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TE WHARE WĀNANGA O WAIRAKA

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FOREWORD

Associate Professor Marcus Williams
Director, Research and Enterprise, Tūāpapa Rangahau – Research and Postgraduate Office, Unitec New Zealand

It is exciting to see the ITP sector increasingly collaborating in its research endeavours. Unitec's annual Research Symposium, held in October and December 2020, was opened up to the sector for the first time, and was lucky enough to be able to run as a live event. Earlier in the year, the ITP Research Symposium, which has been running for over 20 years now, was hosted by Toi Ohomai, and presented fully online due to Covid-19 restrictions.

At the Unitec Research Symposium 2020 there were around 21 presentations from outside of Unitec, with some guests presenting in person and others online. For obvious reasons, there was a strong physical presence from NorthTec Tai Tokerau Wānanga, Manukau Institute of Technology, and Whitireia and WelTec. In total, eight presentations were accepted for publication in the proceedings by Unitec ePress, four of which represent authors from NorthTec, Manukau Institute of Technology, Whitireia and WelTec, and Otago Polytechnic Te Kura Matatini ki Otago; a strong start for collaborative national research publication in Te Pūkenga going forward into the future. This future has strong potential for applied research in Aotearoa, Te Pūkenga forming as it will the largest tertiary institute in Aotearoa with a network of research hubs stretching from Kaitāia to Bluff.

These symposia are so important, because the more we network, share resources and research stories, and weave together complementary research teams, the greater our collective value proposition will be. The diversity of research represented, the highly partnered nature of the research (with industry and community), and the strong alignment with teaching and our students are all great strengths of the sector.

Strong partnership means that we are undertaking research that is by nature more responsive to stakeholder need and, with student integration, it means that industry and employers in general are exposed to the emerging talent and the talent is exposed to industry; this is knowledge transfer in the most direct sense and a unique research niche for the sector. Babar Mahmood and Rishna Bogati's paper in this proceedings, *Assessment of Grease Traps Used in the Small-scale Food Industry: A Pilot Study*, is a perfect example. The project, which won an award at the symposium, engages with the hospitality industry in Tāmaki Makaurau Auckland along with Watercare, and it discloses highly pragmatic results toward resolving a problem that costs ratepayers around $1m per annum in the city.

Unitec's ePress is a perfect repository for such diverse publishing, being an open-access publisher of peer-reviewed paper series, journals, creative e-media, thesis reviews, proceedings, monographs and e-books, available to search engines and providing excellent accessibility.

John Stansfield
Acting Director, Products and Delivery, NorthTec Tai Tokerau Wānanga

NorthTec is excited by and appreciative of the growing collaborations in research that are emerging in our new Te Pūkenga environment. Polytechnics have a unique applied focus and strong relationships with community to bring to this mahi, and the generous opportunity to come together with our peers, or 'bung wantaim' as we say in PNG, is appreciated by us at NorthTec as we begin to grow our research culture.

Dr Daud Ahmed
Research Director, Manukau Institute of Technology

Ease of dissemination, accessibility and usage of impactful applied research is the key focus of the ITP sector researchers and our communities and industries. Unitec's ePress is an effective open-access online platform for quality-assured research publications, and it is encouraging to see that our researchers are increasingly utilising it. I appreciate that the editorial team at ePress is facilitating caring and nurturing support for a range of authors, from early-career to experienced researchers.

Dr Fiona Beals
Principal Lead, Teaching Innovation and Research, Whitireia and WelTec

Opportunities to come together to share research and innovative thinking empower the sector to be at the forefront of vocational education. Whitireia and WelTec are grateful to Unitec for this opportunity, and to the publishing arm of Unitec for making this research visible to a wider audience.

Professor Leoni Schmidt
Director, Research and Postgraduate Studies, Otago Polytechnic
Te Kura Matatini ki Otago

In a year when conference planning and travel were so disrupted, we appreciated that Unitec opened their symposium up to other Te Pūkenga subsidiaries, offering our staff another avenue for peer-reviewed presentation and publication of research.

ASSESSMENT OF GREASE TRAPS USED IN THE SMALL-SCALE FOOD INDUSTRY: A PILOT STUDY

BABAR MAHMOOD
RISHNA BOGATI

Environment / infrastructure

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ABSTRACT

Fat, oil and grease (FOG) deposits in sewer systems are becoming a serious environmental concern for infrastructure engineers and council managers. These deposits can come from both domestic and commercial wastewater. Water and wastewater company Watercare has reported that 70% of sewer blockages in Auckland, New Zealand, are due to material such as rags, wet wipes, wood, tissues, hygiene products, etc., that shouldn't go down the sewer drain. These materials can lead to the blockage of pipes when combined with FOG. This preliminary study was about assessing the grease traps (GTs) that are being used in the small-scale food industry in Auckland. The purpose of this study was to address four key questions: How are FOG deposits actually formed? What types and sizes of GTs are being used? Do the sizes that are used comply with the recommended sizes? What are the issues and/or what is missing in terms of the operation and maintenance of GTs? A questionnaire was prepared to collect data such as type of food service, type of GTs used and their sizes, type of fixtures that are used in the small-scale commercial kitchen area, etc. This study shows that there are some issues with the way the GTs are being operated, maintained and monitored (i.e., some regulatory gaps). The paper also gives a brief overview of different types of GTs, reviews the current compliance practice, and then provides some recommendations and solutions that could lead to improved practice to mitigate wastewater pipe blockages.

KEYWORDS

infrastructure, grease traps, FOG deposits, wastewater, food industry

INTRODUCTION

Fats, oil and grease (FOG) in wastewater systems are predominantly discharged from food service establishments (FSEs) such as food preparation and processing facilities (including restaurants, etc.) and potentially from residential properties (He et al., 2017). FOG undergo reactions with other constituents in the wastewater to form insoluble solids known as FOG deposits, which lead to blockage in pipes and end up in wastewater overflows (He et al., 2017).

As reported by water and wastewater company Watercare (Harrowell, 2018), 70% of pipe blockages in Auckland are caused by rags, concrete, wood, wet wipes, hygiene products, etc. These materials combine with FOG and then stick to the pipes' inner surfaces. Watercare spends almost $1 million each year to remove FOG deposits and clear pipe blockages in Auckland. In the recent past, the *New Zealand Herald* (Neilson, 2019) reported wastewater overflow in Kaipatiki Stream in Glenfield, Auckland. This overflow was due to a blockage in wastewater pipes that basically carry anything that comes from domestic and industrial waste. It is well knowing that 'fatbergs' are likely to form when FOG harden in the wastewater reticulation system (WWRS).

A number of studies have shown that FOG deposits in sewer systems are a global problem. For example, in the USA, FOG deposits, which reduce the wastewater pipes' flow area, were responsible for around 40% to 50% of annual blockages (He et al., 2011; Ducoste et al., 2008). Williams et al. (2012) reported that around 25,000 flooding events occurred throughout the UK annually, due to sewer blockages, and FOG was thought to be a contributing factor for around 50% of the incidents. The annual cost for removal of FOG deposits was US$25 billion (around NZ$41 billion) for the USA, and UK£15–50 million (around NZ$31–103 million) for the UK as reported by Williams et al. (2012) and Del Mundo and Sutheerawattananonda (2017). Further, Marlow et al. (2011) reported that FOG was the primary

cause for 21% of blockages in Australian wastewater systems. Husain et al. (2014) reported that 70% of sanitary sewer overflows (SSOs) in Malaysia were due to FOG deposits.

According to M. Harrison of Watercare, Auckland (personal communication, April 3, 2020) there hasn't been research done in Auckland on characterising FOG deposits. Watercare (in Auckland) uses a 'fingerprinting' method to find high concentrations of contaminants. The fingerprinting method is used to backtrack or trace the source(s) of unwanted substances in the wastewater that are responsible for the mass production of FOG deposits and/or 'fatbergs.' This method is used for wastewater flows from large industry, but wouldn't be applicable to the food industry.

It is well known that it is not permitted to directly discharge FOG into wastewater pipelines in most municipalities within and outside New Zealand. FOG can form hard, solid fatbergs when combined with wipes, paper towels, toilet paper and other sanitary products going down the drain. From the researchers' personal experience, fatbergs can not only block pipes but can also have a detrimental effect on the primary, secondary and tertiary treatment processes that are designed to treat wastewater at wastewater treatment plants (WWTP).

Thus, it is important to have GTs at food preparing and food serving (FPFS) facilities (NZTIWF, 2017) in order to remove animal fats, vegetable oils, etc., at source. However, GTs require maintenance on a regular basis so that the oil and water can be separated at the source. It is not easy to remove FOG once in the pipeline, and also it is an expensive exercise to clear the wastewater-pipe blockages.

That is why FOG deposits in wastewater pipelines are becoming a serious environmental concern globally. Infrastructure engineers are challenged by sewer-pipe blockages (due to FOG deposits), and managers of WWTP are challenged by how to treat and dispose of fatbergs that are coming into the plant. Thus, significant research has recently been carried out in this area. Unfortunately, we still have complaints of pipe blockages in and around Auckland. Therefore, the focus of this pilot-scale study was to assess the GTs that are used in the small-scale FPFS industry in Auckland in order to identify the potential reasons for FOG being discharged into our wastewater pipelines. The aim of the study was to address the key questions:

• How are FOG deposits actually formed?
• What types and sizes of GTs are being used?
• Do the sizes that are used comply with the recommended sizes?
• What are the issues and/or what is missing in terms of the operation and maintenance of GTs?

FORMATION AND CHARACTERISATION OF FOG DEPOSITS

What is FOG?

"FOG are the by-products of cooking (also called brown grease)" (Husain et al., 2014, p. 748). It is well known that FOG is normally produced at food preparation and processing facilities (such as restaurants, cafés, takeaway outlets, etc.). Animal fat, butter, cheese, used cooking oil, sauces, dressing, gravy, deep-frying oil and baking ingredients (either at commercial or domestic levels) are considered as FOG or greasy material (Husain et al., 2014; He et al., 2011). When these wastes are discharged (via a network of pipes from restaurants and homes) to local wastewater pipes, then they can form FOG deposits via a saponification process – which is the conversion of FOG into soap, and is briefly explained below. These FOG deposits build up on the inner surfaces of wastewater pipes over time and are likely to reduce the pipes' flow capacity (Husain et al., 2014; He et al., 2011). Further, FOG deposits keep growing inside the pipes and eventually block them. An overflow or flooding situation can then happen, which is a serious environmental concern both at a local level and more widely.

FOG deposit formation

It was initially believed that FOG material that is discharged from restaurants and the food preparation industry interacts with calcium released from wastewater pipes, which forms calcium-based fatty acid salts (aka FOG deposits) via saponification reaction (He et al., 2011; Keener et al., 2008). Later, a laboratory-scale experiment was also conducted by He et al. (2011) to verify the theory that FOG deposits were formed from the reaction between free fatty acids (FFAs) and calcium chloride. The deposits formed in the lab experiment had strong similarities with the deposits collected from wastewater pipes, which confirmed that FOG deposits were indeed formed by a process called saponification.

FOG deposits are adhesive in nature, which allows them to easily stick to the inner walls of pipes (He et al., 2017, 2011). Further studies on the physical and chemical properties of FOG showed that FOG deposits are likely to have a grainy and sandstone-like texture. The color of FOG deposits ranges from light brown to white (Keener et al., 2008; He et al., 2017, 2011). The adhesive quality of FOG deposit is determined by the composition of FFAs and the ratio of FOG to calcium involved during reaction. He et al. (2013) observed that calcium salts of saturated fatty acids (palmitic) were less adhesive than the calcium salts of unsaturated fatty acids (oleic or linoleic).

Iasmin et al. (2014) and Del Mundo and Sutheerawattananonda (2017) undertook some work to see the effect of calcium chloride and calcium sulphate on the colour and texture of FOG deposits. Calcium sulphate was used to simulate calcium release from corrosion of concrete pipes. It was found that a wastewater pipe with calcium chloride present produced slightly whitish and soft-textured fatty-acid salts. Whereas a wastewater pipe with calcium sulphate present produced slightly whiter, rough and granular fatty-acid salts (Iasmin et al., 2014). Del Mund and Sutheerawattananonda (2017 as cited in He et al., 2017, p. 1195) also reported that all "saponified solids" produced a "distinct colour" when fats reacted with calcium chloride.

As reported by He et al. (2017, p. 1196), "In addition to saponification, the aggregation of unreacted fatty acids (e.g., palmitic, oleic, and linoleic) and calcium was identified as another process in FOG deposit formation … The importance of aggregation in FOG deposit formation was revealed by a recent finding that fatty acids, rather than fatty acid salts … were the predominant species in FOG deposits."

Figure 1 clearly shows how FOG deposits are formed in concrete wastewater pipes. Further details of the formation of FOG deposits can also be found in Otsuka et al. (2020) and He et al. (2017, 2013).

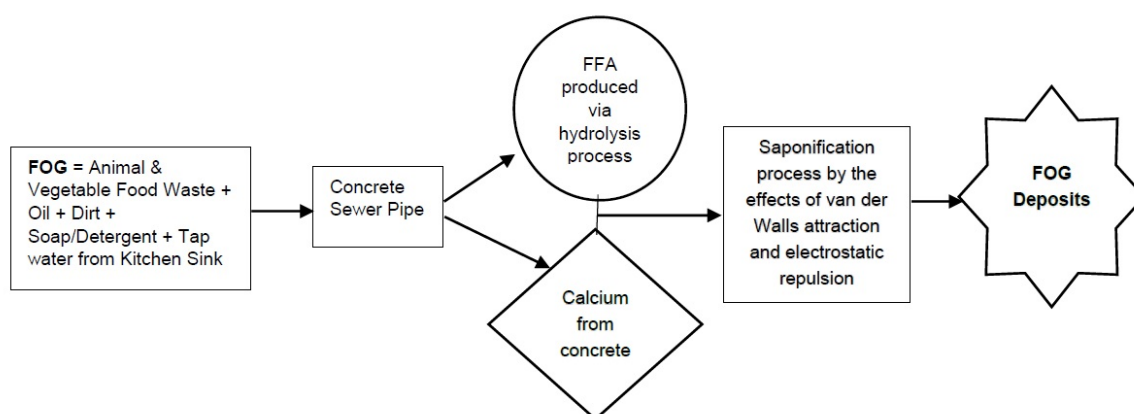Figure 1. A line diagram showing the formation of FOG deposits in a concrete wastewater pipeline.

Furthermore, researchers have proposed that FOG deposits in wastewater pipes undergo biodegradation (He et al., 2015). FOG deposits were found to be degradable under aerobic and nitrate-reducing conditions in a simulated sewer environment (He et al., 2015). It was concluded that the surface of the FOG deposit undergoes aerobic

biodegradation, while the interior nitrogen-containing compound present in the deposit undergoes nitrate-reducing biodegradation. However, compared to the rapid rate of FOG deposit formation, the slow biodegradation on the FOG deposit would seem negligible (He et al., 2015). A brief discussion of sources of FOG and calcium is provided below.

FOG, FFA AND CALCIUM

According to the Restaurant Association of New Zealand, there are more than 17,000 hospitality businesses in New Zealand (Restaurant Association of New Zealand, 2018). Auckland has the highest number of hospitality businesses, with around 1200 FSEs currently operating (Restaurant Association of New Zealand, 2018). Since restaurants are large contributors of FOG, wide distribution of such establishments can result in a heavy build-up of FOG in our wastewater system. Ducoste et al. (2008) identified Asian restaurants as a major contributor of FOG in the United States, followed by seafood restaurants and fast food establishments. Ice cream or coffee shops may also be a source of FOG due to the use of dairy products, which contain high fat levels.

There is no explicit data available that show the contribution of domestic households to FOG discharges into the wastewater system (He et al., 2017). Mattsson et al. (2014) conducted a study in Norway and Sweden that showed that residential areas were the second highest contributors of FOG. Similarly, among industrial areas, fishing and meat industries have been identified as the most likely contributors of FOG.

It is evident that the process of FOG deposit formation (as explained previously) is a complex one, and depends on many factors, such as type of food cooked, type and quantity of oil used, quantity and quality of FOG material leaving the kitchen sink, velocity, volume, temperature and pH of wastewater once in the pipelines, retention and travelling time (from source to wastewater treatment facility) and type of pipes used. All these factors can have a detrimental effect on the production of FFAs and the formation of FOG deposits in sewer pipelines. FFAs are formed by the hydrolysis of FOG (as shown in Figure 1). For example, during cooking, fast hydrolysis has been found to generate FFAs as soon as fat meets moisture (He et al., 2017). It is also suggested that FFAs are produced due to prolonged contact time and mixing between FOG and high moisture along wastewater pipes (while travelling) and at sewer crowns due to release of calcium hydroxide (i.e., from corrosion of concrete pipes).

Further, soap products, including hard soaps, gels and shaving cream, contribute to the presence of FFAs in the wastewater system (Szostak, 2013). FFAs have not been found in laundry detergents or kitchen cleaning products, and no FOG deposits were found downstream of laundry facilities, as reported by Szostak (2013). Human solid waste is another potential source of FFAs in sewers. Human excreta are known to be comprised of 4% to 7% of stearic acid and palmitic acid, which are types of fatty acids (He et al., 2017). However, these materials have not been used in studies as a source of FOG deposit formation due to their negligible quantity.

Similarly, calcium can come from many sources, for example, human urine, and food waste, such as milk, tofu, broccoli, green beans, etc. (He et al., 2017). The concentration of calcium in human urine is estimated to range from 100 to 300mg per day per capita (He et al., 2017). However, further research is needed to investigate the formation of FOG deposits (in wastewater pipelines) from the release of calcium from human urine. Further details of sources of FOG, FFAs, and calcium can be found in He et al. (2017).

TYPES OF GREASE TRAPS

GTs are the primary approach for removing FOG from wastewater produced at FPFS premises before it enters the wastewater reticulation system. There are three main types of GT that are being used in Auckland. A brief description of each is provided below.

Passive grease trap (PGT)

PGTs are normally large, in-ground tanks with two or three compartments (Figure 2), which are constructed outside a restaurant premises. The wastewater from the kitchen enters the tank, and is retained to cool down so that the grease solidifies and floats to the top, and food debris settles at the bottom. As we know, FOG doesn't mix with water and therefore rises to the top. The partially treated wastewater is then slowly discharged from the bottom of the first compartment to the second chamber, and then to the third compartment (Figure 2). The minimum size (as per Auckland Council's requirements [NZTIWF, 2017]) of a PGT is 500 litres (conditional on local council approval). However, in general a PGT size can be calculated based on the number of seats in a restaurant. For example, five litres per seat is the standard, which means a 100-seat restaurant will require a 500-litre PGT (Mactrap, n.d.).
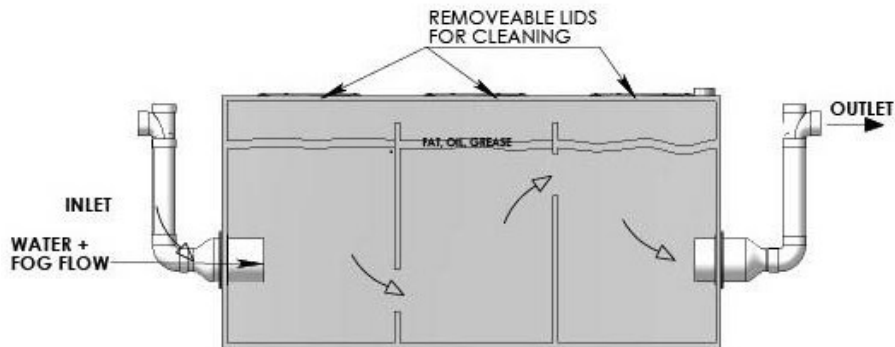
Figure 2. A type of PGT that is currently used in small-scale food outlets (Mactrap, n.d.).

Grease interceptor (GI) or grease removal unit (GRU)

GIs divert the path of grease from flowing into the wastewater system. They separate FOG from the wastewater and store it in a container. This type of trap is normally made of stainless steel (Figure 3). It is installed internally and wastewater (with FOG) is allowed to flow into the trap via a filter to remove food particles. A baffle system is used to separate FOG, which rises to the top (Mactrap, n.d.). A mechanical system is used to continuously remove FOG into a container – which can later be reused, recycled or discarded as required. This type of trap requires professional cleaning every six months (Mactrap, n.d.).
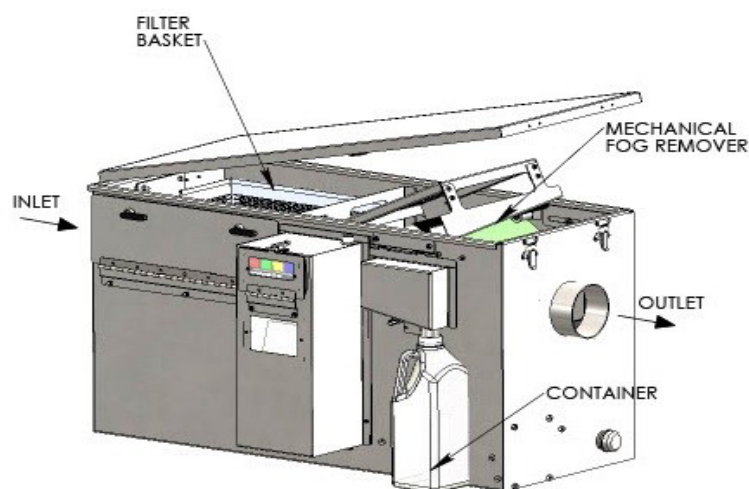
Figure 3. A Mactrap GI or GRU that is available in the market (Mactrap, n.d.).

