World Transactions on Engineering and Technology Education
Vol.2, No.1, 2003

Students' viewpoint on the importance of industry partnerships in engineering and technology teacher training

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ABSTRACT: The training of engineering and technology teachers, who are capable of working together to better prepare the youth for the transition from schools of Further Education and Training (FET) to work in order to reduce unemployment, is an issue of critical concern in South Africa. This has placed a high level of demand on higher education institutions that train engineering and technology teachers to enhance their partnerships with the technology industry, which is historically poor. This article gives a brief overview of the higher education institutions that offer engineering and technology teacher education and explores the research methodology that was used to test learners' viewpoints with regard to partnerships established between industry and higher education and their regular visits to industry during their training, and also presents the relevant results and findings. The article concludes by making suggestions as to how to improve the level of partnership activity between industry and higher education institutions that train engineering and technology teachers.

INTRODUCTION

Since 1965, South African higher education institutions could not produce the scientists, technicians and technologists that the workforce required [1]. Therefore, the country is still facing a shortage of technically skilled workers at all levels, ie engineers, technicians and technical assistance [2][3].

Technological innovations present society with tremendous challenges and opportunities. Economic and technological forces have led to higher unemployment and yet, at the same time, pushed South Africa to a new kind of global competitiveness, resulting in the invention of products that improve the quality of life. This situation requires people to develop new skills and to work in more effective ways [4][5].

According to Galluzo, there is little faith in the ability of teachers and existing schools to prepare students for the workplace and higher education [6]. This loss of confidence is fuelled by the following beliefs:

- The present configuration of schools is incapable of producing learners who can meet the increasingly complex demands of the workplace.
- The present school curriculum is outdated [2]. According to Frentz, all students who complete high school should have acquired the skills needed for employment, as well as those required to continue their education [7].

The Department of Education states the following:

> *The present system of FET (Further Education and Training) qualifications and programmes offered by schools, colleges, industry and private providers do not prepare learners adequately for success in further learning or for productive employment* [2].

The quality of technology education programmes is significantly determined by those successful students who have acquired the relevant skills, knowledge and values needed by society and, more specifically, the workforce [8].

The fundamental reason for this situation is the history of the South African higher education system, which has always been biased towards a specific population group, especially with regard to engineering and technological education. A call was made for careers to be available to all, and if the fruits of this call are to benefit every South African, then higher education, with specific reference to engineering and technology education, should be brought out of the ivory towers and be made available to all South Africans [9].

Until the new Further Education and Training (FET) schools curriculum is developed and implemented, there is currently a lack of faith in the ability of technical educators and technical schools. In order for learners in the workplace to excel on the job, they need to comply with the new democratic system and the information age [6]. This suggests that technical teacher education will operate in a climate that fosters reflective thinking, problem-solving skills and a collaborative environment [6].

Present and future technical educators need to develop the competence to understand and appreciate the current technology and, therefore, instil such understanding among their learners. Although there is a programme for the transformation of FET schools, which emphasises a well-trained workforce, little attention has been paid to a vital process of preparing the youth for a labour intensive market [8]. In South Africa, the question of how to prepare technical educators to the ever-changing and increasingly competitive workplace of a global economy is still to be fully addressed.

To emphasise the need to prepare FET schools learners for the world of work, the South African Department of Education has stated the following:

> *We will place particular emphasis on promoting linkages that combine theory with practice and that offer learners practical and on-the-job training* [4].

BACKGROUND TO TEACHER EDUCATION AND TRAINING FOR FET INSTITUTIONS IN SOUTH AFRICA

There are quite a large number of higher education institutions that offer academic teacher education, as compared to those few that offer technical teacher education. There are currently 20 universities that provide contact teacher education through their departments, faculties or schools of education. However, there are 28,954 student teachers in South Africa [10].

Presently, there are 15 technical institutions in the country. Five out of the 15 existing technical institutions offer teacher education, including teacher preparation for engineering education. These technical institutions cater for a total of 1,846 students [11].

Due to the new OBE Curriculum 2005 framework, there is a great need for FET institutions to implement engineering and technology education programmes. This places great demand on the re-training of educators so as to fit them into the new system. Therefore, the role of technical institutions as providers of engineering and technology education becomes more important than ever before.

PARTNERSHIPS BETWEEN ENGINEERING AND TECHNOLOGY TEACHER TRAINING INSTITUTIONS AND INDUSTRY

The fact that South African engineering and technology education does not adequately meet the needs of the labour market can be attributed to a lack of partnerships between engineering and technology teacher training institutions and industry [12][13]. This fact has been reiterated by the Department of Education as follows:

> *There is a chronic mismatch between higher education's output and the needs of modernising the economy. In particular, there is a shortage of highly trained graduates in fields such as Science, Engineering, Technology and Commerce and this has been detrimental to economic and social development* [10].

