Chapter 9
Students' Perceptions of Employability Towards Interdisciplinary Education in the Construction Engineering Programme in New Zealand

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Abstract Technical skills alone can no longer fulfil and adapt to industry and market demands as an economy grows. Enterprises now need a broader skillset than a single professional or technical expertise. This signifies that the company's needs for personnel are technical and soft skills. Soft skills comprise teamwork, critical thinking, and general thinking capabilities (Becerik-Gerber et al. in Handle Proxy, 2006). Methodology: A questionnaire survey was developed and distributed to all the thirty two year-two and three-degree Bachelor of Construction—quantity surveying and construction management programmes in one higher education polytechnic in New Zealand. Findings: This paper shows that students undertaking those interdisciplinary electives reported a significantly stronger development of work-ready skills in the industry. Specifically, interaction with industry, bi-cultural awareness and problem-solving skills were more developed. Originality/value—This study advances our knowledge of the relationship between interdisciplinary education and students' perceptions of their employability. The goal of this study is to increase understanding of interdisciplinary course design and pedagogy and strengthen the connection between learning and work in New Zealand by examining the effectiveness of interdisciplinary learning with a focus on social-cultural aspects in programmes related to construction engineering in New Zealand.

Keywords Construction management · Employability · Interdisciplinary course · Work readiness · Biculturalism

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9.1 Introduction

With the development of science and the progress of society, the integration of the global economy and the enhancement of cooperation, companies have more diverse needs for employees, and technical capability alone can no longer meet and adapt to the needs of companies in the market. They expect employees to be good at the technical level and apply soft skills. Soft skills are teamwork, collaboration, the ability to evaluate the impact between technological, social, economic, and human elements, critical thinking, and comprehensive thinking skills (Becerik-Gerber et al., 2006). Luxhj and Hansen (1996) identified The inability to collaborate and converse with others; the failure to come up with original solutions, and the inability to handle complex problems requiring the integration of social, economic, legal, and technical factors are just a few of the flaws in traditional education. To inspire students to tackle multidimensional challenges, multidisciplinary learning aims to lower student attrition, promote self-confidence, communication skills, and inventiveness, emphasise integrated problem-solving, and strengthen teacher leadership skills.

Most construction programmes do not allow for continuing evaluation or interdisciplinary connections across courses. In conventional learning, primarily a terminal process, the ability to pass final examinations is the key learned skill. Continuous assessment of a contextualised, autonomous, transdisciplinary, and student-centred approach may improve its effectiveness. As the key player in preparing students for working in the industry, higher education institutes should adjust the corresponding teaching mode to adapt to the rapid development of industry changes. Such changes are embodied in the rational setting of interdisciplinary courses in the curriculum, designed to cultivate interdisciplinary technical talents suitable for the changing society. Interdisciplinary workability is essential in the future community (Kang, 2008). This paper used construction management and quantity surveying programmes in New Zealand higher education as a case study to explore the student's perception of interdisciplinary electives in construction engineering-related programmes.

9.2 Characteristics of the Interdisciplinary Curriculum in General

The traditional engineering curriculum education system in the United Kingdom continues with the handicraft master-apprentice teaching model. This teaching model is dedicated to a deep understanding of the scientific principles of the subject and applying them to the greatest extent in daily production (Robinson, 1990). However, suppose advanced technologies such as BIM, VR, and drones are being extensively used, and more diversification in the workforce is seen in the construction industry. In

that case, this traditional model can no longer catch up with the needs of the industry. The development and reform of new educational models are imperative (Barnard et al., 2013). This curriculum reform model adapted to the development of industry and society is manifested in the introduction and set of interdisciplinary courses. The concept of interdisciplinary courses is comprehensive. It not only refers to the simultaneous study of two or more different types of subjects but also focuses on embedding different knowledge from multiple subjects and integrating them into professional practice (Repko, 2008). The interdisciplinary curriculum will include studying other professional liberal courses, such as philosophy, economics, and business (Klaassen, 2018). The benefits of setting up interdisciplinary courses are twofold.

