

Educating for the Ideal Graduate - A Case for New Measures in Tertiary Education

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Presented by:



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1 EXECUTIVE SUMMARY

This paper looks at the ideal qualities for tertiary graduates, the key steps that tertiary providers should take, and suggestions for performance measures that the Tertiary Education Commission could require that would lead to change.

New Zealand universities are no worse at educating than other countries, but poor education practice is a waste of resources and human potential. Theories for quality education have been well developed and applied in New Zealand schools and to some extent in polytechnics. Yet universities that research and teach these principles fail to apply them within universities. Below are some examples of the gap between theories of educational excellence and common practice in universities:

Education Theories for Excellence	University Education Practice
Well trained quality teachers	Academics not trained in education principles or practice
Feedback to teachers	No process to apply feedback to academics
Personal feedback to students	Impersonal feedback to students
Feedback that reflects and rewards learning	Feedback that identifies shortcomings
Whole learning that encourages IQ, EQ and SQ thinking skills	Narrow band of learning that supports IQ, but discourages EQ and SQ thinking skills
Encourage students to say “I think”	Discourage students to say “I think”.
Two way communication	Lecture theatres
Integrated curriculum	Silo curriculum
Use applied projects to learn theory	Theoretical learning
Team learning	Individual learning with team learning strongly discouraged
Project based assessment	Exam based assessment
Focus on higher orders of Bloom’s Taxonomy of Learning such as judgement, creativity, problem solving and affective learning	Focus on lower orders of Bloom’s Taxonomy of Learning such as knowledge, comprehension, application and analysis.

Below is a summary of the qualities I would expect in the ideal graduate. The higher up the taxonomy the harder it is to use standardised measures and exam based assessment. The challenge is to develop courses and assessment practices to foster higher order learning but are also reliable indicators of learning.

Qualities	Intelligence	Measurement Challenge
Evaluation, idea leadership, synthesis, judgment, insight, creativity, problem solving, intuition, breakthrough thinking, inspiration, intrinsic motivation, vision, commitment, resilience, self belief, enjoyment, flow	SQ	Imprecise, hard to measure many right answers, possibilities, many paths, uncertain outcome, inconsistent standards
Teamwork, people leadership, awareness, action, relationship management, emotional wellbeing, physical wellbeing, optimism, skills, experience	EQ	 <p style="text-align: center;">Increasing measurement challenge</p>
Knowledge, understanding, application, analysis, planning	IQ	

Performance measures are a key way of influencing the behaviour of both students and institutions. Institutional measures need to encourage universities to:

- Focus on the importance of learning,
- Develop a range of student qualities, not just academic knowledge
- Encourage assessment for higher order learning
- Improve the quality of academics as teachers
- Improve the relative performance of Māori and Pasifika students.

Some possible measures that could be applied by the Tertiary Education Commission are suggested in the report.

Universities are a challenge to change. They have given themselves very high status that is pegged to their similarity to prestigious institutions overseas. Yet the status is not deserved. Of 54 students I interviewed who have studied in both universities and polytechnics or PTEs 52 claimed they learnt a lot more in the polytechnics or PTEs and to a higher standard.

Of the 12,000 students I have taught, those who came from the New Zealand education system stood out for their thinking and ‘can do’ qualities. I would like to see New Zealand universities match the educational excellence of New Zealand schools. This would provide excellent graduates as well as a competitive edge for promoting New Zealand as an education destination.

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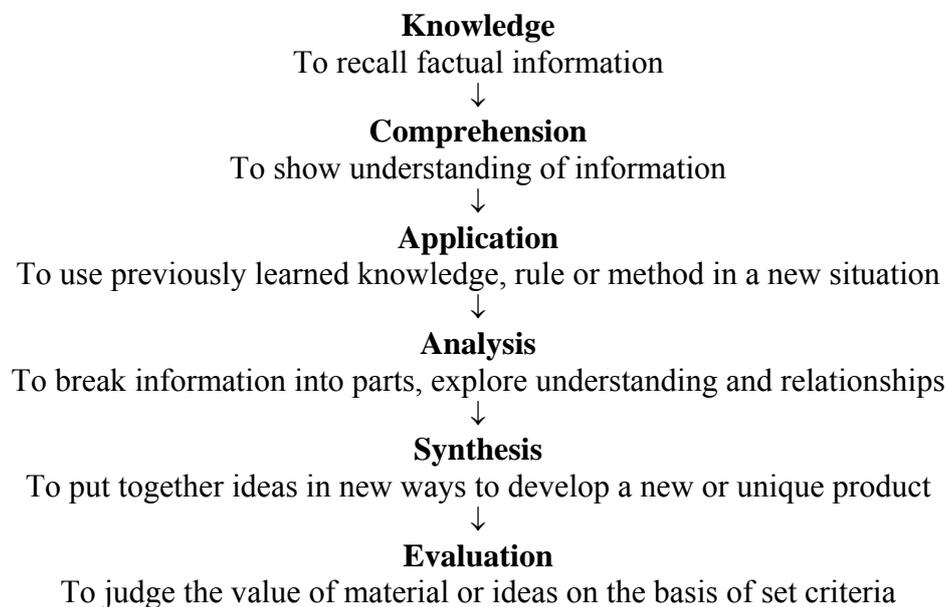
2 THE IDEAL GRADUATE

“Is education about filling a bucket or lighting a fire?” W B Yates

2.1 BLOOM’S TAXONOMY OF LEARNING

Academic versus applied study is sometimes presented as though they are nearly mutually exclusive. Research on how people learn suggests that the more academic study is tied to application the better educated is the student. In fact the way we traditionally teach many academic subjects with an emphasis on knowledge and comprehension is at the lowest level of education attainment.

Bloom (1974) set out a taxonomy of educational objectives:



This taxonomy suggests students should be put into situations where they use, apply, evaluate and synthesise information. A review of the objectives in most university course outlines begin with the words ‘to know ...’ or ‘to understand....’ Learning and assessment are then geared to these outcomes.

