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**“Teachers teach that knowledge waits”<sup>1</sup>:  
But what Knowledge? Connecting Technical  
Training and Profession Education**

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*ABSTRACT*

THIS PAPER REVIEWS AND COMPARES THE ROLE of the university in educating professional surveyors and the polytechnics in training technicians. The paper reviews the attributes of graduates of each pathway and reports on research undertaken on students progressing from their technical training as technicians to their education to become professional surveyors: why they made that choice and how it works for them. The School of Surveying was established specifically to provide for the higher education of the surveying profession in the form which evolved into the Bachelors degree (BSurv). This education exists alongside the technical training which leads to a National Diploma of Surveying (NDS) for surveying technicians. Implicit in this discussion is a concern that these qualifications should have a clearer connection.

*Keywords:* Surveying education, BSurv, National Diploma of Surveying.

**E** DUCATIONAL INSTITUTIONS, JUST LIKE professional institutions, need to reflect regularly on where they are heading in this ever-changing world of innovations in technology, different learning expectations and new career opportunities. One aspect of these changes is that learning institutions should not isolate themselves, but enhance connections between them and with the wider professions. This paper discusses the connections between the ‘what’ and ‘how’ of teaching in the School of Surveying, versus the ‘what’ and ‘how’ of polytechnic training in New Zealand – at least as seen in the National Diploma of Surveying (NDS).

Traditionally, universities and polytechnics have had quite different objectives within the tertiary education sector. Polytechnics were primarily established to provide technical training, directly preparing students for vocational competence, while universities aim to provide a well-rounded education which provides for skills in knowledge acquisition, research, and cross-disciplinary engagement (see the graduate attributes below). However, those distinctions are becoming blurred. Professional schools in the university sector provide for vocationally directed skills and knowledge, while polytechnic degree programmes are increasingly offered for professions like nursing and engineering. Government policy has also sought to blur those distinctions:

The Learning for Life policy agenda advocated for the removal of false or outdated distinctions between “education” and “training”, or between “academic” and “vocational” learning. Unlike most other countries, New Zealand sought to create a highly integrated tertiary education system, with all post-compulsory education services sharing (to a greater or lesser extent) a common policy, funding and regulatory framework administered by the government (NZPC 2017 s1.3).

The degree course at the School of Surveying at the University

of Otago is sometimes challenged by and compared with the technical National Diploma of Surveying (NDS) courses offered at institutions like Unitech and the Waiariki Bay of Plenty Polytech. This is highlighted when students switch or progress from NDS qualification to the BSurv programme. The technical surveying papers at university often take a different approach to knowledge and skill acquisition than the more hands-on experiential approach of polytechnics, but arguably they have some similar end goals – to prepare students to be able to undertake field surveys. It might be expected, therefore, that there could be considerable cross-over between introductory level survey calculations and methods courses at the University of Otago and the practical methods courses of the NDS. In general, having a National Diploma of Surveying allows for exemption of only the first year introductory year papers at Otago. In other words, the two years of part time study towards an NDS translates to one year of full time study for the Bachelor of Surveying (BSurv). It would seem likely however that there is considerable overlap with, for example, some second year BSurv papers, and the knowledge and skills acquired by an NDS student, especially since the NDS student is typically in full time survey work for the duration of that course.

This paper investigates whether this inefficient linkage is a barrier to the several students each year who choose the two-stage route to qualification. I report on a research project undertaken to delve into the motivations and expectations of students who have completed a technical training in surveying (NDS) and subsequently enrol in professional and academic education in surveying (BSurv). I report on the experiences of a cohort of such students and their reflections on the NDS in comparison with the BSurv.