On the one hand, it can improve students' transferable skills such as communication, teamwork, critical thinking, and comprehensive thinking skills (Newell, 1998). Moreover, people with professional skills can bring more diversified value to the company because of their soft skills (Spinks et al., 2007). With the dual guarantee of professional knowledge and soft skills, they can have a better forward-looking judgment on the company's strategic development rather than confining the training of talents to the technical level (Richter & Paretti, 2009).

From students' perspective, a sound selection system and curriculum arrangement play a positive and irreplaceable role in their learning (Barnard et al., 2013). Under the interdisciplinary elective course model, the school provides a variety of interdisciplinary courses for students to choose from. Students will choose courses under the teacher's guidance to minimise the problems of learning motivation without explicit knowledge of what they are looking for or whether the courses match their learning objectives and personal growth plan. (Lattuca et al., 2013; Richter & Paretti, 2009). Among the interdisciplinary electives, humanities-related interdisciplinary elective courses play a crucial role in improving students' interpersonal and communication skills required by the industry before entering society. It can also help students build critical thinking and cultivate holistic thinking skills and team awareness (Barnard et al., 2012). In addition, the people-oriented and encouragement of self-discovery nature of humanities courses support students in better understanding themselves in terms of their strengths and weaknesses through the learning journey (Harrison et al., 2007).

9.3 Characteristics of Interdisciplinary Courses Under the Unique Cultural Background of New Zealand

With New Zealand's unique historical background, Te Tiriti o Waitangi (Treaty of Waitangi) play an essential role in the curriculum design. Interdisciplinary course development in New Zealand has its unique bicultural characteristics. As a unique traditional culture of New Zealand, Māori culture has long embodied the humanistic spirit (Belich, 2002). "The curriculum acknowledges the principles of the Treaty

of Waitangi and the bicultural foundations of Aotearoa New Zealand. All students could acquire knowledge of Te Reo Māori me ōna Tikanga". the Treaty of Waitangi puts forward three "P" principles. These three "p" refer to Partnership, Protection and Participation. The partnership encourages everyone to integrate into each other's establishment. The close contact and cooperation between communities are teamwork in the modern sense (Bennett & Liu, 2018). Protection refers to protecting and learning Māori culture to enhance mutual respect. Participation means that Māori culture should be more diversified to participate in all aspects of social life, including integration into school education, related to overall comprehensive thinking in the modern sense. The interdisciplinary electives incorporate Māori culture into their learning. For regional education, such curriculum settings and arrangements make it easier for students to integrate into the culture and society while positioning their long-term development goals to align with New Zealand. In addition, the bicultural background encourages students' divergent thinking and being more innovative and creative.

9.4 The Influence of STEAM Education on the Construction Engineering-Related Curriculum in New Zealand

As a new educational framework concept introduced at the beginning of the twenty-first century, STEM has played a significant role and far-reaching influence in reforming and promoting academic curricula in the past 20 years (Herro et al., 2017). STEM refers to the interdisciplinary curriculum centred on science, technology, engineering, and mathematics, which aims to encourage students to adapt to the development of science and technology better and comprehensively in modern society and cultivate students to establish a comprehensive engineering thinking mode and scientific thinking attitude (Becerik-Gerber et al., 2006).

However, the pure STEM model can no longer meet the expectations of organisations and enterprises looking for talents with not only technical but also soft skills. The STEAM education model is expanded to STEAM on this basis. The A refers to "Art" literally, but this is a humanistic care discipline represented by Art (Herro et al., 2017). Focusing on humanities and caring subjects, adding related interdisciplinary courses will help improve students' overall creativity and develop divergent thinking (Hunter-Doniger, 2018). From a scientific point of view, adding more "A" can help students develop logical thinking and thinking in images in a balanced manner. This is a basis for enhancing students' overall development ability (Miller, 2014a, 2014b).

