

Transformative learning in engineering education: the improved people and relational skills outcome

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ABSTRACT: In this article, the authors discuss the improved people and relational skills outcome arising from transformative learning within an engineering education context. A study was conducted by the authors, where four outcomes and three factors related to transformative learning in engineering education were identified [1]. The outcomes were: improved people and relational skills, project management ability becoming second nature, changes in ways of thinking and increased resilience. The factors that facilitated them were: the need to break out of comfort zones, the need to have crucial learning experiences, which were experiential in nature, and the importance of staying motivated throughout the entire process of transformation until it is completed. This present article focusses on one of these outcomes in greater detail; namely, the improved people and relational skills outcome. The authors' considerations presented in this article, which constitute a new research contribution, are supported by the interview data from their earlier study [1].

Keywords: Transformative learning, engineering education, people skills, relational skills, soft skills

INTRODUCTION

A qualitative study was undertaken on transformative learning in the engineering education setting of a private university in Malaysia. Four outcomes and three causative factors were identified. The three factors identified were the need to break out of comfort zones, the need to have crucial learning experiences experiential in nature and in staying motivated throughout the entire process of transformation [1]. These factors were further elaborated in earlier articles [2-4]. The four outcomes identified were improved people and relational skills, project management ability becoming second nature, changes in ways of thinking and increased resilience [1].

In addition to technical competencies, non-technical competencies are deemed to be of equal importance for engineering graduates by various engineering education initiatives, such as the International Engineering Alliance [5], the CDIO Initiative [6] and the National Academy of Engineering's Grand Challenge Scholars Program [7], especially in view of the complex challenges of the present and future. It was assumed by the authors that the processes and the attainments of non-technical competencies could be viewed through the lens of transformative learning, hence the rationale and motivation to undertake this study.

One definition of transformative learning as given by Hoggan:

Transformative learning refers to processes that result in significant and irreversible changes in the way a person experiences, conceptualizes, and interacts with the world [8].

In this article, the authors elaborate on the transformative learning outcome of improved people and relational skills which was not previously elaborated upon at length in the previous articles by the authors [2-4].

It has been well established that employers of current and future graduates emphasise the importance of soft-skill attainment - soft skills primarily encompassing communication skills, which require one to have adequate people as well as relational skills. The graduate's capability in being able to communicate effectively with their peers and others is key in ensuring a successful and meaningful career.

Employers specify the need for graduates to have an awareness of, and to have been exposed to, nurturing communication skills, which is directly related to people and relational skills while at university. This is easier said than done, as many universities through their curricula struggle to develop courses (and the associated assessments) to facilitate the development of such skills.

Hassall et al stated that a common demand from graduates is that the curriculum should include communication skills because it plays a central role in developing other attributes that would be beneficial to graduates for prospective employment [9]. The authors further stated that techniques designed to develop communication skills would not address students' apprehension regarding their ability to communicate effectively if this apprehension was an issue for them. Individuals that have high apprehension regarding their communication skills will tend to exhibit lower performance in terms of people and relational skills. The authors concluded that further research into this area is required [9].

Lopes et al sought to identify the needs of nursing students in the field of relational competencies [10]. The investigation was a qualitative study of an exploratory-descriptive nature. Data was mined from more than 60 students of a nursing programme and the results revealed that the students were aware that for them to become competent professionals, they needed greater personal development and better self-knowledge. Improvements in these areas will also enhance their personal and social well-being. The authors concluded that this aim can be achieved by an intervention programme, which lecturers can develop with their students [10].

Saad et al highlighted the need for universities to engage with employers on a regular basis to measure the level of satisfaction of employers with their graduates and to react proactively to ensure that their graduates are relevant to the needs of the industry [11]. Through their survey of employers, they noted that employers gave equal attention to hard skills and soft skills [11].

Saad and Majid presented findings from a survey of close to 300 employers, which was focussed on exploring employers' perceptions of what they consider to be the five most important employability skills required of engineering and ICT graduates [12]. The authors found that teamwork and presentation skills featured highly amongst the skills listed by the employers [12]. These findings were in line with previous studies, where the authors compared their results to engineering employability skills required by Asian employers. It can be assumed that to have a higher skilled ability in working in teams, people and relational skills would have to be a key factor.

Rao stated that research from previous investigators indicated that technical knowledge and skills only accounted for about 15% of the reason that an individual is employed and able to achieve progress in their career [13]. The remaining 85% depends on the individual's people skills to ensure job success. The author went on to study the relevance of soft skills in various institutions, as well as to identify the gaps between curricula and industry in addition to seeking innovative methodologies to impart soft skills to students. The study surveyed various stakeholders across and within educational institutions to elicit their views [13].

The author revealed that students who were equipped with both hard and soft skills will succeed professionally and further noted that employers had stated that those who succeed at work tended to have the right attitude, personality and behaviour. In conclusion the author recommended that academic faculties should focus on developing soft skills content, ensuring that their content is suited to industry expectations [13]. Rao further stated that students and stakeholders within educational institutions must be open and receptive to honing soft skills necessary to increase survivability and success in industry [13]. It was noted that a blend hard and soft skills is necessary to produce successful graduates.