### *What is Surveying*

The profession often has to grapple with the question: ‘what is a surveyor?’ (Coutts 2017). Most surveyors can explain what they do, but also they must acknowledge that there is much that they don’t regularly engage in, but which is also surveying. When faced

with the question ‘what is surveying?’ a common answer may include ‘measuring the land’, but that needs to be followed up with explanations about the wider extent of surveying: land law, planning, cadastral, land development, engineering, hydrography, remote sensing, photogrammetry, geodesy and GIS. That list closely covers the curriculum of the BSurv degree. The Otago BSurv curriculum covers the broad scope of land surveying, while many other countries’ surveying and geomatics degrees are more narrowly focused on measurement science. The Otago BSurv has an enviable reputation throughout the world for providing students with sound preparation for a wide variety of work. There is strong anecdotal evidence from many kiwi surveyors that they can turn their hand to almost everything, they work hard, they enjoy their work and they perform at a high level, and job opportunities are many and varied. One challenge for the education sector lies in covering the field of surveying adequately –incorporating new technologies while teaching basic principles. Will future graduates continue to measure bearings and distances, write field notes and plot plans? How can the school keep adding to the degree (in technological areas that make graduates particularly useful to employers) without removing some other historical content?

It is also important to note that while the science of surveying is important, so too is the art of surveying; it is both a technical exercise and a professional vocation. It requires both field and office work, and the exercise of physical, mental and social skills. Surveyors can be leaders in recognising the capacity of the land and how people use, live, work, and play on the land. Surveyors could also be leaders in promoting resilience and sustainability. Perhaps it is this variety of roles and responsibilities that both confuses people and entices others into the profession.

### *University education*

Universities are centres of education rather than training. There is expected to be a strong link between research and teaching, and to seek out knowledge for its own sake. The New Zealand Productivity

Commission (NZPC 2017) summarises the classical characteristics<sup>2</sup> of university education, which include:

- Research and teaching activity across science and the humanities, with each discipline having a high level of independence to develop its own standards, culture and international community;
- Considerable freedom for academics in determining research programmes and curricula;
- Expression of core Enlightenment values such as intellectual freedom, the pursuit of truth, and the need to challenge conventions; and
- Government funding but not government control: Humboldtian universities are autonomous and independent from government (NZPC 2017 s1.2).

Universities uphold high standards of academic freedom – they apparently have the freedom to investigate knowledge and develop their intellectual independence without an end goal in sight and without the need to justify research on the basis that it will contribute to economic benefits. Universities have a statutory responsibility to demonstrate the link between research and teaching and they have the statutory duty to be the critic and conscience of society. The Education Act 1989 is explicit about these characteristics; academic freedom is described as:

- (a) the freedom of academic staff and students, within the law, to question and test received wisdom, to put forward new ideas and to state controversial or unpopular opinions:
- (b) the freedom of academic staff and students to engage in research:
- (c) the freedom of the institution and its staff to regulate the subject matter of courses taught at the institution:
- (d) the freedom of the institution and its staff to teach and assess students in the manner they consider best promotes learning;
- (e) the freedom of the institution through its chief executive to appoint its own staff.

(Education Act 1989 s161(2))

Universities have the following characteristics:

- (i) they are primarily concerned with more advanced learning, the principal aim being to develop intellectual independence:
  - (ii) their research and teaching are closely interdependent and most of their teaching is done by people who are active in advancing knowledge:
  - (iii) they meet international standards of research and teaching:
  - (iv) they are a repository of knowledge and expertise:
  - (v) they accept a role as critic and conscience of society
- (Education Act 1989 s162(4)(a))

Furthermore:

- (iii) a university is characterised by a wide diversity of teaching and research, especially at a higher level, that maintains, advances, disseminates, and assists the application of knowledge, develops intellectual independence, and promotes community learning.
- (Education Act 1989 s162(4)(b))

As may be expected, university academics and administrators regularly voice these attributes of a university education:

What makes an undergraduate education worthwhile? An education that cultivates creative understanding enables diverse, talented, hardworking graduates to pursue productive careers, to enjoy the pleasures of lifelong learning, and to reap the satisfactions of creatively contributing to society. The corresponding institutional mission of universities is to increase opportunity, to cultivate creative understanding, and—by these and other important means such as innovative research and clinical service—to contribute to society (Gutmann 2011).