2.2 IQ, EQ AND SQ

We can accurately measure dead butterflies stretched out on a pinboard, or less accurately as we observe them fluttering alive and vital.

I would like to suggest two metaphors of education.

The first is **building a wall**. Each layer is based on the foundations of the layer below. Achievement is assessed by the height of the wall. A person with a PhD has a

very high wall that forms a barrier for competitors to scale and catch up. This metaphor sees education as static, with little purpose, and the potential lies with the bricks and the bricklayer (lecture material and lecturer).

The second metaphor is **growing a seed**. This time the potential is with the seed enhanced by the environment in which it is grown. Growth is dynamic and with purpose. It implies that educators need to believe that the student has untapped potential. Their job is like the gardener who provides shelter, fertilizer and water.

Early education is like growing a seed, with teachers using hard and soft measures and focused on the whole child. But higher education is more akin to building a wall, and the measures become more numeric and less holistic. It is time to review the measures of education, especially the reliance on examinations.

It might be useful to consider how the brain thinks.

One form of thinking is undertaken by neurons firing in sequence. Each neuron needs to fire much like the way Christmas lights set each other off in sequence. This thinking enables us to follow rules in ways that are rational and logical such as following mathematical steps or applying a research process. This type of thinking can be called an IQ thinking process. It is accurate, precise, reliable, repeatable and measurable, which makes it very suitable for exam based assessment. It is also within rules thinking. Academics tend to be very high in IQ, and create processes that foster high levels of IQ thinking in their students.

A second type of thinking involves neural networks with up to 100,000 neurons in bundles. Our experiences create pathways through the neurons. It is like when the settlers first arrived. They formed multiple tracks through the bush, but after a while a few routes became favoured and turned into highways while the rest of the tracks were gradually overgrown. Our brain makes highways through the bundles of neurons when we have repeating experiences. We also get lazy, choosing the tried and true way of doing things rather than crafting new experiences.

This type of thinking is sometimes called EQ for emotional quotient. The learning is associative, habit bound, and a conditioned response. It enables us to learn pattern recognition and to acquire tacit learning. But it is difficult to explain what you have learnt. For example as you notice the moods that sweep over a person's face you are confident that you can read their feelings, but would find it difficult to explain in words how you do it. Interviews of 500 managers conducted by one of my 2nd year management classes highlighted interpersonal skills as what they wished they had before becoming a manager. This is mainly a form of EQ learning.

The third type of learning is sometimes called SQ for spiritual intelligence or sensemaking intelligence. It is achieved through running a 40Hz ripple through the brain linking separate parts of the brain. It appears to work most effectively when most of the brain is in the slow alpha and theta rhythms associated with meditating, relaxed, or lucid dreaming. This occurs most easily when musing such as in the shower, strolling, or going to sleep. Linking two thoughts together in the brain can lead to creativity. Linking many thoughts at once can lead to insight, reframing, the ability to break rules and make new rules, and it can give us meaning which in turn

leads to intrinsic motivation. This process is entirely dependant on the individual combining their own unique thoughts and experiences.

My contention is that universities have focused on IQ intelligence as it is easy to teach and measure. I would like to see more effort put into EQ and SQ intelligences. In particular, SQ learning enables students to create their own meaning that in turn motivates students to acquire their own learning.

Control measures are important – you get what you measure! The difficulty is to design a control process that minimises the emotional and physical cost of compliance and maximises the accountability and comprehensiveness of the desired behaviour.¹

The pen and paper tests, that focus on the bottom orders of Bloom’s taxonomy of learning and a narrow skill set, will lead to students doing increasingly well in these tests over time. The focus of the education system will move to ensure this happens..... but at what cost? What will go are higher order skills, holistic skills and intrinsic motivation.

Assessment is the critical tool for focussing student attention on what is important. It is a form of learning and provides feedback.

Universities have regulations governing examinations that suggest they are the ultimate assessment. For example only academics can mark exams, but tutors can do the more difficult and influential process of marking assignments with feedback. In many courses multi choice tests are used on large classes for bureaucratic ease of marking. I feel university is not the place for testing memory and right answers skills.

2.3 QUALITIES OF ‘CAN DO’ STUDENTS

“If you believe you can or you believe you can’t – you’re right!” Henry Ford

Many academics would see the ultimate graduate as somebody just like them – somebody with in-depth theoretical knowledge, the ability to research and write. But as academics we don’t apply that knowledge. Nor are we the kind of people who make new ideas happen.

For me the ideal graduate is somebody with confidence in their ability to learn and apply, and with the vision and courage to make things happen. My teaching experience, and discussions with thousands of students, suggests we are instead creating anxious graduates with analysis paralysis.

¹ The Macnamara Fallacy

- The first step is to measure whatever can be easily measured. **This is okay as far as it goes.**
- The second step is to disregard what can’t be measured easily or give it an arbitrary value. **This is artificial and misleading.**
- The third step is to presume that whatever can’t be measured easily really isn’t important. **This is blindness.**
- The fourth step is to say whatever can’t be measured really doesn’t exist. **This is suicide.**

So I have been designing my courses to develop the missing qualities:

- Passion, especially for ideas
- Energy
- Vision – desired future states can be seen very clearly
- Confidence
- Resilience and optimism
- Creativity
- Experience in making ideas happen
- Courage to be different
- Life expectation that includes being innovative, entrepreneurial or intrapreneurial
- Can work effectively in groups
- Communicate effectively
- Has the ability to carry people with them
- Technical knowledge in their field of endeavour
- Knowledge and ability to apply the business skills that help make ideas happen
- Moderate risk taking for those things that are within their control
- Intrinsic motivation
- Trust their own judgment
- Form their own insights
- Practical
- Action oriented

These skills can be readily taught using action learning, requiring real outcomes, setting immutable deadlines, carefully designed assessment, formative evaluation, constructive feedback, peer learning, peer pressure, group work, town and gown links, and setting very high expectations.