The reform of the STEAM model specific to the QS and CM education model in New Zealand is reflected in the interdisciplinary humanistic care courses based on the background of Māori culture to cultivate students' overall ability. On this basis, optional courses that supplement professional skills are committed to developing

comprehensive talents (Cook, 2016). For example, students can choose introductory project management courses as interdisciplinary elective courses to improve their project management and coordination skills. Learning from different perspectives can also encourage students to further understand and improve their technical skills by interacting with others. Similarly, it has also integrated business and other humanities subjects into the curriculum. Considering the many contributions and reciprocal advantages of all parties concerned, STEAM complements and challenges preconceived perceptions of this emerging educational movement, which is usually focused on calls for competitive economic development and technical improvement (Sochacka et al., 2016). With a deeper understanding of their abilities, students can choose more suitable professional elective courses under the guidance of the humanistic subject.

9.5 The Current Programme Structure of Construction Management (CM) and Quantity Surveying (QS)

The degree is designed to comply with approval and accreditation rules. It is consistent with higher education in New Zealand's objectives, values, desired graduate outcomes, and core academic policies and procedures. The importance of Kia Hihiri (Inspire), Kia Tuhono (Connect), and Kia Pono (Trust) inform and contribute to the culture of the degree and are integrated throughout the programme.

9.6 Vocational Applied Learning

Critical thinking and management capability are developed through participation in activities that provide learning opportunities within industry contexts. Students will use work-integrated learning to understand effective industry practices and develop the industry's skills to be future leaders.

The teaching and learning approaches deployed are founded on Ara's deep and successful history in providing vocational and applied learning with outstanding results for students. This degree is designed to cater for the unmet need for graduates to be able to move into management and leadership roles in the construction industry.

Setting up and arranging applied vocational courses improves students' comprehensibility, including critical thinking and overall thinking ability, transforming these abilities into skills, and preparing for future application at work.

9.7 Cultural Understanding of New Zealand

New Zealand's unique socio-political development has created an atmosphere in which indigenous (Māori) ideas and values are increasingly infused into our country's distinct identity and the resulting worldwide competitive advantage. Simultaneously, the Māori economy is rapidly growing in New Zealand, incorporating Māori viewpoints and goals into decision-making.

Students with the information, abilities, and attitudes necessary to capitalise on New Zealand's worldwide competitive advantage will be more prepared to function well in both a multicultural, long-term New Zealand and a bicultural, global market. Graduates of this degree will have a sound working knowledge of core Māori values and processes through assessed experiential learning within unique Māori settings (e.g., whakawatea Whenua) and relevant curriculum. Collectively, these two lines of knowledge acquisition will produce students able to engage effectively in the growing Māori economy and on the world stage.

The cultivation of cultural awareness of New Zealand enables students to better integrate into the local culture and learn to solve and distinguish problems in a multicultural context. Ability. Comprehensive analysis and critical thinking about the application of knowledge under the background of local culture and how to better integrate professional knowledge into local culture so that this part will become an advantage for future employment.

9.8 Socio-Cultural Learning

Ara values the social context of good learning experiences. Students are more successful in a positive, supportive learning environment, and their fellow learners contribute to their learning. The degree programme design acknowledges that understanding is influenced by cultural background and is a social experience. The Department of Engineering and Architectural Studies has built a culture where students develop a sense of belonging to a broad community of learners.

This sense of belonging is achieved by integrating cultural experiences, team-based learning activities, peer mentoring, and assessment approaches. This focus on assisting students in developing a sense of being part of the New Zealand construction industry prepares them for working in multidisciplinary teams with diverse cultural and socio-economic profiles.

Cultivating Socio-cultural learning curriculum setting and arrangement develop students' ability to adapt to a society based on their professional background. Under the influence of social culture, curriculum education helps students use holistic thinking and critical thinking skills to better adapt to society and have a deeper understanding and understanding of the social role of the construction industry in the future. So that students can solve problems in different environments, better apply

their professional knowledge and express their professional opinions reasonably and appropriately.

9.9 Economic, Social and Environmental Sustainability

Ara commits to the sustainable organisation and providing students with learning opportunities to be sustainable practitioners. The degree programme is designed to give these opportunities; sustainability is considered in economic, social, and environmental terms with attention to the impacts on present and future generations needed to live and thrive.