But universities must also adapt to the changing needs of society, and it would seem that recent New Zealand governments are strongly pushing the expectation that university graduates should be ready to constructively contribute to the economic development

of society. For example, the previous Minister for Tertiary Education welcomed the growing focus on STEM-related subjects (science, technology, engineering and maths): “It’s great to see so many students engaged in areas where they’re likely to head into a solid, well-paying career where demand is high and likely to continue to grow” (Joyce 2016). However, this strong focus on science, technology and business is often to the detriment of the arts and social sciences. So for example, the University of Otago has recently announced a retrenchment of the Division of Humanities, resulting in academic job losses and a variety of humanities courses now being unavailable to students (TEU 2016).

This redirection of resources is concerning to all who see higher education as providing an opportunity to understand the world from many different perspectives and to have an interdisciplinary focus:

We can show how insights of history, philosophy, literature, politics, economics, sociology, and science enrich understandings of law, business, medicine, nursing, engineering, architecture, and education- and how professional understandings in turn can enrich the insights of liberal arts disciplines. We can demonstrate, both theoretically and practically speaking, that understanding the role and responsibilities of professions in society is an important part of the higher education of democratic citizens (Gutmann 2011).

### *Graduate attributes*

The University of Otago has identified a list of graduate attributes that it believes should be acquired through the education available there. It is, however, far from clear how those attributes are attained, because rarely are they made explicit in course prescriptions or actual curricula. Nevertheless these attributes may mark the distinctiveness of university education as opposed to technical training. The attributes are: global perspective, interdisciplinary perspective, lifelong learning, scholarship, communication, critical thinking, cultural understanding, ethics, environmental literacy, information literacy, research, self motivation, teamwork (University of Otago 2013).

There has been some effort to identify some graduate attributes of Surveying students, for example investigating environmental attitudes and awareness (Strack et al. 2013 & 2017).

The graduate attributes are not acquired by osmosis, they do not just happen, and maybe for some, they fail to happen at all. In an ideal world they would be incorporated into the planning of all courses, and across a wide range of different courses and even different disciplines. But in professional schools, it becomes almost inevitable that the variety of practical and professional skills needing to be taught leave little room for wider perspectives. A very full curriculum means that the BSurv degree remains strongly prescribed with an almost exclusive focus on the various components of the surveying profession's needs and little scope to take advantage of the diverse learning opportunities in other disciplines that may contribute to those wider perspective attributes. A wider perspective on surveying education may not contribute to the surveying body of knowledge, but it would provide a better understanding of professional responsibilities and professional contributions to society: "... teaching about the ethics, history, politics, and sociology of the professions would help to prepare students for thinking creatively about the role of the professions in society and how best to hold professionals publicly accountable" (Gutmann 2011). Furthermore:

Consider, for example, the issue of climate change in a world that is both more interconnected and more populous than ever before. To be prepared to make a positive difference in this world, students must understand not only the science of sustainable design and development, but also the economic, political, and other issues in play. The key to solving every complex problem- climate change being one among many- will require connecting knowledge across multiple areas of expertise to both broaden and deepen creative understanding (Gutmann 2011).

The dilemma may become: how to balance the training for practical and pragmatic skills for vocation with an education for critical thinking and lifelong learning? The university expects that graduates will have acquired a rather extensive set of attributes. Similarly, the

profession expects that graduates have gained essential attributes. “The outsiders [the profession] want the students trained for their first job out of university, and the academics inside the system want the student educated for 50 years of self-fulfilment. The trouble is that the students want both” (Schwartz 2003). An appropriately arranged course can ensure that these expectations mostly coincide. Employers are initially mostly interested in being able to put new graduate recruits directly to work: they expect high competency with practical/technical surveying skills. However, those higher professional skills of good communication (oral and written), good teamwork and professional ethics will be what matters in the longer term and hopefully they will quickly become apparent, valued and rewarded.

The School of Surveying sits somewhere within the training/education continuum (although hopefully more towards the academic end) in that the curriculum is certainly directed at professional skills and understanding rather than purely academic pursuits for their own sake. Hannah (2012) identified the dilemma for the School: “The ... challenge has been that of building a high quality research capability whilst still maintaining a strong professional emphasis to the academic program.”