Grease converter trap (GCT)

In a GCT, FOG is broken down using enzymes and bacteria, in a natural process. The size of the GCT depends on the volume of wastewater produced at the food preparation facility. A baffle system is used in a GCT to prevent FOG material leaving the trap (Figure 4), which causes the FOG to float on the water surface (NZTIWF, 2017; Mactrap, n.d.). Normally, a dose of bio-enzyme is used at night to break down FOG that is built up during the day. After breaking down, it is discharged to the wastewater pipeline, ensuring that drains remain free from blockage. It is a requirement from councils to have an automatic dosing system for GCTs, which allows four hours to break down the FOG material (NZTIWF, 2017). This trap is also made of stainless steel (Mactrap, n.d.), and is cheaper than other traps but costly to maintain. The cost of enzymes could be between $600 and $2000 per annum depending on what type of oil is used (low- or high-fat) (Mactrap, n.d.).
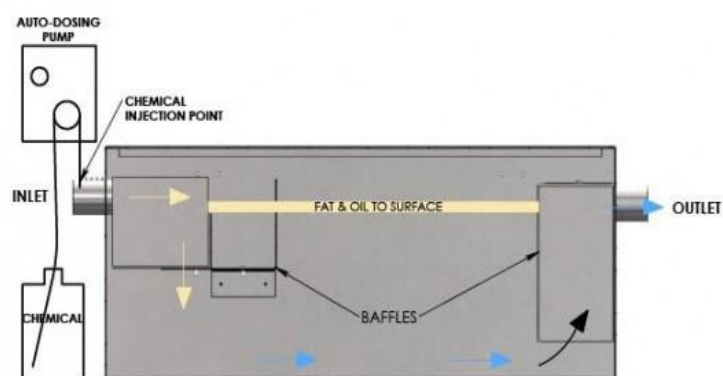
Figure 4. A diagram showing the different parts of a GCT (Mactrap, n.d.).

METHODOLOGY

A questionnaire was prepared to collect data (described in the following sections) from a range of small-scale FPFS businesses in Auckland. Each restaurant was physically visited and the questionnaire was completed at the site. A number of calls were made to numerous small-scale food businesses in Auckland, but only few agreed to participate in the survey. Thus, data could only be collected from eight food services, due to Covid-19 restrictions in Auckland. It would have been preferable to be able to survey a larger number of food services. Also, some business owners were not comfortable to share some of the information in terms of operation, maintenance frequency and costs, etc. There was no data available or accessible in terms of volume/flow rate of wastewater that is being discharged from FPFS businesses in the Auckland region.

Type and size of GT used

The data regarding the type of GT was collected to determine whether the respective FPFS facilities were using a GT, and if yes then what type, a PGT or GCT or GI trap. The GT size data was also collected to check and compare the sizes used with the recommended or required sizes.

Fixture Unit Rating (Fur) to estimate GT size

GT size also depends on the type of fixtures that are installed in a kitchen, and therefore the information regarding the type of fixtures installed in a kitchen was collected. This information helped to determine whether the current GT is an appropriate size (or not) for the effective pre-treatment of FOG.

According to the GT guidelines for New Zealand Trade Waste Officers (NZTIWF, 2017), there are two methods available to estimate the appropriate size of GTs.

The first method (which was used in this study) is based on the Fixture Unit Rating (FUR), in which a rating value is given for each type of fixture (refer to NZTIWF, 2017). In this method, the FUR value was used for each type of fixture (i.e., steamer, wok, hand basin, rinse basin, kitchen sink, etc.). This FUR value was then multiplied by the number of each of that fixture to estimate the maximum number of Fixture Units (FU). All FU values were added and then multiplied by 100 litres (as per NZTIWF, 2017) to determine the appropriate size (in litres) of the GT for that facility.

The second method is based on hourly peak-flow rates of wastewater (NZTIWF, 2017), and could not be used as there was no wastewater flow-rate data available for the surveyed food services.

Types of food prepared

Data regarding types of food prepared at the surveyed FPFS businesses were collected to determine what sort of food was prepared and what type of food preparation required high usage of oil in the kitchen. This information assisted in determining which type of FPFS facility might be producing wastewater with the most FOG material.

Type and quantity of oil used

It is known that the amount of oil used each day is directly proportional to the amount of oil found in the wastewater leaving the kitchen area. Also, different oils have different fat contents. Therefore, data on the type and amount of oil used was also collected for this study.

Operation and maintenance data

GT operation and maintenance data for the FPFS facilities in the study were collected. It was intended to compare this data set with the grease trap guidelines on how often a grease trap needs to be cleaned.

Location of GT

The data on where the GT is located were collected to check whether the wastewater draining from the kitchen area was passing through the GT for pre-treatment. This data also assisted in checking whether the GT is installed at a place that is easy to access for cleaning and clearing purposes.

RESULTS AND DISCUSSION

Food industry

Table 1 shows the type of FPFS industry visited and the type of food prepared at those facilities (refer to Figure 5). There was a total of eight small-scale food businesses that could be visited during the Covid-19 restrictions in Auckland, which was a challenge under the given circumstances. Thus, there were three Chinese restaurants, two cafés, and one each of Japanese food, pizza and burger services that could be surveyed (Table 1).

Food industry	Number
Café	2
Pizza service	1
Japanese food service	1
Chinese restaurant	3
Burger service	1

Table 1: Small-scale FPFS industry surveyed/visited.

Type of food and oil used

Most of the food prepared at the surveyed food services involved deep frying (Figure 5). The results show that 50% to 90% of food services were preparing deep-fried potato chips, fish, chicken and red meat, etc., which does require a reasonable quantity of oil.
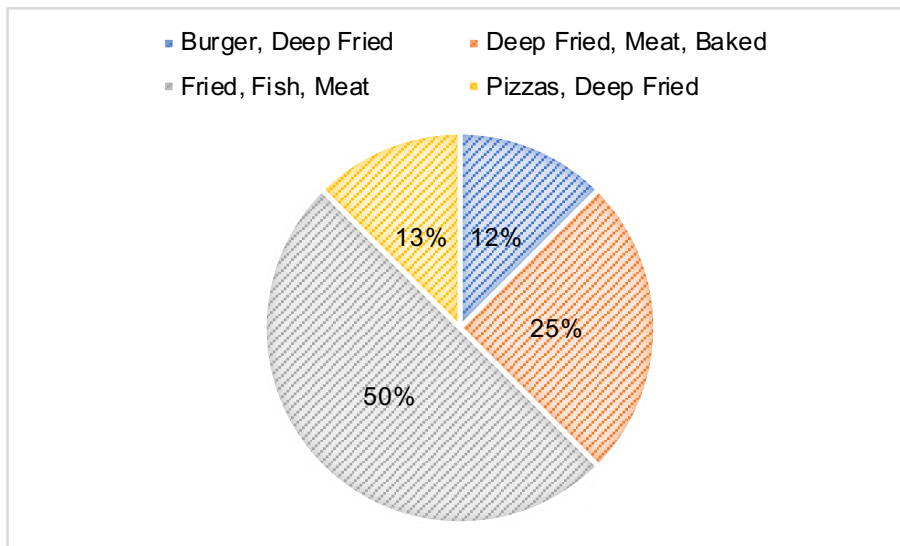
Figure 5: The type of food that was prepared at the surveyed FPFS facilities.

All food services were using vegetable oils (i.e., canola, soybean, sunflower, etc.). However, most of the food services were using canola oil (more than 50%, see Figure 6), being the cheapest oil available in the market.

The quantity of oil used at the respective food services varied between 3 and 6 litres per day (L/d) (Figure 7). At the end of the day the used oil was discharged into the sink, which is considered to be a bad practice.

To give an idea of how much used oil may be going down the drain, based on an estimated average of 5L of oil used in a day, 35L in a week (assuming a 7-day working week), 1750L of waste oil would be produced in a year (based on 50 working weeks of the year). This means 1750L of used oil may be drained every year by a single FPFS business – multiply this number by the number of these businesses in the Auckland region, and that would give us an idea of how much FOG material maybe going to the WWRS.

The used oil, which should be recycled, was going down the drain and contributing to the formation of FOG deposits, which means that it is very likely that a pipe blockage will occur. Further, this also indicates that the formation of fatbergs is likely to occur further down the pipe lines. Eventually, these fatbergs are likely to travel towards the WWTP and create challenges for plant engineers, managers and operators to treat or remove them.
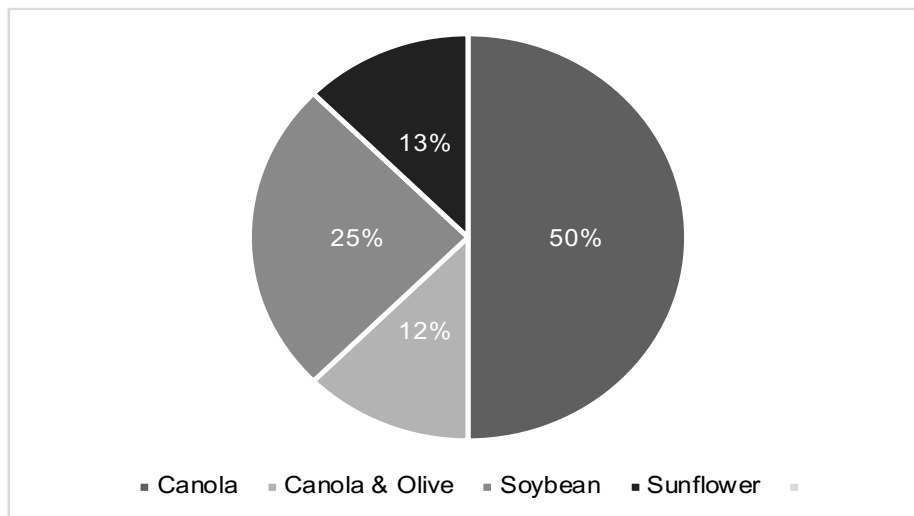
Figure 6. The type of oil used at the surveyed FPFS facilities.
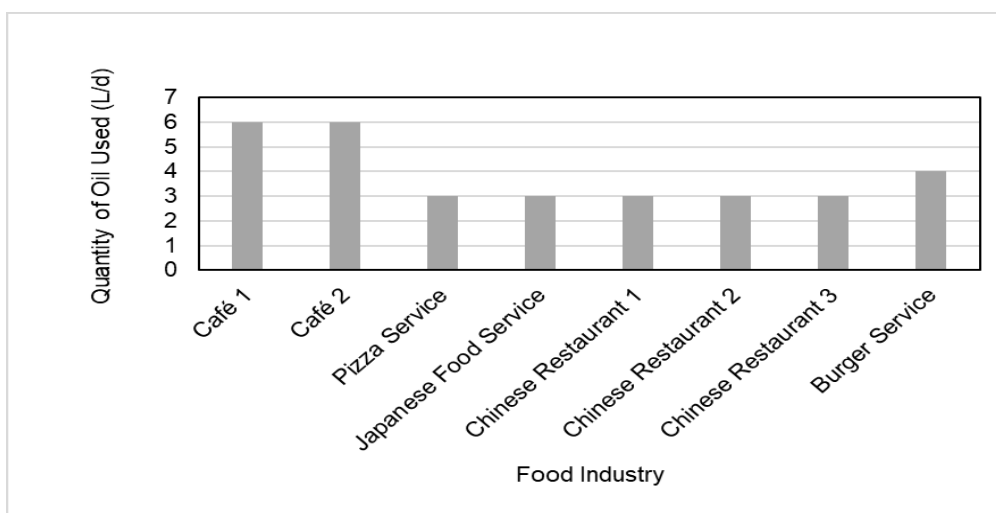
Figure 7: The quantity of oil used per day at the respective FPFS facilities.

GT types and sizes

The results show that two types of GTs (i.e., PGT and GC) were used in the surveyed food facilities (Figure 8). Fifty percent of the food services used GCs, 25% used PGTs and 25% of the facilities didn't have any GT installed on site. It is not known what was the reason, but it was revealed that the staff were unaware of the fact that there is a requirement to have a GT installed on the premises.

Having no GT installed means that there is no process in place to separate FOG from the wastewater at source (before it goes to the wastewater pipelines). Further, it was observed that there is no system of checking to see whether a GT is installed on an FPFS facility such as the ones in this study.
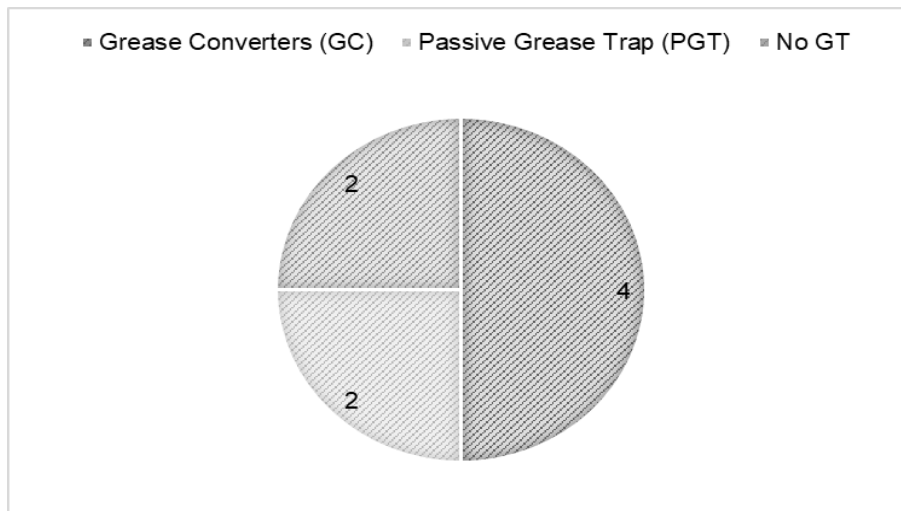
Figure 8: The types of GTs used at the surveyed FPFS facilities.

Figure 9 shows the size of GTs used at the respective food facilities. The GT size used ranged between 75L and 800L. The biggest size was 800L, which was used at the Chinese restaurants. Again, no GT was installed at two facilities (Figure 9).

It should be noted that a PGT works on the principle of retention and sedimentation, and therefore it normally has a large capacity in order to work efficiently. On the other hand, GCs work with the help of bio-enzymes and do not require long retention times, hence they come in different sizes to accommodate the wastewater produced by different FPFS businesses.
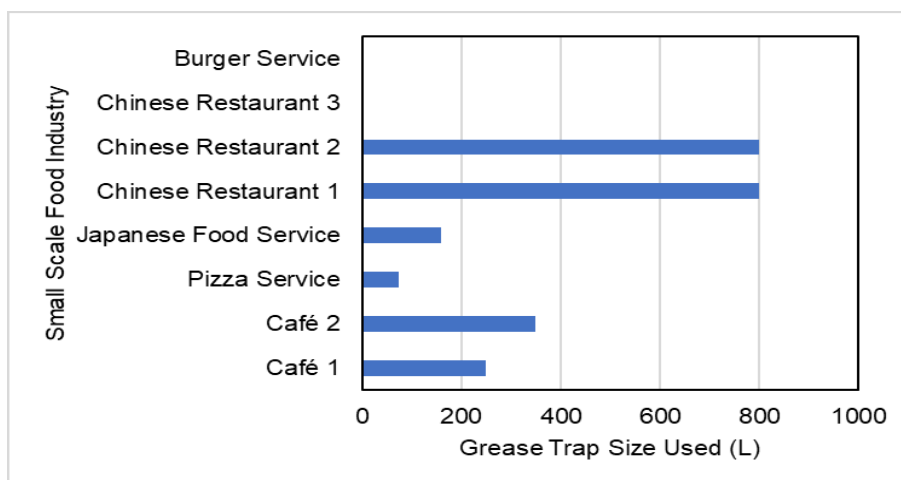
Figure 9: Sizes of the GTs used.

Fixture Unit Rating and recommended GT size

As mentioned previously, FUR values (NZTIWF, 2017) and the actual number of fixtures employed at the FPFS facility were used to estimate the number of Fixture Units for each facility. Then the total number of FUs was multiplied by 100L to determine the appropriate size of the GT for each facility.

Basically, the size of the GT depends on the number of FUs used – the GT's required size increases as the number of FUs increases (Figure 10).

The results show that the GT sizes that were used at the facilities surveyed ranged between 75L and 800L (Figures 9 and 10). The estimated number of FUs varied between 7 and 16 (Figure 10).

It is clear from the results that the pizza food service had the smallest GT installed (i.e., a 75L GC trap, Figure 10), but the required GT size for this facility is 500L (estimated as per NZTIWF, 2017). The small size of the GT used at this service may be due to space constraints, but there was no documentation available to check that. The GT used at this facility is under sized, and therefore there is a possibility that the GC trap may not be breaking down the FOG effectively (using enzymes and bacteria). Therefore, it is very likely that untreated or partially treated FOG was going down the wastewater pipelines, which leads to blockage of pipes and reduction in flow area due to the formation of FOG deposits on the inner surfaces of the pipes.

Further, results show that all surveyed FPFS facilities had an under-sized GT installed (Figure 10), which means FOG were being released untreated or partially treated (at the source) and were likely to be contributing to FOG deposit formation, which may end up blocking the pipes at a later stage.
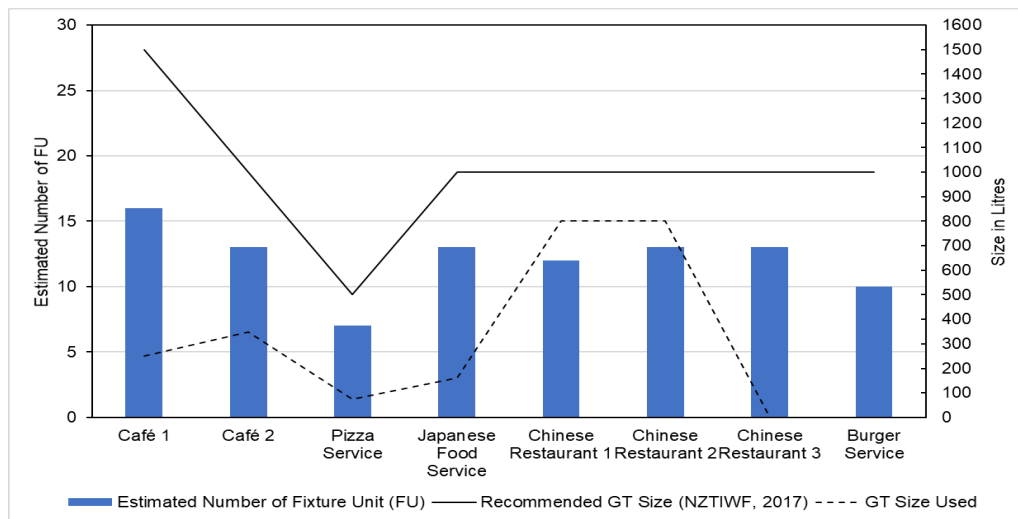
Figure 10. The estimated number of FUs, sizes of GTs used, and the recommended GT size as per calculations.

Location of GT

Table 2 shows the location of GTs used at each food service facility. It was observed that the locations of the GTs at the FPFS facilities were easily accessible for cleaning and maintenance purposes. The PGTs were located underground behind the buildings of the respective food services (Table 2). The GCs were placed under the sinks as per the instructions in the GT guidelines (NZTIWF, 2017), which was a good practice. The GC for Café 2 was kept near the back door due to space restrictions inside the kitchen (Table 2).

Food industry	Type of GT	Location of GT
Café 1	Grease converter	Under the sink
Café 2	Grease converter	Near the back door
Pizza service	Grease converter	Under the sink
Japanese food service	Grease converter	Under the sink
Chinese food service 1	Passive grease trap	Behind the building
Chinese food service 2	Passive grease trap	Behind the building
Chinese food service 3	No grease trap	N/A
Burger service	No grease trap	N/A

Table 2. Location of GTs.

Further, it was observed that all GC traps had an automatic bio-enzyme dosing system, which is good news, as NZTIWF (2017) guidelines state that all GCs should have this in order to effectively break down the FOG. Therefore, the only manual work required for these is to refill the bio-enzyme liquid. Refilling depends on the time of operation of the trap, but no data was available.

Required maintenance of GTs

It should be noted here that GTs aren't a rubbish bin. It is important that solid rubbish (at the FPFS facilities) is removed using the sink filter before wastewater goes to the GT. Table 3 shows the required frequency of maintenance of GTs (NZTIWF, 2017). The frequency of cleaning and maintenance depends on the use and size of the GTs. For example, Mactrap (n.d.) recommends that a PGT needs to be cleaned twice a year, using a vacuum pump.

However, it was observed that no record was kept or available for the time and frequency of cleaning of the GTs at the surveyed FPFS facilities.

GT Types	Recommended frequency of maintenance
Grease converter	6 months
Grease converter	4–5 months
Grease converter	6 weeks
Grease converter	3 months
Passive GT	5–6 months
Passive GT	5–6 months

Table 3. Recommended frequency of cleaning for the different types of GTs in the FPFS facilities surveyed.

SUMMARY AND CONCLUSIONS

Accumulation of FOG deposits in wastewater pipelines is becoming a global challenge for environmental engineers and managers, and the sustainability of WWRSs may be at some risk. This pilot study was about understanding and addressing the key questions:

• How are FOG deposits actually formed?

• What types and sizes of grease traps are being used at small-scale food preparation and service industries in Auckland?

• Do the sizes that are being used comply with the recommended sizes?

• What are the issues and/or what is missing?

Based on the results of this study, the following conclusions can be drawn:

1. The literature review (He et al., 2017, 2015, 2013, 2011) shows that FOG deposits are formed from the chemical reactions of FFA and calcium chloride (as a result of the saponification process). FOG deposits are the main cause of wastewater pipeline blockages, which lead to wastewater pipes overflowing, which is a serious environmental concern today.

2. Knowledge of the FOG-deposit formation process is important, as it will ultimately improve our understanding of how they are formed and what possible measures could be undertaken to prevent or minimise the risk of formation of FOG deposits.

3. The direct discharge of FOG is not allowed in the FPFS industry in New Zealand, and therefore it is required that each facility has a GT installed onsite. This study shows that 25% of the surveyed food facilities didn't have a GT installed onsite at the time of the survey. The reason for that is unknown. What is also unknown is how many other cases like these might be present in Auckland and elsewhere.

4. The study shows that 50% to 90% of food that was prepared at the food services surveyed involved deep frying, which means a lot of FOG is produced onsite. Most of the food industry uses canola oil, that being a cheaper option.

5. The quantity of oil used on a daily basis ranged between 3L and 6L. Used oil was drained to GTs, which is an unacceptable practice.

