International Journal of Business, Human and Social Sciences
ISSN: 2517-9411
Vol:11, No:11, 2017

The Relevance of Sustainability Skills for International Students

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Abstract**—**Sustainability often appears to be an unfamiliar concept to many international students that enrol in a New Zealand technological degree. Lecturers' experiences with classroom interactions and evaluation of assessments indicate that studying the concept enlightens and enhances international students understanding of sustainability. However, in most cases, even after studying sustainability in their degree programme, students are not given an opportunity to practice and apply this concept into their professions in their home countries. Therefore, using a qualitative approach, the academics conducted research to determine the change in international students understanding of sustainability before and after their enrolment in an Applied Technology degree. The research also aimed to evaluate if international students viewed sustainability of relevance to their professions and whether the students felt that they will be provided with an opportunity to apply their knowledge about sustainability in the industry. The findings of the research are presented in this paper.

Keywords**—**Education for sustainability, international students, vocational education.

I. Introduction

THE decade of Education for Sustainable Development inspired a worldwide drive to embed education for sustainability at all educational levels [1]. This decade reinforced the critical role education played in attaining a sustainable future. Education for sustainability may help transform individual's attitude and values, and can inspire them to become sustainable practitioners [1]. According to the International Centre for Technical and Vocational Education and Training, "programmes should provide encouragement and opportunities for students to learn how to reflect upon their own values, how they affect lifestyle choices and the social, economic and environmental impacts that would result if everyone in the world believed and acted as they did" [2, p. 17]. Higher education can support sustainability education and help create students that may one day help shape a sustainable future [3], [4].

In order to achieve such a future, a reorientation in educational curricula and teaching and learning is needed [5]. With the embedding of sustainability concepts into the curriculum, future generations would be able to acquire skills, knowledge and attitudes needed to perform in a more sustainable manner in the workplace. Curriculum and educational methods must be designed to allow for transformation in students' perspectives and viewpoints about sustainability and this transformation holds the key to a sustainable future [6].

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II. Literature

A Canadian study investigating the environmental values of students indicate that many students do alter their views on the importance of environmental issues as a result of education for sustainability [7]. In this Canadian research the transformation showed a shift in student's perspectives. A comparable investigation conducted in the UK provided similar positive results but additionally indicated a sense of futility amongst the students regarding the future of society in the face of broad-based environmental challenges [8]. Although many of the students surveyed thought that environmental sustainability was a 'good thing', few were aware of the wider social, political and economic dimensions of sustainable development. Thus, there is a significance of widening students' perceptions of sustainability from a limited focus on environmental knowledge to an appreciation of wider concepts, including economic influences, governance issues and societal impact [9]. The interconnectivity between these wider issues and recommends encouraging students "to make more direct links to their own lives, perhaps thereby encompassing a more political, 'who decides?' dimension of sustainable development" [9, p. 555]. These studies have primarily examined the views of students as a homogeneous group but have not looked at their countries of origin. However, an earlier paper examined environmental attitudes of college students across 14 countries, mainly in North and South America. They demonstrated that high levels of environmental values were not restricted to wealthy, post-materialist countries and showed that in general, their Latino respondents answered their questionnaire in a more pro-environmental manner than US students [10].

More recently, some researchers used a modified version of the New Environmental Paradigm (NEP) questionnaire to survey the responses of international students studying business and IT at an Australian university [11]. This survey examined the wider sustainability responses of students who had participated in a programme designed specifically for international students and who were introduced to sustainability concepts, both theoretically and at a level of personal responsibility. These students came from a number of developing countries, such as Asia, Latin America, Africa and Eastern Europe. However, in contrast to the findings of Reference [10], the authors of this research considered that people from wealthier countries had a greater level of environmental concern than from those poorer nations.

Nevertheless, their findings agreed with the general premise that older students out of the Y-generation category displayed a more heightened awareness of environmental issues than did younger students. In addition, it is likely that students' attitudes are influenced by many social factors with gender, age, occupation and chosen area of study playing significant roles. Reference [12] stressed that the level of education attained may also have substantial impact in attitudinal differences. When a higher proportion of youngsters acquire a higher level education, attitudinal difference reduces in strength. Reference [12] emphasized that different fields of education are influential towards attitudes, for example, the attitude of a humanities student may be significantly different from a communications student.