The School of Surveying was established over 50 years ago specifically to recognise that professional qualities and higher learning standards required the higher learning of a university degree (Coutts & Strack 2012). But like many similar professional programs there are conflicting expectations. “Schools in research-intensive universities have long had a cultural-bias against being characterised as ‘trade schools’, sometimes resisting the teaching and assessment skills that are too narrowly aimed at ... practice, preferring to assess students through research essays and other tasks that develop ‘critical thinking’ ... that is a luxury not always afforded to the practising profession which our students will soon join” (Sherry 2016;147).

### *Polytechnic training*

The National Diploma of Surveying is usually taught part-time

alongside full time employment. The curriculum is specifically focused on work skills the students will need in practice as technicians. Survey technicians usually carry out the field work side of surveying under the supervision of a graduate and licensed land surveyor; they do the practical side of measurement science. They may then also extend their scope of work to reduce and process those field measurements, prepare plans or spatial data files, and ultimately, consult with clients and plan survey projects. Depending on the size of the practice, technicians may, after several years of good experience begin to take a role in client liaison, designing subdivisions and managing construction monitoring, but as is evidenced by the research below, technicians often find the advanced path blocked to further professional development and responsibility.

The NDS course at the Waiariki Bay of Plenty Polytechnic has some very specific learning outcomes (skill and knowledge of surveying practices) but more generically lists graduate attributes in 3 areas: literacy, environmental sustainability and internationalisation (Waiariki BoP Polytech 2016).

### *Transition from NDS to BSurv*

It is not the purpose of this paper to prescribe an appropriate curriculum for the NDS. Rather, it is concerned with how students may conveniently transition from one qualification to the next. Given the regular 3 or 4 students per year entering the BSurv programme after having completed the NDS, there are some issues that need to be addressed.

### *Course advice, passion and grit*

Firstly there is a course advice issue: students are often not aware of the scope of practice available with each qualification<sup>3</sup> (perhaps this is about not understanding the surveying profession), and do not understand academic expectations. An on-going concern for the School of Surveying and by necessary implication, the profession, is to provide course advice at the right time. Secondary school visits and

information to schools' careers advisors are the primary avenues for external programme advice. However, there is only sparse anecdotal evidence about the effectiveness of this approach. The Productivity Commission records that "Decision making starts very early. Studies consistently found the decision-making process starts much earlier than Years 11 and 12, likely as early as Year 7" (NZPC 2017 Box3.2 s3).

University course advice is becoming more automated. A change in University of Otago administrative processes to on-line enrolment unfortunately means that individually tailored programme and course advice is not regularly available, and when centralised advice is given, it is unlikely to delve into the question; 'Why Surveying?' It does not auger well for sustained commitment to the profession when a student into their third year of study answers that question with 'because my parents want me to'. A suitable response (given that the student had some startling and consistent fails) may be: 'time to grow up, make your own choices and get out of here!' School teachers have a big influence on student choices. For example, one student who has transitioned from the NDS to the BSurv programme was advised at high school that he was not 'university material' (Interviewee J). This placed an immediate barrier in front of him that took some time to breach. Now, having completed the NDS and worked for several years in survey practice, he is a highly capable, practical and academic student in the BSurv programme. He has a passion to learn and a passion to understand the underlying complexities of surveying. Perhaps he received the wrong advice, or perhaps he needed that additional time and maturity to find his own path?

Another graduate of several years experience also believes that getting good advice to make the right choices and then proceeding with passion are the keys to learning and fulfilment: "I believe considering your undergraduate degree options thoroughly is important to success. I am not the first person to say it, but passion is vital to achieving your best. Understanding your personality and what you are really interested in will enable you to make good choices. This is something that can be very ambiguous for young

adults entering university, so I believe comprehensive guidance is important” (Interviewee M). He continues: “I did not consider my options thoroughly enough when choosing surveying as a degree. This may have resulted in poor selection and affected my desire to excel. Passion drives success” (M). This graduate also reflects on his learning efforts and achievements: “I think I was under the impression that the surveying industry (at least in NZ) didn’t consider / portray honours or high achievement as a prerequisite to maximise future opportunities, and that initial jobs in the market were obtainable without excellent grades” (M).