6. The size of GTs used ranged between 75L and 800L. The results show GTs used at all the FPFS facilities surveyed were under sized. This is a worry, as untreated or partially treated FOG is being discharged from these facilities, which is likely the cause of overflow and blockages of wastewater pipes.

7. All GTs were installed at the recommended places (either under the sink inside, or outside the facility) where it was easy to access, clean and maintain them.

8. There was no proper record of how and when the GTs were cleaned and maintained.

9. In terms of size, the GTs being used at the surveyed FPFS facilities in Auckland at the time of the survey did not comply with the criteria set out by the Auckland Council guidelines for GTs (NZTIWF, 2017). According to the guidelines, the minimum required size for any GT is 500L unless restricted by space. None of the facilities surveyed had a GT of recommended capacity installed for the effective treatment of FOG at the source.

What was missing?

1. No mechanism is in place to check whether a GT is installed in a FPFS facility or not.

2. No mechanism is in place to keep and check GT cleaning and maintenance records.

3. No process or mechanism is in place to check whether used oil is recycled or not.

Recommendations

It is recommended that:

- When a food licence is issued by the respective local council, there should be a mandatory compliance criterion of installing a GT. Apparently, there is a process currently in place; however, it is suggested that this process be reviewed for effective implementation.
- The council should keep a record of all GTs installed, possibly online, to ensure that a recommended or required GT size is installed.
- An online system should be developed in which a record of cleaning and maintenance data is kept, and business owners should be required to keep that record up to date. In this way, local councils could keep up-to-date information on GT operations, which would eventually reduce the FOG levels released at the source.

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AUTHORS

Babar Mahmood is an environmental engineer with 30 years of experience working in industry, academia and research. He is a Senior Lecturer in the department of Civil Engineering at Unitec New Zealand where he has been Programme Director for engineering programmes for 10 years. He has been a reviewer for numerous journals and conference publications, and has also been appointed as an external examiner for PhD theses, and an external examiner and moderator for national exams.

Rishna Bogati has recently completed a Bachelor of Engineering (Civil) degree from Unitec New Zealand. She is currently working as a road design engineer for the Timaru District Council.

LEARNING THROUGH THE MULTIDISCIPLINARY STUDIO: A PEDAGOGICAL APPROACH FOR LANDSCAPE/ARCHITECTURE COLLABORATION

XINXIN WANG
DR MATTHEW BRADBURY
DR LÚCIA CAMARGOS MELCHIORS

Pedagogy / sustainable design

ePress   Unitec Institute of Technology
Te Whare Wānanga o Wairaka

ABSTRACT

Conventional design education emphasises disciplinary boundaries that are related to professional obligations. For the architecture and landscape architecture disciplines, the traditional studio of design education has emphasised conventional disciplinary thinking. However, given the many pressing contemporary issues the design professions are facing, not least the effects of climate change, this siloed thinking is proving inadequate to explore new solutions to building a sustainable city.

We argue that a multidisciplinary focus for the design professional is a more appropriate way to meet these severe challenges to the sustainability of our cities. Architects and landscape architects need to work together to share expertise, specialist knowledge and skills to develop more comprehensive solutions than those of the individual disciplines.

In response to this challenge, the Unitec School of Architecture has established a joint design studio to explore how to design urban spaces in a multidisciplinary and collaborative environment. The studio brings senior architecture students and landscape architecture students together for a one-semester design project. Students work in groups with similar numbers from each discipline. The studio framework is deliberated to discuss contemporary urban design issues presented by stakeholders in a multidisciplinary learning space. Two key pillars are Research by Design as the critical design method and acknowledgment of mana whenua (the Indigenous Māori people with historical and territorial rights over the land).

The collaboration process is organised as group-based research for the masterplan phase, followed by individual design work. Teaching–learning activities are arranged to support group and individual design work. After six years of working on contemporary urban issues, the learning outcomes of the studio suggest that students have been able to expand their creative capacity to develop design strategies that have broken down traditional disciplinary boundaries to deal with complex urban issues.

The results suggest that the multidisciplinary approach has fostered methodological and analytic interaction amongst landscape and architecture students for six years of design exploration. The studio has enabled students to gain a holistic understanding of contemporary urban issues, and an active and collaborative design process has developed iterative design solutions. The multidisciplinary studio has been an effective teaching–learning method that can help design educators develop effective studio teaching models to facilitate interdisciplinary collaboration.

KEYWORDS

design education, multidisciplary learning, design pedagogy, architecture students, landscape architecture students, Unitec New Zealand

INTRODUCTION

The design studio is the typical pedagogical environment for students to learn design skills through the exploration of usual, often typological problems. The architecture and landscape architecture learning environments are typically based on design-studio teaching, but, while sharing some disciplinary commonalities, are usually

developed as independent programmes (Koo, 2012). At Unitec, Te Whare Wānanga o Wairaka, the Bachelor of Architectural Studies (BAS) and Bachelor of Landscape Architecture (BLA) are taught as separate programmes.

Landscape architecture studios traditionally train students to design open spaces, typically large public areas such as parks and civic spaces. Architecture studios usually focus on teaching students to create buildings. These studios are essential for junior students to learn fundamental design principles and address simple design problems within their professional boundaries (Park, 2020). However, in the senior year of study, both landscape and architecture students are expected to deal with more complex design problems. These issues are often characterised by multi-layered climatic, biotic, spatial and cultural concerns that are often beyond the capabilities of a single individual student (Koo, 2012; Park, 2020; Soliman, 2017). It is here that a multidisciplinary collaboration between the landscape architecture and architecture disciplines can help students to address complex issues.

Demand for collaboration in design studios also comes from several external forces. Many professional bodies consider the capacity to co-operate with a wide range of disciplines as one of the core values for landscape architects, architects and urban designers (Koo, 2012; Park, 2020). The development of leadership and teamwork skills is also critical, especially the designer's ability to synthesise knowledge, negotiate design direction and integrate design solutions (Leathem et al., 2019). The ability to communicate, present and respond to non-professionals, such as clients and users, is also expected in the development of a design professional (Leathem et al., 2019; Soliman, 2017).

There is also a strong need to bring a social dimension to the design studio to broaden conventional spatial-design thinking. In many design schools in New Zealand, final-year students are expected to transfer generalised theory to localised, site-specific design solutions, especially ones that respond to mana whenua, to help reflect Indigenous values. The social realm demands an understanding of the many layers and aspects of site-specific knowledge that would not be fully grasped in single-disciplinary training (Koo, 2012; Park, 2020). A more comprehensive approach is needed to address these issues, which a multidisciplinary collaboration between landscape and architecture studios can start to explore.

However, despite the need and expectation from the design industry for graduates to integrate with different disciplines, the multidisciplinary approach does not seem to be widely implemented in architectural and landscape education. In a study of 24 American universities, Koo (2012) found that integration between the landscape and architecture disciplines is weak in both design studio and lecture courses. Koo points out that landscape and architecture studios mainly focus on students working in their own discipline; few studios offer learning opportunities for students from the other discipline. The lack of multidisciplinary integration in architectural studios is also highlighted by Soliman (2017) and Leathem et al. (2019) in their pedagogical research.

Driven by a consideration of these concerns, the adjacencies of the architecture and landscape programmes at Unitec, and several pressing urban issues that have become evident in the rapidly urbanising Auckland region, a joint landscape/architecture studio has been established at Unitec. The collaborative studio, started in 2016, aims to foster a learning environment that enables students to exchange skills, share experience, discuss complementary views and create a collaborative design process closer to that of professional practice.

The first section of this paper discusses the issues around conventional design education and suggests a need for a more innovative approach. The second part presents a pedagogical approach, a multidisciplinary studio, that includes a studio framework and a collaboration process. The Results section summarises the results of six years of studio teaching, detailing student achievements through internal and external collaboration. Following a description of the features of the joint studio, the paper closes by discussing the successes and challenges of this particular pedagogical approach.

APPROACHES FOR MULTIDISCIPLINARY COLLABORATION

The studio is designed as a multidisciplinary and collaborative approach to design education. The collaborative approach starts from the multidisciplinary teaching team: an urban designer, landscape architect and architect from different national backgrounds. The subjects of the studio projects are carefully chosen to reflect collaborative goals. Each studio project is connected to a contemporary issue, with a client, a concerned community and a physical site that will be specifically affected by both urban changes and the effects of climate change.

Landscape architecture and architecture students are organised in groups; each group has four to six students, with similar numbers from each discipline. Students also engage closely with the affected community: stakeholders, government agencies, practitioners, community groups and mana whenua (the Indigenous Māori people with historical and territorial rights over the land) (Auckland Council, n.d.a). The collaborative process takes 12 weeks: six weeks' team work on a masterplan and six weeks' work on an individual building or landscape design. Students are expected to carry through strategies from the group masterplan to their individual projects.

The collaborative process is facilitated by a studio framework that consists of four key approaches and is supported by a wide range of teaching–learning methods. The four key approaches are highlighted here and will be explained in detail.

- A contemporary design problem with connected stakeholders. This approach offers students the experience of exploring contemporary urban issues that are connected to landscape and architecture practice. This allows students to learn from studying real-life problems (Cerra, 2016; Ng, 2013).
- Creating a multidisciplinary space for collaborative learning. Multidisciplinary teamwork is essential in successful professional practice (Soliman, 2017). Facilitating an interactive collaborative learning environment helps landscape and architecture students to learn from each other.
- Research by Design: The importance of Research by Design has been highlighted by many scholars as an important way to generate an integrative approach in the creative professions (Hauberg, 2011; Roggema, 2017).
- Acknowledgment of mana whenua through collective learning and active engagement with the local community. Embedding Te Aranga Principles in the design process is critical to help students acknowledge their responsibilities to Māori under Te Tiriti o Waitangi (Kake & Paul, 2018).

Contemporary design problems with engaged stakeholders

Exploring contemporary design problems in studio teaching has been recommended by many scholars and educators (Koo, 2012; Young, 1993). This approach is particularly useful in a multidisciplinary studio, because it helps students connect to problems that affect them directly (Park, 2020). This approach can also challenge students' conventional design thinking and push them to work collaboratively beyond their professional boundaries (Ng, 2013). This approach guides the selection of each year's project, helping the teaching team align with a significant urban issue in the Auckland region. In this way, the studio also promotes lively interaction between the landscape and architecture disciplines. By working closely with clients and communities, students are expected to work in a design environment that is close to professional practice.

The first project was in 2016, located in Wellsford, a small town situated on Auckland's northern fringe. The town was chosen as a site because it encompassed many issues of the sprawl vs compact city debate (Lowrie, 2014) that were part of the discussion of Auckland's future direction. Students worked in teams to explore sustainable regional-development models that were an alternative to the compact-city model.

In 2017, the environmental effects of climate change started to become a critical issue around the world (Carter et al., 2015; Thead, 2016). The demand for local, practical solutions became more urgent (Climate Change Adaptation Technical Working Group, 2017; Morton, 2017). Two locations, the Hīhīaua Peninsula in Whangārei and the Port of Onehunga in Auckland, were chosen as sites for studio projects. The aim of these projects was to investigate

different climate adaptation strategies without undermining the typical waterfront model (Bradbury et al., 2018; Wang et al., 2021).

The Hīhīaua project was initiated by the Momentum North group (a community group in Whangārei) in 2017. The Onehunga project was supported by Panuku Development Auckland (an Auckland Council-controlled organisation that delivers urban regeneration) in 2019 and 2020. In 2021, high-density housing development became an urgent issue due to the land-supply constraints in Auckland and the post-Covid market. Kāinga Ora, the New Zealand housing and urban development authority, suggested that the joint studio explore a site in the Tāmaki redevelopment zone, the Maybury Street block. Two issues were important: the provision of high-density housing on a site with the potential for extensive flooding due to climate change. Table 1 summarises the design problems and key stakeholders involved in the studio projects from 2016 to 2021.

Year	Project	Site location	Design problems	Clients	Other stakeholders
2016	Wellsford	Upper Rodney, Auckland	Sprawl vs compact debate of Auckland regional development	Auckland Council	Wellsford community
2017	Hīhīaua Peninsula	Whangārei, Northland	Climate change; waterfront revitalisation	The Momentum North group	Hīhīaua community; Whangārei District Council; He Puna Marama Trust; Te Kopu Pacific Indigenous and Local Knowledge Centre of Distinction
2018	Mt Roskill	Mt Roskill–Mt Albert, Auckland	Suburban intensification		Mt Roskill community
2019	Port of Onehunga	Onehunga, Auckland	Climate change; waterfront redevelopment	Panuku Development Auckland	Onehunga Township; Rau Hoskins
2020	Port of Onehunga	Onehunga, Auckland	Climate change; waterfront redevelopment	Panuku Development Auckland	Onehunga Township; Amiria Puia-Taylor, director of The 312 Hub
2021	Maybury Street	Glen Innes, Auckland	Housing development; climate change	Kāinga Ora	Guest speakers from NIWA, Healthy Waters; Rau Hoskins, WSP NZ Ltd

Table 1: Design problems and clients (stakeholders) in the joint landscape/architecture studio.

Creating a multidisciplinary space for collaborative learning

The core approach used in the joint landscape/architecture studio is collaborative learning. This is an approach that encourages students to understand non-routine perspectives, and promotes knowledge exchange and the appreciation of diversity through sharing different design viewpoints, learning new approaches and techniques (Hirt & Luescher, 2007; Kim et al., 2015). Using this method, knowledge is socially constructed through a learning process that occurs via peer conversations, feedback and constructive conflicts. In a multidisciplinary setting,

different disciplinary backgrounds complement students' experiences and skills to deal with complex urban problems (De Hei et al., 2015; Hirt & Luescher, 2007; Kim et al., 2015; Miles, 2018).

Collaborative learning is promoted by internal and external activities beyond the studio space that require a disciplinary mix of competencies. In addition to the conventional studio environment in which lecturers give presentations and provide feedback, the joint studio encourages active learning by providing opportunities for students to present ideas and give feedback.

These opportunities include students' oral and visual presentations, informal pin-ups and discussions, discussion among groups, peer feedback between groups, and student–lecturer discussion. The external activities emphasise direct engagement with stakeholders. They not only include client-led site visits, client presentations and briefing, but also critiques from guest experts in landscape, architecture and stormwater. Presentations to mana whenua and to the community are also a critical part of the external collaboration.

Research by Design

An important approach employed by the joint studio is Research by Design, which is highlighted by many educators as being suitable for the creative disciplines (De Queiroz Barbosa et al., 2014; Hauberg, 2011; Roggema, 2017; Verbeke, 2011). It is a methodology that helps students to see that the design process is also a research process. In this way of thinking, the design is not only an outcome, but a tool, part of the creative process, and can be used to reflect on complex problems (Hauberg, 2011; Roggema, 2017; De Queiroz Barbosa et al., 2014; Verbeke, 2011). Research by Design also plays a critical role in the landscape/architecture interaction, because design presentation, such as sketching, mapping, modelling, technical drawing and 3D rendering, is a common way to actively represent cognitive ideas. This can help visualise thoughts that are often difficult to express orally (Hauberg, 2011).

In the joint landscape/architecture studio, Research by Design is consciously used as the project development methodology. The process starts from the first week through a mix of literature review, precedent study, contextual analysis and site analysis. These tasks are divided among group members, based on their strengths. For example, landscape students typically undertake research on climate change, environment, history and cultural issues, while architecture students usually focus on the built form, housing typology and social issues. At the end of the second week, each group produces a research report, consisting of findings from literature and case studies, analysis of the site and identified design strategies. The research findings then guide the following four-week masterplan phase: each group explores potential design solutions, evaluates their suitability for the site and makes a design direction. The result for each group is a masterplan that integrates both landscape and architecture strategies. The next part of the project is an individual-based process lasting six weeks. Following the design objectives developed in the masterplan, each team member chooses one site for an individual design project. Although the projects are all different, with landscape students working on an open space and architecture students working on a building, students are encouraged to continue their group collaboration throughout the detailed design phase by prioritising the interface between buildings and open spaces.

Acknowledgement of mana whenua through collective learning and active engagement with the local community

A critical part of the studio collaboration is acknowledging mana whenua. To do this, the studio incorporates the Te Aranga Māori Design Principles – a set of principles based on intrinsic Indigenous cultural values (Auckland Design Manual, 2018). Matauranga Māori (Māori culture) articulates the past, present and future, incorporating both physical and spiritual dimensions and the idea of connecting whānau (extended family) and whenua (land), flora, fauna and natural elements. These principles emerged through an engagement between mana whenua that originated in the Māori desire to enhance their culture, presence, visibility and participation in the design of the physical environment (Kake & Paul, 2018). Te Aranga Principles provide directions to positively respond to mana whenua, aiming to form a holistic view of the built environment and its connection to mana whenua, which might be missing in a separated landscape or architecture studio.

The teaching–learning of Te Aranga Principles employs various methods, depending on the communities associated with the site. This integration has sometimes been difficult to build, so the studio invites guests and incorporates some activities to facilitate collective learning. For instance, guided by Māori professionals and educators, each group of students investigates one aspect of the principles, and shares their knowledge with other classmates. This method is very effective, allowing students to quickly grasp the rich layers of the site and its context. Another method is to actively engage with local communities and Māori representatives. For example, in the 2017 Hīhīaua project, students were welcomed by a pōwhiri (a traditional Māori welcoming ceremony) (100% Pure New Zealand, n.d.) held at the He Puna Marama Trust. The local community and mana whenua played a critical role throughout the design and feedback process.

The framework described above fosters a student-centred, active collaboration between landscape and architecture disciplines. The collaboration strategy, objectives and supporting activities are summarised in Table 2.

Teaching–learning strategy	Design phase	Aims of the collaboration	Activities for collaboration	
			Internal	External
Group-based	Research	Produce one holistic research report, which includes theory and precedent review. Identify the main issues and present potential design strategies.	Group discussion. Oral presentation and peer review. Divide research tasks and synthesise results. Write up the research report. GIS analysis and modelling.	Client briefing. Site visit. Meeting with the 'client' and community. Seminars from practitioners in various disciplines. Māori guest speaker and consultants.
	Masterplan	Reach one collective design decision that integrates both landscape and architecture design strategies.	Share knowledge and ideas through discussion and drawing. Sketch various concepts and co-operative designs. Make physical models to test design ideas. Make design decisions for a masterplan.	Group presentation to the client and community representatives. Respond to stakeholders' feedback. Respond to mana whenua.
Individual-based	Detailed design	Architecture students to design a building to respond to public space. Landscape students to design a public space respond to the adjacent building.	Select and divide design sites from the masterplan. Peer consultation from other disciplines. Peer presentation and feedback. Computer-aided visualisation and presentation.	Individual presentation to the client and community. Presentation to guest critics and respond to their feedback. Respond to mana whenua.

Table 2: Collaboration process in the joint landscape/architecture studio.

RESULTS OF THE MULTIDISCIPLINARY COLLABORATION

The multidisciplinary studio framework has aided collaborations between landscape and architecture students over the last six years. The outcomes can be summarised from four aspects: First, the multidisciplinary collaboration has enabled students to gain a holistic understanding of contemporary problems that are often discussed in practice. Second, the landscape–architecture teamwork has helped knowledge-sharing and an interactive design

process. Third, the student–stakeholder engagement has contributed to integrative solutions beyond stakeholders' expectations. Finally, students have been able to embed Indigenous knowledge through Te Aranga Principles in their design work.

However, the multidisciplinary collaboration has also experienced some challenges. First, preparing a realistic project that fits the studio scope and finding the right client is a big challenge for the teaching team, requiring considerable time and energy. Second, organising student group work requires a knowledge of the students' strengths and skills. Although most groups work well together, some groups have had difficulties in dealing with disagreement and design priorities. Moreover, external collaboration often depends on the stakeholders' time and availability. For example, not all stakeholders have been able to attend students' presentations of both masterplan and the detailed investigations. In addition, despite the efforts to incorporate Te Aranga Principles with help from Māori academics and mana whenua, some students still have difficulties in applying these principles in their design work. For instance, some students from different international backgrounds find their understanding of Indigenous culture is limited.

The sections below summarise the key findings from the studio process.

Result One: Students are able to interact with contemporary problems

Through the engagement with real sites and concerned clients, the joint studio has exposed students to the multidisciplinary, interconnected issues that are typically presented in most landscape and architecture practices. For example, the 2017 Hīhīaua project was initiated by the Momentum North Group, a local community group in Whangārei. The group and communities' representatives worked closely with the joint studio from the first site visit to the final design presentation. Through visiting the site and talking to the clients and stakeholders, in particular He Puna Marama Trust and Te Kopu Pacific Indigenous and Local Knowledge Centre of Distinction, students gained a holistic understanding of both the proposal for a new waterfront development and the flooding threats posed by the effects of climate change. To investigate the impact of flooding on the site, students conducted hydrological analysis at two scales: the catchment and immediate site. After extensive research and mapping, students identified ways to utilise the flooding as an opportunity for waterfront redevelopment.
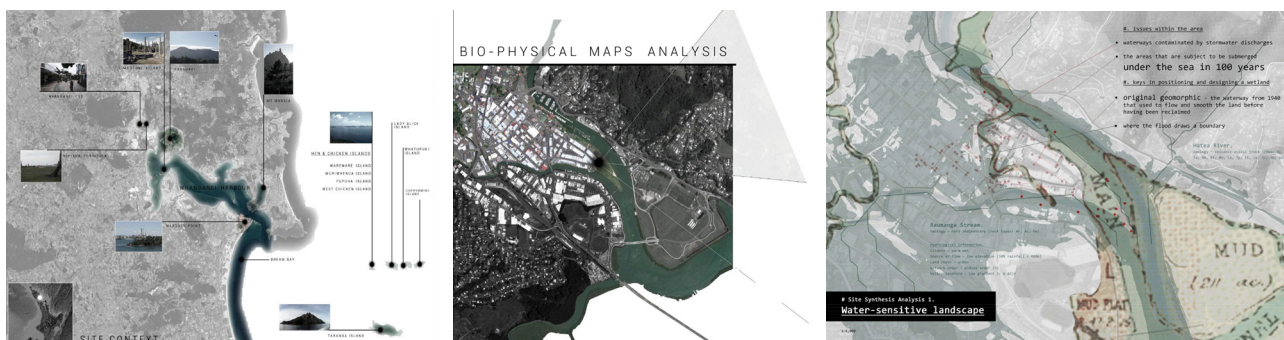
Figure 1. Site analysis across different scales for the Hīhīaua project. Student group: Yamen Jawish, Jill Koh, Sarah Mosley, Wesley Twiss, Yujie Zou.