Fortunately New Zealand is blessed with New Zealanders and a school education system geared to developing these qualities and applying these educational processes. It is just the university sector that does not apply these principles. The Prime Minister of Singapore said they look to New Zealanders for creativity and problem solving. They envy our ability to think and tackle challenges. So it is easy for our universities to adopt quality education principles.

2.4 A SUMMARY OF QUALITIES

Below is a summary of the qualities that would be expected from the ideal graduate. This pulls together the concepts listed above and relates them to the challenge of providing meaningful measures. A university education should aim to develop students with all of the qualities needed to fulfil their potential and contribute fully to society.

Qualities	Intelligence	Measurement Challenge
Evaluation, synthesis, judgment, insight, creativity, problem solving, intuition, breakthrough thinking, inspiration, vision, commitment, resilience, self belief, enjoyment, flow	SQ	Imprecise, hard to measure many right answers, possibilities, many paths, uncertain outcome, inconsistent standards
Teamwork, leadership, awareness, action, relationship management, emotional wellbeing, physical wellbeing, optimism, skills, experience	EQ	↑
Knowledge, understanding, application, analysis, planning	IQ	Precise, measurable, right answers, within rules, deterministic, know that you know, consistent standards

3 THE CURRENT GRADUATE

Why is it that the best of my 22 masters students should only be as good as the worst of my 150 undergraduate students, four years in a row, although they were studying the same innovation material?

When we asked the masters students why they were taking the MMSTech degree they divided into three groups:

1. Students who had received outstanding grades in their undergraduate studies and felt they owed themselves a masters degree;
2. Students who didn't know what to do with their life, or doubted they would succeed, so decided to come back for more study; and
3. Overseas students from a rote learning educational system with limited English who felt they needed more qualifications to overcome the cultural challenges facing them.

None of the students said they did the degree because they wanted the learning. They were anxious about grades and wanted to be confident they knew the right answers. Of course in innovation there are no right answers. Each year I struggled to break through the anxiety barriers to inject the students with the confidence to be creative, solve problems and take charge of their learning.

Over the years, I have taught 12,000 students and had meaningful conversations with about 2500 of them. While at Victoria University, I also established 11 programmes aimed at assisting Maori and Pacific Islanders to developing their business and resource management skills. These conversations had some repeating themes.

Many students have told me they made a major mistake in a first year assignment – they used the words ‘I think’. Their marker berated them for the temerity to put their own ideas forward, rather than quoting a more knowledgeable source, so graded them with a fail. These students were typically confused and angry that, unlike school, university discouraged them from thinking. They decided to ‘play the game’ and never use the words ‘I think’ again.

Students, especially Maori and Pacific Islanders, talked about the extreme loneliness of their first and often second year. An astonishing number of people said they did not get to know anybody until they were in smaller classes in their third year. There appeared to be a direct correlation between loneliness and academic performance, with many Maori citing it as the major reason that they gave up.

Another theme that stood out for me was the student's belief that university achievement was all about getting good grades in a programme of study, especially in the MBA. They were also convinced that this was what employers were primarily interested in. They were surprised that employers were also interested in their personal qualities, and achievements outside the classroom. Price Waterhouse for instance ranks communication skills most highly, and how people use their voluntary time second. Academic performance ranks fifth out of eight criteria, and they are

seeking graduates with at least a B average or above. In general the students felt their studies were neither about learning nor about growing to their potential.

Graduates from the Young Enterprise Scheme run for Year 12 and 13 high school students stood out as exceptional performers who were able to tackle a variety of challenges. Even years after they completed the scheme they were consistently the best performers who assumed strong leadership roles. This is a role model programme of educational excellence.

It seemed to me that the students came in on two legs, we gave them a crutch, and they hobbled out on three legs.

4 WHY THE GAP?

In a rapidly changing world the future belongs to the learners. The learned are equipped for a world that no longer exists.

So what is causing the gap between my perception of an ideal graduate, and our current graduates who are paralysed by analysis?

4.1 NARROW VISION OF EDUCATION

Our vision of tertiary education has been conditioned by the education received by academics. Since academics, as perceived by themselves and society, are at the top of the education totem pole, then the vision is to create graduates with the qualities of academics.

What is needed is a much more holistic vision of education. Polytechnics and PTEs largely hold this vision. I have spoken to 56 students who have experienced both university and polytechnic or PTE education. Of these 54 concluded that the polytechnic or PTE provide a better and more rigorous education.

4.2 ASSESSMENT PRACTICES OF STUDENTS

Assessment is heavily focussed on exams. Especially with large classes, there is an unwillingness to set assessment that requires effort and judgement to mark. This is despite the massive profits brought in by these courses.

Assessment is not simply a way of assessing performance. It is the primary way that signals to the students what is important. It is also the process by which students are coached in how to improve. Research by Professor John Hatte of Auckland University found that feedback provided in schools was by far the most effective educational tool for stimulating high performance in students.

4.3 MEASUREMENTS OF ACADEMIC INSTITUTIONS

When universities were first expected to report on their performance, they turned to a very simple measure – number of publications. (This is despite the fact that publications account for less than 1% of the inception of successful innovations, yet the majority of the New Zealand non-medical research budget is spent with publications as the major output.) The adage ‘what you measure is what you get’ held true. Publications became increasingly important. They became the basis for promotions, and in turn the promoted staff used them as the basis for managing their departments. Measures for publications have become more sophisticated but the principle holds – publications are the most important output.

By implication, teaching has become less important. Student evaluations are seen as the academic’s personal data and are only provided as feedback. Little management

notice has been given to them. The simple act of making this data publicly available, so that students could use it as a basis for choosing their course of study, would have a dramatic effect on universities. The measurement would count. Nothing else would need to be done with the measure for it to have a transformational effect on the quality of teaching. Section 5 has many more ideas on appropriate measurement for the tertiary sector.