The Productivity Commission describes how education is co-produced – that lecturers and students have to work together and success is largely achieved through motivation: “Motivation is important: students of all ages put more effort into the co-produced process, and consequently learn better, when they are motivated (intrinsically and extrinsically) by a desire to learn” (NZPC 2017 s2.2). The report describes the personal attributes that students bring to their tertiary education: intelligence being the most obvious attribute, but further, that “grit” or perseverance was a reliable predictor of academic success (NZPC 2017 s2.3). It is difficult to assess “grit” but it would be reasonable to conclude that an NDS graduate, making a big commitment to a further three years of university education, is likely to demonstrate true grit.

### *Transitioning*

It would seem that in some examples of the diploma for technicians programme, the curriculum seeks to introduce a wide spectrum of the surveying body of knowledge to prepare students for a more diverse role as a professional assistant. It could be argued that this gives a false impression of the scope of work a technician can reasonably undertake. The profession has a great need for competent and efficient field surveyors for which the NDS programme is ideally suited. The profession does itself a disservice by expecting that high professional standards (service to the cadastre and to the public) can be provided adequately by staff trained solely in technical

skills. Perhaps the profession has lost sight of the very purpose of a university degree.

A well articulated path from the diploma to degree level requires a strength in mathematics, survey calculations, survey methods, cadastral surveying and field practice. The usual exemptions available to an NDS student are the first year surveying papers SURV101 (Introductory Surveying) and SURV102 (Geospatial Science), the numeracy paper MATH160, the literacy paper (typically ENGL228 – English for the Professions) plus three other 100 level papers. One of the most obvious barriers in the degree first year for an NDS student to transition into the BSurv is the standard of mathematical competence (specifically Calculus and Algebra) needed to satisfy the MATH160 requirements. The gatekeeper courses for entry into the professional BSurv programme are MATH160, SURV201, SURV202, SURV207 and SURV298.

In earlier times when the New Zealand Certificate in Land Surveying (NZCLS) was the technical qualification, and this was generally a 3 year part time course, it was possible to have several papers of the second year of the degree exempted. The NDS is now a shorter course and perhaps more diverse, but less rigorous on the core competencies. Currently it is unusual for NDS students to be given exemption for the 200 level papers (depending on consideration of subsequent experience and a report on skills and competency), but the transition from NDS into the BSurv could be much facilitated if the NDS prepared students more effectively for these technical courses and reduced the focus on other more professional courses. If the maths and survey practice curriculum areas are taught to a higher level, students could more easily transition into the BSurv programme. In any event, students would be more effective technicians with those more focused

skills and understanding.

The BoP Polytechnic NDS programme document states: “This qualification is designed for people wishing to work in the surveying profession as land surveyors. Its purpose is to provide the surveying profession with trained people who are able to undertake field and office work associated with land surveying, in a **professional**

**manner**” (Waiariki BoP Polytech 2016. Emphasis added). It might save aspiring technicians being given false expectations if the word ‘competent’ was used in preference to ‘professional’.

*What do students want? Are graduates different?*

While many older academics recognise the importance of the traditional skills of literacy and numeracy on which relatively less stress is placed in modern NCEA curricula, students today are extremely capable at navigating the IT environment, accessing on-line information, and multi-tasking across different learning and information platforms. So, for example; libraries are consistently dismissed as first choice sources of information for most students; scheduled lectures may not be seen as the most efficient format for learning, and; most students need to be taught the distinction between academic peer reviewed research and Wikipedia entries, in terms of the quality of the information.

It is worth remembering that technology taught now may be obsolete within 10 years – higher level understanding will count for much more than ability to use any particular software or hardware. It is also worth remembering that our society generally expects more immediate information and answers to problems. How and what do we teach in this evolving environment?

Many students have very short-term aims concerning their degree qualification. It is not unusual, when asked why they are at university (specifically at the School of Surveying), for a student to answer: ‘to get a job’. It is somewhat reassuring when, towards the end of the period of study or maybe after a year or two in the work force, students or graduates acknowledge that they learned very much more than just what they needed to start work surveying, and even say that they have become excited by learning opportunities. Both the new perspectives of students and the needs of society somehow need to be accommodated, so that on the one hand the benefits of a university education are not taken for granted, and on the other, higher-level learning objectives can be achieved.