From another perspective, the concept of sustainable development has always been part of New Zealand's traditional culture—Māori culture, which has a profound historical impact on New Zealand's society. The concept of "Kaitiatanga" emphasises that humans are the children of Ranginui and Papatunuka. Nature has nurtured human beings, and human beings should also be the Kaitiaki of nature. Such a relationship is as natural as the family members in the extended family guarding the family. Whether how history develops and the social form changes, the spiritual support of human beings is always rooted in nature; from this perspective, the concept of Māori Kaitiatanga and sustainable development in modern society are inherited. Now in New Zealand, this concept exists in the traditional Māori culture and is widely accepted by modern companies and integrated into the company culture as part of the company's sustainable development philosophy.

Sustainability and the wise use of global resources are integrated throughout the programme with specific learning outcomes in relevant courses. An example would be the Estimation courses, where the minimisation and cost of materials, labour and plant waste are calculated.

The courses–Site Management and Site Safety- cover procedures for managing waste on sites, while energy efficiency is studied in Building Services and Construction. Quantity surveying students research life-cycle costs and sustainable alternatives in Cost Planning and Building Information Modelling (BIM). Students model energy consumption using appropriate software such as BRANZ ALF (Annual Loss Factor) and Design Navigator in the first-year Environment course. They were extended in the BIM Project elective course in the first year, where students use more sophisticated software to measure energy efficiency.

Economic, Social and Environmental Sustainability train students in their professional background to cultivate students' compatibility with society. With the concept of sustainable development, we constantly improve our comprehensive thinking ability and quality from a professional point of view to think about how to maximise economic energy conservation and sustainability. Using the curriculum advantages of interdisciplinary education enables students to integrate such concepts into their professional studies before entering society, helping them adapt to social development needs.

9.10 Employability of Learners

From helping employment, reforming the interdisciplinary elective course system based on humanistic care courses can help students improve their competitiveness and are a guarantee for enhancing Employability (Richter & Paretti, 2009). Taking QS and CM majors in New Zealand as an example, learning about Māori cultural background courses can help students integrate into the local culture, integrate into local enterprises, and play an active role in employment. Their data shows that more companies pay more attention to the soft power of employees than professional skills when recruiting employees, and employees' soft skills and professional qualities are placed in an equally prominent position. Furthermore, students do not have the opportunity to systematically understand their soft skill training and promotion during school. In that case, it is difficult for them to realise their shortcomings and professional ability in the enterprise. Soft power and professional ability complement each other, and improving the delicate portraits can help students understand themselves more clearly and better understand themselves. Critical thinking will help students better understand the gap between themselves and the company's employment requirements and can and of their subjective initiative to make up for the opening.

Through the knowledge and understanding of Māori culture during university, students can deepen their belief in and knowledge of local culture and better integrate into local culture, bring local culture to the enterprise, and combine local culture with the humanistic care culture of modern society. It can better base itself on the local area, provide enterprises with cohesion, and increase their core competitiveness (Davis et al., 2014). More companies respond that the lack of professional competence and the lack of humanities culture become more serious when graduates enter the company because most engineering students do not have the consciousness of choosing humanities subjects during their school years. This also reflects from one aspect, such as construction management (CM) and quantity surveying (QS) majors in the third year, to provide students with the importance of humanities interdisciplinary courses. If the school does not offer such a choice, most students choose elective courses based on professional courses, which leads to a complete lack of education for humanistic care courses. If the school takes humanities courses as its characteristic, it will compensate for the student's shortcomings in education. The 21st-century innovation concept's STEM teaching idea alludes to an interdisciplinary education that includes science, technology, engineering, and math. In addition to learning in a single course and from peers in various fields, students also have the chance to develop their original and diverse ways of thinking outside of professional classes. Additionally, this teaching approach might help pupils become more conscious of collaboration.