Fernández-Sanz et al presented a study which was aimed at identifying the most important soft skills from experts' perspective, as well as whether these choices depended on the experts' nationality [14]. The survey data collected from 133 experts who responded showed that there was indeed a recommended set of soft skills that were similar across nationalities and would therefore be globally applicable. These included communication skills, as well as teamwork/interpersonal skills [14].

The authors also noted that soft skills are a key complement to technical skills especially in a multinational employment setting. As universities increase their mobility options of students, it would be necessary for these institutions to also assist their students develop these skills which will lead them to an increase in awareness and understanding of cultural differences in a multinational setting. The data collected from the study spanned 45 different countries and confirmed a core set of preferred soft skills that were applicable globally [14].

Shekhawat and Bakilapadavu presented a paper which discussed the various soft skills needed by engineering students [15]. The paper also highlighted how such skills were imparted to students and discussed how the skills may be achieved through a course offering. The authors argued that technical professionals may not be able to fully meet the requirements of their job if they lacked certain soft skills that included people skills [15].

Holik and Sanda provided insight into their recommendations for preparing graduates for the workforce via an empirical study that draws attention to the importance of developing communication skills [16]. As with previous investigators, the authors maintained that soft skills must complement hard skills as it will assist graduates navigate their everyday lives. These social skills help students integrate into groups, maintain social relationship, they facilitate cooperation, effective communication, and develop assertiveness and the ability to solve challenges. The authors posed the question as to how can graduates be prepared for such challenges and how can these skills be developed at the university. The authors also wanted to understand whether students considered communication skills as being important (or otherwise) and how would they evaluate their own communication skills [16].

The study was conducted across 475 university students. The results indicated a lack of communicative competencies which will in turn hinder academic achievement. The authors proposed that a workable solution to address this shortcoming would be to provide students with adequate platforms and opportunities to speak and interact, enabling them to elaborate their opinions and standpoints, share experiences and actively participate in their own learning process. They reiterated this necessity strongly as their survey found that graduates have serious deficiencies in the fields of communication and needed improvement in the areas of openness and cooperation [16].

METHODOLOGY

A qualitative research methodology was employed for this study. This methodology adopted the interpretivist/constructivist epistemology, the basic qualitative study methodology and the selection of participants through purposeful sampling for semi-structured interviews. Well-established qualitative procedures were applied in the data collection and data analysis. This research methodology was explained in detail and given appropriate justification in articles by Tien et al [1][2].

RESULTS AND DISCUSSION

The theme identified through the qualitative study as improved people and relational skills refer to the transformations resulting in improvements in the ability to understand, communicate and relate to other human beings. It included the capability to lead and function effectively in a team. These are highly desirable qualities for engineers and engineering leaders, while also being applicable to them in other areas of life.

This transformative learning outcome category included that of mastering effective communication, growing in leadership ability, understanding others, handling difficult team members, working effectively with people and overcoming shyness. These transformations may be associated with what Hoggan classified as changes in the participants' self, worldview and behaviour [8]. A sample of participants' interview responses are presented below.

Interview participant 2 (IP2) had served as a project team leader during her foundation year in the engineering programme. As team leader she had to manage a difficult team. The team comprised of a member who appeared to have mental health issues who seemed to be on the verge of a nervous breakdown constantly, another member who had anger management problems and was almost physically violent towards another member, as well as a member from a foreign country who presented her with communication and cultural challenges.

However, from this formative experience she developed tolerance for working with difficult people. At the time when it happened, she did not appreciate the value of her experience. Neither was she aware of the positive changes it had wrought in her until realisation came in her later projects when she worked with other people.

Because I am the leader of the group, so I need to talk to them, I have to take care of how they feel. Sometimes, one gets angry very easily, the other one suddenly just gets depressed.... There is one from a foreign country, so, communication skills it is quite hard for us, so it is maybe cultural difference ... that group of mine may not be the best group, but it is one of the best experiences I have ever had. - IP2

I did not realise it myself. I just realised that I do not really have much conflicts as compared to other groups... ...I have higher tolerance in a lot of stuff but I did not realise it. But what you hear from people ... I think you are a very nice person, you never actually like argue with people and stuff like that, but then, when I think back of myself, it is like I think maybe because of the tolerance I have developed during foundation [year]. - IP2

I cannot think of a time like I started... I think this is the best experience, but it just come along the way like suddenly you feel like you can actually work with people more easily as compared to other people. - IP2

Interview participant 10 (IP10) who had always served as the group leader for his project-based modules believed that he had developed the ability to persuade and motivate his team members as a result his group project experiences.