## *Higher achievement*

As indicated by the comment of interviewee M (above), it would seem that the profession, or at least current employers, do not see immediate value in higher achievers and honours degrees. Higher level students regularly report that while they may be capable of undertaking an honours degree, they do not see that the extra work involved (an extra 28 points or the equivalent of about one and a half papers) will be valued or compensated for in their future employment. I would suggest that this is the result of short-term thinking on the part of both students and employers. While no research has specifically targeted this point, I suspect that honours degrees will provide considerable benefit (and perhaps increasing benefit) further along the professional path. As my interviewee M now sees, with the wisdom of hindsight:

I want to excel and do the very best I can do working on whatever suitable opportunities come my way. Most of those opportunities outline prerequisites such as ‘demonstrated record of prolonged outstanding academic and professional achievement’. For many opportunities, this includes undergraduate degree achievement ... failing to do your best and achieving to your ability potentially presents unnecessary hurdles down the track, and in some cases makes the future opportunity pool smaller. ... try to think about your achievement as something that will never change, and something that will contribute to your reputation not only for immediate opportunities out of university, but also for opportunities in the future. A strong reputation is supported by a string of numerous consistent achievements - start early (M 2017).

A university education should broaden the mind, allow students to connect knowledge themes, promote knowledge independence, and develop confidence to continually question the status quo (Sun Kwok 2015). High achievement is its own reward.

*Survey questionnaire for BSurv students who have NDS or similar qualification*

It is expected that students who have attained a NDS have a reasonably complete understanding of the core measurement and technical activities of a survey technician. That qualification provides a clear career path, albeit one that is usually controlled and dominated by a professionally qualified surveyor. For such students to then decide to upgrade their qualification to the BSurv with an expectation of a more independently focused professional career, there must be an expectation of a different level of learning, and skills and knowledge capability. The experience of such students may provide some real understanding of the differences between the technician and the professional surveyor, and the educational needs of each. In this context, student responses may provide some guidance about course content and learning styles that will better inform university educators to do their work: review the curriculum and provide more appropriate and efficient learning opportunities.

All sixteen students enrolled in the BSurv programme who had previously completed a technician diploma in surveying, engineering or hydrography were identified by their enrolment status and exemptions. These students were invited to respond to an online SurveyMonkey questionnaire that asked the following questions:

1. Why have you chosen (What is the main reason you chose) to continue your education via a BSurv after completing an NDS?
2. Please briefly summarise your perception of the graduate attributes of the NDS. In other words what knowledge, skill, competency attributes arise from this qualification?
3. Please briefly summarise your perception of the graduate attributes of the BSurv. In other words what knowledge, skill, competency attributes arise from this qualification?
4. When comparing the 2 qualifications, comment on the scope of the curriculum, the teaching/learning styles, the study load and expectations.

5. Do you have any comments or concerns about the linkage between NDS and BSurv? Comment on the cross-over between the 2 qualifications. For example, should the NDS have allowed for other exemptions from BSurv curriculum, i.e. for easier/quicker completion of BSurv. (Note - it is normal for NDS students to be exempted the first year surveying programme)
6. How do you expect the BSurv to change your career prospects? (where was a NDS leading you? Where will a BSurv lead you?)
7. Do you have other comments about your choice.

The research was conducted subject to University ethical approval which ensured that participants were fully informed about the intent of the research and the use to which it would be put. Students were given the opportunity to remain anonymous, but also asked if they would accept a further personal approach for clarification if necessary.

It is worth noting that NDS students are by definition usually an older cohort of students (not straight from school) and they usually have a much higher commitment to learning – they have given up jobs and a wage, for study and a loan, in anticipation that higher rewards (financial, job progression, satisfaction and fulfilment) will make up for the three extra years of study.