9.11 Research Gap

Although we know that one of the academic goals of an interdisciplinary course is to assist graduates in transitioning into the workforce (Holdsworth & Sandri, 2021), we do not know how students view the increase in employability due to interdisciplinary courses. Academics value the study because it allows them to examine how students perceive their employability and how multidisciplinary elective activities impact that perspective, which can then be used to drive future curriculum development. The study also allows for examining more particular graduate behaviours throughout the transition to work, such as self-esteem. The application of skills in a context, the development of bicultural awareness, and the transfer to the profession have all been highlighted as broad transdisciplinary course-specific aims in New Zealand higher education construction engineering courses but have not been examined. This research, which examines the success of an interdisciplinary course from the student's viewpoint, attempts to fill this gap.

9.12 Methodology

The role and significance of interdisciplinary elective courses in QS and CM majors are investigated using a questionnaire survey. In the form of questionnaire surveys sent to third-year undergraduates, open-ended and chosen questions are utilised as the starting point for gathering the opinions of third-year undergraduate students on interdisciplinary elective courses. This research aims to investigate students' perceptions of employability following interdisciplinary elective courses on students' elective courses. A comprehensive examination of six criteria, including in-depth integration of cultural, social, and economic sustainability of interdisciplinary elective courses, was performed.

The study population ($N = 32$) consisted of every student in years 2 and 3. It is important to note that the students in their last year of undergraduate construction engineering studies had much experience working in the field, including internships or teaching in high schools (specifically, engineering or science). Before this programme, they had little exposure to interdisciplinary teaching and learning.

According to the constructive-qualitative method, a phenomenon under research should be handled holistically in its natural environment (Patton, 1990). The study described how students' attitudes and thought patterns changed during the course (Stake, 1995). The previous session began with students completing open, anonymous questionnaires.

9.13 Analysis and Findings

9.13.1 Profile of Respondents

The total number of year two and year three Degree students is thirty-two, all of them were sent the questionnaire, and eighteen valid responses were received. The effective response rate was 56.25%. Two-thirds of respondents are full-time students, and another one-third are students working in the industry in different capacities, such as consultancy firms, main contractors, and suppliers. All respondents are students, and more than 30% are from industry, showing the survey results' representativeness, currency, and appropriateness.

9.13.2 Reliability of the Data

As shown in Table 9.1, most learners are full-time students accounting for 66.7% of respondents, and 33.3% are working in construction engineering-related industry. All the full-time students received the internship opportunity in year two, and all respondents have industry experience. The survey result validates students' attitudes towards interdisciplinary electives regarding the competencies expected in the industry showing the relevance and value of the research results.

Data reliability is referred to as consistency. Cronbach's alpha values greater than 0.70, according to Nunnally and Bernstein (1994), suggest strong internal consistency. The data's 0.94 Cronbach's alpha indicates that it is of very high quality.

Table 9.1 The background of the respondents

Category	Attribute	Percentage (N = 100%)
Occupation respondent	Student only	66.7
	Consultant	5.5
	Main Contractor	11.0
	Supplier	11.0
	Other	5.5

9.14 Findings

9.14.1 Attitudes Towards the Influence of Interdisciplinary Electives Over the Application of Knowledge

As part of the questionnaire that the students completed at the start of the first session, they were asked: "When you think about your research methods, industry project outcomes, or working/internship experience as part of your degree programme, how do your interdisciplinary electives influence your application of construction knowledge and skills in solving the technical problem(s)?" Half of those interviewed agreed that it impacted the application of essential facts, implying a cognitive effect. At the same time, 44% were indifferent, and 6% disagreed, according to the data.

The students were questioned about their views on vocational applied learning via interdisciplinary learning in the most recent questionnaire, which they completed at the beginning of the most recent session. For the second time, one-third of those who answered the survey thought that multidisciplinary electives did not influence the application of construction engineering knowledge, with the remaining one-third remaining undecided.

In my current position as a project manager for a design-build business, I need transdisciplinary abilities daily. This is something I have done and continue to do regularly. It is referred to as "learning by doing". Students' perceptions of change toward interdisciplinary learning are summarised in Table 9.2.