4.4 STATUS THE DRIVER

I often puzzled at the bizarre decisions made in universities. Why did the strategic planning meetings never discuss the impact on student learning, uptake of research, or contribution to New Zealand? Surely this is what our clients, the students and government, wanted from their investment. When I ran a template over the decisions that made status the most important goal, all the decisions made sense.

Status can be a powerful tool for fostering new qualities in tertiary education. Recognition can be readily provided for successful education practice.

4.5 RESOURCE ALLOCATION INCENTIVES

The Government provides generous resources for student numbers. Why then are the large introductory classes used mainly as cash cows, starved of resources, commitment and good educational practice?

Firstly, no account is made of the quality of the education. So long as there is a course outline, a lecturer turns up and there is some assessment, the money will roll in to the university. I have found it has always been a battle to get any money for undergraduate teaching. For example with my 1000 student class I have been refused a \$1.50 stapler, \$2 for letterhead paper, \$3 each for a white board pen for tutors, \$30 for rubbish bags, and \$25 for gifts for guests speakers who present to three streams. On a matter costing \$2, my professor once complained that my course cost more than other courses. I asked if he meant per student or per course. He said, "Per course!" This is despite the course generating over \$1.5million in profit even after rental on buildings and other overhead expenses have been deducted. Yet I have had no difficulty in getting large resources for very small masters classes.

Internally the resources are reallocated. While the Government and students fund on a per student basis, the resources are reallocated on a status basis. Senior classes benefit from the resources. So, too, does research time.

4.6 PROMOTION MECHANISMS

Teaching quality and quantity has little effect on promotion. For example, right now my husband is being pushed into early retirement. For seven years he has had over double the teaching load of the departmental average, is rated as one of the best teachers in the Faculty, and had a high impact on applying learning for New Zealand society. However his research output is lower than average, so he is being pressured to leave to improve the university's PBRF average performance.

4.7 THE TEACHING:RESEARCH CONFLICT

I have read dozens of articles on the teaching:research nexus. To my fascination, these articles wax lyrically about this underlying principle of universities and the benefits it brings; yet none of them quoted any research to support their belief.

The research that does exist demonstrates the opposite. Teaching and research compete for time. Research is usually too narrow to inform teaching, although teaching can inform research. Personality types most suited to research are not the same as the personality types most suited to teaching.

Universities argue that research is necessary to improve the quality of teaching. Even if this were true, it argues that research is an overhead. And like all good overheads should be minimised! This is clearly not the intention of the argument.

Efforts to improve the quality of tertiary education should look carefully at the teaching:research nexus fable, and judge its true benefits and costs. It is also a consideration in accountability to students as they should be entitled to pay for what benefits they actually receive.

5 A TAXONOMY OF MEASURES

The most dangerous idea is when you only have one of them. This taxonomy is designed to provide a potpourri of ways that universities could be measured, with some initial evaluation of their impact.

5.1 USE OF THIS TAXONOMY

Some common errors made in strategic planning with measurements are given below.

1. There should not be too many measures so none can be clearly focussed on. Ideally there is one big hairy, scary, measure that is selected, communicated, role modelled, measured, and reminded. Also it should be a measure that if successful would mean a number of things would have to have been done right to achieve it. For example a measure based on the outcome of “student enthusiasm for learning”, would imply that there are good lecturers, systems, values, and learning in the university. In addition to the big measure should be a supporting suite of about five or six measures – no more! People can only focus on a limited range of measures before they all lose their motivating power. The universities are perhaps the only sector in government that has escaped over-measurement – a latter-day form of Taylor’s scientific management dogma.
2. Goals need to be meaningful and measurable. For example a goal to create ‘a good learning environment’ is too general. Some strategic plans I have looked at have no measurable objectives at all, just a series of platitudes. The adage you get what you measure is very true.
3. Easy measurements. Sometimes it is tempting to have measurements of easy to measure items like number of students enrolled or pass rate. All measures need to be judged on the impact they will have in the long term on behaviour.
4. Measures may lack challenge, and be created to maintain the status quo.
5. Measurements are often directed at the main activity. However if this is already been done well, and there is every expectation that it will continue to be done well, then it is a waste of a measure. It is better to focus on what needs to be changed or improved.

5.2 TYPES OF MEASURES

FEEDBACK, FEEDFORWARD AND CONCURRENT MEASURES

Feedback measures are those that occur after the event. For example ‘did we meet our budget’, ‘student evaluations’ and so on. It is too late after the event to fix it up, but they do provide a good picture on what happened. Feedback measures are the most common measures used.

Feedforward measures are ones that believe that if you get it right then good results would occur. Examples include good staff training, good staff appointment, lecture

room systems, close relationship with the students and so on. Business is moving away from feedback to feedforward in the belief that it is better to get it right the first time than to fix up what is wrong.

Concurrent controls are like the water temperature dial on the car. They are measures that tell you how you are going right now. They are often used like the warning indicator lamp. Little notice of the measure is taken under normal circumstances, but at critical points a warning is made. For example teaching may be okay unless there is a student complaint.

This taxonomy will provide a range of these different types of measures to choose from.

INPUT, OUTPUT AND OUTCOME MEASURES

Input measures are very easy to measure but often say little about what those inputs have achieved. For example approval to spend \$100,000 on a computer suite does not say whether the expenditure is likely to be successful.

The government moved from input to output funding across its government departments in 1987. The intention was to put more emphasis on what the funds were trying to achieve. The difficulty with output measures is that they are much more difficult to devise than input measures. They therefore run the gauntlet of being chosen because they are measurable rather than meaningful.

This led to debate on whether the government is really after outputs or outcomes. In education do we want students who can pass maths exams, or do we want them to be confident and capable of solving issues that have a numeracy component. The difficulty with measuring outcomes is that much of what happens is not in the control of the organisation. However outcome measures have a wonderful way of focussing the attention of staff in the organisation on the real value of what they are trying to achieve. In education this is a critical element of success.

ATTITUDINAL AND BEHAVIOURAL MEASURES

Where possible behavioural measures are best. These show what people actually do rather than what they say they would do or think.