Another example is the Port of Onehunga waterfront development. The client, Panuku (the Auckland urban development authority), invited the Unitec joint studio to help in the development of their thinking about the future of the port, especially the effect climate change, in particular sea-level rise, will have on the conventional waterfront-development model. Panuku helped in the development of the studio brief, organised the site visit, and took part in key presentations during the design process. The students were expected to tackle the sea-level-rise issue while simultaneously developing a medium-density urban-development programme. Through a serious analysis of rising sea levels, landscape and architecture students were able to integrate adaptation strategies through the masterplan to detailed design phases.
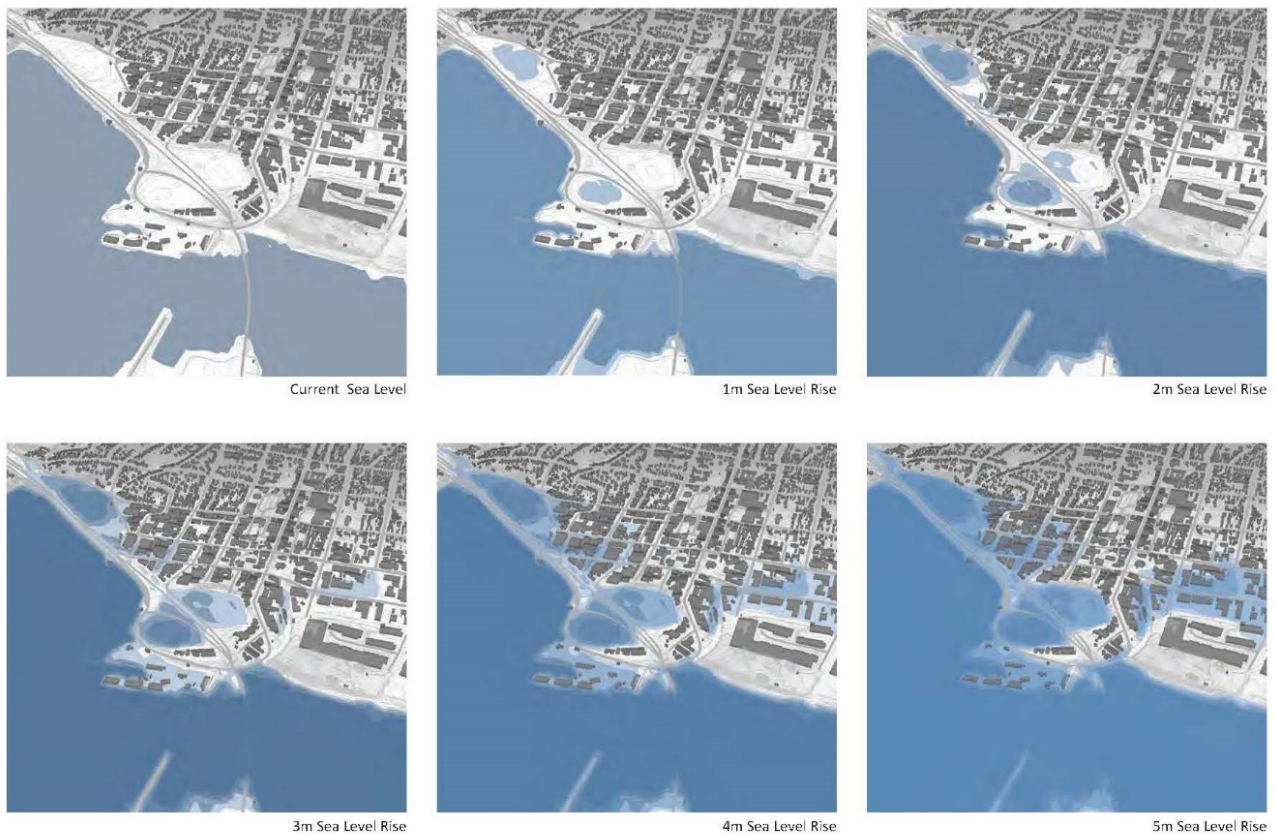
Figure 2: Sea-level-rise analysis for the Port of Onehunga project. Student group: Deepak Badhan, Peter Chen, Suyi Gan, Haiyue Li, Kelsey Stankovich, Yue Yu.

Result Two: Students are able to exchange knowledge and learn from each other (internal collaboration)

The collaboration between students of architecture and landscape architecture aims to explore ways in which buildings and urban spaces together create resilience to climate change. In this way, the different disciplines contribute to finding better solutions by working together. By increasing discussion and teamwork, the specificity of knowledge from each discipline is shared and reconstructed, helping students to learn from each other. The design results show how this collaborative process helps students develop hybrid designs that share features from both disciplines.

Some landscape architecture students have shared their skill in large-scale site analysis, especially using Geographic Information System (GIS) mapping and analysis of the site's topography and hydrology, helping architecture students understand how landform and water flow can impact the placement of buildings. Working with architecture students, some landscape students have developed a deeper understanding of how public spaces are affected by the building's orientation and footprint, helping them to reflect the importance of the built environment.

The use of hybrid architectural elements, such as green walls, green façades and green roofs, shows how knowledge and different views are shared between disciplines, helping the students to learn new approaches and techniques. Architecture students usually define the best location for these elements by considering functional and aesthetic aspects: functions and the use of spaces, materials, structure, climatic conditions and the relationship with the built environment. Landscape students contribute to this discussion by identifying the appropriate species to be used on these vegetated surfaces, considering their maintenance and impact on the biodiversity of the site. Through conversations between peers, constructive conflicts, workshops, sketches and modelling, knowledge is exchanged and constructed throughout the course in the studio environment (see Figure 3).

Figure 3. Activities developed during studios. Photographs: the authors.

Result Three: The student–stakeholder engagement contributes to innovative solutions beyond stakeholders' expectations (external collaboration)

The engagement between students and community members, clients and industry professionals has contributed to the project's development. Traditional lectures with tutors and invited experts in different fields (Māori knowledge, urban design and water management) help students develop research methods. Other activities organised throughout the project have also been essential to expand and unite knowledge between the different groups involved in these projects. In discussions with community members, students have had the opportunity to talk with residents and community representatives, and better understand their aspirations and needs. Presentations in which students show their work to peers, clients (communities or government agencies) and industry professionals have helped provide students with relevant feedback on their ideas.

Over the six years, invited industry critics (architects, urban planners and landscape designers) have commented on the importance of collaborative design work in the urban domain. For example, Christina van Bohemen, past president of the New Zealand Institute of Architects (NZIA) commented: "I think that it's such a good idea to run joint architecture and landscape projects – it's never too early to start working collaboratively!" (Landscape Architecture Aotearoa, 2019). Photographs in Figure 4 show presentations organised in different studios over the years.

Feedback from peers and clients has also contributed to creating a process closer to contemporary design practice and has highlighted the social responsibility students will face in their future careers. Engagement with the community adds complexity to a process that is already challenging for students, making them reflect on the interrelationship of physical, cultural and social aspects in their projects. As one student reflected: "It was definitely a challenge, to find design solutions that would be resilient, achievable, affordable, aesthetic, functional and, more importantly, would suit the community" (Unitec Institute of Technology, 2017).

Student feedback reinforces the importance of community engagement: "Once you realised these people were genuinely interested in your ideas, it's quite rewarding. … Working on a project like this illuminated some of the challenges we'll be faced with when we enter the workforce" (Unitec Institute of Technology, 2017). Reflections on the experience with one community group reinforce the idea that it is not a unilateral process, and that both parties involved in the discussions (students and community) have benefited. The community comments emphasise that the student projects contributed to expanding their views of the site: "students have presented a truly masterful

Figure 4. Presentations in joint landscape/architecture studios, over various years. Photographs: the authors.

piece of work that far exceeded any of our expectations" (Bradbury et al., 2018, p. 9). Another community member mentioned that students "have done a wonderful service to our city and provided us with so many thought-provoking options. When we first conceived the idea, I think most of that loose group of people known as Momentum North had a very different strategy for the development of the area than we do now, after having had the benefit of your thinking. That is a wonderful success for all stakeholders" (Bradbury et al., 2018, p. 9).

Result Four: Students are able to embed Indigenous knowledge in design work

An important part of the studio collaboration is integrating the Te Aranga Design Principles as part of our obligations under Te Tiriti o Waitangi (The Treaty of Waitangi). Among the seven Te Aranga Māori Design Principles are: mana rangatiratanga (to recognise and respect the authority of tribes); whakapapa (to celebrate Māori names and naming); taiao (to protect, restore and enhance the natural environment); mauri tū (to protect, maintain and enhance environmental health); mahi toi (to capture and express Māori narratives and creative expression); tohu (to acknowledge the wider cultural landscape, significant sites, landmarks); and ahi kā (to endure the living presence – access to natural resources, the guardianship to land) (Auckland Design Manual, 2016). The most frequently used principles have been taiao and tohu, to address climate-change-related problems. Whakapapa, mauri tū and mahi toi have also been used to explore the cultural and historical characteristics of the design site.

Lectures, site visits and workshops with mana whenua have created opportunities for students to acknowledge Māori culture and values (Figure 5). Continuing feedback from mana whenua and community members has helped the students to understand the ways in which critical Indigenous knowledge has been integrated into the design work (Bradbury et al., 2018). Giving feedback on the Hīhīaua project, Tui Shortland, Director of Te Kopu Pacific Indigenous and Local Knowledge Centre of Distinction, commented: "The use of a celestial viewing compass, Te Kāpehu Whetū, in the Pacific Indigenous and Local Knowledge Centre was a successful gesture to integrate the building with the cosmos" (Bradbury et al., 2018, p. 134). A distinguished Momentum North member, Peter Ogle, stated the following: "One of my favourite landscape designs. The forest, medicinal plantings, water filtration and the terraces working as flood defence, but also as a natural draw to the river. Reflecting all the cultures of Micronesia, Melanesia and Polynesia in a marae-style layout, and incorporating the elements of Māui, ika and waka within the framing, worked for me" (Bradbury et al., 2018, p. 134). Figures 6 and 7 are examples of how students have integrated Te Aranga Principles in the design of public space and buildings.

Figure 5: Students engage with mana whenua. Top row, left to right: Tui Shortland, Te Kopu Pacific Indigenous and Local Knowledge Centre of Distinction; Amiria Puia-Taylor, director of The 312 Hub; presentation to Te Warihi Hetaraka, Hīhīaua Cultural Centre Trust. Bottom row, left to right: pōwhiri hosted by He Puna Marama Trust; Tui Shortland critiquing at a presentation at Unitec; students presenting to Whangārei District Council. Photographs: The authors.

| TACTICAL URBANISM TO ENHANCE PUBLIC SPACE, PARTICULARLY STREET ART, MURALS/COLOURFUL INSERTS, CARVING, AND COMMUNITY PLANTING |

TACTICAL URBANISM

Figure 6. Example of how students have integrated Te Aranga Principles in public-space design.
Student group: Aleesha Kumar, Sharon Eccleshall, Shibing Li, Sianne Smith, Vignesh Krishnamoorthy.

This experience has enabled students to create solutions that break down disciplinary boundaries and produce design work that exceeds the stakeholders' expectations. Some informal feedback suggests that the combination of internal and external collaboration may have contributed to creating integrative design solutions that go beyond the conventional boundaries. One of the senior urban designers in Panuku commented: "It was fantastic to see the quality and attention to detail that the Unitec fourth-year students included in their inspiring Onehunga port projects. Particularly, following the development of concepts into detailed plans was outstanding – some of the work even surpassed the quality of work Panuku sees in real-life projects and developments across Auckland" (personal correspondence with the authors, June 8, 2020).

Figure 7: Example of how students have integrated Te Aranga Principles in building design.
Student: Madhuvanthi Padmanabhan.

DISCUSSION

The multidisciplinary approach described in this paper, tested and refined over the last six years, serves as an opportunity for landscape and architecture students to build collaboration capacity, integrate innovative strategies and respond to complex social–environmental issues. Compared with a single-disciplinary studio-teaching approach, the multidisciplinary approach has some unique features that have contributed to the success of the studio.

The use of topical urban projects is important to the success of the studio. Auckland and the greater Auckland region, including Whangārei and Wellsford, have generated many fascinating and critical social and urban issues. These have been caused by the unexpected and unprecedented urban growth in the Auckland region over the last ten years.

A consequence of this has been a debate over the future direction of Auckland's growth (Lowrie, 2014; Nichols, 2016). Should the city concentrate urban growth in the inner city, what we might call the compact-city argument (Auckland Council, n.d.b), or should growth happen in the regions, following Auckland's linear form (Bogunovich & Bradbury, 2012) but concentrating around nodes along this corridor?

In recent years the environmental effects of climate change on the way we develop cities have become more important. For example, an extremely successful urban model, waterfront development, has come to seem less desirable. One of the questions raised in the joint-studio discussion has been what might replace this hitherto internationally dominant urban-development model.

By posing these critical questions, students are drawn into the projects, eager to explore real-world issues. Similarly, stakeholders, such as councils and development agencies, are also attracted by the opportunity that the joint studio presents. By having students explore issues that are very much at the forefront of their minds, stakeholders can see the implications of innovative and collaborative design work. Studio critics, a vital part of the studio process, are likewise engaged by projects that are part of the public discourse. By being engaged in the larger public awareness of a project, the critic brings a more urgent critical engagement with the issues than that shown for more abstract projects.

The use of publication is another important feature of the studios. Requiring students to investigate a site and interrogate the brief is hardly a new technique. But requiring them to examine in a manner that can be collected

and published is an important part of the collaborative process. Forming the architecture and landscape students into groups and giving them specific research goals, such as immediate site analysis, demographic surveys and GIS mapping of the sites, and background research, such as the different urban and housing typologies, helps build a collective knowledge of the site. Requiring each group to prepare a publication document of their research, which ultimately becomes one overall studio document, helps the groups develop co-operative skills in collecting and presenting data. Some students have used infographics to present complex information. Putting together the studio document means the collaborative skills developed in each group are then tested by assembling the meta-document to be published on Issuu (Bradbury, 2016). This then acts as a shared resource for the development of each group's masterplan. In this way, students see the efficacy and value of a collective and collaborative effort to collect as much data as possible, a job that would be impossible to accomplish as an individual.

The student work in the Hīhīaua project followed a similar trajectory, with students forming groups and focusing on disparate site data to bring into a joint publication. However, in the Hīhīaua project, the importance of linking the research with the design work was emphasised. Students were encouraged to prepare their design work not just for a conventional studio presentation and a crit, but also for publication with written commentary. The results include a peer-reviewed academic publication (Bradbury et al., 2018) and two journal articles (Bradbury et al., 2017; Wang et al., 2018). Most recently, outcomes from the Port of Onehunga project have also led to a peer-reviewed publication (Wang et al., 2021).

Publication of students' work, both site research and design, has helped students form collaborative ties and to see and use the results of the joint projects. In addition, the publication of the work has been educative – that is, students have been able to freely use the information to help inform design work – and presentational – a record of these endeavors could be folded into a student CV. In this way, their collaborative research and design work could be seen by future employers as evidence of their engagement with collaborative practice in a real-world scenario.

CONCLUSION

This paper presents the development of a multidisciplinary approach for a joint landscape/architecture studio over six years. The studio framework shared here provides a platform for landscape and architecture students to work collaboratively on a project that is close to professional reality. The four key aspects – working on contemporary issues, collaborative learning, Research by Design and acknowledging mana whenua – enable landscape and architecture students to actively engage with internal and external stakeholders.

Through six years of experimentation, the overall trajectory of the multidisciplinary studio has been positive. The results suggest that multidisciplinary collaboration can foster methodological and analytic interaction amongst the landscape and architecture students. The integrative collaboration enables students to expand knowledge, complement each other's views, become critical of conventional solutions and produce integrated design solutions that break professional boundaries. We suggest that this process has resulted in several unique design strategies that address complex contemporary problems.

We also believe that while the focus of this studio approach is to foster collaboration for landscape and architecture programmes, the collaborative studio framework could also be applied to joint studios for other design disciplines.

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AUTHORS

Xinxin Wang is a Lecturer in the School of Architecture, Unitec New Zealand. Prior to becoming an academic, Xinxin worked for two decades in China, in the urban and landscape-design field. Her research interests include climate adaptation, low-impact urban design and integrated green–grey infrastructure. She has given presentations at international conferences and universities, including The University of Sydney and The University of Auckland.

Dr Matthew Bradbury is an Associate Professor in the School of Architecture, Unitec New Zealand, and leader of the Master of Landscape Architecture programme. Building a city that is resilient to climate change is Matthew's primary research area; he has written and presented extensively on this subject, including in a recent publication by Routledge, *Water City: Practical Strategies to Address Climate Change*.

Dr Lúcia Camargos Melchiors is a Lecturer in the School of Architecture, Unitec New Zealand. She received a PhD in Urban and Regional Planning (2019) from the Federal University of Rio Grande do Sul, Brazil. She worked as a lecturer and registered architect in Brazil, and was a member of the Board of Directors of the Institute of Architects (IAB/RS). Her research interests include social, physical and institutional aspects of urban development and planning, on a local and regional scale, comprising housing policies, community action and collaborative design processes.

THE SCOPE OF TALANOA RESEARCH METHODOLOGY: THE PLACE OF RESEARCH METHODS THAT ARE NOT ROOTED IN PASIFIKA TRADITIONS

DR HELEN GREMILLION
JASON HALLIE
DR FALANIKO TOMINIKO

ABSTRACT

This paper explores the scope of Talanoa research methodology, a pan-Pacific approach to research. We ask about the implications of Talanoa research projects incorporating methods of data collection that have not been formulated from within Pasifika traditions. In the process, this paper examines distinctions as well as overlaps between the research categories of 'methodology' and 'method.' We argue that applying a Pasifika lens to this topic renders insights that are not available from Eurocentric perspectives. Ultimately, based on an analysis of existing Pasifika literature on the topic, we suggest that a range of research methods that are not uniquely Pasifika can be compatible with a Talanoa approach. In addition, we suggest that as a decolonising Indigenous methodology, Talanoa research – when examined alongside or in concert with Eurocentric research approaches – raises critical questions around contextualising research as cultural activity.

KEYWORDS

Talanoa, Pacific research, Talanoa research methodology, research methods, Indigenous research

INTRODUCTION

"E fafaga fanau a manu I fugala'au, ae fafaga fanau o tagata I upu ma tala" – little birds are fed with leaves and flowers while little children are fed with words and stories. This old Sāmoan proverb speaks to the importance of verbal communication in the growth of a child. Sāmoa and the Pacific in general are steeped in oral tradition and history. This oral tradition is the foundation of learning and knowledge dispersal, and this practice is continued today not only in the form of 'everyday' talanoa (conversation, talk, exchange of ideas/thinking), but also via Talanoa research methodology, which is used widely in contemporary Pasifika research.

This paper explores the scope of Talanoa research methodology. Specifically, we ask: For research projects that employ this methodology, what are the possibilities for, and the implications and risks of, utilising methods of data collection that are not themselves Pasifika? After reviewing the core components of Talanoa research, and based on an analysis of existing Pasifika literature in relation to this topic, we argue that research methods that are not uniquely Pasifika can be compatible with a Talanoa methodological approach. We focus on Westernised interviews and focus groups when exploring this topic, as these methods (particularly the former) are the most widely cited in discussions about methods within Talanoa approaches to research. Ultimately, we suggest that while 'Western' and 'Pacific' research approaches can be dichotomised, they need not be, necessarily. As far as we are aware, to date – with the exception of Prescott (2008), and Suaalii-Sauni and Fulu-Aiolupotea (2014) – our conclusion about the compatibility of (certain) Westernised methods with Talanoa methodology has not been articulated explicitly elsewhere in the literature. We build on these authors' work, and we show how an examination of 'methodology' and 'method' through a Pasifika lens renders insights about research activity that are unavailable from Eurocentric perspectives. In addition, we suggest that an examination of these issues raises critical questions around what it means to contextualise research culturally, including questions around how best to ensure that Talanoa research maintains its decolonising intentions and effects. We note that while this latter topic is not the main focus of our paper, we cite a few key considerations in relation to it.

A brief comment on terminology is in order. In this paper we use the term 'talanoa' (with a lowercase 't') to signify everyday cultural practices of conversation/talk. We use the term 'Talanoa' (with an uppercase 'T') when referring to Talanoa research methodology or methods. We note, however, that these conventions do not always apply to quotes from authors we cite.

Our motivation for exploring the scope of Talanoa research methodology stems from our roles within the Master of Applied Practice – Social Practice (MAP-SP) programme at Unitec New Zealand, Te Whare Wānanga o Wairaka, in Auckland. The MAP-SP is a qualification focusing on applied and community/industry-engaged research, designed primarily for social workers, community developers, counsellors, and those working in allied fields. The programme places emphasis on Indigenous methodologies; notably, approximately 60% of its students are Māori and/or Pasifika. At the time of this writing, more than 30% of MAP-SP students are Pasifika. Accordingly, Talanoa research methodology features strongly within numerous student projects. Each of this article's authors is involved in the MAP-SP. Associate Professor Helen Gremillion is the MAP-SP Discipline Leader and is also a course lecturer and supervisor in the programme. Jason Hallie is a lecturer and the Pacific Champion within Social Practice programmes at Unitec. He provides pastoral care to Pasifika students, and he also teaches a bachelor's course dedicated to talanoa. Dr Falaniko Tominiko is Director of Pacific Success at Unitec, and he serves as a MAP-SP supervisor. He has used Talanoa research methodology in his academic pursuits.

