ENGINEERING STUDENTS' PERCEPTIONS OF PRE-EMPLOYMENT TESTS: AN AWARENESS RAISING EXERCISE

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Abstract. *In today's world, jobs have become very competitive and demanding in terms of some companies' requirements. It often happens that an unlimited number of individuals may apply for an announced vacancy. To screen and filter out the many interested applicants, a great number of companies no longer solely rely on a well designed CV, an appealing job application letter (JAL) and good performance in an interview. In addition to the above, many companies all over the world necessitate that prospective job applicants sit for personality attributes tests. Such tests supplement the initial assumptions made about the applicants' capabilities through the CV, the JAL and the interview. This study reports on the use of one such tests in a professional communication skills course for engineering students at a private English-medium university in the United Arab Emirates, and how it is utilized to better prepare students for workplace requirements and enable them to negotiate test results and refer to them as evidence for possessing highly requisite personal attributes. Pre- and post-test survey results point to students' gains in understanding test purposes and how these can be geared towards self-marketing.*

Key words: *professional communication skills, engineering students pre-employment tests, workplace requirements*

1. INTRODUCTION

In today's global and complex world, recruiting engineering companies are putting in place pre-employment tests for various reasons. The fact that a well-designed CV, a professionally written job application letter and an interview cannot by any means reveal the true qualities and personalities of job seekers have resulted in many companies requiring their job applicants to sit for personality trait and team work tests (e.g.,Di Milia 2004; König, Klehe, Berchtold and Kleinmann 2010; König, Merz and Trauffer 2012; Zibarras and Woods, 2010). Today's work environment is rich in many of these commercial tests. Job advertising agencies give these tests to job applicants "(I)n an effort to improve the predictability of the selection process and reduce the reliance on the brief interaction that an interview allows… " (Thill and Bovée 2007, 459). According to Thill and Bovée (ibid, 2007, 549) such tests are used to help in assessing "such factors as integrity, personality, job skills, and substance use." In spite of the adoption of countless engineering companies of these testing tools and their increased frequency all over the world, engineering students, to the best of the researchers' knowledge, are hardly informed about these tests or exposed to them. Therefore, the present researchers, in an attempt to better serve their students, prepare them for the requirements of the work

environment and acquaint them with test types they may be required to sit for, have made a decision to administer the Belbin Get Set Self-Perception Inventory (SPI) to all American University of Sharjah (AUS) engineering students when they register for the compulsory ENG207 course: Professional Communication for Engineers. This has become a common practice since the first semester of the year 2011. The test since then, see El-Sakran, Prescott, and Mesanovic (2013), has been administered twice to students, at the start and conclusion of the course, to sensitize them to their personal attributes (i.e., teamwork skills and team roles), and a general class discussion is held to discuss the test results with the students. During these discussions and deliberations, it has come to the present writers' attention that some students are not in agreement with the test results. Consequently, it was decided to probe into students' perceptions of the SPI before and after the course was taught. In other words, students' views of their pre course test results are compared with their post course test results to gauge their understanding regarding any improvements in their personal attributes and whether they feel they have gained more and improved in terms of personal attributes or not. The sections below provide detailed descriptions of the test, the context it is used in, the instrument used to measure students' perceptions and the students' feedback.