9.14.2 Attitudes Towards the Role of Interdisciplinary Electives in Cultural Understanding of the New Zealand Workplace

In the preliminary questionnaire, students were asked, 'How do you estimate the importance of those interdisciplinary electives such as business, culture, say, Te Reo, ICT, management (approaches, methods, strategies, and tools) in grasping the problem(s) you encountered in your workplace?' In the final questionnaire, students were asked, 'How do you estimate the importance of those interdisciplinary electives such as business, culture, say, Te Reo, ICT, management (approaches, methods, strategies. According to the study's findings, most students (67%) had no opinion: they were 'neutral.' However, just 22% of the remaining students felt that it might benefit them in terms of cultural awareness. In comparison, 11% answered that they did not perceive a connection between this behavioural component and their knowledge of workplace challenges.

After examining their responses, it was shown that half (53%) of respondents considered that interdisciplinary electives were beneficial.

Table 9.2 Students' perception of change toward Interdisciplinary learning

		Before			After		
	Questions	Agree (%)	Neutral (%)	Disagree (%)	Agree (%)	Neutral (%)	Disagree (%)
Q.1	Thinking about your research methods, industry project outcomes or your working/internship experience undertaken as part of your degree programme, how do the interdisciplinary electives influence your application of construction knowledge and skills in solving the technical problem(s)?	50	44	6	33	33	33
Q.2	How do you rate the role of those interdisciplinary electives such as business, culture, say, Te Reo, ICT, and management (approaches, methods, strategies, tools) in understanding the problem(s) you encountered in your workplace?	22	67	11	53	27	20
Q.3	Upon completion of this course, I can function in multi-disciplinary teams	56	44	0	53	7	40
Q.4	Upon completion of this course, I can and professional and ethical responsibility	44	44	11	53	33	13

(continued)

Table 9.2 (continued)

		Before			After		
	Questions	Agree (%)	Neutral (%)	Disagree (%)	Agree (%)	Neutral (%)	Disagree (%)
Q.5	Reflecting upon your programme of study (degree course), the integration of the different disciplines in your electives (business, culture, ICT, management) enriched your learning experience?	28	61	11	53	13	33
Q.6	How important do you think interdisciplinary electives (Culture, Business, ICT, Management) prepare you for industry, particularly the soft skills required in critical thinking, problem-solving, and teamwork?	28	50	22	40	27	33

One student said in response to an open question. "It has helped me understand the structure and importance of different roles in my workplace, why they approach/view projects differently and can sometimes have different outcomes or priorities, but they all contribute to the big picture and the project's success," another student said in response (Student A).

Also included are excerpts from student interviews that demonstrate how they believe interdisciplinary learning has improved their understanding: "I'll incorporate them into my work", "For example, when I go to work, I will use talents that I have learned via interdisciplinary knowledge, such as communication abilities." (Student C).

According to the questionnaire results, the observations' behavioural component—practicality–fosters the students' considerable enthusiasm for interdisciplinary learning and learning.

9.14.3 Attitudes Toward Social and Cultural Learning

In your electives (business, cultural, ICT, management), explain how combining multiple disciplines has benefited your learning experience. 'Positive' is an adjective

that refers to a positive attitude (or reaction), whereas 'non-positive' refers to a negative attitude (or response) or a lack of a perspective (or response). The percentage of students in each cell in the table corresponds to the cell in question. According to the graph, most students (61%) expressed apprehension regarding interdisciplinary learning and teaching before the start of the semester. When asked how they felt about interdisciplinary education, 28% said they felt optimistic about it, while just 11% said they felt adverse.

According to the findings, a favourable attitude toward interdisciplinary and cross-disciplinary learning was shown by most students (53%) after the course. A third of the students expressed dissatisfaction with interdisciplinary knowledge in their surveys (33%).

When the tables are compared, it becomes clear that the student's points of view shifted drastically over the course. At the beginning of the semester, most students had a neutral idea regarding interdisciplinary electives on job application and learning experience. Still, towards the conclusion of the semester, they had a positive attitude toward both, from 28% up to 53%.

