REFLECTIONS TOWARDS ENHANCING STUDENT RETENTION APPROACHES IN ENGINEERING EDUCATION FROM A CO-CURRICULAR PERSPECTIVE

AS Lourens: HoD, Industrial Engineering
RE Connelly: Senior Counselling Psychologist, Student Counselling
RC Plaatjes: Senior Academic Professional Developer, AD Unit
PJ Snyders: Academic, Industrial Engineering
REFLECTIONS TOWARDS ENHANCING STUDENT RETENTION APPROACHES IN ENGINEERING EDUCATION FROM A CO-CURRICULAR PERSPECTIVE

Abstract

One of the strategic goals of a South African university in the Eastern Cape is to create seamless learning environments to holistically support and develop students in and outside the classroom. To achieve this, the responsibility for developing students’ abilities is shared by academics and professional support services. This collaboration between academic and professional support services is embedded in a humanised approach aimed at providing supportive and affirming learning communities that enable students to reach their full potential and be successful in higher education. Research findings indicate that active involvement of students in the learning process during and after lectures is one of the key factors governing student success. Therefore, the aim of the collaboration is to equip students to manage the demands of their studies, to enhance their employability, and to sensitise them to the competencies and practices required in the world of work. This aim was achieved by developing co-curricular interventions, that included an early identification system, study skills and time management workshops, a workplace orientation workshop, improving writing abilities and a women in engineering leadership association. Another positive outcome of a collaborative approach is that it creates the opportunity for discursive spaces where teaching and learning practices are shared and understood which, in turn, fosters and supports the scholarship of teaching and learning. This article reflects on the collaborative approach between the Department of Industrial Engineering (DoIE) at a South African university and two of the university’s professional development departments and describes how the collaborative relationship developed over time. In addition, the article describes how co-curricular interventions were developed, supported and executed as an outcome of this collaboration.
Introduction

Industrial Engineering graduates are mostly employed within the manufacturing sector, which is traditionally a competitive and fast-changing environment. However, student attrition is a problem especially in engineering education and among first-year students, in particular (Rintala, Andersson & Kairamo, 2011). Therefore, to better prepare engineering students to meet the high expectations of a competitive workplace, and to improve throughput rates, educators and researchers should make an effort to design, implement and evaluate optimal learning environments (Poitras & Poitras, 2011). Poitras and Poitras (2011) propose that an optimal learning environment should take into account the learners’ individual differences in attitudes, abilities, behaviours and preferences. Although Rintala et al (2011) also emphasise the importance of social and academic integration of students to improve student retention, they recognize the role of educational persistence that is a product of a complex set of interactions among personal, institutional and external factors.

Yorke and Longden (2004) identified four common problem areas experienced by first-year students in particular, namely, students’ poor decision-making in course selection; unsatisfactory experiences in their study courses; failure to cope with programme demands and personal circumstances external to the institution. Tinto (1987) found that the first two years in university are crucial for student retention and the first-year experience is highly significant in terms of predicting success. It is during this period that students are most vulnerable in terms of academic failure and are most likely to experience social, emotional and financial challenges.

Taking cognisance of these research findings, the DoIE developed co-curricular interventions to improve student retention, to better prepare students for the workplace and to
provide an optimal learning environment aligned with the vision, mission and values of the department. However, the DoIE did not have the mandate, nor the necessary knowledge, skills and expertise to develop co-curricular interventions independently. Therefore, the DoIE approached the Student Counselling, Career and Development Centre (Student Counselling), and, later, the Academic Development Unit (AD Unit, formally known as the Centre of Teaching, Learning and Media), for professional support. Over a five-year period, a close partnership developed between the DoIE and the professional support units.

This article reflects not only on collaborative partnership building, but also on the integration of co-curricular interventions into formal curricula. This article has been jointly authored by the various collaboration partners and reflects their different perspectives of the co-curricular interventions.