Talanoa and Kaupapa Māori research methodologies are two key Indigenous approaches to research that are covered in the MAP-SP. In accordance with Unitec's commitment to Te Tiriti o Waitangi, Kaupapa Māori methodology is given primacy; indeed, it is cited specifically within learning outcomes of required courses. While Talanoa and Kaupapa Māori methodologies are distinctly different (and it is beyond the scope of this paper to explore these differences fully), Pasifika scholar Timote Vaioleti (2011) notes an important similarity: the former encompasses a decolonising Pasifika world view, and the latter a decolonising Māori world view. In addition, both approaches reflect ways of seeing, being and acting in the world that extend well beyond research practices. However, unlike a Kaupapa Māori research approach – which does not detail particular research procedures or methods, and is often utilised in concert with methods of data collection that are not Kaupapa Māori per se[1] – a Talanoa research approach describes not only overall methodology but also specific methods. As the MAP-SP grows and enhances its coverage of Indigenous approaches to research, and considering the fact that both Māori and Pasifika scholars have noted strong compatibilities between Indigenous research approaches and certain non-Indigenous ones (Prescott, 2008; Stevenson, 2018; Vaioleti, 2011, 2013; Walker et al., 2006), in this paper we ask: Can Talanoa methodology, like Kaupapa Māori methodology, co-exist with a variety of research methods? Can Pasifika research possibilities be enhanced thereby, without risking compromising the spirit and aims of a Talanoa approach?

METHODOLOGY AND METHOD: WHAT'S THE DIFFERENCE?

As background for this article's core topics, we offer an overview of the terms 'methodology' and 'method.' For more comprehensive discussion of the points covered in this section of our paper, see Mills and Birks (2014) and Clough and Nutbrown (2012).

Research methodology refers to overall research design, inclusive of research philosophy and/or world view. It encompasses not only methods of data collection and analysis, but also the principles that sit behind and justify methods. Examples of research methodologies include, for example: Talanoa approaches, Kaupapa Māori research, phenomenological approaches, experimental research, and participatory action research. Methods, on the other

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1   Stevenson (2018) writes that beyond key cultural and ethical values articulated in the literature applicable to Kaupapa Māori research, Kaupapa Māori "does not inform how to carry out the research project" (p. 55). Similarly, Walker et al. (2006) state that one of "the idiosyncrasies of Kaupapa Maori research is that writers do not tell you how to do kaupapa Maori research; instead, they tend to focus on what it does and the effects that it has" (p. 335). Walker et al. further clarify that "methods of data collection in Kaupapa Maori research are not particular to Maori … [and] may well draw upon Westernised research designs" (p. 336).

hand, are specific tools of data collection and/or data analysis. Examples of methods of data collection include interviews, focus groups, surveys, randomised control trials, standardised tests and journaling. Methods of data analysis include, for example, statistical analysis and thematic analysis. In this paper, when we discuss methods, we refer to methods of data collection only.

Methodologies, along with research questions, often determine methods. For example, the methodological principle that findings are to be based on verifiable observation (the principle of empiricism) leads to research methods involving measurement techniques that reduce data to numbers. In contrast, the methodological principle that meaning making is subjective (a phenomenological principle) leads to research methods that, for example, draw out people's narratives or stories.

Although it is possible to draw upon more than one research methodology for a given research project, typically only one is chosen. Note that 'mixed-methods' research methodology entails the collection and synthesis of both quantitative and qualitative data. In most cases, methods of data collection are not unique to particular methodologies; for instance, interviews and focus groups are used across a wide range of qualitative and mixed-methods methodological approaches.

Talanoa research methodology is typically utilised for qualitative research amongst Pasifika people. The question of what constitutes appropriate Talanoa research methods (of data collection) is the core topic of this article.

TALANOA AS METHODOLOGY AND METHOD – AND MUCH MORE

In most scholarly writing about Talanoa approaches to research, the concepts of methodology and method are elided. Often, the terms are used interchangeably and/or both are referenced. Fa'avae et al. (2016) explain that Talanoa research "encompasses a practical method and the theoretical concepts used to enact that method [i.e., a methodology]" (p. 140).[2]

Timote Vaioleti, a Tongan academic and education researcher who is widely acknowledged as the originator of Talanoa research methodology,[3] sheds further light on the all-encompassing nature of a Talanoa approach to research. While Talanoa can be defined simply as a Pasifika "personal encounter where people story their issues, their realities and aspirations" (Vaioleti, 2006, p. 21), it is much richer than such a definition could imply. Because this methodology builds upon an age-old Pasifika practice of engaging and communicating – "adding to it a technical research-related meaning" (Suaalii-Sauni & Fulu-Aiolupotea, 2014, p. 333) – it taps into and encompasses an expansive Pasifika world view and ways of being. Vaioleti writes:

> While it may be useful to simply list a number of characteristics integral to a talanoa encounter, this seems a rather prescriptive and linear way of articulating an holistic way of being and relating. Its complexity is part of its attraction. Talanoa should not be separated from ethics, spirituality, nature of being, existence, time and space, causality, ceremony, and social order. Talanoa is an encounter, individually or in a group, made possible only by a desire by all involved to engage verbally, intellectually, spiritually even emotionally about issues at hand. … In agreeing to take part in talanoa kau nga fa'u [participants] place their mana and reputation on the line. It is the obligation of the researcher to kau nga fa'u, their relatives, their ancestors, their village, to process or advance talanoa authentically and develop the results respectfully and for the purpose for which knowledge is being co-created and given. (2011, pp. 128–129)

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2   Fa'avae et al. (2016) go on to explain that Talanoa research also encompasses "the analysis of the information collected" (p. 140). This topic is beyond the scope of the present article.

3   Suaalii-Sauni and Fulu-Aiolupotea (2014, p. 333) note that Sitiveni Halapua, also a Tongan academic, "is recorded in the literature as also using the talanoa concept, but as a Pacific method for negotiating dialogue between national bodies towards conflict resolution." They also note that Halapua's contribution occurred prior to Vaioleti's formalising of Talanoa as a research methodology/method.

The quote above signals certain characteristics of a Talanoa research approach, such as face-to-face encounters and reciprocity, which are outlined below. The larger point it highlights is that the purposes and reach of Talanoa research extend well beyond that which is captured by the terms 'methodology' and 'method.' We suggest that as a decolonising Indigenous methodology, Talanoa research raises critical questions about the meaning and goals of research, including its fundamental component parts and procedural elements. This bigger picture has a bearing on our key question for this article: whether or not research employing Talanoa methodology can incorporate non-Pasifika data collection methods and still maintain its integrity as a Talanoa approach.

Before we address these critical questions around methodology and methods, it is necessary to explore the cultural meanings of talanoa more fully.

DEFINING EVERYDAY TALANOA, AND IMPLICATIONS FOR TALANOA RESEARCH

The concept of talanoa

As noted above, Talanoa research builds upon talanoa as a long-standing, Pasifika cultural practice. 'Talanoa' is a Tongan word which, however, signifies a concept considered to be pan-Pacific.[4] Citing Prescott (2008), Fa'avae et al. (2016, p. 140) note that as "an oratory tradition, talanoa is a concept recognised in Samoa, Fiji, Tonga, Cook Islands, Niue, Hawai'i and the Solomon Islands." The concept does carry a "diversity of meanings" (Tagicakiverata & Nilan, 2018, p. 3) across these different Pasifika contexts. This diversity reflects cross-cultural differences in understandings of talanoa as an everyday cultural practice or way of being. However, across these various contexts, talanoa is a traditional form of knowledge sharing that is often firmly rooted in the community, and takes place orally and in person (Fairbairn-Dunlop, 2014).

Vaioleti writes that, in the Tongan context:

> Talanoa can be referred to as a conversation, a talk, an exchange of ideas or thinking, whether formal or informal. … *Tala* means to inform, tell, relate and command, as well as to ask or apply. *Noa* means of any kind, ordinary, nothing in particular, purely imaginary or void. … Talanoa, then, literally means talking about nothing in particular, and interacting without a rigid framework. (2006, p. 23)

Similarly, Meo-Sewabu writes that, from a Fijian perspective, one can define 'tala' as:

> … 'to offload'. *Noa* is often used with a prefix *'na noa'* meaning yesterday, so *talanoa* means literally offloading stories of recent events. … early Fijians expressed oral tradition through several means. One of these was *talanoa,* when stories were relayed by the old to young people. (2014, p. 347)

However, Vaioleti (2011, 2006) clarifies that the literal meaning of talanoa does not adequately capture its breadth and – especially for research purposes – its rigour. Referring to its implementation in research, he notes that there are "many complex components of Talanoa" (2011, p. 116), allowing for a range of modes and procedures for both data collection and data analysis. Further, although some have interpreted Talanoa processes to be most appropriate for light-hearted or less serious research topics and questions (Tagicakiverata & Nilan, 2018; see also Suaalii-Sauni & Fulu-Aioluptea, 2014), Vaioleti details multiple possibilities for Talanoa methods (outlined below) which do not preclude serious and/or probing research. More generally, he argues that Talanoa's lack of a rigid framework should not be taken to mean that Talanoa research is devoid of purpose or direction. In fact, Vaioleti (2011) is unequivocal that the aims of a given Talanoa research session must be clear to all those involved, and that the researcher takes an active role shaping the data-collection process in light of these aims.

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4   Note that there is a range of Pasifika research methodologies distinct from Talanoa methodology, including: faafaletui (Sāmoa) (Tamasese et al., 2005); kakala (Tonga) (Thaman, 1997); tivaevae (Cook Islands) (Maua-Hodges, 1999); te vaka (Tokelau) (Kalavite, 2014); vanua (Fiji) (Kalavite, 2014); and talaloto (Tonga) (Naufahu, 2018).

The idea that talanoa talk is about 'nothing in particular' does not capture the meaning of 'noa' in Pasifika research practice. Vaioleti (2006, p. 24) writes that "*noa* creates the space and conditions" of a Talanoa encounter. For instance, when seeking participants' consent to proceed with a Talanoa session, after the researcher states the purpose of the Talanoa s/he pauses, and during "the pause (noa, space), the researcher's head should be slightly bowed and looking towards the ground to communicate s/he is finished and now waiting for a decision" (2011, p. 127). Halapua (2003) suggests that, more broadly, the concept of space within talanoa is linked to the concept of vā. Vā is generally described as the 'space in between,' and socially represents the relationship between two or more people (Anae, 1998; Lilomaiava-Doktor, 2009; Mila-Schaaf, 2006). Vā is:

> … the existence of relationships between individuals and groups or communities. Maintaining these relationships pre-empts the conduct of participants during a talanoa. Respect for elders, family members, society and tradition encourages participants to consider the wider context of their existence and not just their individual point of view. (Prescott, 2008, p. 135)

The role of vā in Talanoa research points strongly to Pasifika world views infusing Talanoa processes and protocols. These world views can be articulated as values and principles.

Talanoa research values and principles

While Pasifika values and principles shaping Talanoa research vary across a range of Pasifika contexts, some core elements that are pan-Pacific can be identified, in keeping with a general understanding of Talanoa research as a pan-Pacific approach.

Values include:

- Mo'oni: pure, real, authentic. Halapua (2007) cites the importance of speaking from the heart within talanoa encounters.
- Mālie (as developed by Manu'atu, 2000): a state of energised and uplifted spirits, linked to an experience of connectedness and enlightenment. This state occurs during what Vaioleti terms a "good Talanoa encounter" (2006, p. 24).
- Māfana: warmth. Māfana can be described as "warm feelings" associated with mālie (Fa'ave et al., 2016, p. 141; see also Manu'atu, 2000).[5]
- Faka'apa'apa: respectful, humble, considerate (Vaioleti, 2006).
- Anga Lelei: kindness, tolerance, helpfulness, calmness, dignity (Vaioleti, 2006).

Pasifika scholars stress that, as Fa'avae et al. (2016, p. 142) put it, Pasifika values – as well as Pasifika principles (some of which are detailed below) – "are not merely superficial cultural rituals; they are key to research quality. The richness and type of research knowledge made available to the researcher depends on the depth of the respectful relationship between the researcher and participants." As noted above, Talanoa research is conducted within and predicated upon a rich tapestry of relationships that is inseparable from Pasifika social – as well as spiritual and ontological – understandings.[6]

Vaioleti (2011) reviews some key principles of talanoa/Talanoa research. He emphasises that while "the practise of talanoa may seem on the surface to be very flexible, open, and casual, when used formally as a means of communication, talanoa are structured by tapu, cultural expectations, and accountability" (p. 115), including

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5   When mālie and māfana are no longer present in a Talanoa process, the session naturally comes to an end.

6   These conditions of Talanoa research raise the important question of how best to ensure that appropriate Pasifika cultural expertise is incorporated into Talanoa research teams. An exploration of this topic is beyond the scope of this paper.

understandings of appropriate behaviour according to gender, class, age and cultural rank (see also Fairbairn-Dunlop, 2014, and Vaioleti, 2013). At the same time, Talanoa research:

> … can mean a conversation or discussion where the participants and the researcher/s have considerable power in deciding the desired process and protocol that is likely to lead to certain outcomes of the discussions. They can participate in this process, decide on in its form and length, create its ambience, structure, and choose whenever to disengage if desired. (Vaioleti, 2011, p. 122)

In these ways, Talanoa research takes place from within Pasifika cultural and interpersonal frameworks that are understood as living and evolving, and as ever-negotiated – within certain constraints, limits, or sociocultural 'givens.' Fundamentally, Talanoa research co-constructs findings through culturally contextualised encounters.

There are important implications here for identifying a few additional Talanoa research principles. Vaioleti (2013, p. 206) writes that "cultural interplays during talanoa such as moods, emotions, silence, deep and reflective thoughts, eye and body movements are all parts of the talanoa. Behaviors are integrated and inseparable parts of the phenomenon the participants experience." Coupled with the fact that Talanoa research is rooted in oral tradition, these features of Talanoa mean that it is almost always conducted face to face.[7] In addition, a focus on emergent findings and on co-constructed processes and outcomes means that a positioning of the researcher as a powerful 'expert' – common within many (but not all) Eurocentric research approaches – does not apply. Power sharing between researchers and participants is a key element of Talanoa. Finally, and in keeping with the latter point, Talanoa research entails reciprocity, mutual accountability, and a commitment to pursue research outcomes that will benefit involved Pasifika communities. As Vaioleti (2011) puts it, Talanoa research "firmly places the power to define what the Pacific issues are at the centre of the encounter between the researchers and kau nga fa'u [participants]" (p. 128). Vaioleti continues, emphasising the constitutive role of relationships for Talanoa research: "This is where real and meaningful relationships are vital and have relevance for the research outcome" (p. 128).

In addition, Talanoa research is decolonising. The combination of Pasifika values underpinning Talanoa research, the ethical imperative that the research will benefit Pasifika people and the empowerment of the kau nga fa'u speak to Talanoa's decolonising effects. For the Talanoa to be successful there needs to be a high value placed on Indigenous cultural ethics, values and practices. Vaioleti (2006, p. 24) notes that Talanoa research is, therefore, "resistant to rigid, institutional, hegemonic control." Taken together, this set of perspectives challenges the views of some Eurocentric researchers that Talanoa is an unscientific mode of storytelling lacking in rigour and focused on romanticising Pasifika history (see Fairbairn-Dunlop, 2014).

TALANOA AS A DISTINCTIVE RESEARCH METHODOLOGY

Because Talanoa research takes place within Pasifika ways of knowing and being, existing Eurocentric categories of research methodology do not neatly apply to it. In addition, as noted above, writings about Talanoa research often elide the concepts of methodology and method. As an Indigenous cultural practice that has been developed into a form of academic research, Talanoa occupies a space that challenges and confounds mainstream research activity and categorisation.

That said, Vaioleti (2006, 2011, 2013) has helpfully identified a range of Eurocentric methodological approaches with which a Talanoa approach is aligned. He cites similarities with grounded theory, naturalistic inquiry, ethnography, narrative inquiry and phenomenology; and he holds that phenomenology is the most closely aligned approach. A benefit of examining such similarities is that it allows researchers who are unfamiliar with Talanoa an avenue for

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7   Face-to-face encounters can include virtual ones. Fairbairn-Dunlop (2014) chronicles the successful use of a virtual space where a talanoa was held to promote Pasifika postgraduate research in Aotearoa. This mechanism was subsequently evaluated and found to be culturally appropriate and supportive for the researchers.

understanding it, while also sharpening Talanoa's distinctiveness (see also Fairbairn-Dunlop, 2014). In this section of our paper we explicate some points in this regard in relation to phenomenology.

Vaioleti points out that phenomenological approaches to research are similar to Talanoa approaches in that they both focus on participants' meaning making of lived experience. Further, lived experience is a very rich construct in both traditions. Citing Moustakas (1994), who writes about phenomenology, Vaioleti (2013) explains that both traditions focus on "the wholeness of experience and a search for the essence of experiences" (p. 206). This understanding of experience is inclusive of moods, emotions and embodied phenomena such as eye and body movements (see also Suaalii-Sauni & Fulu-Aiolupotea, 2014). In addition, Talanoa follows what Vaioleti identifies as a Heideggerian phenomenological approach. First, Heidegger "insisted that the observer [e.g., a researcher] … couldn't separate herself from the world being studied" (Vaioleti, 2013, p. 206. See also Heidegger, 1962). Second, the wholeness of experience is a "being-in-the-world," or the meaning of "being," that is realised and accessed via "contextual entrenchment" (Vaioleti, 2013, p. 206). Following the first point here about a Heideggerian approach, this contextual entrenchment applies to both the researcher and participants.

However, although Vaioleti locates Talanoa within the phenomenological research family, he also argues that Talanoa "does not fit totally with a phenomenological perspective" (2011, p. 133). This lack of a complete fit is due to the fact that, within a Talanoa approach, cultural considerations may suffuse the explication or exploration of world views. In other words, Pasifika-specific protocols and cultural processes constitutively shape Talanoa research. Writing about this issue in relation to Tongan phenomena, Vaioleti (2013, p. 194) states that a given Talanoa research project must be aligned "with the anga fakafonua (culture or rites of Tongan people) which include knowledge ('ilo fakafonua [Tongan knowledge]), values (mahu'inga fakafonua [Tongan values]), language (lea fakafonua [Tongan language]) and ways (founga fakafonua [Tongan ways])." Suaalii-Sauni and Fulu-Aiolupotea summarise the situation as follows:

> … phenomenology, like other social science methodologies, begin[s] with a concern for universal knowledge. Pacific indigenous research … begins by contrast with a concern for ethnic specific knowledge and the protection of an ethnic, pan-ethnic or Indigenous heritage. Their different starting points make it difficult, therefore, for Pacific research to sit comfortably within phenomenology. (2014, p. 342)

TALANOA METHODS

Vaioleti (2013) identifies at least eight possible Talanoa research methods, which Fa'avae et al. summarise as follows:

> … talanoa vave (quick and surface verbal exchange between two or more people);[8] talanoa faikava (focused talanoa by males who share similar interests while drinking kava [traditional alcoholic beverage from crushed kava root]); talanoa usu (deep and more intimate talanoa which is mālie and māfana and involves humour);[9] talanoa tevolo (spiritual talanoa which involves sharing about supernatural visitations, dreams or visions of people who have passed); talanoa faka'eke'eke (closest to a modern interview and involves verbal searching and more probing questions); pō talanoa (talking in everyday matters such as politics, church matters, children, television); talanoa'i (talking which involves high-level analysis, synthesis and evaluation); and tālanga (similar to a debate or constructive argument about issues that require attention).[10] (2016, p. 141)

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8   Vaioleti (2013, p. 200) states that talanoa vave is used in research to secure "commitments for a deeper and more formal talanoa at a later stage," or to "remind, maintain connection or ensure shared understanding."

9   Vaioleti (2013, p. 201) clarifies that this form of talanoa can be "for pleasure and perhaps just filling time before another engagement. For researchers, it is an ideal way to build trust for more objectified talanoa such as faka'eke'eke, talanga and talanoa'i."

10   Tālanga is "used by outsiders or less powerful individual[s] or groups to invite themselves into a talanoa" (Vaioleti, 2013, p. 203). It can also be used to challenge perceived assumptions embedded in the research process, allowing participants to raise issues around "perceived abuse of power or injustice during a talanoa research process. Tālanga then can contribute greatly to the validity and reliability of [Talanoa research] approaches" (p. 204).

The selection of method/s for a given Talanoa research project will depend on the researcher's intention and on the direction of a particular Talanoa. Kalavite (2014, p. 169) notes that Talanoa methods range from a more formal approach, which she likens to – but does not equate with – semi-structured interviewing (allowing for guiding questions and relatively set timeframes), to an informal approach (likened to, but again not equated with, an unstructured interview).

Vaioleti (2013) writes that one method may dominate a given research process "although others [can] be employed fluidly, interchangeably to set and maintain a good atmosphere, pass or obtain information holistically, prod or triangulate while observing all technical and cultural protocols during the data collection or data co-construction" (p. 199). The cultural skill of a Talanoa research process – what Fa'avae et al. (2016) call "the arts of Talanoa" (p. 145) – enables not only multiple methods but also the co-existence of seemingly contradictory pulls towards structure and flexibility within a given Talanoa. Although, in keeping with the value of mo'oni, Talanoa research processes prize speaking from the heart and often spontaneously, Vaioleti argues that, overall, a "highly structured approach is vital" in order for participants to be able to "co-construct meaning from the encounter because talanoa employs an open technique where the precise nature of any question asked has not been determined in advance, but will depend on the way in which the talanoa develops" (Vaioleti, 2011, p. 128).[11]

The above descriptors of Talanoa methods reveal what appear to be, from a Eurocentric perspective, a confounding of methodology and method. Specifically, the cultural features of Talanoa research render its methods inseparable from its methodology. In the next section of this paper, we turn to the inverse question: i.e., the question of whether Talanoa methodology is inseparable from Talanoa methods. To reiterate our key question: Does the use of Westernised methods as part of a Talanoa study make cultural sense, and/or threaten to compromise the cultural integrity of a Talanoa approach?