Reference [12] additionally confirmed that students' attitudes are clearly related with socio-cultural and economic backgrounds and this could be demonstrated by comparing students from academic programmes, who had more tolerant attitudes than students in vocational programs. The research found that vocational students have more positive environmental attitudes than science and engineering students [13]. This was mainly because the researched vocational students studied aspects of sustainability in their courses while the science students had not. Another research showed that vocational students who were not exposed to Sustainability education had less positive environmental attitudes [14].

The literature highlighted here suggests that while significant research is currently being undertaken on the environmental perspectives of international students from the business and IT disciplines, there appears to be a gap in our understanding of the views of international students from the vocational area, a gap that this paper attempts to address.

III. Methodology

Since 2004, within the Bachelor of Applied Technology (BAT) degree, second-year students participate in a compulsory course entitled Sustainable Technologies. Students are from a range of practical disciplines, including Automotive, Electrotechnology and Construction. From 2004, one notable feature has been that the proportion of international participants has slowly increased until now they comprise 60% of the average class. The majority of these students come from Saudi Arabia, Malaysia and China. The latest sustainability index from these countries shows that their ranking is low and still falling, with Malaysia ranking 37, Saudi Arabia 51, and China 78 on a comparative global scale [15]. These figures underpin the significant importance in transforming the awareness of these students and in emphasising that as individuals, they can make a difference.

This research aimed to obtain students prior knowledge of sustainability before they joined the Sustainable Technologies course and any change in their knowledge after completion of the course, and in turn gauge their perceptions on applying sustainability skills in industry. A qualitative research methodology was employed with questionnaires acting as the main method for data collection. Reference [16] recommends the use of a values scale for attitude measurement. Thus, a questionnaire was designed using a combination of qualitative and quantitative questions to collect data. The questionnaire was designed online using Google Docs and the link of the questionnaire was later emailed to the students who had consented to participate in the research. The questionnaires were administered twice spanning two semesters, however, the response rate was poor. Therefore, a modified paper based questionnaire was designed and distributed to students. The results were then entered and analysed using Microsoft Excel. The questionnaire findings are presented in Section IV.

IV. Findings & Discussion

Twenty-two international students participated in the Online Survey. The students originated mainly from Saudi Arabia, Malaysia and India with a few participants being from the Pacific Island States. All students were enrolled in the Bachelor of Applied Technology (BAT) programme with 45% studying Automotive Technology, 45% studying Electrotechnology and 10% specializing in Building Technology.

A. Students' Pre and Post Knowledge of Sustainability

As suspected by the course lecturers, 50% of the international research participants had little or no awareness of sustainability before they embarked in the Sustainable Technologies Course in the BAT, as indicated in Fig. 1. As most international students acquire cross-credits for part of their BAT programme as a result of an existing Memorandum of Understanding (MoU) between their home institutes and host institutes, it is likely that these students may not have covered concepts of sustainability in the programmes they completed in their home countries.

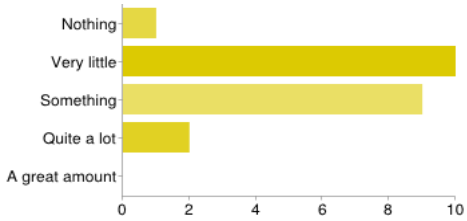

Fig. 1 **S**tudents' existing knowledge of sustainability prior to entering the BAT

The data indicated in Fig. 2 shows that all the students felt they expanded their understanding of the potential values of sustainability after embarking in the Sustainable Technologies course-findings that support the research Reference [7]. This also agrees with research on Australian apprentices' and trainees' where the numbers of young skilled workers learning sustainability skills increased significantly, mainly through studying at technical and further education (TAFE) institutes [17]. This longitudinal study showed that between 2008-2011 there has been a profound positive improvement in apprentices' and trainees' attitude towards sustainability that has been brought about by training institutes, media and personal sources (family and friends). As a result, there appears to be a determined effort by these students to take

positive environmental action as well as awareness of social and economic aspects of sustainability, and growing concern about the future.