**Study Context: The Department of Industrial Engineering**

The vision of the DoIE is to be the leader in all aspects of Operations, Quality and Industrial Engineering through sustainable partnerships, innovation and commitment to teaching and learning quality. The mission of the DoIE is to work for the growth of its internal and external stakeholders by providing excellent academic training, innovative research, scholarship and professional expertise. The DoIE has also identified various values related to academic and professional excellence as worthy of pursuit. Aligned with the DoIE’s mission and values several student centered co-curricular interventions were developed in collaboration with afore-mentioned professional support departments at the university.

**Co-curricular interventions**

Central to the development of the co-curricular intervention process was the information provided by the indigenous Learning Enhancement Checklist (LEC) assessments (De la Harpe
The LEC covers a range of domains of a student’s life and focuses on the non-cognitive variables influencing academic success. Examples of these variables include challenges related to course choice; financial problems; study and time management, tests and exams; language difficulties; student life as well as personal and emotional issues.

The following co-curricular intervention for part-time students was developed.

**Co-curricular interventions for part-time students**

In 2010, the DoIE initiated a co-curricular intervention to assist part-time Operations Management students as these students are traditionally mature students who have generally not completed any previous higher education qualifications; and most of them completed formal studies approximately ten years ago. Thus, a key objective of the co-curricular intervention was to develop the students’ learning and study management skills to boost their confidence. The second objective was to improve the pass rate of their first-year modules and the third objective was to provide academic support as they are employed full-time and do not have access to the usual workshops and support services offered by the university.

The co-curricular intervention consists of a developmental Learning Styles workshop presented by Student Counselling. This workshop is based on David Kolb’s conceptualisation of the Experiential Learning Cycle (Kolb, 1984). This workshop is followed by a Study Skills workshop presented by the AD Unit. Since 2010 (to the present), these co-curricular interventions are offered to every new first-year intake. After allowing the students some time to settle into the new routine of part-time studies for three weeks, this compulsory workshop is offered.

Feedback received from part-time NDip Operations Management students who attended a Learning Styles workshop presented in 2011 was encouraging.

**Learning Styles and Study Skills feedback from students (2011).**
REFLECTIONS TOWARDS ENHANCING STUDENT RETENTION APPROACHES IN ENGINEERING EDUCATION FROM A CO-CURRICULAR PERSPECTIVE

In general, the students stated that the workshop helped them with skills that they have struggled with for many years. The majority indicated that the workshop was interesting, motivational, clear and easy to understand. They reported that the workshops made it clear which study methods they should use specific to their personality, and, therefore, they felt that the workshop succeeded in preparing them to be more successful in their studies. The insights gained made them more effective and efficient in the workplace. They commented on group discussions and the interactive nature of the workshops that gave them the opportunity to meet fellow students who experienced similar fears and concerns.

The facilitator’s report was circulated to the first-year academics to guide them in their teaching practices for this specific group of students. This report detailed the range of learning styles in their class.

The principles that informed this part-time co-curricular intervention were then extended to include the first-year, full-time students.

Co-curricular interventions for full-time students

Several workshops and programmes are offered to all students by several service and developmental departments within the university. However, to actively pursue the DoIE’s mission, it was decided to develop co-curricular interventions specifically for full-time Industrial Engineering students. These included an early identification system (EIS); a workplace orientation workshop; the Women in Engineering Leadership Association (WELA); co-curricular interventions in collaboration with the AD Unit and co-curricular interventions aimed at improving the writing abilities of students.

The DoIE implemented the first co-curricular intervention, the EIS in 2007, which is continuously evolving as it adapts to the current needs and institutional readmission policies. The purpose was to make students aware that they run the risk of being excluded (refused admission) from their course of study owing to poor academic progress.
Implementing an EIS based on a developmental continuum.