Integrating non-Pasifika-specific research methods within Talanoa research methodology

There is general agreement amongst Pasifika scholars that Talanoa research involves "a process of storying and gathering of narratives" (Suaalii-Sauni & Fulu-Aiolupotea, 2014, p. 334). As such, the main Westernised research methods that are sometimes used within a Talanoa approach, or to which Talanoa research methods are compared, are interviews and focus groups (see Fa'avae, 2016; Kalavite, 2014; 'Otunuku, 2011; Prescott, 2008; Suaalii-Sauni & Fulu-Aiolupotea, 2014; Vaioleti, 2013). While other inductive, Westernised social science methods – such as 'insider' ethnographic methods and case studies – may also be a good fit, this discussion will be limited to the role of interviews and focus groups for Talanoa research, with a focus on the former (as it is the most widely cited).

Before discussing the issue of using interviews or focus groups within Talanoa research, it is important to acknowledge that – as Fa'avae et al. (2016), Prescott (2008), and Suaalii-Sauni and Fulu-Aiolupotea (2014) point out – in some research reports the term 'talanoa' is used interchangeably or in concert with 'interviews' without reference to any methodological implications. For instance, while Otsuka (2005) describes a Talanoa data collection process for an education study in Fiji, he also refers (without explanation) to interviews with study participants. Similarly, Teevale et al. (2012) write about implementing an "open-ended Talanoa interview style" (p. 283),[12] and Mo'ungatonga (2003) refers to her Talanoa sessions as interviews.

On one level, this situation may be simply a matter of translating Pasifika terms into English. For example, Fa'avae et al. (2016) write that, for a research project they describe, they "decided that maybe we could talanoa (pō talanoa)

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11   Note as well that in its focus on debate and argument, tālanga can offer what Vaioleti identifies as a contrasting perspective to the warmth and empathy associated with Talanoa research (see Footnote 10 for additional detail).

12   In Teevale et al.'s (2012) study, Talanoa research methodology was not adopted (among other descriptors, the authors cite appreciative inquiry and grounded theory). Discussing the implications of using Talanoa methods for studies that employ non-Pasifika methodologies is beyond the scope of this paper.

and do interviews (talanoa faka'eke'eke) at different times, or on different occasions. The talanoa seemed necessary to the interviews, and the interviews opened up topics for subsequent talanoa" (p. 146). Fa'avae et al.'s use of the term 'interview' here is clearly an English translation of faka'eke'eke (as noted above, faka'ek'eeke is, according to Vaioleti [2013], closest to a modern interview) – particularly considering that they write critically not only about a Westernised 'interview mode' but also about scholars interchangeably referencing 'talanoa' and 'interviews' in their research publications.

On the other hand, there are times when scholars distinguish between Talanoa and Westernised methods and yet still apply Westernised terms to Talanoa processes. Suaalii-Sauni and Fulu-Aiolupotea (2014) note that, although it is "not yet sharp," "the distinction between an interview or focus group and a talanoa … session … is becoming clearer as more researchers use" Pasifika methods (p. 335); at the same time, they write, there is currently "a necessity for Pacific researchers to describe their use of talanoa … in ways that suggest [it] to be synonymous with European-termed social research methods, such as the focus group or interview" (p. 335). Suaalii-Sauni and Fulu-Aiolupotea clarify that institutional politics play a role in this latter situation, reporting on the circumstances of a Pasifika research team that received research funding for a project, after multiple unsuccessful attempts, only once they accepted advice to use the term 'focus groups' instead of a Pasifika term for their chosen research method.

In this light, Suaalii-Sauni and Fulu-Aiolupotea (2014) advocate for the use of Pasifika terms for Pasifika research. They argue that, in "the political manoeuvrings that come as a matter of course with any attempts to decolonise academic research," it is imperative for Indigenous research terms "to have presence and legitimacy in both the academic and Pacific worlds" (p. 336). This is a powerful point to make, and one that is echoed by Māori scholars emphasising the importance of te reo when promoting and growing Kaupapa Māori research (see Walker et al., 2006). As mentioned above, however, Kaupapa Māori researchers frequently employ a range of research methods, inclusive of Westernised ones (referred to in Westernised terms). Arguably there is power as well in co-opting Westernised methods within Indigenous methodologies, making use of them to suit overarching Indigenous research processes and outcomes.

In fact, Suaalii-Sauni and Fulu-Aiolupotea (2014) are clear that what is most important in relation to the above issues for decolonising Pasifika research is that Pasifika research *methodology* is identified as culturally specific and is autonomous. Writing about the Pasifika methodology of faafaletui as well as Talanoa methodology, they state that for the goal of developing Pasifika research, "we are more uneasy with the suggested practice of locating talanoa or faafaletui as research methodologies within phenomenology or interpretive constructivism, than with the coupling of talanoa and faafaletui as research methods with other social research methods" (p. 336). They note that Vaioleti (2006, 2011) locates Talanoa within the phenomenological research family, and that Prescott (2008) states that Talanoa is linked to interpretive constructivism.[13] Suaalii-Sauni and Fulu-Aiolupotea are clarifying that they are uneasy with these methodologically blurred lines, and are relatively more comfortable with mixing and matching Pasifika and Westernised methods. They argue that methodological autonomy allows Indigenous researchers to privilege "a research process that always keeps at the forefront a respect for cultural context and meaning, no matter what the research" (p. 336) – i.e., inclusive of a range of research topics and data-gathering tools (not necessarily Indigenous tools).

We agree that Westernised research methods can be compatible with Talanoa methodology, and that the key to upholding the values, purposes and decolonising effects of Talanoa research is to preserve Talanoa's methodological autonomy. As long as Pasifika cultural contexts, values and meanings are at the forefront of research processes, a variety of methods (perhaps in modified form: see below) can be utilised without compromising Pasifika intellectual, spiritual and cultural connections between researchers and participants (see Kalavite, 2014). We suggest that in this way – i.e., with respect to mixing and matching research methods across cultural frameworks – Pasifika research can be similar to Kaupapa Māori research. We now turn to a discussion of this

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13   Interpretive constructivism is typically viewed as a research paradigm, which is a slightly larger umbrella than a research methodology (see Mertens, 2010).

topic from a slightly different angle: one that queries the idea that Westernised methods are uniformly Eurocentric. We also look again at the question of how important it might be to utilise Pasifika terms for research methods when one's methodological approach is Pasifika.

Not all Westernised interview methods are equally Eurocentric. While Pasifika scholars generally agree that Westernised interviews are not in themselves adequate for capturing the relational and cultural richness of Talanoa processes (Fa'avae, 2016; Prescott, 2008), Prescott (2008) explains that there are many types of 'Western' interview approaches (including group interviews), and that the content, meaning and purpose of an interview is shaped constitutively by the way it is theorised and put into practice. It is true that Eurocentric interviews can be relationally sterile, and structured to transmit knowledge one way, for the benefit of a seemingly neutral researcher. But in his discussion of the history and development of Westernised interview techniques, Prescott points out that interviews can also be used within, and their processes shaped by, research methodologies that acknowledge the sociocultural situatedness of participants and researchers, the co-construction of realities amongst research participants (including the researcher) and "the desire to understand rather than explain" (Fontana & Frey, 2005, p. 706). So, as Prescott (2008) puts it, while "the *talanoa* process should not be mistaken as simply a particular style of interview, there are a number of similarities between unstructured interviews and *talanoa*" (p. 132).

Prescott (2008) utilises talanoa "as a complementary addition" (p. 133) to the interview, and at times uses the terms interchangeably (with a clear methodological justification provided for doing so). Similarly, Suaalii-Sauni and Fulu-Aiolupotea (2014) see "little difference in practice" between Talanoa methods "and an interview or focus group in terms of the general mechanics of actually carrying them out" (p. 337). However, in both of these articles, an argument is made that if methods are referenced using Pasifika terms, Pasifika values and processes are more likely to stay top of mind. Prescott notes that popular perceptions of (more structured) interview processes, when referred to as 'interviews,' may hinder Pasifika peoples' participation. A long history of colonising research amongst Pasifika peoples informs such perception, which remains relevant currently. Prescott suggests that a researcher utilising Talanoa methodology "may go to extraordinary lengths to explain a form of interview that addresses the weaknesses generally associated with traditional [Westernised] interviews, when they may simply request that they would like to *talanoa* with the participant" (p. 130).

All things considered, it seems that the use of Pasifika vs. Westernised methods and terms can depend on context. Pasifika scholars are negotiating an academic space that has been shaped by Western epistemologies. Talanoa processes have been deliberately crafted as 'academic' and translated into existing research worlds. With these points in mind, and with appropriate contextual understanding, translation can work in multiple directions: e.g., Pasifika terms can be used for a research method to enlist Pasifika participants for a collaborative, decolonising project that is funded by a body to whom methods are described as interviews. In their discussion of capacity building around, and the teaching of, Pasifika methodologies, Suaalii-Sauni and Fulu-Aiolupotea (2014) state that "academic researchers who work with Pacific peoples benefit most, in our experience, when there is deliberate and mutual sharing and probing of Pacific *and* Western epistemologies inherent in contemporary Pacific research" (p. 332) (italics in the original).

As stated above, Suaalii-Sauni and Fulu-Aiolupotea (2014) do support the use of non-Pasifika methods within research projects that employ Pasifika methodologies. Examples of such research include 'Otunuku's 2011 project with parents and caregivers of secondary school students in New Zealand, using focus groups and a Talanoa methodology. 'Otunuku explains that the focus group process was shaped by Talanoa (methodological) values and protocols, deviating from what would ordinarily be prescribed for a focus-group process. For instance, focus-group time frames were expanded, since "making connections between researchers and participants – either through family, relatives, school mates, place of birth, or shared acquaintances – took nearly half the time prescribed by the literature on focus groups" (p. 46).

Another example signals the potential of expanding Talanoa research beyond the qualitative research approaches with which it has been associated – a potentiality that, as Suaalii-Sauni and Fulu-Aiolupotea (2014) note, offers

a strong case for methodological autonomy (as opposed to a too-tight association with phenomenology or interpretive constructivism). It is worth quoting at length:

> … although using the talanoa … as a methodological framework for quantitative research has not yet been done, it is theoretically possible. In reflecting on this, … because of the way in which we conducted our basic epidemiology and questionnaire work with the Samoan villages …, it could be said that what we did fell quite comfortably within … the scope of a talanoa … research methodology. What we did was engage the principles of building a culturally appropriate relationship with village representatives before entering the village, and we respected the village protocols throughout the data collection process up until the final stage of disseminating our findings back to them face to face. The relevance of Pacific research methodologies such as talanoa … to medical research, such as epidemiology, is an interesting area for indigenous health or development researchers to follow up on. (Suaalii-Sauni & Fulu-Aiolupotea, 2014, p. 338)[14]

It is important to stress that colonising representations or appropriations of Talanoa research are an ever-present possibility. In this light it would seem risky to include non-Pasifika methods within Talanoa methodological approaches. However, restricting Pasifika researchers to Pasifika-only methods can be seen as a colonising practice in itself. We can turn this issue on its head: why should Eurocentric research concepts be enabled to claim all the non-Indigenous (and only non-Indigenous) research territory with which they have been associated? We reflect further on this question in the final section of this paper.

CONCLUSION AND DISCUSSION

This paper argues that research methods that are not specific to Pasifika traditions can be compatible with Talanoa research methodology. We agree with Suaalii-Sauni and Fulu-Aiolupotea (2014) that the key to preserving the integrity and intentions of a Talanoa research approach – including its decolonising effects – is methodological autonomy, not specific research methods. To achieve this end, it is imperative that Pasifika research processes maintain respectful, collaborative and power-sharing relationships as well as core Pasifika values and principles throughout; any non-Pasifika methods employed may be modified accordingly.

In the process of reaching this conclusion, this paper critically queries the categories of 'methodology' and 'method.' When viewed through a Pasifika lens, new insights about these categories arise; for instance, the inseparability of Pasifika methods from Pasifika methodological considerations. Unpacking Talanoa as methodology and/or method reveals the (Western) cultural limitations of these terms, which are not always clearly distinguishable within Pasifika research traditions, and are in these contexts infused with quite specific cultural protocols and world views that are not typically associated with these constructs. Further, as part of examining the implications of utilising non-Pasifika methods within a Talanoa methodological approach, we have argued that not all Westernised research methods are equally Eurocentric. Some Westernised methods have been crafted to be porous to sociocultural contextualisation, and to allow for the co-construction of knowledge amongst research participants (including researchers). We conclude our paper with some reflections on this latter point.

Suaalii-Sauni and Fulu-Aiolupotea (2014) write that one effect of exploring rigorously and simultaneously (in their teaching) both Pasifika and Westernised research approaches, and openly considering the suitability of any research method for a Talanoa project, is that this process raises questions about the common assumption that qualitative research, when it is thought about generically (i.e., from within Western paradigms), is devoid of any cultural specificity. They write that such an exercise in the classroom "forced us to compare and think more carefully about what was common across these research methodologies and methods, and what was more specific to some than

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14   In relation to Kaupapa Māori research, Walker et al. (2006, p. 336) note that the "Westernised research designs" that can be used include surveys and experiments, even though "certain kinds of qualitative research, for example oral histories, narratives, and case studies, and methods like interviews and focus groups, fit more comfortably within a Maori way of doing."

others" (p. 337). In this paper, we too have uncovered the possibility that Westernised methods can embed cultural content.

A question that is then also raised is: what Western cultural assumptions and protocols might be embedded in Eurocentric methodologies and methods, masquerading as universal principles (or as principles that can apply generically to all 'non-Indigenous' research contexts)? When Prescott (2008) identified contemporary forms of (Westernised) interviewing as a good fit with Talanoa research, he pointed out a blind spot within Eurocentric scholarship that addresses the development of interview methods allowing for this fit. He writes that in descriptions of how interviews have evolved as research tools to accommodate rich cultural contextualisation, "there does not appear to have been any regard given to the possibility that such forms of communication already exist" (p. 130) – i.e., within very long-standing practices of talanoa (and other oral, Indigenous traditions). We suggest that this situation reveals a set of Western protocols and assumptions embedded in Eurocentric approaches to research: namely, the unacknowledged (and likely non-conscious),[15] rhetorical erasure of collectivist, non-European precedents in relation to its own research constructs. Put differently, it is perhaps a uniquely Western (and quintessentially colonising) approach to stake apparently 'new' claims – claims about, for example, the development or evolution of an interactive tool (employed in research) allowing for rich cultural contextualisation – when in fact said claims are not new and are not, at root, Western. With this perspective in mind, it is reasonable to argue that the use of interviews – and, potentially, a whole range of research methods currently identified as Western – within a Talanoa project (modified accordingly as needed) is entirely appropriate and justified.

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15   Hence the blind spot.

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AUTHORS

Dr Helen Gremillion is an Associate Professor of Social Practice at Unitec New Zealand, and is Discipline Leader of the Master of Applied Practice – Social Practice programme. She is also Research Professional Development Liaison in Tūāpapa Rangahau (Unitec's Research and Enterprise Office). Her research and teaching interests include qualitative research methodologies, gender studies, narrative therapy, te ao Māori within counsellor education, constructionist theories of the body and of sexualities, research ethics, cultural studies and medical anthropology.

Jason Hallie is a Lecturer and Pacific Champion in Social Practice at Unitec New Zealand. He has over 20 years' experience as a social worker. From the age of five, Jason had a Tongan step-father, from the village of Kolomotu'a. Jason and his Pālagi brother and Tongan/Pālagi sisters were brought up with strong aspects of anga fakatonga (the Tongan way), which strongly influenced his identity as Tongan and motivated him to become a social worker – often taking on responsibility working with Pasifika people and organisations. He completed his master's thesis in alcohol education and is interested in further Pacific research.

Dr Falaniko Tominiko is of Sāmoan descent. He holds the chiefly title Seulupe from his mother's village, Apia, the capital of Western Sāmoa. Falaniko holds a doctoral degree from the University of Auckland in Pacific Studies. He is currently a Research Fellow on a Marsden-funded project that is looking at the experiences of transnational Sāmoan matai (chiefs). His other research interests are Pacific traditional leadership, politics, history, culture, language and arts. Falaniko is a member of the Ministry of Social Development Pacific Advisory Group, NZQA Taupulenga advisory group and the Auckland Museum Pacific Advisory Group board, and is currently the Director of Pacific Success at Unitec New Zealand.

THE PERFORMANCE OF A DIVERSE COHORT OF CIVIL ENGINEERING STUDENTS AT UNITEC INSTITUTE OF TECHNOLOGY (2010 TO 2019)

WEI LOO
LUSA TULEASCA

ePress   Unitec Institute of Technology TE WHARE WĀNANGA O WAIRAKA

ABSTRACT

The growth in international students over the past decade, and large-scale immigration into the Auckland area, have both contributed to a rapidly diversifying student cohort at Unitec New Zealand. In the period 2010 to 2019, 1856 distinct students studied civil engineering at Unitec. Within the domestic cohort alone, these students came from 39 different nationalities, and at least 28 different ethnic groups. The topic of this paper is how educational performance is associated with various demographic characteristics, particularly in respect of nationality, ethnicity, gender, age, part-time or full-time study, and activity prior to study. Particularly important are the findings pertaining to the New Zealand Government's designated priority groups. Māori in civil engineering are underrepresented in relation to their proportion of the population in West Auckland, but are performing well academically, whereas domestic Pasifika, who are well represented, are falling behind other groups in terms of educational performance. International students, on the whole, academically outperform domestic students. The article concludes with 17 key findings, and a recommendation that future research focuses on students who drop out of civil engineering during their first year of study. An enhanced understanding of this group of students has the potential to significantly improve educational performance indicators for civil engineering, starting from when students begin their first semester of study in the discipline.

KEYWORDS

civil engineering, diverse student cohort, educational performance, Unitec New Zealand

INTRODUCTION

Civil Engineering is described in the *Encyclopaedia Britannica* as "the profession of designing and executing structural works that serve the general public" (Garth Watson, 1999).

Civil engineering education has over 40 years of history at Unitec New Zealand (formerly named Carrington Technical Institute until 1994, then Unitec Institute of Technology until 2020). In 1976, Carrington Technical Institute was established at the present Mt Albert site. Within two years, delivery of the partly work-based New Zealand Certificate in Engineering (NZCE) in both the civil and mechanical disciplines had already started. While the NZCE was reputed to serve students and industry very well, in 1998 the government began to progressively disestablish the qualification. The replacement qualification, developed by a consortium of polytechnics, was the Level 6 Diploma in Engineering (Civil) in 2000. This was quickly followed by the launch of the Bachelor of Engineering Technology (Civil) at Unitec in 2001. Both these qualifications were initially offered in the civil discipline only (Kirman & Blakely, 2018).

In 2010, both the diploma and the degree were brought under the auspices of nationwide governing bodies – the New Zealand Board of Engineering Diplomas (NZBED) and the Metro Group of Institutes of Technology, respectively. This was done to bring greater consistency to graduate outcomes, curricula, and course content right across the country. It is important to note that the New Zealand Diploma in Engineering (NZDE) and the Bachelor of Engineering Technology (BEngTech) are also governed by international accords – the Dublin Accord in the case of the NZDE, and the Washington Accord in the case of the BEngTech. These accords anchor the programmes to

international best practice and help ensure their international recognition – at least throughout most of the English-speaking world.

This article is primarily concerned with the demographic characteristics and educational performance of civil engineering students who enrolled in the civil engineering diploma or degree programme at Unitec during the period 2010 to 2019. This is a particularly interesting period, which during its first half enjoyed a near doubling of enrolments. It was also a period of rapid demographic change. For example, in 2010, international students represented just 11% of the civil engineering cohort. By 2016 this had increased to 45%. Altogether, by the end of the decade under study, 1856 students representing a diverse cohort of 39 different nationalities and 29 ethnicities had enrolled at some point, in one or more courses of study in civil engineering. These facts alone make the matter of diversity and academic achievement in civil engineering at Unitec a topic well worth studying.

Notes:

- EFTS (Equivalent Full-time Students): A typical full-time student studies 8 x 15-credit courses in a year, representing 1 EFTS. One 15-credit course therefore corresponds to 0.125 EFTS.
- The National Diploma in Engineering (Civil) started phasing out in 2011 and was replaced by the New Zealand Diploma in Engineering (Civil) in 2011. In this article, the term NZDE(Civil) likewise refers to both qualifications.
- The data supporting the study is sourced from Unitec's PeopleSoft enrolment database. The data is processed using the UnionBI application (Loo, 2016–2021). UnionBI provides a user-friendly interface allowing for the automated scripting and batch processing of large and complex SQL statements, and the efficient presentation of reports and charts.

CIVIL ENGINEERING: BROAD ENROLMENT TRENDS

The earliest records of civil engineering enrolments in Unitec's PeopleSoft database are from 2001. Thus, to date, more than two decades of enrolment data are available. Enrolment trends in civil engineering from 2001 to 2019 are presented in Figure 1.
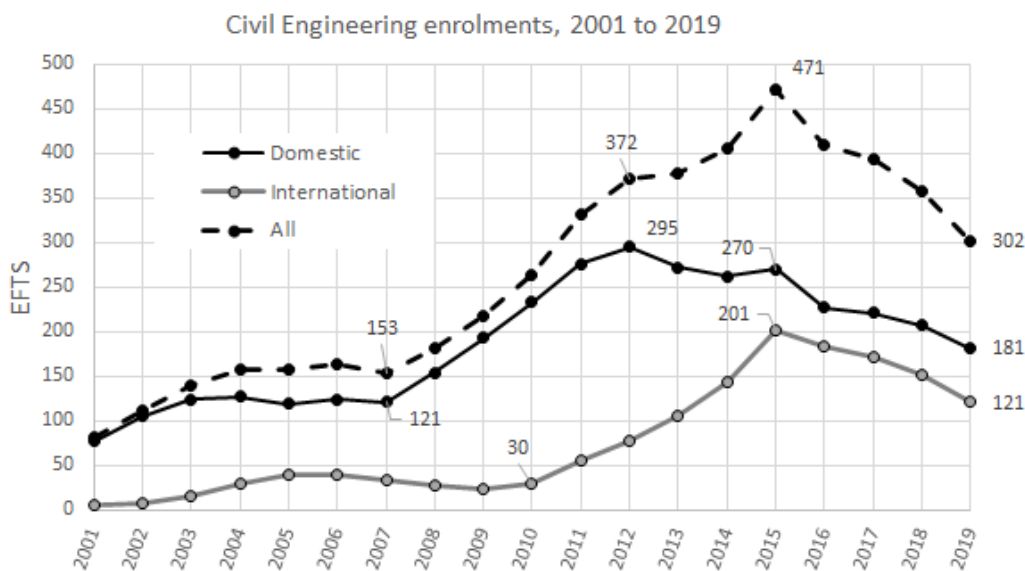

Figure 1. Civil engineering enrolments, 2001 to 2019 (EFTS).

