

## Strategies for engineering and technology education in the era of the knowledge economy – the Taiwanese example

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**ABSTRACT:** In this article, the authors present findings of a study into the current situation and difficulties encountered in the field of engineering and technology education in Taiwan. The number of students in vocational schools in Taiwan has recently decreased. So greater emphasis and effort needs to be placed on seeking how to improve the quality of vocational education. The *knowledge economy* has overwhelmed the learning fields, including engineering and technology education. It is only when learners catch the spirit of the nucleus value that they will be able to create more and more originality in their lives, and thereby bring about greater and more fruitful happiness for people. In this study, the authors offer four strategies for engineering and technology education in the era of the knowledge economy. The importance of engineering and technology education needs to be fully understood and the authors have confidence that adjustments would make learners possess increased abilities and wisdom that will help facilitate students' and workers' professional progression in this time of the knowledge economy.

### INTRODUCTION

In agricultural times, people earned a living through their labour, so that time could be called the *labour economy*. In the industrial era, the operation of technique was the most important ability, so for this reason, that time could be dubbed the *technique economy*. Nowadays, the application of people's intellect results in much valuable knowledge, so this could be called the *knowledge economy* or the *knowledge-based economy*. In any case, knowledge is a very serious matter, radically changing the economic picture of the world [1].

The knowledge economy has overwhelmed the learning fields, including engineering and technology education. Besides practicing techniques ingeniously, students need to know *why* it was, not only *how* it was. Enlightening students' interests is more important than giving them the answers. It is only when learners catch the spirit of the nucleus value that they can generate higher levels of originality in their lives and thereby bring about greater and more fruitful happiness for the people around them.

In the knowledge-based economy, *innovation is driven by the interaction of producers and users in the exchange of both codified and tacit knowledge*. It also points to an interactive model of innovation (replacing the old linear model), which consists of knowledge flows and relationships among industry, government and academia in the development of science and technology [2].

In the study presented in this article, the authors elaborate on the current situation and difficulties encountered in engineering and technology education in Taiwan. The number of students enrolled in vocational schools in Taiwan has significantly decreased in recent times. In line with the Chinese traditional concept, parents prefer their children to take academic courses rather than technical courses.

A diploma-oriented education makes people highly praise those who concentrate on academic subject areas. Therefore, what students learn in school could not be correspondingly applied in practical life. As such, identifying how to improve the quality of vocational education requires greater attention and effort.

### THE KNOWLEDGE ECONOMY

The Organization for Economic Co-operation and Development (OECD) report, *The Knowledge-Based Economy*, begins with the following statement:

*OECD analysis is increasingly directed to understanding the dynamics of the knowledge based economy and its relationship to traditional economics, as reflected in new growth theory. The growing codification of knowledge and its transmission through communications and computer networks has led to the emerging information society. The need for workers to acquire a range of skills and to continuously adapt these skills underlies the learning economy. The importance of knowledge and technology diffusion requires better understanding of knowledge networks and national innovation systems [3].*

This report is divided into three sections that focus on the trends and implications of the knowledge-based economy. The OECD has also looked at the role of the science system in the knowledge-based economy and indicators, as well as dealing with the question of measurement [4-6].

However, this focus tends to overshadow the very significant challenges being made to the formal schooling sector where the knowledge economy discourse suggests that this sector is delivering neither the kind of educational experience nor

appropriately equipped individuals who are the key to the development of a competitive knowledge-based economy and society [7].

Whatever changes occur in human society, the economy, life and education, identifying how to capture useful information and transform it so that it becomes the helpful knowledge is the key to ensuring a degree of competition. Therefore, in this current context of the knowledge economy, people should pay more attention to seeking advanced knowledge and possessing innovative thinking.

#### Structure and Definition of the Knowledge Economy

As mentioned above, the knowledge economy can be defined as production and services that are based on knowledge-intensive activities. Such activities contribute to an accelerated pace of technological and scientific advancement, as well as equally rapid obsolescence.

The key components of a knowledge economy include a greater reliance on people's intellectual capabilities than on physical inputs or natural resources, combined with efforts to integrate improvements at every stage of the production process, from the R&D laboratory to the factory floor to the interface with customers [8].

#### THE CURRENT SITUATION IN TAIWAN

Deeply impacted by the knowledge economy, education faces a serious trial. The number of students in vocational schools in Taiwan have decreased significantly. Engineering and technology education in Taiwan is facing various troubles and challenges. These are elaborated on below.

#### The Function of Engineering and Technology Education

The function of engineering and technology education has increasingly become useless. In the Chinese traditional concept, parents prefer their children to undertake academic courses rather than technical courses. A diploma-oriented education makes people highly praise those who concentrate on academic subject fields.