The rationale behind the EIS initiative was to develop a system to retain and support students. This system has over time become more efficient, professional and student-friendly. As this system evolved, communication with students became a key link. In 2007 the department erred by issuing students with punitive letters of warning, alerting them to the risk of academic exclusion, and instructing them to seek assistance from Student Counselling. By 2008, a friendlier letter was issued and students were categorised on a low to high-risk continuum. In 2009, not only the at-risk students were identified, but also the achievers were recognised and they received congratulatory letters. This was done with the intention of motivating the students to perform. By 2010 the DoIE was concerned about the number of identified at-risk students who failed to seek assistance from Student Counselling as recommended in the referral letter. The DoIE, therefore, decided to refine the intervention by having student counsellors visit classes to explain the purpose of the EIS to students. By 2011, DoIE achievers, at-risk and borderline students were identified. At this stage, the AD Unit became involved and based on the 2010 LEC results, the AD negotiated Time Management and Study Strategies workshops into the first years’ timetable. This signified the start of a more structured approach to improving student retention. In addition, the EIS was expanded to align with the institution’s Centre for Access, Assessment and Research results that identifies developmental needs in first-year students. Voluntary mentoring invitations were also sent to the warned / at-risk students.

Mentoring became a medium to humanise pedagogy. Humanising pedagogy, which recognises the individual in the classroom, refers to how teaching and learning supports humanness (Zinn, 2011). Therefore, no warning/referral letters were issued in 2012. This indicated a move towards self-directed learning where students could independently utilise the
REFLECTIONS TOWARDS ENHANCING STUDENT RETENTION APPROACHES IN ENGINEERING EDUCATION FROM A CO-CURRICULAR PERSPECTIVE

resources available. This creates a culture of ownership, moving away from perceived punitive measures for poor-performing students.

The DoIE also identified developmental opportunities beyond the classroom. These initiatives aligned the DoIE with the institutional strategic priorities which states that learning does not only happen in the classroom. One of the earliest co-curricular interventions offered by the DoIE was the Workplace Orientation (WOW) Workshop.

Workplace Orientation Workshop (WOW). The aim of the WOW workshop was to prepare students for their one-year experiential training in industry and to orientate, prepare and sensitise students for entering formal employment. Various external participants were invited, including speakers from industry as well as graduates who had recently made the transition from student to employee.

As students are often insecure and express concern about workplace etiquette relating to addressing managers and dress code, the workshop was beneficial as it gave them some clarity and guidelines regarding formal workplace expectations. The Human Resources practitioners also shared valuable information related to the formal interview process, and this was often new information for students.

Industry partners participating in the workshop had identified a gap in the writing ability of engineering graduates with reference to report writing. This led to collaboration between an academic staff member and the Writing Centre Unit.

Improving writing abilities. Since 2009, there has been a collaborative project between a colleague from the Writing Centre and an academic in DoIE. This co-curricular intervention is in its fourth year and is constantly being refined. The co-curricular intervention was aimed at improving teaching and learning practices in DoIE, thereby addressing both language proficiency and academic literacy. Initially, a pilot module, Industrial Manufacturing Relations (level 2), was selected from the Industrial Engineering curriculum in this initiative. As this
REFLECTIONS TOWARDS ENHANCING STUDENT RETENTION APPROACHES IN ENGINEERING EDUCATION FROM A CO-CURRICULAR PERSPECTIVE

intervention evolved, the focus was moved to a first-year module, Production Engineering 1, to ensure that effective teaching and learning practices were embedded from the outset.

In this module students are taught a drafting/revising process which is repeated until the final report is submitted. A process of integrating writing practices into the module was developed by using specific assessments rather than a generic rubric. During the writing process, the academic provided written and verbal feedback on report requirements and discourse, while the Writing Centre provided feedback on writing, for example, language use and coherence. This practice integrated the Writing Centre into the report writing process as support.

One of the many positive aspects of this co-curricular intervention is the standardised use of the report-writing booklet illustrating the Harvard referencing conventions. This ensures referencing and report structure consistency therefore academic staff members became explicit in their practice regarding writing.

In addition to providing academic development and support, a relatively new co-curricular intervention housed within the Engineering School and project-managed by the DoIE, is the women in engineering leadership association (WELA).