Between 2007 and 2012, growth was largely driven by domestic enrolments increasing by nearly two and a half times – from 121 EFTS in 2007 to 295 EFTS in 2012. After 2012, domestic enrolments gradually declined. Various reasons have been proposed for the decline, and these are mentioned later in this section. Nevertheless, despite the post-2012 decline in domestic students, overall growth was sustained for another few years due to a huge increase in internationals during the period 2010 to 2015. In this five-year period, international enrolments increased almost seven-fold – from 30 EFTS in 2010 to a peak of 201 EFTS in 2015.

However, after 2015, international enrolments also entered a decline. This, together with the continued reduction of domestic enrolments, contributed to a 36% decline in civil engineering EFTS over the 2015 to 2019 period. This reduction in civil engineering enrolments was consistent with the 37% fall in *overall* enrolments (9706 EFTS to 6088 EFTS) across the institute over the same period (see Figure 2).
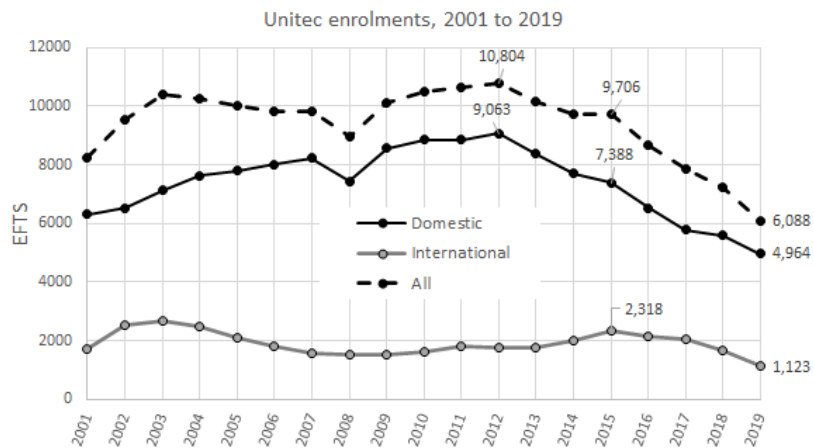

Figure 2. Unitec Institute of Technology, enrolments across all programmes, 2001 to 2019.

Unitec's struggles in attracting students in recent years have been variously attributed to a buoyant labour market in the period leading up to the 2020 Covid-19 situation (Gerritsen, 2019), the reputational damage caused by the failed 'transformation' restructure of 2013 to 2017 (Loo, 2018), and the dangers of emphasising corporate managerialism over staff voice (Kenkel, 2020; Loo, 2019). Successive NZQA category downgrades, from Category 1 to 2 in late 2016, and Category 2 to 3 in late 2018, damaged the public reputation of Unitec, and created difficulties in processing international visas. The failure of Unitec's 'transformation' has been exposed by Dr David Cooke in his report *Blind Faith: Deconstructing Unitec 2015 to 2017* (Cooke, 2018), and has also been extensively reported on in the media (Collins, 2018; Franks, 2018).

In Figure 3, civil engineering enrolments are decomposed into the BEngTech(Civil) and NZDE(Civil).
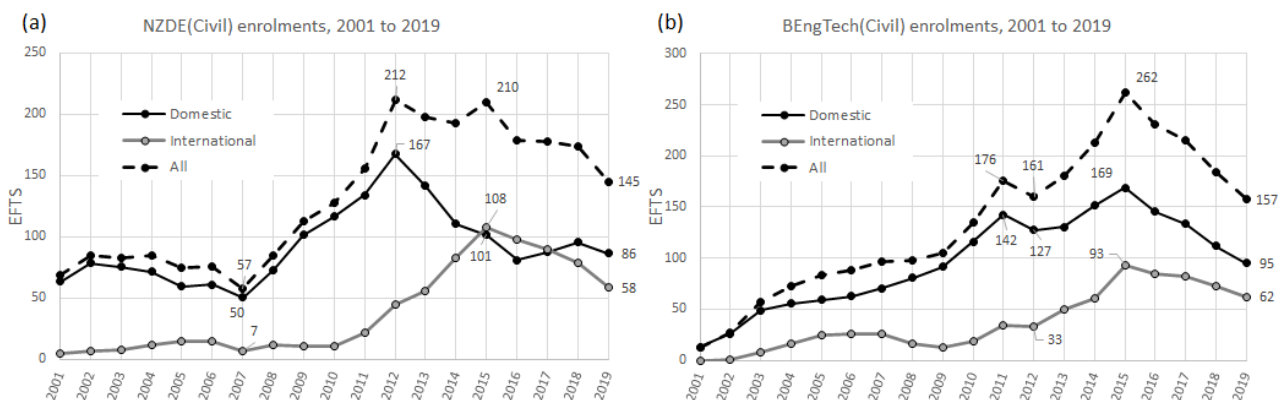

Figure 3. Civil engineering enrolments, 2001 to 2019 (a) for the NZDE(Civil) and (b) for the BEngTech(Civil).

It is seen that both the BEngTech(Civil) and the NZDE(Civil) are characterised by significant growth in enrolments in the ten-year period leading up to 2015, particularly of international students. By 2015, the NZDE(Civil) had more than half its student cohort of international origin, while over one third of BEngTech(Civil) students were international. However, since 2015, the proportion of international students within the civil engineering cohort has declined, with a possible contributing factor being the NZQA category downgrade mentioned above.

The following sections narrow the focus to students who studied civil engineering during the 10-year period of 2010 to 2019. A decade is a naturally and commonly accepted duration of time adopted for academic study, with further salience obtained by the fact that 2010 was the year when the revised BEngTech(Civil) degree was introduced across the country, followed by the roll-out of the new NZDE(Civil) qualification in 2011.

DEMOGRAPHIC CHARACTERISTICS AND EDUCATIONAL PERFORMANCE (2010 TO 2019)

In the 10-year period 2010 to 2019, Unitec's Department of Civil Engineering educated 1856 students (by head count), studying either on the BEngTech(Civil) or the NZDE(Civil). These students represent 3684 EFTS of enrolments. On average, each student thus enrolled in 2 EFTS (16 x 15-credit courses), the equivalent of two years of full-time study. In terms of individual *course* enrolments, there were 15,154 in the BEngTech(Civil) and 14,665 in the NZDE(Civil).

Figure 4 presents these enrolments both in terms of head count and EFTS.
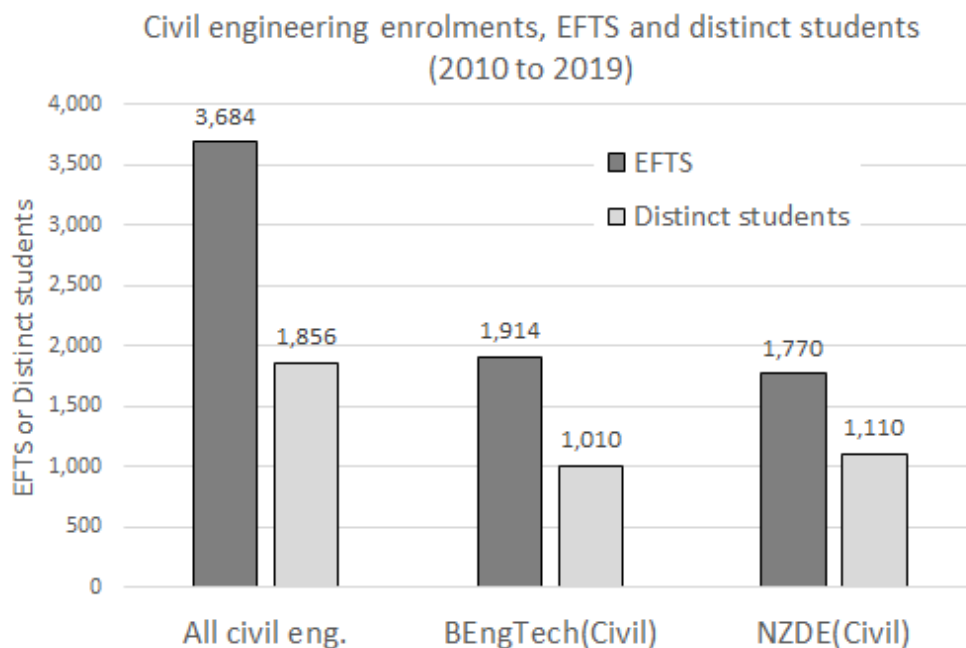
Figure 4. BEngTech(Civil) degree and NZDE(Civil) enrolments (EFTS and Distinct students), 2010 to 2019.

Overall educational performance is presented in Figure 5. Note that course success is simply the aggregate number of courses passed, divided by the total number of courses enrolled less courses listed as continuing or deferred. GPA stands for Grade Point Average. Unitec adopts the 0 to 9 grade-point system common to most New Zealand tertiary institutes (The University of Auckland, 2021).

(a) Civil engineering course success (2010 to 2019)

(b) Civil engineering GPA (2010 to 2019)
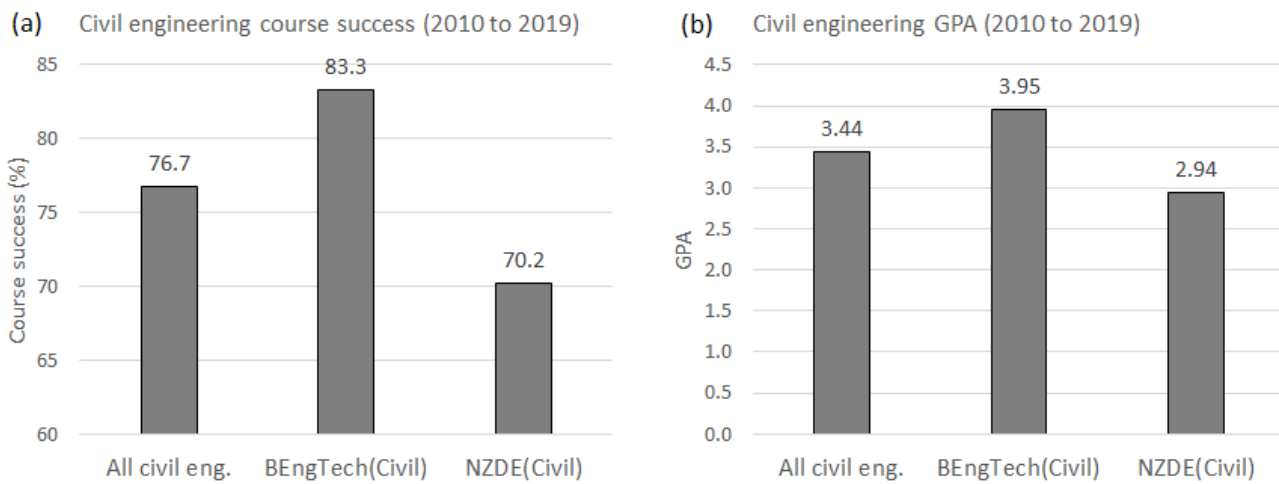
Figure 5. Civil engineering educational performance in terms of (a) course success and (b) GPA.

In the following sections we investigate the student cohort with respect to six key demographic statistics: nationality, ethnicity, gender, prior activity, age and part-time or full-time study.

Nationality

Over the ten-year period 2010 to 2019, students from 39 nationalities enrolled in civil engineering. Table 1 shows the EFTS enrolments by nationality. The nationalities are further categorised as domestic (New Zealand citizens, permanent residents and Australian citizens), or from one of seven broad geographic regions – Asia, Middle East, the Pacific, Africa, North America, South America or Europe.

As a proportion of overall EFTS enrolments, 67% of civil engineering students are domestic, 24% from Asia, 5% from the Pacific, and 2% from the Middle East (see Figure 6). Just 2% are from 'other' regions, namely North and South America, Africa and Europe. It is emphasised that this refers to *nationality*, and not ethnicity. While *ethnicity* often closely correlates with *nationality*, they are different concepts. Note that Figure 6 also provides the nationality breakdown for the BEngTech(Civil) and NZDE(Civil), separately.

Figure 6. Students by broad geographical region, in percentages.

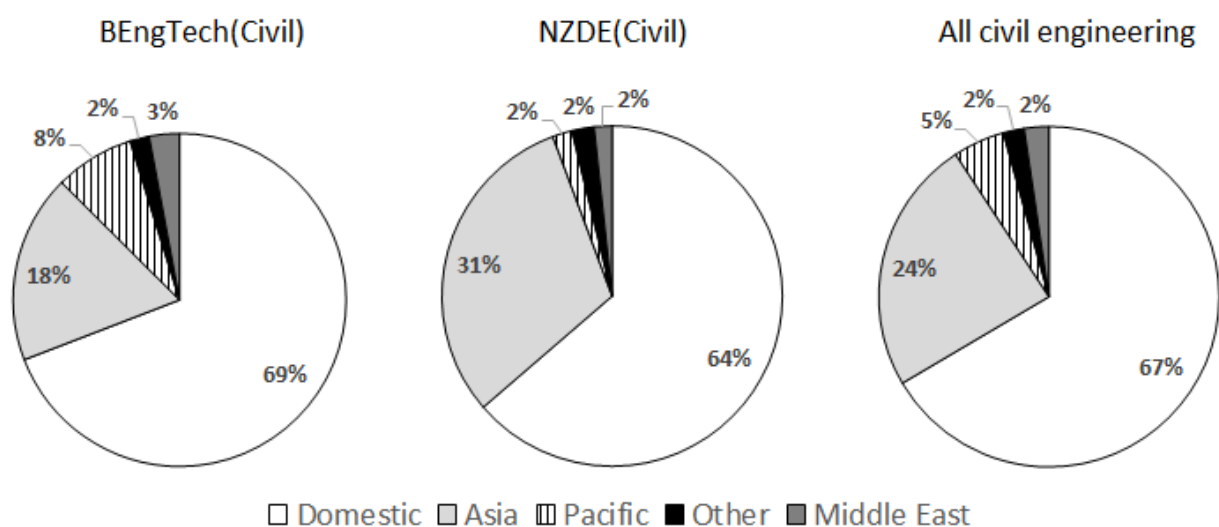| Residency	Region/Category	Degree	Diploma	Total	Percent
NZL: New Zealand	Domestic	804	754	1559	42.4%
NZP: New Zealand Permanent	Domestic	510	365	875	23.8%
CHN: China	Asia	241	334	575	15.7%
IND: India	Asia	68	135	203	5.53%
SAU: Saudi Arabia	Middle East	51	24	75	2.05%
SLB: Solomon Islands	Pacific	49	3	52	1.42%
LKA: Sri Lanka	Asia	12	26	38	1.02%
KEN: Kenya	Africa	14	22	36	0.98%
FJI: Fiji	Pacific	17	19	36	0.97%
TON: Tonga	Pacific	27	1	28	0.75%
PNG: Papua New Guinea	Pacific	17	6	23	0.64%
KIR: Kiribati	Pacific	15	3	18	0.49%
RUS: Russian Federation	Europe	5	9	15	0.40%
VUT: Vanuatu	Pacific	14	0	14	0.37%
TWN: Taiwan	Asia	9	3	12	0.32%
VNM: Viet Nam	Asia	3	7	10	0.27%
AUS: Australia	Domestic	8	2	10	0.26%
KOR: Korea Republic of	Asia	1	7	8	0.23%
BGD: Bangladesh	Asia	3	4	8	0.21%
WSM: Samoa	Pacific	7	1	8	0.20%
PHL: Philippines	Asia	4	4	7	0.20%
NPL: Nepal	Asia	0	7	7	0.18%
TMP: East Timor	Asia	5	2	7	0.18%
IRN: Iran (Islamic Republic Of)	Middle East	2	4	6	0.17%
CHL: Chile	South America	3	2	5	0.13%
BRA: Brazil	South America	4	0	4	0.12%
PAK: Pakistan	Asia	1	3	4	0.11%
FRA: France	Europe	4	0	4	0.11%
HKG: Hong Kong	Asia	0	3	3	0.09%
MMR: Myanmar	Asia	3	0	3	0.09%
ZAF: South Africa	Africa	1	2	3	0.08%
THA: Thailand	Asia	0	3	3	0.08%
TUV: Tuvalu	Pacific	3	0	3	0.08%
MUS: Mauritius	Africa	3	0	3	0.07%
KHM: Cambodia	Asia	0	3	3	0.07%
IRQ: Iraq	Middle East	2	1	2	0.07%
USA: United States	North America	2	0	2	0.05%
NAM: Namibia	Africa	0	2	2	0.05%
JOR: Jordan	Middle East	2	0	2	0.04%
OMN: Oman	Middle East	0	1	1	0.01%
	Totals	1912	1761	3673	100%

Table 1. National origin of civil engineering students (EFTS), 2010 to 2019.

In terms of educational performance, international students outperform domestics, both in terms of course success and GPA, across both the NZDE(Civil) and BEngTech(Civil) programmes (see Figure 7).
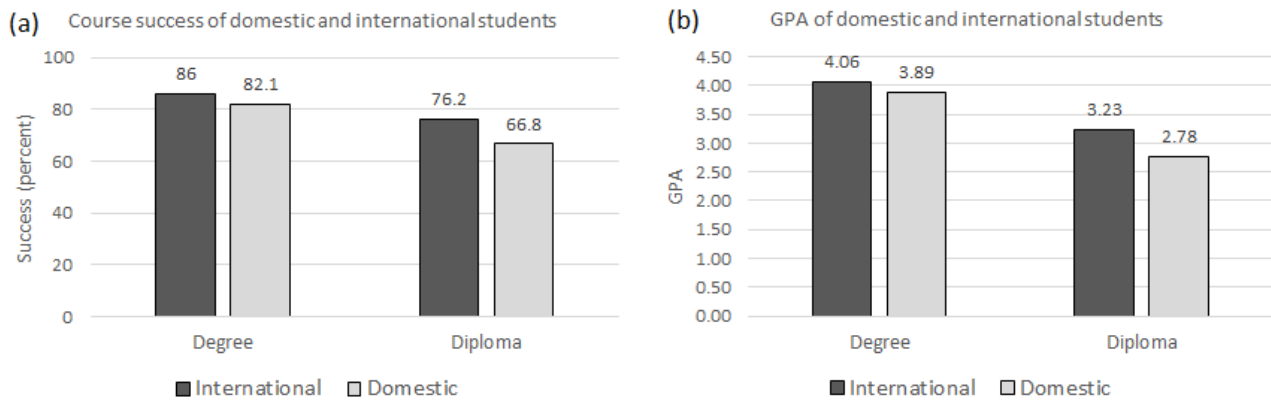

Figure 7. Educational performance of international vs domestic students, in terms of (a) course success and (b) GPA.

Educational performance in terms of geographic region is presented in Figure 8. Note that only four broad groupings are shown – Domestic, Asia, Pacific and Middle East. These four groupings make up 98% of enrolments in terms of EFTS.
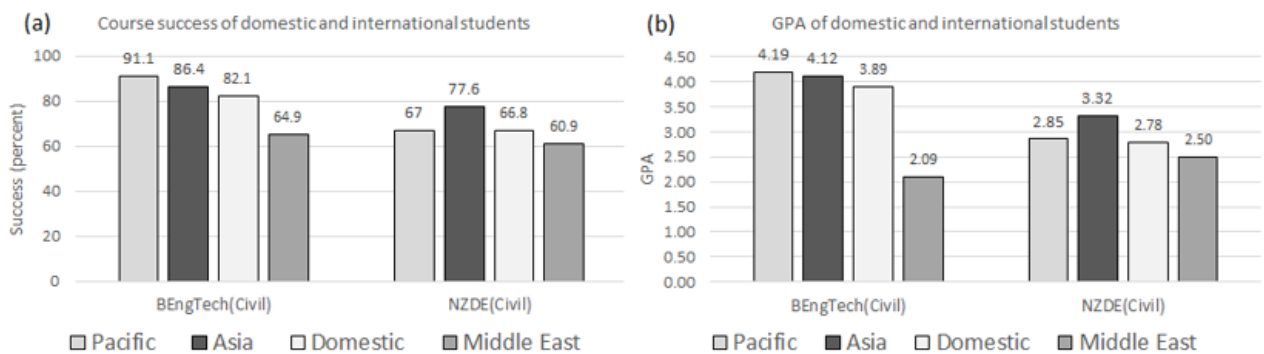

Figure 8. Educational performance by geographic region, (a) course success and (b) GPA.

From Figure 8 it is seen that for the BEngTech(Civil) degree, students from the Pacific perform the best, followed by students from Asia, and then domestic students. Students from the Middle East lag significantly behind students of other groups. For the NZDE(Civil), students from Asia perform the best, followed by students from the Pacific, then domestic students, while again, students from the Middle East are found to be struggling compared with students from other groups.

Ethnicity (of domestic students)

Domestic students make up 67% of EFTS of the civil engineering cohort (2010 to 2019) – see Figure 6. These domestic students are from at least 28 ethnic groups (two of the groups are 'other' or 'no response'). The ethnicities are grouped as African, Asian, European, Latin American, Māori, Middle Eastern and Pasifika. These classifications are adopted in the New Zealand census (StatsNZ, 2018). In the case of students who belong to two or more ethnicities, the ethnicity adopted by Unitec for reporting is assumed to be in line with the ethnic priority rankings used by New Zealand's Ministry of Education (Education Counts, 2021).