1.1. Team role behavior

In the course *ENG207 Professional Communication for Engineers* an engineering multidisciplinary project (EMDP) is the pedagogic tool that has agency in promoting students' attainment of professional communication skills and developing personal traits. The course draws on the work of Bowen (2013) in developing "valued skills" [communication skills, interaction skills and efficiency skills] as well as nurturing "valued traits" [personal integrity, intrinsic drive, mutual respect, collaborative mindset]. It is university policy that engineering students study this course before conducting their senior design projects and particularly prior to internship. The course contents addressing professional communication and academic skills have been incorporated in the engineering multidisciplinary project (EMDP) as shown in Figure 1.
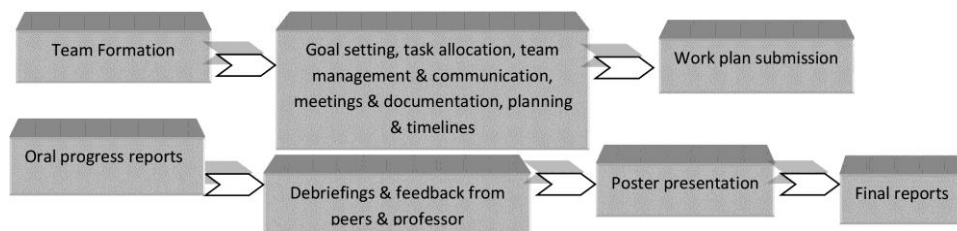

Fig. 1 EMDP - Development and Implementation Model

Other important aspects of the course facilitate the multidisciplinary team work and encourage the valued skills and traits. Students are educated to conduct effective meetings, to plan and document decisions, to set planning goals and meet deadlines, to manage themselves and their peers, to show leadership and to evaluate their peers. There is emphasis on responsibility at personal, inter-personal and community levels developing the sense of a community of professional practice. In keeping with recent research findings (Bowen 2013; Crawford 2012) the course emphasizes both skills and traits and aims to develop leadership

qualities anchored in moral and ethical principles. This reflects the need engineers have for competencies beyond possessing sound technical knowledge and engineering skills.

The engineering multidisciplinary teams are formed in compliance with the following requirements; teams must be comprised of three or four students and each team must contain students from at least three different engineering major disciplines. The requirements are to ensure multi-disciplinary project and teamwork. Team building as a phase of the students' EMDP work is discussed in detail by Prescott et al. (2012). Students engage in team-building informed by the administration of the Belbin Get-Set Self Perception Inventory (SPI) (Belbin Associates, 2014), used to provide both individual and team profile preferences of the nine roles deemed by Belbin as essential for well-functioning teams. Use of this instrument is intended to raise students' awareness of the characteristics of team-role behavior and assist them to develop their capacities to work together in coordinated, inter-dependent ways. Understanding the significance of the different roles that constitute effective teams is considered to aid this development. Belbin Team Roles are used to identify behavioral strengths and weaknesses and the reports the students each receive enable them "to build mutual trust, understanding and productive working relationships" (Belbin Associates 2014). Student collaborative use of their individual Belbin reports within a team helps both the individual and the team develop self-awareness and increase effectiveness. The students' engagement with multidisciplinary teamwork is believed to enhance this development and lead to a more informed understanding of team-role behavior.

The Belbin Get-Set Self Perception Inventory (SPI) is a measure of perceived preference for the nine different team-role behaviors rather than an actual measure. Instead of providing information regarding individual personality traits, the SPI gauges behavior in order to identify groupings or clusters (Team Roles) which characterize an individual's behavioral contribution to the team. An individual has a combination of preferred, manageable and least preferred roles.

As the Belbin documentation makes clear:

The distribution and interrelation of these roles across an individual's profile have a great influence on the way the roles will be played out in practice and experienced by others. Whilst an individual may claim to prefer or enjoy a particular role, it does not necessarily mean that they can or should play only this role (Belbin Associates 2014).

This measure has been found to have high face validity, Balderson and Broderick (1996) while Dulewicz (1995) established the criterion validity of the Belbin Team Roles in making teams more successful. Balderson and Broderick have further reported that there was no significant gender bias for any Team Role.

1.2. Background to the current investigation

An earlier investigation (El-Sakran, Prescott and Mesanovic 2013) showed that students' understanding of team-role behavior is positively influenced by self-awareness and appreciation of the need to work cohesively in teams. This study was conducted with the individual Belbin results of three cohorts of ENG207 students at the beginning and end of the Spring Semester, 2011. A further aspect to the investigation was an examination of team results also at the beginning and end of the course. Significant improvement in the total scores was evidenced in four team role behaviors. The student sample used in the investigation was 25.45% of the total enrolment which can be claimed to be a reasonable representative sample. At the time it was suggested that a further investigation to examine

the perceptions of the students concerning the Belbin team-role behaviors would be appropriate. The study reported in the sections that follow is that further investigation.