ABSOLUTE MEASURES OR GAPS

Questionnaires often ask what people think is the level of service or quality – this is an absolute measure. For example a question asking about the perception of the quality of the university's facilities may show that people feel they are okay. Is okay good enough or not? A gap measure would ask what level they would expect from a good university, what they are getting from this university and if it is better or worse than their expectations. It can be very expensive and unnecessary to exceed expectations.

SYSTEMS, EVENTS AND INDICATORS

These are three specific types of measures that deserve comment. Systems measures would be based on whether there is a system in place or how well it works. Events

would look at a single point in time. It might be a measurement on a particular day. It could be a look at the performance in a competition. Indicators are measures of things that might suggest that things are going well or badly. For example a high level of staff turnover rate usually indicates a poor organisation, or low attendance at classes a poor lecturer.

	<ul style="list-style-type: none"> • Student performance in business • Employability • Employer feedback • Innovativeness in NZ workforce 	<ul style="list-style-type: none"> • Employer feedback by questionnaire • Participation in life-long learning (% of 25-64 age classes) • Employment in medium-high tech jobs (% of total workforce) • Rising no. of people in business, environment and RS&T sectors who took a critical role in the first adoption of a technology, idea or process that is new to the world, NZ or the industry in the last 2 years • Pop with tertiary education (% of 25-64 age classes) 	<p>K - K AK -</p>
	<ul style="list-style-type: none"> • Lecturer quality • Shared vision for educational achievement • Peer learning 	<ul style="list-style-type: none"> • Published student evaluations of lecturers • Educational goals committed to by university • Lecturer training – eg teaching credits from courses for academics • Education seminars • Attendance at education seminars • Networks of academics to foster innovative teaching practice • Awards for teaching excellence in higher order learning • 2+2 programme – academics attend other lecturer’s classes and report back on the 2 best things, and the 2 things that need improvement. In turn they are also assessed by colleagues (this focuses on change and improvement not business as usual) • Teaching goals in academic performance reviews • Published case studies of teaching excellence in universities • Case studies of costs to benefits of teaching programmes 	<p>*EAKIC K AI EI EI KI I *EI E AKI A</p>
	<ul style="list-style-type: none"> • Retention of Maori and Pacific Island students • Improved relative performance of Maori and Pacific Island students • Growth in FFPS performance in higher order learning 	<ul style="list-style-type: none"> • Foreign fee paying student selection based on criteria that include learning qualities beyond exam performance • Foreign fee paying enrolments or applications 	<p>K -</p>
Research	<ul style="list-style-type: none"> • More output/outcome focussed research in universities • More demand led R,S&T • More useful R,S&T for NZ • Closer linkages with business and environment sectors • Improved return on investment from university research • Less cross subsidisation from teaching into research 	<ul style="list-style-type: none"> • University R&D income from non-government sources • University R&D profit from non government sources • University collaborations • % of research money from non-government research users • % of funded research conducted with researchers from other organisations 	<p>AK - EK AK A</p>

	<ul style="list-style-type: none"> •Easier science user access to university research staff and facilities •Graduates more skilled at innovation •Graduates match areas of shortfall in the science/innovation system •World class RS&T capability •Research portfolios that may lead to NZ competitive advantage •Research portfolios that match NZ's needs •Research range of strategic, applied and commercial science •Improved return on investment •Easier access by research users to university talent •Closer linkages with business and environment sectors •Research is conducted to the drumbeat of users •Increased linkages between disciplines 	<ul style="list-style-type: none"> •Cross university student competition in innovation •Profitability of university companies •International publications •% of student research in graduate programmes on government research priority areas as defined by MoRST •Case studies in research investment impact •No of university products, processes and research reports that have been implemented by users per \$1million of investment within 3 years •Exceed benchmark outputs of codified IP •% of academics who have had a critical role in the first adoption of a technology, idea or process that is new to the world, NZ or the industry in the last 2 years •University innovation index Eg Σ(% of non government investment in university research, % of co-funded research projects, % of innovators (critical impact on an innovation in last 2 years) to total project team funded by FRST, % of FRST investments leading to codified IP in last year) set to 100 for 2003. •Increase the % of research contracts completed on time, in full to A1 standard by x% 	<p>K EA - A A AK - AKI *AKI A</p>
Contrib to NZ & Global Society	<ul style="list-style-type: none"> •Increased export growth •Increased med to high tech export growth •Higher standard of living •Improved quality of life •Raised skill level •Raised skill level in critical areas of skill shortage •Increased innovativeness 	<ul style="list-style-type: none"> •Reference country average level of medium to high technology manufacturing exports rising from a current level of 18% to 48% •NZ to become ecologically sustainable by MoE's indicators •Wages per worker •No. of new graduates in areas defined as a shortfall by Nz Immigration Service 	<p>K K K AK</p>

Organisation Performance	<ul style="list-style-type: none"> • Continuous innovation • Learning organisation (shared vision, challenge mental models, team learning, personal mastery, systems thinking) • Low staff turnover rate • Supportive environment • Strong alumni • Transformational leadership 	<ul style="list-style-type: none"> • % of university student enrolments in courses introduced in the last five years • Staff turnover rate less than x% 	- A
Social Equity & Impact on Environment	<ul style="list-style-type: none"> • Improved Maori and Pacific Island socio-economic level • Maori and Pacific Island ownership of economic resources • Regional development • Environmental improvement • Improved performance of Maori and Pacific Island students in tertiary study • Improved participation rates of Maori and Pacific Island students in tertiary study • Improved offerings of courses of study of value to meet Maori needs • Improved processes for supporting Pacific Island needs for graduates who will work and contribute with appropriate technology at home in the Islands. 	<ul style="list-style-type: none"> • Target group (eg Maori, Pacific Island, iwi, acute region) socio-economic indicators rise from 80% to 90% of the NZ average income • % of NZ capital asset base owned by Maori and Pacific Islanders • Increase the no of people in target groups who took a critical role in the adoption of a technology or process that is new to the world, NZ, region, industry or firm in the last year by 40% • Increase in % of Maori and Pacific Island owned firms • Ecological footprint (the acreage required for the average NZer) • Partnering courses developed in conjunction with Pacific Island governments • % of Maori and Pacific Island graduates 	EK EAK E AK
Finances	<ul style="list-style-type: none"> • Sound financial performance • Research revenue • Student income • Cost effectiveness • Profitable • Meeting goals • Town and gown links • Funds raised from private sector • Private chairs 	<ul style="list-style-type: none"> • Profitability • Case study of costs of courses • Revenue from students, FFPS, and business • No of private chairs • Meet goals 	EAKI A A - A
Overall	<ul style="list-style-type: none"> • Impact 	<ul style="list-style-type: none"> • Extent that academics have made an impact. Performance appraisal based on the question “Demonstrate the impact that you have had through your teaching, research, and society contribution.” 	*EAKIC

