocated to different deliverables associated with a large team project led students to exert pressure on one another and onto themselves not to drop the team. The strict rules in Module 3 regarding the size of a team aggravated this problem, since if a student dropped out of Module 3, it might mean that the rest of his or her team were disqualified. Academically poor students were willing to sacrifice their other subjects in order to continue to support their teams, not realising that their contribution to the team effort was not making a great difference. In many cases the rest of the team felt as if they were carrying such a student and might have been able to be more productive if they were not required to accommodate a student who lacked certain competencies or skills.

In an attempt to discourage students to neglect outstanding modules, students were invited to sign the so-called INANE agreement which essentially required students to devote due attention to outstanding modules while maintaining only the sub-minimums for Module 3. A compromise that was made for students who signed the agreement was that students who remained in Module 3 after some members of their team had been eliminated due to non-compliance to the agreement would be catered for regardless of what happened to their original team. The responsibility to accommodate these stranded students and provide for the possibility to pass Module 3 was transferred to the lecturer, and therefore the team members were relieved of the responsibility to carry the weak members at all cost in order to save themselves. Team managers were also advised to allow for 'study leave' for students who had not yet complied with the requirements of the course to support them in keeping to the agreement. By doing this, the students, from an educational viewpoint, were given the permission not to feel guilty about their teams. If the students were more relaxed in terms of their responsibilities towards their teams, the chances were increased that they would be able to contribute to expectations and experience the rewarding feeling of achieving in a team. A slight majority of students felt that the use of the INANE agreement improved their personal motivation and team morale. There were, however, a number of students strongly opposed to the idea and felt that it impacted negatively on them.

We had great expectations that our effort would result in a more positive prognosis regarding the performance of students in Module 2A and Module 2B in 2006, when compared with the results of 2005. In the first semester it appeared to have paid off. However, too few students were involved to make any conclusive inferences. Unfortunately the application of the INANE agreement could not be monitored in the second semester. As a result, the already dismal results of the previous year were magnified. Since the students knew that their progress could not continue being monitored, it is possible that they were not sufficiently motivated to pass. One can only surmise whether monitoring could have improved their progress and what the implications could have been if students who failed to comply with the INANE

agreement were to be removed. It is therefore recommended that, in future, students' adherence to the INANE agreement be more closely monitored until the end of the academic year.

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