1.3. Investigation context

It is standard practice at the American University of Sharjah for all engineering students registered in the ENG207 course to undertake the Belbin GET SET SPI at the start of a semester. These results help students work to identify and develop weaknesses and to consolidate strengths in accordance with their team role profiles. This procedure complements the engineering multi-disciplinary project (EMDP) work which forms the core of the collaborative endeavor in the course. For instance, the attributes 'plant', 'resource investigator' and 'shaper' are required in the initial stages of the projects when teams have an urgent need to generate ideas, identify resources, plan ahead and make decisions. A team which understands any preferential weaknesses in these roles can swiftly move to address the situation and remedy weaknesses by a combination of awareness and developmental exercises. Conscious decisions to actively develop deficient attributes have been shown to benefit understanding and performance of student teams. Other attributes such as 'coordinator', 'team-worker', 'implementer' and 'monitor/evaluator', needed in the middle stages of the EMDP work similarly benefit from awareness and enhancement. Attributes such as 'completer/finisher' and 'specialist' generally become stronger preferences towards the end of the project. It is at this stage that teams have need for the qualities of the 'completer/finisher' to guarantee adherence to project deadlines. The other attribute, 'specialist', may often increase in preference as a result of students' gaining specialist engineering knowledge from team members belonging to other engineering disciplines.

2. DATA SOURCE

At the start (February) of the Spring 2015 semester students (n=116) from six sections of the total cohort of ten sections were surveyed upon receiving their Belbin SPI profiles. (The survey instrument is at Appendix). First, the students were asked to rank the nine Belbin team-role behavior results on a five item Likert scale (strongly agree-strongly disagree). Then they were asked if the team-role results reflected what they understood as their personality traits and to provide reasons for their positive or negative response. Finally they were asked if the Belbin SPI "opened their eyes" to something new about their character and if "yes" to elaborate. At the conclusion (May) of the Spring 2015 semester the same six sections of students again undertook the Belbin GET SET SPI and on receiving their results were asked to again take the survey. Our hypothesis was that there would be a closer correlation between the Belbin SPI results and the students' perceptions at the end of the semester as a result of engagement with the engineering multi-disciplinary teamwork throughout the semester.

3. DATA ANALYSIS

With respect to the first question on the survey, which asked the students to rank the nine Belbin team-role behavior results on a five item Likert scale only responses to the strongly agree, agree points on the scale that totaled in excess of 60 per cent of the total

respondents were considered to have positive significance. Similarly, responses to the strongly disagree, disagree points on the scale were considered to have negative significance.

Responses to the two 'yes/no' questions were totaled while the reasons provided for the answers were analyzed using Srivastava's Iterative Analysis framework (Srivastava and Hopwood 2009). The framework places emphasis on examination of data as a reflexive process rather than a "repetitive mechanical task" with the clear purpose of initiating insight and developing meaning.

4. RESULTS

4.1. Ranking the belbin team-role behaviors

Students' rankings of the nine Belbin team-role behaviors revealed more significant agreement than significant disagreement with the Belbin results for both the February, 2015 and the May 2015 administrations of the Belbin GET SET SPI. The February 2015 responses revealed 13 instances of significant agreement with the Belbin results. These significant agreements were spread across all six sections of student respondents and included all the team-role behaviors with the exception of Team worker. The team-role behavior result that was significantly endorsed most frequently was Plant, which received significant agreement from three of the six sections in the survey.