APPENDIX I - EDUCATIONAL PRACTICES FOR HIGHER ORDER LEARNING

Below are some ideas on some educational practices that can be used in universities to foster higher order learning.

DISCOVERY LEARNING

"There are no mistakes in jazz, just some unexpected notes".

"Edison discover several hundred ways how not to produce the light bulb"

"Mistakes are just a learning experience"

"Adventure is the champagne of life"

Below are some ideas on modern learning principles applied in our schools but seldom in our universities. Indeed they are becoming less common as universities modify their teaching to cope with influx of rote learning students from Asia.

- * Experiential learning (EQ) fosters motivation, recall and insight.

"We learn 10% of what we read, 15% if what we hear, but 80% of what we experience" (Anon, 1992).

"The best teachers and business seminar organisers plan plenty of action sessions to back up the theory so students can purposefully use and apply the learning" (Dryden and Vos, 1993)

"To learn anything fast and effectively, you have to see it, hear it and feel it." (Stockwell, 1992)

- * Students who take charge of their own learning (SQ) will exceed their own goals:

"Students should be given choices and responsibility for their own education" (Schulz, 1993)

"Motivation and productivity skyrocket when students reach their goals" (Youngs, 1992)

- * Students learn in a variety of different ways:

"Some students are very visual: they have to see everything. Others don't want to see something written down: they're more auditory types. Others are kinesthetic: they have to stand and move. They learn even abstract things by moving their bodies." (Schmid, 1990)

- * Students come to university with a wealth of experience and insights:

"Maori students who have come to the University seeking new understanding or who wish to combine their own cultural knowledge with academic meanings sometimes find that the patterns of academic discourse inhibits them from finding the words for their own lived experiences." (Kidman, 1994)

I read a study of a group of people who were asked to determine what was the best value for money for some cans of product on supermarket shelves. Ninety-eight percent of the participants were able to arrive at the correct conclusion. However only 42% of the same participants got the right answer when given the identical mathematical challenge - but this time presented in the mathematical format that they had been taught at school to solve this kind of problem! This implies that people learn best in context, perform best in context, and are best able to apply what they have learnt if it is learnt in the same format that the knowledge needs to be applied.

FOSTER INTRINSIC MOTIVATION

"I'm a boy!" Pinnochio motivated from within instead of from strings without.

Intrinsic motivation is fostered by three states:

- Choice² In assignments I set for students, grades rose by 10% if the students chose their own topic.
- Collaboration Teamwork drives exceptional performances as energy and ideas are shared. It can also occasionally be spectacularly dysfunctional.
- Context³ Real projects raise performance around 25%.

Extrinsic motivation reduces intrinsic motivation.⁴ A's, stars and rewards make classroom management easier but lead students to a reliance on external approval and rewards.

² Medics used to think that heart attacks were most likely in Type A executives who pushed themselves in stressful ways. Research however has shown that the most at risk group are those in jobs over which they have little or no control.

³ "I approached three workers breaking rocks on a building site. I asked the first grumpy worker what he was doing. "Breaking rocks", was the reply. The second more cheerful worker said he was "Earning a living." But the third worker shone with happiness. He said he was, "Building a cathedral"."

⁴ Theresa Amabile conducted a study on intrinsic motivation. She got volunteers who said they enjoyed writing poetry. They were asked to each write a poem which was assessed for poetic quality by a group of experts. The group was then divided into the three. The first group was given a lecture designed to provide extrinsic motivation. They were told about how much money successful poets can earn, the esteem they are held in by others, and so on. The second group was given an intrinsic motivation lecture, covering topics like the joy of expressing oneself, delight in a well turned phrase and so on. The third group was a control group and not given any lecture. The volunteers were then asked to write another poem. The control group remained at the same level of poetic quality, the intrinsically motivated group improved, but the extrinsically motivate group performed significantly worse than on their first poem.

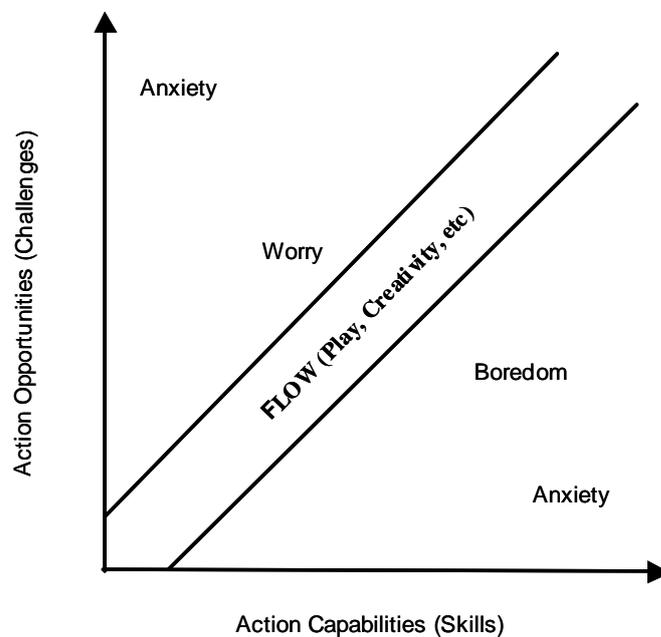
Educators and employers can only require the minimum but need to excite their students and employees to achieve the maximum. For example rules can be set that would require trampers to get to the base camp, but only intrinsically motivated mountaineers will climb Everest.