**WELA.** WELA is one of five projects initiated and managed by the university and the merSETA (manufacturing, engineering and related services sector education and training authority) chair in Engineering Development. It is the goal of WELA to focus on the academic, professional and personal development of women in engineering.

In 2011 and 2012 university surveys indicated that first-year women engineering students (WES) displayed certain fears and insecurities about studying and working in a male-dominated environment (Lourens, 2011 & 2012).

It is argued that the development of co-curricular interventions can assist WES to overcome their fears and insecurities. Consequently, as these students overcame their
insecurities and negative perceptions, a well-balanced, self-assured, and effective WES with a greater sense of inclusion would emerge. Marra, Rodgers, Shen and Bogue (2009) and Bandura (1997) suggest that co-curricular interventions should be established on the four pillars of self-efficacy, namely, mastery experiences, social persuasion, vicarious experiences and physiological states (Lourens, 2011).

In the course of consultations between Student Counselling and later the AD Unit, a WELA programme was developed. This included a series of developmental workshops, a mentorship programme, engineering related short courses and a technical project. In addition, two publications were issued annually, one featuring inspirational woman in the engineering field working in the area, and one publication featuring the senior-WELA members (Lourens, 2011). Senior WELA members were featured in the WELA Inspiration Students booklet. Extracts from the 2012 WELA Inspirational Students booklet gives an indication of the impact of WELA. One student said, “WELA has been an awesome stepping stone for me …I got to know about SaWomeng and I had the opportunity to go to Cape Town as a delegate” and another said, “WELA allows me to grow into the woman I've always wanted to be.” What is evident from the extracts is that WELA was achieving its goals, namely, to develop female engineering students on an academic, professional and personal level.

The various co-curricular interventions developed and offered by the DoIE and their partners has been outlined and described and reflected on by either the facilitator or the participants. In the following section reflections from the three collaborators are presented.

Overall reflections

This section provides a personal and professional reflection from the DoIE, Student Counselling and the AD Unit partners spanning the past five years.

Overall reflection from the DoIE
For the DoIE, the aim of developing co-curricular interventions were to improve student retention, prepare students for the workplace, provide an optimal learning environment and to live and pursue the mission, vision, values and goals of the institution and the department. In doing so, the DoIE formed partnerships with support services within the university, in this case, Student Counselling and the AD Unit.

Although these partnerships led to many and varied benefits, for the individual staff members in the partnership, the greatest benefit was personal and professional growth. A potential obstacle, namely, “differences” turned out to be one of the greatest catalysts for individual growth. This observation was noted at a group brainstorming and planning meeting. The DoIE staff members, who traditionally came from a more practical, industry-orientated background, interacted with the Academic Support and Student Counselling partners who conventionally operate in a more caring and nurturing environment. The academic staff found the differences in perspective and background led to a new perception of student co-curricular interventions. The resultant new attitude was more caring, developmentally focused, involved and nurturing. Not only was the new thinking beneficial, but also the creativity and free flow of ideas became evident in formal and informal communication amongst partners. The DoIE welcomed ideas for development and new initiatives from Student Counselling and the AD Unit. Likewise, the DoIE’s requests and suggestions were accommodated and actioned by Student Counselling and the AD Unit.

The DoIE’s students gained greatly from all the co-curricular interventions. This was evident in the student feedback and the decline in the number of excluded students since the interventions had been implemented. Students reported that co-curricular interventions improved their learning, study management skills and boosted their confidence. Not only have the pass rate of first year modules improved, but a concerted effort was made to provide access
REFLECTIONS TOWARDS ENHANCING STUDENT RETENTION APPROACHES IN ENGINEERING EDUCATION FROM A CO-CURRICULAR PERSPECTIVE

to university support services to students who would not normally have access, such as part-time students.