In the May 2015 administration the responses revealed 17 instances of significant agreement with the Belbin results. Again these significant agreements were spread across all six sections of student respondents and included all the team-role behaviors with the exception of Team worker. In the May results the team-role behavior, Plant again received the most frequent significant endorsement; from five of the six sections. Also in the May results the team-role behavior, Shaper was endorsed by three of the six sections in the survey.

The team-role behavior, Team worker did not receive a significant and positive endorsement in either survey. In the February, 2015 survey two sections registered significant disagreement with the Belbin rankings concerning Team worker while two other sections registered results that were within 5 per cent of the 60 per cent threshold. Significant disagreement with the Belbin rankings for Team worker increased from two sections to three sections in the May, 2015 survey responses. Both sections that registered significant disagreement in the February results maintained a similar level of disagreement while the third section registered disagreement that rose from near significant to clearly significant (70 per cent).

4.1.1. Do team-role results reflect personality traits?

The results to the question concerning Belbin team-role results and students' individual perceptions of their personality traits were ambivalent for both the February, 2015 and the May 2015 surveys. In terms of YES v NO in February the per cent values were 64 as opposed to 52 respectively. In terms of YES v NO in May the per cent values were 62 as opposed to 57 respectively.

Reasons students provided in support of their YES NO response to the question about the Belbin team-role results were more numerous where disagreement was registered than where there were instances of agreement. In the February 2015 survey the phrases of disagreement included the following:

- abilities are better than results show
- results under estimate ability
- results are unfair
- should have scored higher
- "test" result didn't reflect personality
- "test" neglected important traits
- some traits showed up which (I) do not have
- being an AUS student have developed team work skills
- answers not accurate
- (I'm) aware of my capabilities
- scores not accurate
- questions not clear
- team work score is shocking
- cannot see relationship between character and results

In the May 2015 survey similar phrases of disagreement were registered with the added dimension of specific reference to particular team-role behaviors. By far the most frequent of these comments were directed at the Team worker behavior but both Plant and Completer/Finisher were mentioned by a number of respondents. The most common phrase of disagreement, worded diversely, related to the development of team-role behaviors during work on the engineering multidisciplinary project. A typical response was "… disagree with the team worker result, our team has very good results and our team work helped us"

In the February 2015 survey the phrases of agreement included the following:
- agree to some extent
- more "yes" than "no"
- reasonable
- describes me
- scores reflect my true traits
- match to an extent, satisfied
- strongly agree, results match
- results are precise, agree with results
- match to an extent
- results reflect my habits and personality
- generally accurate despite some disagreement

In the May 2015 survey fewer phrases of agreement were registered and there was a noticeable concentration on the team-role behaviors that students identified with their work on the engineering multidisciplinary project. Two common phrases of agreement were "results more accurate than the first report" and "results reflect work on the EMDP" usually accompanied by reference to particular team-role behaviors. The most commonly mentioned team-role behavior was Implementer with Specialist, Team worker, Resource Investigator, Coordinator and Shaper all receiving regular reference. Monitor investigator was the one team-role behavior not to feature in any of the student responses.

4.1.2. New aspects of character revealed

The results to the question concerning whether Belbin team-role results "opened students' eyes" to aspects of their character that they were not previously aware of received more positive responses than negative in both the February and May 2015 surveys. The ratio of positive to negative responses was stronger for February (60:40) than for May (54:46).

Very few elaborations were evident in the February 2015 survey. In the May 2015 survey students elaborated in two main ways to support their responses. These elaborations were related to particular team-role behaviors. The first set was a series of closely related observations that the Belbin GET SET SPI revealed aspects of personality that (they) did not know/understand/value previously. Particular team-role behaviors that were mentioned were Implementer, Plant, Specialist, Shaper and Resource investigator. The second set, which also referred to particular team-role behaviors, was that the Belbin results showed where there was potential to improve. Team-role behaviors mentioned in this context were Plant, Specialist, Shaper and Resource investigator. Additional comments that elaborated the YES NO response were generally positive:

- focuses attention on team building
- learnt to work for good of the team "the collective"
- Belbin lifted personal awareness and helped communication and team role skills
- developed strategic thinking
- a good team is a collaborative entity
- developed ability to listen to other viewpoints
- Belbin identifies roles need to develop
- Belbin reflects preferences

One comment stood out and perhaps reflected the respondent's experience during the semester:

- low preference result at end of semester supported by experience during EMDP

5. DISCUSSION

The students' ranking of the Belbin team-role behaviors revealed two main issues. First, the increase in significant agreement with the Belbin preferences between the February and May administrations from 13 to 17 indicated some increase in understanding of the different team-roles most likely as a result of team work on the engineering multidisciplinary project. In this respect this result is somewhat in agreement with the findings of the 2013 study of El-Sakran, Prescott, and Mesanovic, which showed students' understanding of team-role behavior to be positively influenced by awareness of self and team-role behavior resulting from engineering multidisciplinary project work.

The Teamwork behavior ranking went against the general trend with an increase in significant disagreement with the Belbin preferences from two sections to three between the February and May administrations. Further, the remaining three sections registered weak positive endorsements of the Teamwork behavior rankings; registering just below 30 per cent in one section or slightly above in the other two sections. In these three sections the neutral rating was prominent. A conclusion that might be drawn from these results is that the notion of team worker as defined by Belbin, "Co-operative, perceptive and diplomatic. Listens and averts friction" (Belbin Associates 2015) is a concept students find difficult to come to terms with. The experience of working in a multidisciplinary team for a 15 week semester at the junior year level is intended as a preparation for Internship and the Cap Stone senior design work of the senior year. The Teamwork role is a behavior that requires interdependent social interaction and interpersonal awareness from all members, skills that even experienced professionals can find challenging to exhibit consistently.

In response to the question about team-role results reflecting personality traits the results in February and May were ambivalent; 64 to 52 YES v NO in February and 62 to 57 YES v NO in May. An obvious conclusion is that teamwork experience did not necessarily clarify students' understandings about team-role behaviors. One consistent element in these findings was that the most frequent phrases of disagreement were directed at the Team worker behavior, especially noticeable in the May 2015 responses. This element reflected the level of disagreement in the ranking exercise commented on earlier. The phrases of agreement were more directed to specific team-role behaviors (Specialist, Team worker, Resource Investigator, Coordinator and Shaper) that students identified with their EMDP work in the May 2015 responses.

6. Conclusion

No doubt that students' understanding and knowledge of their personality strengths and weaknesses is of utmost importance for successful job applications and in their future careers. Such awareness will help them leverage personality strengths and develop weaknesses. Furthermore, they can utilize the knowledge they have gained from the tests in their CVs, JALs and job interviews as evidence for possession of required skills. Based on the above results and as a consequence of reflection-on-students' personal learning experiences, we have come to realize that students need to be made aware that some of the course contents they study will demonstrate their optimal relevance when they apply for engineering internship positions or full time jobs. We round off by saying that coming to grips with understanding full course contents relevance requires enough time to reflect on one's own learning experiences until one encounters (a) situation(s) where and when the outcomes of such learning will be fully realized, materialized and optimal relevance is achieved (Cindy 2010; Davis, Ponnamperuma and Ker 2009; Scheja 2006).

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APPENDIX

Table 1 Team role results from belbin self-perception

Roles	Score	Scale				
Plant (PL)		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Resource Investigator (RI)		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Coordinator (CO)		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Shaper (SH)		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Monitor evaluator (ME)		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Team worker (TW)		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Implementer (IMP)		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Completer/finisher (CF)		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Specialist (SP)		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Questions:

1. Do you think the scores you obtained reflect your true personality traits?
    Yes   No

2. Please give reasons/justifications for choosing either YES or NO.

3. Has taking this test opened your eyes to something new about your character?
    Yes   No

4. If yes, what is this that you learnt?