FLOW

“If your dreams don’t scare you they are not big enough” Bill Gates

Csikszentmihalyi (1975) set out to answer the question of why play is enjoyable and therefore what makes play intrinsically rewarding? That research resulted in Csikszentmihalyi developing his persuasive theory of “flow” when a person’s skills are in balance with the challenges of a particular situation. This concept is depicted in Figure 1 below:

Figure 1: Model of the flow state



Source: Csikszentmihalyi, 1975, p. 56.

When action opportunities are perceived by the actor to overwhelm his capabilities, the resulting stress is experienced as anxiety. When the ratio of capabilities is higher, the experience is worry. The state of flow is felt when opportunities for action are unbalanced with the actor’s skills. The experience is then autotelic. When skills are greater than opportunities for using them, the state of boredom results, which again fades into anxiety when the ratio becomes too large.

Intrinsic motivation is an autotelic experience and leads to a state of flow. (Csikszentmihalyi, 1975, 1988, 1988a, 1990; Csikszentmihalyi and Kleiber, 1991).

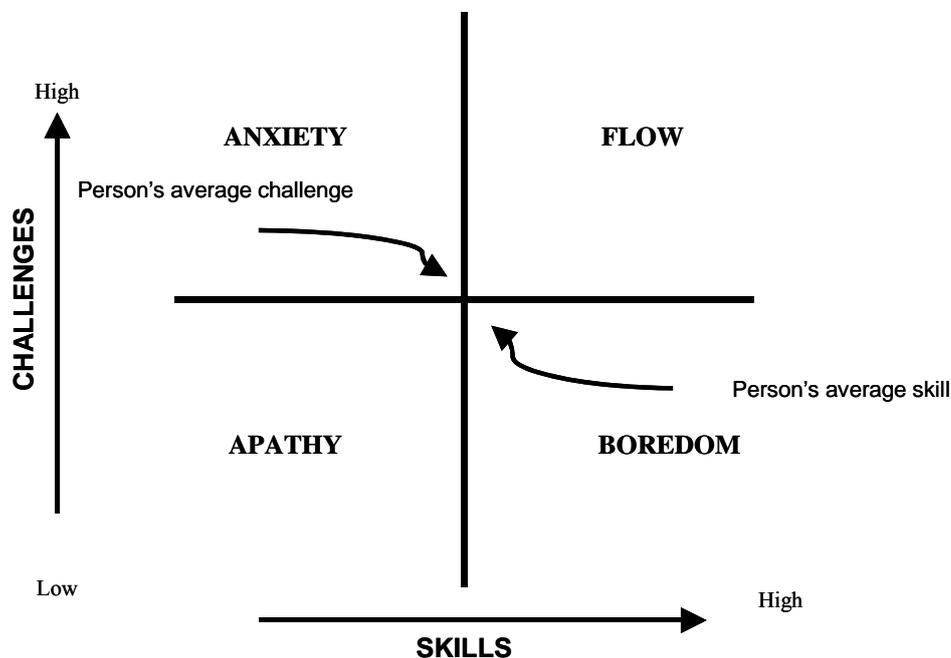
Csikszentmihalyi found that autotelic personalities achieve continual improvement and growth as they develop and refine new skills leading to a continual movement out along the “flow path” depicted in Figure 1.

Csikszentmihalyi identifies the characteristic of the flow experience as:

- Merging action and awareness
- Centering of attention
- Loss of ego
- Control of action and environment
- Demands for action and clear feedback
- Autotelic nature of flow

Csikszentmihalyi later modified his concept of flow to include a continual ratcheting upwards of competence. Even if skills and challenges are matched, individuals will feel apathy when an experience is below their performance level.

Figure 2: Modified flow state model



Source: Csikszentmihalyi and Csikszentmihalyi, 1988, p.261.

Flow only occurs beyond the crosshairs as skills are continuously developed and improved by the seeking ever-greater challenges

With education, students need to be provided with a rising level of challenges against which they develop their skills.

LEARN WHILE DOING

“With jamming jazz – rehearsal is performance, performance is rehearsal.”

“No matter how high we fly, we always return with something new.”

“Jazz is impervious to recipes.”

Jazz is often used as a metaphor for fostering innovation. It provides insights into the how an organization can improvise (or innovate) while performing. Like a good organization, a good jazz band requires individual excellence, passion, a charted direction, practice, preparation, leadership, support for colleagues, an encouragement to achieve new sounds, an enthralled audience, and debriefing. This is the same list of qualities in an education environment that fosters innovativeness. It also demonstrates the excellence that can be achieved while performing. The proposed NZIM Entrepreneurs' Certificate aims to teach entrepreneurship to those currently engaged in running or starting a business.⁵

LEARNED OPTIMISM

Seligman (1997) found that optimists are happier, healthier, live longer, are less likely to divorce, earn more, are more successful at sports, politics, sales, and business, but are less accurate. Pessimists are more accurate but die younger, are poorer, and more miserable. Optimism is learned. Martin Seligman's work has spawned nearly 1000 world studies on learned optimism.

The brain is incapable of distinguishing between fact and what it is told. Seligman has found that the difference between optimists and pessimists can be measured by three simple language patterns that they use. For example, if an optimist did well in a maths exam they might say, “I’m good at exams.” This implies that they are good at all sorts of exams not just maths (non specific), good now and in the future (permanent), and they take the credit. A pessimist might say, “I had a great maths teacher.” This implies they are only good at maths (specific), now (temporary) and the teacher takes the credit.