9.14.4 Attitudes Toward Interdisciplinary Electives on the Soft Skills Improvement

"What role do you believe multidisciplinary electives (culture, business, information technology, and management) have in preparing you for the workplace, especially in developing soft skills such as critical thinking, problem-solving, and teamwork?"

Specifically, it indicates that students' attitudes toward interdisciplinary learning and teaching were neutral at the beginning of the course (50%), with just 22% having negative attitudes against either or both. A few students expressed an interest in multidisciplinary electives focused on soft-skills development, which were offered as part of the curriculum (28%).

The results demonstrate that, after the semester, 40% of students had a positive assessment of interdisciplinary electives on soft skills growth. However, the number of people opposed to it increased from 22 to 33%.

According to the open question in the survey, "it has the potential to teach me certain important skills, such as communication and collaboration". In addition, information and communications technology (ICT) may aid me in better use of the computer and keeping up with society."

"Lessons in interdisciplinary topics have assisted me in comprehending issues from various viewpoints, and they have improved my comprehension and problem-solving abilities." (Student C is an example of this.)

9.14.5 Attitudes Towards Functionality in Multidisciplinary Teams

The preliminary questionnaire, which the students answered before the first session's commencement, asked whether they felt they were "qualified to function in multidisciplinary teams" after completing the course. According to research, a favourable attitude toward the topic is expressed by most students (56%), while 44% say no opinion on the matter.

Students answered at the beginning of the final session and were asked their opinions on the Interdisciplinary team working again. There was a behavioural component of agreement with 40% of the students this time around and the corresponding favourable attitude of 53% last time.

"Interdisciplinary studies will aid me in better integrating into society while also boosting my talents," says the student.

The question was posed: "How have you reconciled and synthesised interdisciplinary knowledge and understanding with your technical background, considering your professional experiences or studies?".

"Coming up with solutions as a group."

9.14.6 Attitude Towards Ethical and Professional Aspects

After completing the course, the students were invited to complete a preliminary questionnaire at the start of the first session. They were asked whether they understood their professional and ethical responsibilities. Statistics show that over half of the students (44%) had no opinion on the matter, indicating that they were neutral. Most students (44%) were more positive in their assessment.

The students were questioned about their views toward interdisciplinary learning in the most recent questionnaire, which they completed at the start of the most recent session. More than half of the students expressed support this time, while 33% voiced neutrality and 13% voiced opposition.

9.15 Discussion

According to students, interdisciplinary learning in construction engineering courses helped them integrate well into the workplace. Still, it also helped them understand the subject matter better because of the cultural aspect. They further stated that this approach was natural and appropriate for today's generation, where the line between cultural and technical skills is blurred.

We understand that no such results for undergraduate New Zealand students in science and engineering education have been recorded. Students experienced

a sense of accomplishment after the course, which is typical of multidisciplinary learning and stems from the need to integrate into society and a bi-cultural workplace. Some students had significant prior work experience in their respective fields before enrolling.

This sentiment was echoed in the behavioural component. Students spent much more time learning about the new subject than the technical abilities they had previously learned in years one and two of their education. Furthermore, because of education, the cognitive component of students' perceptions is altered. Before taking the course, students believed that interdisciplinary electives would be challenging to prepare them for the collaboration skills expected in the industry because most students believe that hard skills are more important; however, by the end of the course, students identified challenges had been alleviated, and the interdisciplinary electives were assisting them in learning and applying technical skills that are expressed in finding a balanced mix of disciplinary know-how and experience. They also discovered that working across fields benefits all of these abilities. According to Marcketti and Karpova (2014), students enjoyed engaging with business to enhance problem-solving skills in a real-world context with their classmates; effective collaborative learning in higher education is dependent on reliance, accountability, and participation (De Hei et al., 2015). Stember (1991) proposed similar requirements for good interdisciplinary cooperation, focusing on belonging. Successful interdisciplinary teams must be able to balance differentiation and integration. Although this is the first time we have observed their behavioural expression of the value of technical and interdisciplinary skills, these attitudes are consistent with the literature's discussion of the difficulties associated with interdisciplinary teaching (Grünzweig, 2004; McComas & Wang, 1998), and this is the first time we have observed their attitudes regarding the value of technical and soft skills. Despite the significant difficulties associated with interdisciplinary learning—such as biculturalism and management, which students encountered during the course—there was a substantial increase in the proportion of students who agreed that interdisciplinary electives effectively support their understanding of workplace problems. Similarly, kaitiakitanga cannot exist without mana, tapu, and mauri. Because they are all interrelated, we must also pose the whakapapa necessary to be a kaitiaki. Although most students claimed that they were unsure or could not decide whether interdisciplinary electives could help them better understand ethics and professionalism in their roles as construction engineering specialists or enrich their learning experience beyond the existing technical core curriculum before taking the course, more than half had expressed support for studying interdisciplinarity at the end. This tendency might be related to students' increased social participation with students from other departments and their recognition of the significant academic benefits of interdisciplinary study.