For years now, young people, parents, community leaders and various stakeholders in education have not been included in decision-making and curriculum development. During the pre-transformation period (ie before 1994), there were no significant partnerships between industry and higher education institutions, particularly with regard to technical teacher training departments.

However, during the period of transformation, institutions of higher education in engineering and technology education could no longer afford to stay isolated from industries if they wanted to meet the needs of the labour market [13]. In view of this situation, Nxumalo has asked the following question:

> *What have our teachers got when they graduate from our technikons (technical institutions), colleges of education and universities to make these dreams come true?* [14].

Partnerships are the vehicle for the delivery of activities that support school to post-school transitions. These partnerships will enable engineering and technology teachers to further encourage and improve partnerships between schools and industry. It is envisaged that these partnerships will gradually increase the enterprising culture that is required in engineering and technology education [15].

RESEARCH METHODOLOGY

Learners' viewpoints were sought with regard to the partnerships established between industry and higher education institutions, as well as their regular visits to industry during their training.

Population and Sample

The sample came from three technical institutions that offer teacher preparation in engineering and technology education in South Africa, as well as two FET colleges and two technical high schools.

The population consisted of 173 students from these institutions. All students were in their final year of study and they were asked to determine whether they considered that their needs had been met during the education process. They were also asked whether their regular visits to industry during their engineering and technology teacher training was important or not.

Instrumentation

The study was conducted to identify significant factors in the training of engineering and technology teachers. One aspect of the study incorporated the partnerships between engineering and technology teacher training institutions and industry as part of curriculum for their training. It was considered important to obtain as much information as possible from the learners involved in the teacher preparation programmes for engineering and technology education.

The questionnaires were used to collect data as they are conveniently used to obtain information that would otherwise be beyond the physical reach of the researcher [16]. According to Tuckman, a questionnaire is considered to be a relevant instrument of measurement that could successfully reveal data about persons by asking them, rather than observing their behaviour in a particular way [17].

The questionnaire was also used to obtain information about the participants' thoughts, perceptions, opinions, values and beliefs about the teaching and learning of student teachers [18].

The questionnaire used a summated rating scale, or Likert scale, to measure abstract constructs.

Results and Findings

Students were asked to provide their opinions on three types of partnerships and their importance in the training of engineering and technology teachers. A summary of the results is presented in Table 1.

The findings displayed in Table 1 reveal that the majority of learners (91%, 87% and 92%) agreed that all of the partnerships mentioned in the table are important for the development and promotion of engineering and technology education.

CONCLUSIONS

Partnerships between engineering and technology teacher training institutions and industry are considered necessary to keep teachers abreast with the latest development in the technological environment. A programme for partnerships should be developed that includes regular industrial tours by teacher educators (lecturers) and students, as well as tailor-made, short practical courses for lecturers so that they can develop the relevant technological knowledge and skills.

All engineering and technology teacher training programmes should be structured to prepare teachers with the necessary skills and knowledge so that they can develop and implement integrated contextual curricula that prepare young people for the workplace, as well as for continuing education. This is a huge challenge for South Africa because of the high level of youth unemployment. This will require specific policies and procedures that will encourage industry to establish partnerships with engineering and technology teacher training institutions.

These partnerships should be collaborative among teacher educators in order to develop new knowledge bases that focus upon career development as a life-long process and utilise problems and protocols from various workplaces as the context for teaching and learning in cooperative and interdisciplinary settings.

Teacher training programmes in institutions of higher education, particularly in engineering and technology education, have unique opportunities to provide leadership in training teachers who are capable of working together to prepare youth for their transition from school to work. The training of teachers who will become instructional leaders for the workforce preparation of the youth should be given the highest priority at engineering and technology teacher training institutions of higher education in South Africa.

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Table 1: Students' viewpoints on the importance of partnerships in engineering and technology teacher training.

Types of Partnerships		Evaluation Scale		
		Disagree	Do not know	Agree
1.	Engineering and technology teacher training will be enhanced by partnership between teacher training institutions and industry.	7%	2%	91%
2.	A professional consortium of engineering and technology education bodies which develops the engineering and technology education programmes should be established.	8%	5%	87%
3.	The establishment of a national association of industrial and technology teachers in South Africa will keep engineering and technology teachers abreast with the latest development.	3%	5%	92%

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