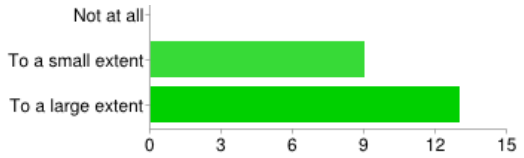

Fig. 2 The post-course change in student perceptions about sustainability

B. Students' Perceptions of Sustainability Application

A total of 65% of the participants believed that sustainable technology was being applied in a very limited manner at present in their home countries within their specialization, as indicated in Fig. 3. Nevertheless, most students perceive that sustainability should be an important aspect of their professional life and want it applied to a greater extent in their home countries. This is an encouraging result considering that 80% of international participants intend to return to their home countries after completion of their studies. This research confirmed that the students from the three countries mentioned (Saudi Arabia, Malaysia and China) overwhelmingly believed that expanding their knowledge of sustainability was a valuable step, and most felt that there were many opportunities for the application of sustainability within their industries in their home countries. Not only is this outcome in agreement with other published findings [7], [11] but it also supports the conclusions that vocational students see a particular requirement for skills for sustainability to be systematically considered within their tertiary education programme [18]. Drawing these two strands together, the results indicate that providing international vocational students with increased awareness of 'green' issues relevant to their industry will be of significant importance in the coming decades.

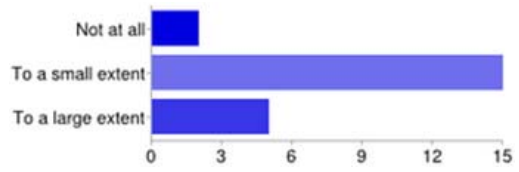

Fig. 3 Students perception of the actual application of sustainability in their home countries

C. Relevancy of Sustainability Practice for International Students

Some 82% of participants aspire to seek employment in their specializations after their return to their home countries. Even though students indicated that sustainable technologies had the potential to be applied to a larger extent in their home countries (Fig. 4), the majority of them doubted whether this potential could actually be achieved in practice (Fig. 4). This result is similar to the conclusions reached by [8]. In order to allow students to overcome their feelings of futility regarding practical applications of sustainability, it is vital that they are exposed to practical success stories from their own discipline. In other words, while reflections on the negative impacts of issues like global warming and loss of tropical rain forests have their place in Sustainability programmes, they must be balanced by evidence of a positive and productive nature.

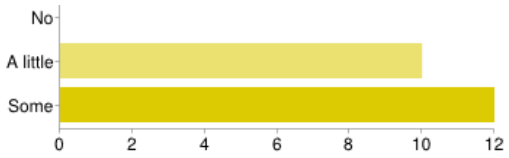

Fig. 4 Students' perception of the potential application of sustainable technology in their industry in their own country

V. Conclusion

Subsequent to the primary findings discussed in this paper, one of the authors has carried out a case study on international students' responses to problem-based sustainability projects [18]. The students who participated were from Automotive and Electrical disciplines and originated from Tanzania, Fiji and Saudi Arabia. They jointly undertook a practical project to convert a fossil-fuelled Tuk-Tuk into an electric vehicle, powered by solar energy. Although not everything went as planned, the participants agreed that their perspectives of the value of sustainability had been expanded by their experiences. Interviews with these students confirmed that their project had encouraged student centeredness, self-regulation and collaboration. The participants felt empowered to tackle complex issues within the theme of sustainability and agreed that they had experienced a transformative learning process. At the end of their research they described a number of ways in which they hoped to take sustainability concepts back to their home countries for practical application in their own industries although they were uncertain how successful this might be.

It is evident through both phases of this research that even with some change in international students' perceptions on the importance of sustainability; they are still hesitant on the future practical application of the concept in their home countries. This reluctance to embrace this concept in their future professional lives raises the question of whether they will accept their roles as change agents of the future. It can be concluded that the international students continuing uncertainty on the future application of sustainability highlights that many may still consider it as irrelevant.

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