By developing and implementing co-curricular interventions, DoIE staff members were encouraged to follow a student-centred and collaborative approach to teaching and learning, thereby taking responsibility for their co-curricular interventions. For example, one of the overall classroom objectives of each staff member in the DoIE was to encourage students to read, write and interpret the discourse of Industrial Engineering to develop their competencies as independent thinkers. Fortunately, the classes were small (± 25 students), which allowed for an in-depth approach and individual attention. Another positive outcome of the co-curricular intervention was the standardisation of scientific assignment practices throughout the DoIE.

It is evident that developing co-curricular interventions with Student Counselling and AD Unit partners have benefited the three participating departments on a personal and professional level. However, the co-curricular interventions also provided a service to students, employers, and industry as well as providing practical examples of the institution and departmental values.

Reflection from Student Counselling partner

Student Counselling identified four key growth areas. Firstly, a significant shift was noted in the Student Counselling Centre’s statistics regarding reasons for referral. In the past, the majority of referred students were excluded students. Currently, most of the referred students are warned students. This trend indicates that the faculty is responding to at-risk students earlier than they had done before. Secondly, through this partnership, Student Counselling had become increasingly involved in proactive, developmental interventions. Thirdly, this pioneering partnership provided Student Counselling with an opportunity to refine communication strategies with other departments across the university. Finally, giving
feedback to the DoIE was a non-negotiable step in establishing and defining an effective partnership.

**Reflections from AD Unit partner**

The root of these support co-curricular interventions is a humanising approach aimed at providing a supportive and affirming environment that enabled students to reach their full potential by providing “appropriate academic development and mentoring initiatives”. (CHE 2004:90) In the light of this finding, it appeared that a more integrated approach was necessary to support students more effectively. The Engineering Council of the United Kingdom argues, “Professional competence integrates knowledge, understanding, skills and values. It goes beyond the ability to perform specific tasks …. [and] generally involves a combination of formal education and further training and experience” (2003: 6).

To shape the existing process into the more integrated model, an on-going conversation is necessary. People-centered approaches encourage open communication, personal development and creativity, which promote the establishment of integrity and responsibility as the foundation of all systems, processes and interaction within the DoIE.

**Conclusion and Recommendations**

This article reflected on the collaborative approach between the DoIE and two professional support departments and described how the relationship developed over a five-year period. This article also presented a discussion on the various co-curricular interventions that have been identified, developed and presented during this period. Because of these interventions, it is evident that the university is working towards the creation of seamless learning and teaching environments to holistically support and develop students.

Based on the partners’ reflections, the following co-curricular intervention recommendations can be made to other universities:
More co-curricular interventions should be offered to part-time students during vacations, after hours and on weekends.

Faculty and support staff should design co-curricular interventions to nudge students towards taking ownership for reaching their potential, as students do not naturally seek solutions unless their attention is drawn to them.

Institutions’ strategic priorities, values, goals and objectives should contribute towards informing interventions which requires a more proactive and intentional approach instead of a spontaneous and intuitive approach.

Although engineering students traditionally have a heavy workload leaving little time for additional activities, academic timetables should be adapted to accommodate co-curricular interventions.

The content of interventions should be refined until it merits recognition on the Co-Curricular Academic Record (formal student academic record). This will provide an added incentive to students to attend interventions and formalise the process from being an intervention towards a systematic approach for student success.

This study demonstrates that partnerships that focus jointly on developing co-curricular interventions contribute to equipping students for the demands of their studies, enhance student employability and sensitise them to the required competencies and practices required in the world of work.

Together the collaborative team was able to implement developmental interventions aimed at transforming mindsets and catapulting students onto a higher motivational and emotional contour. This demonstrates that student development and retention is a multifaceted challenge that can be addressed effectively through partnerships.
REFLECTIONS TOWARDS ENHANCING STUDENT RETENTION APPROACHES IN ENGINEERING EDUCATION FROM A CO-CURRICULAR PERSPECTIVE

THIS IS WHAT WE DO TO PRACTICE AN INTEGRATED LEARNING APPROACH

References


WELA Inspirational students, 2012. NMMU, Port Elizabeth, South Africa.
