Keynote Address

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THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

"New Zealand's experience: Education and Training approaches and solutions in the context of the fourth industrial revolution"

Introduction

Education provides the skills, knowledge and values necessary for people to be productive members of society. Consequently we have traditionally taught young people the basics of grammar, reading, writing and arithmetic, provided them with socialization skills, and inculcated them in the standard social norms of punctuality, obedience and respect for authority. But today in New Zealand we are re-evaluating much of this approach to education because of the realization that it is based around the requirements of factory, commercial and agricultural work associated with the second industrial revolution - that is, before use of computers in the workplace began to transform the economic landscape. The children born in the next decade will grow up in a world where from an early age they have at their fingertips devices that make the routine learning of facts and the ability to remember those facts of little value. Much more value will be associated with understanding concepts and how to use them, and with those skills that computer-driven devices find it difficult to undertake, particularly those requiring imagination and interpersonal skills.

The Information Age and the Education System

Today we are immersed in an 'Information Age' where children are preparing to be globally connected citizens in a world in which digital technology is ubiquitous. We know that 40 percent of today's jobs will not exist in a few decades time so it will be normal to change jobs several times during a person's working life as different careers are created. If our education systems are to adapt to meet these changes in the world some significant barriers must be overcome.

However, the pace of change in education systems is slow. While we may recognize the need for change, education systems usually slower to change than the world in which our students actually live. The reasons why change is difficult to achieve are:

1. State control of the curriculum in the compulsory schooling sector. New Zealand as in most countries the compulsory schooling curriculum is set by government agencies, and this is usually slow and difficult to change. Alternative curricula are not normally welcomed in the state school system, and even private schools may be constrained in what they teach.

2. The capability of teachers is relatively slow to change, upskilling requirements for teachers associated with major changes in the curriculum being particularly challenging. Even in tertiary education sector the teachers may be a barrier to innovation, and in some respects the relative independence of the tertiary sector in relation to curriculum often means that tertiary teachers have more power to avoid change than would be true in the compulsory sector.
3. Our focus on examinations as a way to test what students have learned. Traditional examinations are usually designed to test memory as much as they are to test knowledge and skills. And examinations are often preferred where large numbers of students are involved, including in the compulsory schooling sector, because they provide centralized control of the process and the appearance (though in fact it is the illusion) or rigor in the ranking of candidates.
4. We have very traditional ideas about the subjects that should be studied by students who are presumed to have higher or lower intellectual ability. So even in systems where students are not "streamed" on the basis of tests of intelligence, we still often stream students by the subjects that we persuade them to take – with students who are thought to have lower intellectual capacity being encouraged to take subjects that prepare them for more manual and routine work, and students with higher intellectual capability streamed into the sciences, languages and literature.
5. We are very focused on pre-requisites, so that students cannot take a subject this year unless they studied that subject, or something considered suitable preparation, in the previous year. This means that there is a lot of "path dependency" in education choices, and once students have gone down one education path it is difficult for them to change paths.
6. We have found it difficult, especially under our existing educations systems, to generate social change, social advancement, and to lift families socio-economic status using education. Educational attainment is, unfortunately, persistently related to the educational attainment of a child's parents, and the educational attainment of a child's mother is the best predictor or a child's educational achievement.

Below I consider each of these issues in more detail.

Curriculum Change

Curriculum change is urgently needed in all countries to move the curriculum away from 20th century concepts of knowledge and learning. But to rewrite a curriculum to avoid an emphasis on routine skills and memorization is very difficult when the whole system has been based on that approach for 200 years. And to shift the curriculum to encourage innovation, and to encourage interpersonal skill and teamwork development through group tasks goes against a long history of focus on the individual, and setting problems where we know exactly what the answer will be. Research clearly shows that people do not learn well as 'spectators', as passive recipients of pre-packaged, bite-sized pieces of knowledge: good learning requires active engagement across the whole education spectrum. The problem with conceptual thinking and encouragement to innovate

and active learning is that it is much more difficult to write into the curriculum than our traditional approaches to education. But we must try.

Teaching

Just as difficult, is training teachers to take a new approach based on concepts, innovation, teamwork and interpersonal skills. How do we train teachers to teach that? And how will it be assessed? So before we begin the absolutely enormous task of retraining out teachers, we need to understand exactly what we are retraining them to do, and at the moment there is relatively little systematic thinking about this. Certainly, teacher training organisations in New Zealand are still training teachers pretty much as they have done for a long time (and in part they are constrained by the accreditation body, the Teachers' Council, which is very conservative in its approach.

Examinations

In New Zealand, the examinations for the last years of secondary schooling will, in the next five years, be able to be taken on line. This also means that students will be able to take those exams when they feel ready to take them. The days of having to take an exam at 8am on one particular day will not last more than another decade in the secondary school system. Interestingly, university staff are often more resistant to changing from traditional examinations, even though most individual papers now have at least some of their assessment based on tests and assignments completed during, rather than at the end, of the course.

Looking further out, we can expect digital technology to provide opportunities for students to take on-line exams that are actually interactive: that is, where the questions asked and the tasks set respond to the answers to previous questions. Exams like this will be much better at testing critical thinking and conceptual knowledge, and place little value on memory.

Subjects

Our traditional ideas about subjects had us putting students who were thought to have low intellectual capacity into trades-based subjects, and in subjects with a high level of routine such as clerical work. But the thing we know with the greatest certainty about the future is that far fewer of these types of jobs will exist. Clerical skills without advanced desktop computer skills will be useless, mechanical skills will not be relevant unless they are at the level where there is an understanding of engineering and the programing of robots.

One of the biggest challenges will be that in the past we have thought that only the most intelligent students could study engineering. But in the future, a lot more students will need to know some engineering, and so technical college and university teachers will need to work out how to move their ways of thinking about teaching away from the current intellectual elitism of these subjects to teaching that is much more accessible to a wider range of students and a wider range of careers.

Path Dependence

A key way in which to break the problems of prerequisites, especially for adult learners, is to provide pathways into graduate degrees that recognize experience but not specific prior knowledge. The first degree of this type was the MBA, but now universities in many countries are increasingly offering master's degrees that are career focused but not pre-requisite focused.

Social Mobility

Many aspects of education in New Zealand have undergone transformation in the past two decades, including the areas of governance, curriculum, assessment, qualifications, and teaching and learning. New Zealand does however face many issues in its education system, particularly in relation to the low levels of educational achievement by students from low socio-economic communities. We know that education is a very valuable way to assist families in raising their standard of living, but we are not doing nearly as well in using education for this purpose as we should, with many families stuck in multi-generation cycles of low income, crime, and poor health. But new ways of thinking about learning, and digital technology that changes the way in which we think about attainment in our system, have at least the potential to engage learners from low socio-economic groups to a greater extent than previously. The more people learn, the more they are capable of learning.

Conclusion

Educationalists first started to talk about '21st century learning' during the latter years of the 20th century. At that time, the phrase held connotations of the future, of change, of something different from practices of the day. However, now that we are in the second decade of the 21st century we can say with certainty that we have not moved nearly fast enough to work out what 21st Century learning means and to actually implement it in the classroom. Indeed, in New Zealand we are still sponsoring commissions who are studying "the future or work" and otherwise delaying change in the educational system. As things stand, there is a growing gap between the education our young people are getting, and the education they need to equip them for the future of work. All education systems need to address these issues with urgency.