#### Confusing School System of Engineering and Technology Education

The school system of engineering and technology education has become confusing. In order to match up the demands of formal schooling, the Ministry of Education in Taiwan has introduced a specific educational policy and expanded the scope of schools. However, they are not concerned about whether the quality of students could catch up with social changes.

#### Decreasing Student Numbers

The number of students in vocational schools has decreased; at the same time, the birth rate has rapidly decreased over recent years. Many schools are faced with the challenge of falling student recruitment.

Furthermore, parents will choose more highly rated schools for their children in order to maximise their children's opportunities for future achievements. If some schools do not produce better outcomes, they will be eliminated through competition.

#### Inadequate Resources for Engineering and Technology Education

The inadequate level of resources for engineering and technology education can result in a reduction of the quality of teaching. Because of financial reductions in government budgets, schools may not have sufficient funding to buy facilities. Also, insufficient educational funds makes the running of administration much more difficult.

#### Difficult Connectivity between Engineering and Technology Courses

The complexity and transformation of engineering and technology courses has resulted in difficult connectivity. Various engineering and technology courses have a lot of differences between their subjects. Identifying how to make students realise all their subjects has many difficulties. Nowadays, teachers still cannot help students understand all the knowledge they need to acquire.

#### Lack of Collaboration with Industry

The general lack of collaboration with enterprises and industry means that students do not have sufficient or quality professional experience. The goal of engineering and technology education is to foster all levels of talented technical persons. However, the learning courses in schools cannot match the requirements for the abilities needed by various industries. After graduation, many students cannot find appropriate positions for their careers.

#### STRATEGIES AND OPPORTUNITIES FOR TAIWAN IN THE ERA OF THE KNOWLEDGE ECONOMY

The current situation with regard to education and the knowledge economy in Taiwan has given rise to a crisis and these troubles are set to become increasingly exacerbated. By mastering various types of knowledge and abilities, one can realise more opportunities to gain more wealth. The arrival of the knowledge economy promotes people to seek knowledge actively and manage their wisdom more effectively. In this study, the authors offer four strategies to correspond to the engineering and technology education in knowledge economy times and these described below.

#### Reconstruct Professional Engineering and Technology Education

The reconstruction of professional engineering and technology education needs to be carried out first. The knowledge economy emphasises the ideals of innovation and old ways of thinking have to be changed.

Understanding the differences of students and inspiring the power of learning will make them think more completely. Furthermore, networked information creates highly changed surroundings. Knowledge capital should be mastered in order to help promote the individual, the nation, the economy and knowledge generally.

#### Re-Examine the Learning Environment

The learning environment needs to be re-examined. The popularisation of higher education has become a new trend. However, the quality of schools should be controlled. When

advertising for teachers, a school's administration should be concerned about their specialisation ability. Teachers need to make efforts to successfully realise courses and provide innovative teaching, thereby influencing the learning achievements of students.

### Create Unique Learning Styles for Schools

The creation of unique learning styles for schools is also important. Schools have their special surroundings and members. So all schools cannot be measured to the same standard. By facing the challenges of the knowledge economy, a school-based curriculum will help schools to develop their own characteristics. Facilitating cooperation between schools will help them to recognise each other's strengths and characteristics. Another strategy is to hold international conferences in order to foster educational and cultural exchanges.

### Build Partnerships with Industry

Partnerships with enterprises and key companies need to be built. Education is a partnership career and the school is one partner of this relationship. Engineering and technology schools should make full use of the resources available and build exquisite marketing strategies. Schools can offer advice to businesses on the following:

- R&D techniques;
- Strategies and approaches to encourage innovation;
- The provision of counsel;
- The provision of human resources.

Another important strategy for schools is to strengthen the foundation of university-industry cooperation.

### CONCLUSIONS

To sum up, the following strategies will help to realise the opportunities provided by the knowledge economy:

- Reconstruct professional engineering and technology education;
- Re-examine the learning environment;
- Create unique learning styles for schools;
- Build partnerships with industry.

The success factor in these times of the knowledge economy is people. After receiving education, human beings will be able to transform knowledge into value judgements and achieve the

goals of education. Nowadays, one can obtain knowledge very easily, but it is more important to know how to change it so that it becomes a practicable treasure. The only way to achieving these goals is by thinking of innovation continuously, and life-long learning to build on knowledge already acquired. It is believed that knowledge can create a better future world.

Nowadays, learners are the hope for a better future. Scholars and teachers should take the responsibility for learners, not only in providing the guiding principles, but also in various other aspects. The importance of engineering and technology education needs to be fully understood. The authors are confident that certain adjustments would help learners possess increased abilities and wisdom in order to become more aligned with the trend of this era of the knowledge economy.

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