### *Selected responses*

In response to the initial question about why students chose to enrol in BSurv, the almost unanimous response was that it is to extend their career path; specifically, the BSurv is the only path to become a fully licensed cadastral and/or professional surveyor. One response typifies that concern: “a sense that I had reached a limit as to what I could do without a degree” (Respondent A).

Replying to the graduate attributes of the NDS programme elicited the unsurprising result that the focus was on practical and technical skills rather than theoretical understanding. On the other

hand, the attributes of the BSurv programme included: “Analytical skills to aid with problem solving” (Respondent B), and “very high expectation and ... understand the theory behind everything” (Respondent C).

When comparing the two programmes’ teaching and learning and workload expectations, it was clear that a major part of the NDS was the work experience and the ability to question work colleagues and apply their learning in the work environment. “I found working whilst I was studying NDS very helpful. I had work colleagues that could help me in all fields of the NDS, planning, engineering, survey etc” (Respondent F). On the other hand: “in Otago, the students are more concentrated on study rather than work experiences” (Respondent E); “The curriculum of the NDS are somewhat concise. On the other hand, the curriculum of the BSurv expand every knowledge I have learnt from the NDS. The NDS’s teaching styles emphasise self-study skill but lack of explanation of knowledge sometimes. The BSurv teaching styles are more evolved as the lectures are informative and giving students sufficient knowledge to solve problems. The study load of BSurv is about three times more than the NDS. However, BSurv provides more knowledge and study materials” (Respondent H); and “Studying in polytechnic the main focus is on “how” while in Otago university is on “why”. In terms of teaching/learning styles, studying at Unitec allows for more interaction between lecturers and students since it is a relatively small class, while in Otago University it seems to encourage learning from our peers. Both study loads are quite heavy, but BSurv is heavier” (Respondent G).

In response to the question about the appropriateness of the available cross-credits from NDS to BSurv there was a balance of opposing views. Several students felt as if they entered the BSurv at the right level: “I view my Diploma as having correctly being cross-credited, there aren’t any papers I have completed so far that I feel I didn’t get anything out of” (Respondent J); “The second year papers are quite important, being exempted can be a loss” (Respondent G); and “It is well cross-credited in terms of not having to do the first year, and the second year papers give better foundations on what

was learnt during the NDS” (Respondent K). However, others felt they should have earned more exemptions: “SURV201, SURV207 and SURV208 were the least useful papers which could have been included as exemptions” (Respondent B); “I suggest the School of Surveying can design several exams for exemptions of the 200 level papers. By given some time for preparation through the textbook or other study materials, I believe more exemptions will be approved. Because the NDS graduates who do not stop study are more targets oriented than the other undergraduates” (Respondent E); and “The NDS students have the competency of studying 300-level papers. However, the current policy only allows exemption of the first year. Given that the professional years start from the second year and the NDS students already have some professional experience. Hence, the NDS students starting from the second year in here is unfair and discouraged. The NDS should be able to start their BSurv study from the third year” (Respondent H).

Whether students were happy or not with the exemptions allowing them to transition into the BSurv, none of them regret the decision to bite the bullet and do it. “The NDS would have likely led to a senior survey technician position and depending on the circumstances a small chance of moving in to a management position. The BSurv will allow me to pursue licensing which can fast track a management position. Maybe ownership further down the track (which would have been difficult with NDS)” (Respondent B); “The BSURV has significantly broadened my career opportunities. Previously my career was limited to working for someone else in the private sector. Now I am confident that I can obtain work in a multitude of sectors/areas that were previously inaccessible. It is these new challenges that have kept me in the industry” (Respondent D); “The BSurv opens the door to becoming a registered professional or licensed cadastral surveyor. The NDS was not leading me anywhere in terms of job progression. I would have simply become a more experienced survey technician over time until I reached a point where I ‘hit a wall’ in terms of advancing my career” (Respondent N).

The general feeling about the advantages of completing

a BSurv and thereby able to become an independent practitioner supports the idea that “A student trained with a narrow and specific skill is a tool, to be manipulated and used by others. A broadly educated student is empowered to change the world, make a difference to an enterprise or an organisation, and at the same time lead a personally intellectually fulfilling life” (Sun Kwok 2015).