The study's theoretical contribution is the description of attitudes held by students in scientific and engineering education regarding interdisciplinary learning and teaching of science and engineering disciplines. To the best of our knowledge, this is the first time this kind has been characterised. For example, the findings' implications for teacher education programmes may be used as a case study to illustrate the practical impact. Moreover, engineers and scientists are in short supply (National Science

Board 2010). Significant efforts are being made to persuade high school graduates to pursue jobs in these sectors to enhance their contributions (Rockland et al. 2010). The Follow-up study will include interviewing course graduates after they have completed their teacher training to see if and how they incorporate interdisciplinary teachings into their work at high schools in the future.

9.16 Conclusions

After taking the elective, interdisciplinary courses, the research examined how students' perceptions of interdisciplinary science and engineering learning and teaching evolved. Participants' data showed that student perceptions changed during the study. At the beginning of the research, most students had unfavourable views about interdisciplinary learning and teaching, but towards the end, most students had positive attitudes toward both. Most students who participated in the survey agreed that their soft skills had improved after participating in interdisciplinary courses. These improvements are mainly reflected in the advancement of teamwork, critical thinking and comprehensive thinking ability. The progress of these abilities is different from professional skills, which can be quantified, but more of a process of subtle improvement and progress in daily learning and life. The third-year students who participated in the questionnaire had positive and significant feedback on the impact of the interdisciplinary curriculum from those who had work experience and were currently working. These experiences are the insights brought by the synergistic effect of practical work experience and interdisciplinary curriculum learning. On the one hand, the teaching of interdisciplinary courses promotes the improvement of students' soft skills by broadening students' horizons and enhancing students' understanding and perception ability. From this perspective, interdisciplinary courses indirectly improve students' learning ability, and the value of ability improvement to students and the industry is immeasurable. Students have a more intuitive understanding and experience of soft skills and how to improve soft skills through personal participation in the learning of interdisciplinary courses. Students can smoothly understand the interdisciplinary cognitive curriculum in the emotional part, develop an interest in it through learning, and establish a virtuous learning cycle under the guidance of interest. According to the study's findings, following the training, a cognitive component (interdisciplinary learning is natural and enhances knowledge) was added to the pre-existing emotional part (interdisciplinary learning is natural and improves understanding) to produce a complete picture (finding interest in education). This is a response to the discovery of additional learning problems. It happens with difficulties uncovered in previously unknown new regions of knowledge. Despite the significant challenges that interdisciplinary teaching entails- challenges that the students were exposed to as part of the lessons they taught-the proportion of students who expressed interest in taking interdisciplinary classes in the future increased significantly over the course of the semester.

Successful interdisciplinary needs a more profound commitment to be allies or create partnership approaches centred on kaitiakitanga. When organisations who have not done the work take those concepts, they become flat, one-dimensional marketing terms rather than deep values that are solutions to our student's learning.

Limitations of study

The study's modest sample size is one of its flaws; It would be ideal if it included recent graduates from more tertiary institutes. Further research is recommended to ascertain the differences in perceptions between full-time students and those in employment.

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