Group projects? One thing I would say is the communication side, and you need to learn how to be persuasive. Communication, be persuasive, and knowing how to split the task. Do it fairly and keeping everyone happy because if one of the members is not happy about the project, it is very hard to progress. And it is not fun to do at all. That is part of the leadership skills, and being persuasive is very important, and knowing who should get what task and keeping them interested, passionate, happy. - IP10

Sometimes just get the feeling of it, who should do what... Yeah, but handling more projects, I mean leading more projects you get, you get, the feeling is more accurate. Something like that. - IP10

Interview participant 1 (IP1) felt that the most meaningful learning experiences for him were the semester 5 and 6 capstone project module. The experiences improved his ability to understand and communicate with different people.

I think it is more on my ability and thinking perspective I will say that it gave me a different... I have to understand the different perspectives of the different people that we are working with, so it gave me a better,

more communicating style to learn or to communicate better with different people... It gave me how to think a different perspective, like when I talk about perspective we have to of course communicate. - IP1

Interview participant 9 (IP9) managed to overcome his shyness through making cold calls in sourcing for sponsorship for AIESEC (an international youth organisation with a chapter at Taylor's University) projects. He had deliberately sought this experience.

So, the reason why I joined AIESEC was because I know that I have zero sale skills and I want to build on it.... I was quite a shy person and I thought that I have nothing to lose. It turns out [to be] a wonderful experience. I met new friends, I got better in communication and I got to meet like, a couple of companies and now still keep in touch with them which for me I think it is quite cool to have it. - IP9

When asked if he could still do cold calls now that he is no longer with AIESEC.

Yeah, I can... I could just take my phone and pick up any number and call. Yeah. Because I think the main reason because you have done it like, I think I clocked out 1,200 calls in AIESEC; so, you get used to it. Once you get used to it, it is pretty easy to do, yeah, just that first few steps [was hard]. - IP9

IP9 used to be a person who preferred to do everything by himself. However, he soon discovered during his foundation year that he was limited in his programming skill, while another team member was very good at it. This led to changes in his worldview, self and behaviour in how he approached his project modules over the course of his study.

I used to be a person that wants to do it all myself. I would like to make sure that the quality is there, so... but during that, during that time, I was trying to do it myself but then, I found that the quality of programming that I put up is not as good as what S can put it up. - IP9

So, rather than just relying on myself, I rely on others and now, until like the final semester and even starting fourth semester, my project has been going very smoothly because I could rely on others and leverage on their strength and they can leverage on mine. And it makes the project much easier; no complication, no what, crisis, no fighting each other, so much easier. - IP9

Interview participant 8 (IP8) in leading group projects developed the ability to be objective and open-minded towards other member's ideas, as well as being persuasive in resolving intellectual disagreements within the group.

But now it is like five persons in a group, and five persons want to give the idea. So, now we have conflict of ideas. It is a very critical situation where you have to make a wise decision, you have to balance out the matrix, see whose idea you will be taking. There is a lot of you know, if let's say I am giving the idea but if my co-member has a better idea, as a leader I should take that, and I should also learn how to make my other members understand why their idea is not, you know, being selected here also. That kind of conflict, the senior years. So, first is like a human conflict, there is an intellectual conflict. - IP8

The entire list of individual codes under this category include *understand others' perspectives which helps in communication, seeing others' perspectives, leadership, utilising members strengths, keeping members interested, passionate, happy, task delegation, teamwork, communication, overcome shyness, higher tolerance, patience, dealing/working/coping with people, open mindedness towards others' approaches, persuasiveness and sternness in dealing with underperforming member.*

From the interview participants' responses, it was observed that the changes have met the stability, depth and breadth criteria mentioned by Hoggan to be regarded as a transformative learning outcome for the participants [8]. Depth represents the degree to which a transformative learning outcome was affected. Breadth considers the number of contexts in which the change is demonstrated, while relative stability suggests a lasting change.

CONCLUSIONS

A qualitative study undertaken by the authors found that engineering students experienced transformative learning outcomes in the areas of improved people and relational skills, project management ability becoming second nature, changes in ways of thinking and increased resilience [1]. The factors causing them and the ways to facilitate these factors, which were the breaking out of comfort zones, crucial learning experiences experiential in nature and staying motivated through the process of transformation, were elaborated in previous articles [2-4].

In this present article, the authors highlight one of the transformative learning outcomes observed in the study, i.e. that of improved people and relational skills, explaining what it is and how the interview participants have experienced it, thereby offering further insights into the transformative learning phenomena that the study has revealed.

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BIOGRAPHIES



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Satish Namasivayam has over a decade's worth of experience in higher education. He has held several academic leadership positions, where he has played an instrumental role in the execution of various strategies that have helped in positioning academic schools. As a third-generation mechanical engineer, he was formerly a Fellow of the Institution of Mechanical Engineers and a Chartered Engineer, registered with the Engineering Council, United Kingdom. He is also a Professional Engineer with Practising Certificate, registered with the Board of Engineers Malaysia. Dr Namasivayam is an evaluator with the Engineering Accreditation Council, Malaysia, and has been involved in evaluating engineering degrees for accreditation in the country. He is also the only Malaysian member on the International Steering Committee for the Global Grand Challenges, National Academy of Engineering, USA. Dr Namasivayam was formerly Editor-in-Chief of the Journal of Engineering Science

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