### *Commentary*

There is an ongoing need within the profession for well trained and competent technicians, and therefore a clear career path for NDS graduates. Further professional education should not be an expectation. However, career advancement is the key motivation for NDS technicians to study for a BSurv. These students know what surveying is about, they have more life and work place experience and generally have raised motivation to succeed. It would seem that none regret their decision and they take the opportunity for deeper learning, even if they initially thought that some courses repeated existing knowledge. From a teacher’s point of view, technicians provide great assistance for learning, bringing their experience and examples to class discussions, and obviously able to put each course in a wider practical context. They also usually model good study habits and enthusiasm for learning. These technicians are a welcome addition to the student cohort.

Anecdotal evidence (for example, discussions at conferences) indicates that employers are generally satisfied with the abilities of the Otago BSurv graduates, notwithstanding some initial complaints that new graduates have little practical experience and need close supervision for at least the first 6 months. There is a very fast learning curve for BSurv graduates, and rapid promotion opportunities. Many young surveyors may be offered partnerships within 10 years of graduation, and most will be involved with the professional aspects of surveying rather than the technical aspects within a year or two; few will be primarily involved in field work operations. The basic skills of measurement are trivial for a well informed professional. New graduates are very aware of the latest

technology and often will lead technological development of survey practice. Senior managers of survey businesses are aware of the technology (the capabilities, time saving, and economies of new technology), but leave it to the younger employees to implement that technology.

Land law, planning and environmental law are likely to be high on the professional's agenda. Professional focus must necessarily focus on key professional competencies: oral and written communication, client liaison, and professional ethics. Engagement with District and Regional Plans (submissions on plan preparation and plan changes), preparing resource consents, appearing before the Environment Court as applicant or advocate, or before the general courts as expert witnesses often occupies the professional's attention. Practice management, including HR, business strategic planning, and marketing are also likely to be a large part of the professional surveyor's work.

Perhaps the experience of learning is at least as important as the skills and knowledge learned. Much of today's technical curriculum may not remain relevant for the duration of a career, so the higher aspirations of tertiary education; self-directed and lifelong learning, interdisciplinary thinking, teamwork, communication, must be inculcated from the start. The graduate attributes clearly suggest a well-rounded graduate ready to take the next step of their careers; "to broaden their mind and horizons, to allow them to see the relationships of apparently disparate phenomena, to acquire knowledge independently and to develop the confidence to challenge authority or dogma. These are the qualities that will make them leaders of the future" (Sun Kwok 2015). But only a few of these attributes can be tied back to the actual curriculum, the assessment or the teaching. If the School is serious about these as key to a tertiary education, then perhaps a lot more focus should be placed on them. After-all, many of the technical skills and work procedures are learned relatively easily in a practical work setting rather than at a university.

Is the programme trying to do too much teaching (which partially disempowers students from taking responsibility for their

own learning) and not enough guiding? Can teachers trust students enough to leave the learning process to them? There is a developing trend in education towards blended learning and the flipped classroom (Edudemic 2017), where the academics are not necessarily delivering all knowledge but are mere facilitators of learning, and students take a larger part of the responsibility for their learning, often using video and learning materials available outside of scheduled class time. The challenge inherent in this trend is yet to be met by the School of Surveying, and was not investigated by this research, but inevitably it will need to be addressed in the future.

This investigation into the motivations of technician surveyors to advance their qualifications through the BSurv programme to become professional surveyors has provided some insight into more general learning motivations. The lessons learned by questioning students might prompt further reflection on the content and delivery of the BSurv programme. Furthermore, the developments of surveying technology and practice will continue to force change on the profession and the education sector. Can the challenge be met promptly and effectively? It will certainly require closer engagement between the technicians, professionals and educators.

### *Notes*

<sup>1</sup> Bob Dylan 1965. Ballad of a Thin Man.

<sup>2</sup> The “Humboldtian Model” (NZPC 2017)

<sup>3</sup> Looking beyond the BSurv, the School offers 3 year BSc degrees in Land Planning and Development, Survey Measurement, and GIS

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