If instead they did poorly in a maths exam, the optimist might say, “My teacher is hopeless but if I swot I’ll do well.” This implies that the failure is just maths (specific) can be improved (temporary) and there is a tendency to blame others. A pessimist might say, “I’m never any good at exams.” In this case the problem is all exams (non-specific), always (permanent) and the pessimist takes the blame.

⁵ This is a far cry from the “classroom of right answers”. A British teacher was appointed to a school for gifted children in West London to teach creativity. As she entered the grounds she noticed the immaculate grounds dotted with play equipment. Her first impression on walking into the classroom was of children sitting obediently on the mat, their anxious white faces turned to her. “How does a bird learn to fly?” she asked them. There was a deathly silence, the faces became more taut and anxious. Finally a child raised her hand. “We haven’t learnt that yet”, she whispered. The teacher tried again. “How would you weigh a giraffe?” she asked. Nobody had the courage to speak; the children just squirmed with embarrassment and nervousness aware that they had failed to know the right answer. The teacher spent eight months at the school but left exasperated that she could not teach these gifted children to be creative. They were too inculcated with getting right answers for significant adults. Her next school was in a low income part of East London. The playground was a dirt patch with a tyre hanging on a rope for a swing. “How would you weigh a giraffe?” she asked. Ideas flowed. “Put it on scales.” “No, you’d need four scales, one for each hoof!” “Get a big spring balance.” One boy who had been sitting quietly raised his hand. “I’d get a big truck and a carrot. I’d get the giraffe on the truck, slam the door, then weigh the truck!”

These three language patterns can be taught and even modified later in life. I believe the language patterns ought to be taught at New Zealand universities and our assessment feedback need to foster optimism.

SUPPORTIVE ENVIRONMENT

“People are motivated by significant others”

In an epidemiological laboratory in the United States a hidden camera was set up in the mens’ washroom. They found that if a person was present in the washroom, people washed their hands after going to the toilet on 92% of occasions. If there was nobody present they washed their hands on just 16% of occasions. Clearly knowing the right thing to do was not the issue. People were influenced by significant others.⁶

Adoption and diffusion literature clearly shows that people are most influenced by their peers. Creating a supportive environment for learning therefore is a process of building supportive networks of likeminded people. In agriculture it was found that the most successful (and cheapest) way of getting innovative new ideas onto farms was through farm discussion groups. My own research into adoption of bluefin tuna fishing techniques highlighted that the fishers would listen and trust their peers ahead of any experts or written information even though they knew that none of their peers had ever caught a bluefin tuna.

Another way of providing a supportive environment is to create the perception of success. People like to be part of something that is successful. Lloyd May, a former school principal and national expert on building organization culture for success, argues that a success culture is built on noticing and rewarding every evidence of the desired behaviour. This leads to more success and an upward spiral of achievement results.

There are two implications for New Zealand universities. Firstly, we need to create the environment and systems that engage students in exploring learning together. I have developed some robust systems for assessing group learning that minimizes the free rider problem. Dr Linda Angell has some other excellent systems that she used at Penn State University but is not allowed to use here.

Secondly, Vice Chancellors need to espouse the learning qualities sought and celebrate success in achieving them. Students and staff will choose to be part of a successful learning organisation.

⁶ A similar story was of trainee priests who were approached individually to go through the subway to present the story of the Good Samaritan to a group of students. In the subway was an actor who coughed, spluttered and even writhed on the ground. When the trainee thought the students were expecting them in 10 minutes time they usually stopped (as a good Samaritan should!) to check if the person was okay. However when they were told that the students had been waiting for 5 minutes very few stopped. Same people, same circumstances, but this time they might be seen as letting significant others down by not getting to the presentation on time.

JUST DO IT – ON THE FIELD ACTION, OFF THE FIELD STUDY

“We always plan too much and think too little”

All Blacks on the rugby field will drive for the goal line. Picture Mils Muliaina with the ball outnumbered by five steaming Springboks. If he was a good MBA graduate he would take the ball and leave the field. Clearly he is going to fail against such overwhelming odds. Of course determination will eventually see the team score despite the difficulties posed by 15 determined opponents. This on-the-field behaviour is governed by goals and determination. Off-the-field the All Blacks will study videos of games and opponents, and will practise maneuvers. We know that we will never get great All Blacks solely through off-the-field learning. Yet at university we teach in abstract environments.

Leading universities around the world like Stanford have moved out of the classroom, designing exciting new courses aimed at on the field learning, including bearing the consequences of making poor judgments. Stanford assesses staff performance on impact – whether that be impact from teaching, research or society contribution. How can New Zealand universities design educational experiences that link theory and practice?

APPENDIX 2: POLICY TOOLS FOR TEC AND MINISTRY OF EDUCATION

Below is a range of tools open to the Ministry to influence the quality of tertiary education. Only the use of measurements have been discussed more fully.

Measurements are powerful tools for changing behaviour. They can be used as indicators or controls. My preference, where possible, is to use them as indicators and leave the power of social conscience to transform the organisation.

Resource levels from Government can be increased or decreased. Both processes could stimulate improved teaching performance. An increase provides more resources, whereas a decrease provides an imperative to attract student money and therefore meet student expectations.

The **resource allocation process** can be more important than the level of resources. This can include the criteria to receive funding, mechanisms by which funding can be provided, and the basis for sharing costs with others such as students.

Recognition is especially important as a driver for change in the university system. Favourite ways of recognising academics are access to (small levels of) untagged funding, and attendance at international conferences.

The **vision** needs to be developed and a process in place for it to be **shared**.

Experiments can be an easier way of stimulating change than tackling an entrenched system. For example a chosen new practice could be well funded in a trial, with the results publicised and participants recognised.

Audits can be undertaken. Change is created when the audit process describes the new key things they will be looked for.

Collaborative learning stimulates energy and commitment to trial new ideas. For example there could be a network with workshops for quality or innovative teaching practice across tertiary institutions.

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