Enrolments by ethnicity and ethnic group are shown in Table 2.

Ethnicity	Group	Enrolments (EFTS)			
		Degree	Diploma	Total	Percent
NZ European/Pakeha	European	249.5	250.6	500.1	20.5%
Indian	Asian	274.1	165.1	439.3	18.0%
Chinese	Asian	153.5	84.9	238.4	9.76%
Other	Other	93.0	68.9	161.9	6.63%
Middle Eastern	Middle Eastern	76.2	72.9	149.1	6.10%
New Zealand Maori	Maori	48.5	93.5	142.0	5.82%
African	African	54.6	56.8	111.4	4.56%
Samoan	Pasifika	47.3	50.4	97.7	4.00%
Tongan	Pasifika	40.0	45.1	85.1	3.48%
Other Asian	Asian	56.8	23.2	80.0	3.27%
Filipino	Asian	41.1	38.6	79.7	3.26%
Other European	European	25.1	28.0	53.1	2.17%
Fijian	Pasifika	25.1	25.9	51.0	2.09%
Cook Island Maori	Pasifika	11.5	26.2	37.7	1.54%
Latin American	Latin American	20.5	8.4	28.8	1.18%
Other Pasifika Island	Pasifika	11.5	14.4	25.9	1.06%
No response	No response	16.4	9.1	25.5	1.04%
Korean	Asian	12.3	8.3	20.6	0.84%
Sri Lankan	Asian	13.8	6.0	19.7	0.81%
Niuean	Pasifika	3.4	12.9	16.3	0.67%
British/Irish	European	6.7	9.5	16.1	0.66%
Other South East Asian	Asian	9.6	6.2	15.8	0.65%
Australian	European	7.5	2.7	10.2	0.42%
Vietnamese	Asian	3.2	6.1	9.3	0.38%
Dutch	European	5.8	2.0	7.8	0.32%
Japanese	Asian	7.1	0.0	7.1	0.29%
German	European	4.9	2.2	7.1	0.29%
Cambodian	Asian	3.4	0.0	3.4	0.14%
Polish	European	0.0	2.1	2.1	0.09%
		1322	1120	2442	100%

Table 2. Ethnicity of domestic civil engineering students (2010 to 2019)

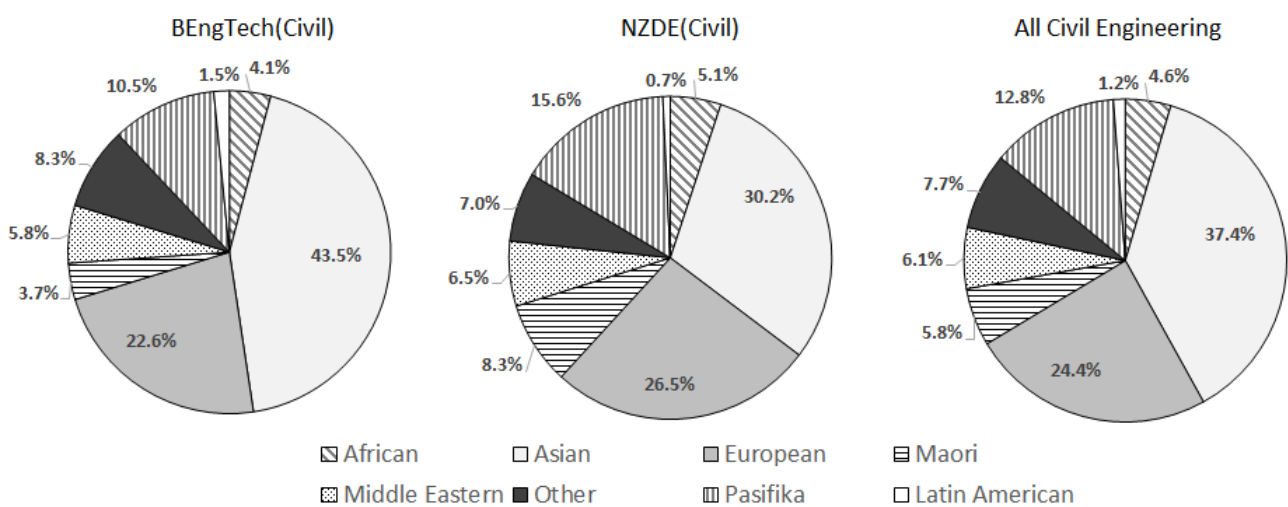Figure 9 shows the proportional break-down of the major ethnic groups.

Figure 9. Ethnic background of domestic students as a proportion of all civil engineering students.

From Figure 9, out of all civil engineering students, the largest group are of an Asian ethnicity (37.4%), followed by European (24.4%), Pasifika (12.8%), Māori (5.8%), Middle Eastern (6.1%), African (4.6%) and Latin American (1.2%).

Pasifika and Māori are both priority groups in terms of encouraging participation and enhancing educational performance (Unitec, 2019–2020). The other priority group is under-25s – see the section titled 'Age of students.' The main 'catchment' for domestic students is the West Auckland area. Around 12% of the population in this area identify as Māori and 14% as Pasifika (Huakau, 2016). The proportion of Pasifika in civil engineering (12.8%) appears to be quite close to their representation in the community (14%). However, Māori, at just 5.8% of the overall cohort, are significantly underrepresented – given that 12% of the local population is Māori.

Educational performance by ethnicity (of domestic students only) is presented in Figure 10. Overall domestic success is also included (black column).
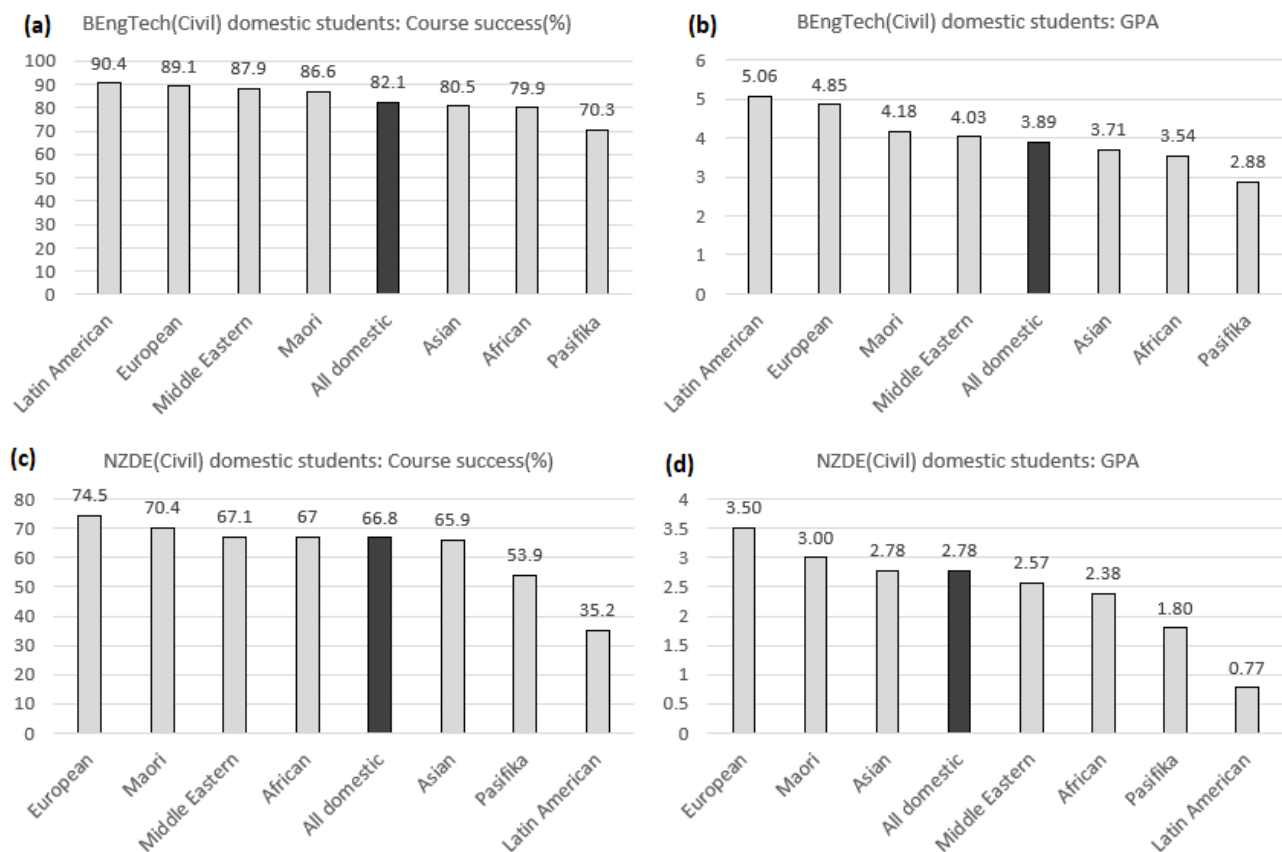

Figure 10. Educational performance by ethnic background (for domestic students only) for the BEngTech(Civil) in terms of (a) course success, (b) GPA, and for the NZDE(Civil) in terms of (c) course success, and (d) GPA.

If we disregard the very small number of Latin American enrolments, domestic students of European ethnicity perform the best in both programmes, whether in terms of course success or GPA. Māori also perform well in both programmes, exceeding the overall domestic performance in terms of both success and GPA. However, Pasifika course success and GPA in both programmes lag significantly behind the overall averages. For the BEngTech(Civil) the overall success rate is 82.1%, which is 11.8 percentage points above the 70.3% of Pasifika. For the NZDE the overall success rate is 66.8%, while Pasifika success is just 53.9% (12.9 percentage point gap).

An interesting finding is that among domestic Pasifika students, Pasifika *New Zealand permanent residents* significantly outperform Pasifika *New Zealand citizens*. This applies in the case of both the NZDE(Civil) and BEngTech(Civil) (Figure 11).
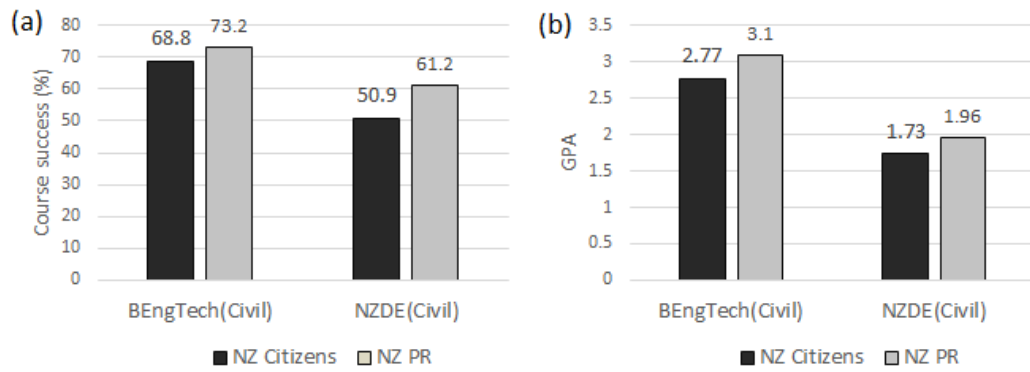
Figure 11. Pasifika students: New Zealand citizens vs New Zealand permanent residents (PR) in terms of (a) course success for the BEngTech(Civil) and NZDE(Civil), and (b) GPA for the BEngTech(Civil) and NZDE(Civil).

Gender

From Figure 12, civil engineering clearly has difficulty in attracting female students. In the BEngTech(Civil) only 12.7% of students are female, while for the NZDE(Civil) just 11.9% of students are female. For domestic students the rate of female participation is 16.5% and 14.1% for the BEngTech(Civil) and NZDE(Civil) respectively, while for internationals the corresponding rates are 12.7% and 12.3%.
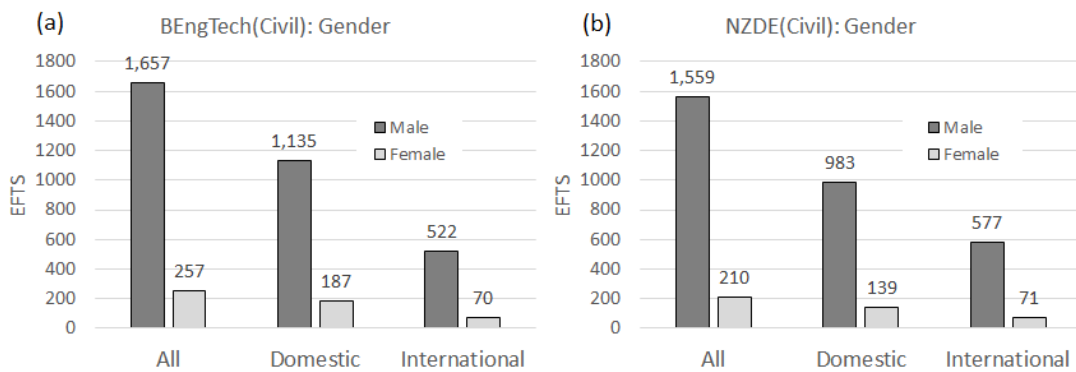
Figure 12. Female and male students for the (a) BEngTech(Civil), and (b) NZDE(Civil).

Despite female students being significantly under-represented, they perform well academically (see Figure 13). In terms of course success, female internationals outperform male internationals, who in turn outperform female domestics, who outperform male domestics (Figure 13 [a]).
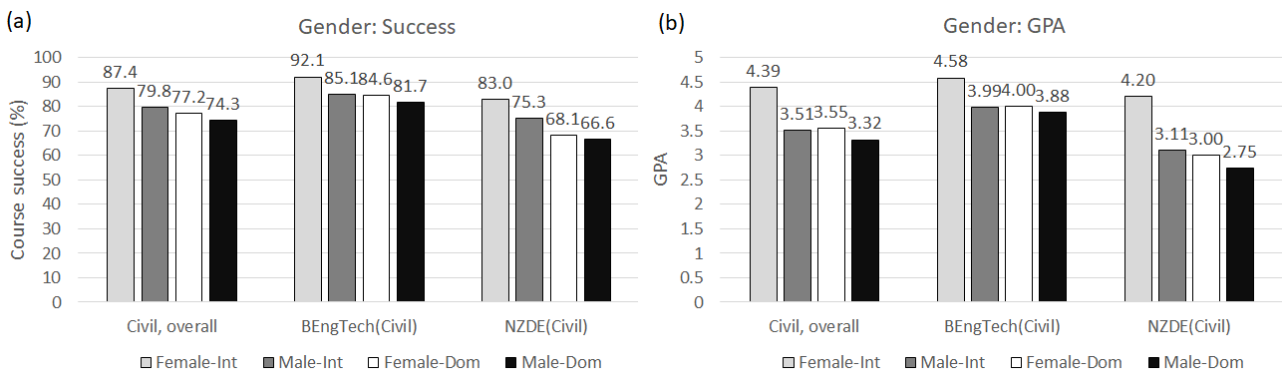

Figure 13. Educational performance by gender, in terms of (a) course success rates and (b) GPA.

Prior activity

The term *prior activity* refers to the activity the student was involved in immediately before his or her *first* semester of study at Unitec, regardless of programme. The prior activities of students enrolled on the BEngTech(Civil) and NZDE(Civil) during 2010 to 2019, are shown in Figure 14.
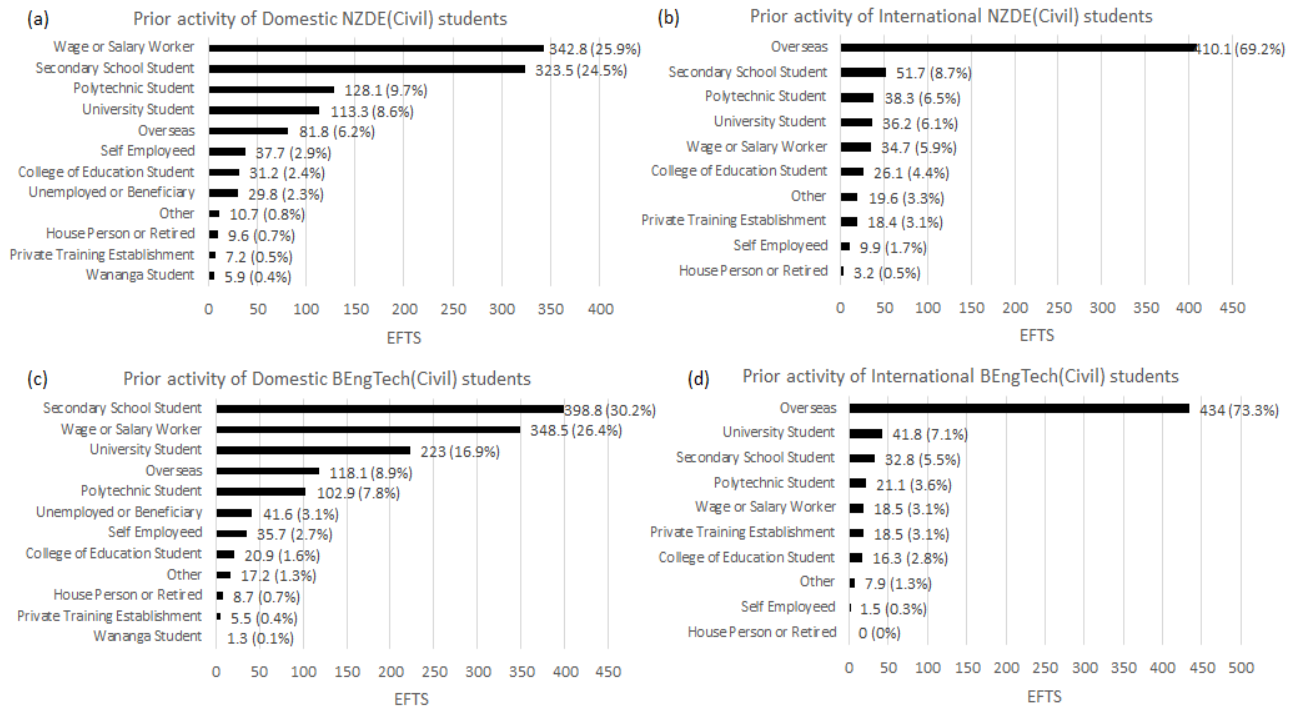
Figure 14. Prior activities of (a) domestic NZDE(Civil) students, (b) international NZDE(Civil) students, (c) domestic BEngTech(Civil) students and (d) international BEngTech(Civil) students.

A plurality of domestic NZDE(Civil) students (25.9%) come from a wage or salary background. Former secondary school students also make up a significant percentage of the domestic NZDE cohort (24.5%). For the BEngTech(Civil), 30.2% are from a secondary school background, followed by wage or salary background (26.4%). Most international students arrived at Unitec straight from overseas (69.2% for the NZDE and 73.3% for the BEngTech).

To simplify the investigation of prior activity and educational performance, the following broad groupings of activities are adopted and presented in Table 3.

Tertiary education	Secondary school	Workforce	Unemployed	Overseas
College of Education Student	Secondary School Student	House Person or Retired	Unemployed or Beneficiary	Overseas
Polytechnic Student		Self Employeed		
Private Training Establishment		Wage or Salary Worker		
University Student				
Wananga Student				

Table 3. Grouping of prior activities.

Course success and GPA associated with prior-activity group, for degree and diploma, and international and domestic students, are shown in Figure 15.
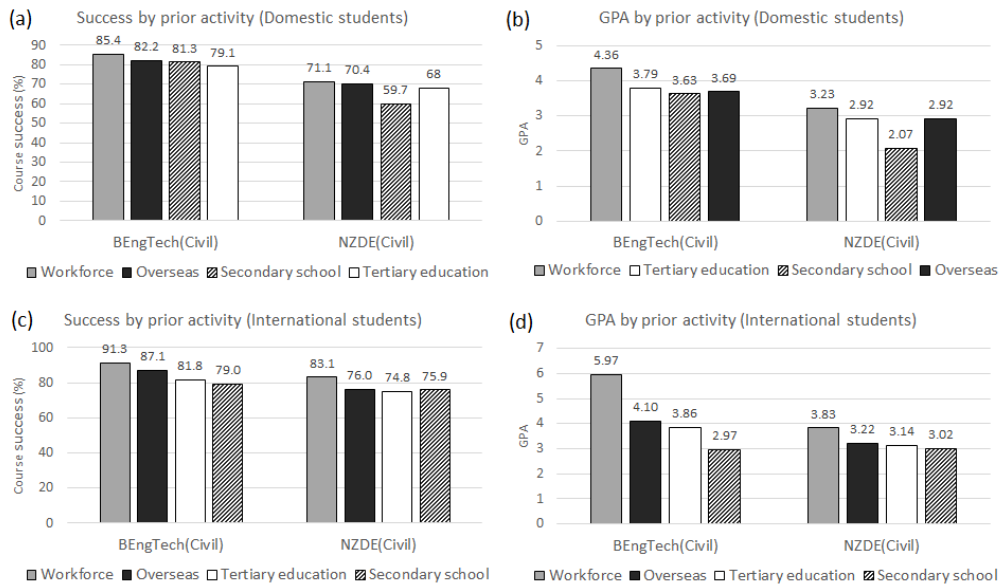
Figure 15. Course success by prior activity of (a) domestic BEngTech(Civil) and domestic NZDE(Civil) students, (b) GPA by prior activity of domestic BEngTech(Civil) and domestic NZDE(Civil) students, (c) course success by prior activity of international BEngTech(Civil) and international NZDE(Civil) students, (d) GPA by prior activity of international BEngTech(Civil) and international NZDE(Civil) students.

From Figure 15, students who arrive from the workforce, regardless of whether they are domestic or international, have the highest rates of course success on both programmes. Students from the workforce also significantly outperform other students when it comes to GPA. Students arriving directly from overseas, whether domestic or international, also have high rates of success on both programmes.

Age of students

The ages of civil engineering students (based on enrolments between 2010 to 2019) are shown in Figure 16. Note that the *age* given is the age at the beginning of the semester for the relevant course studied. The distributions are weighted by EFTS. As would be expected, the mean age and median age of BEngTech students is higher than that of NZDE students. The spread (standard deviation) of the age distributions is similar for both groups.
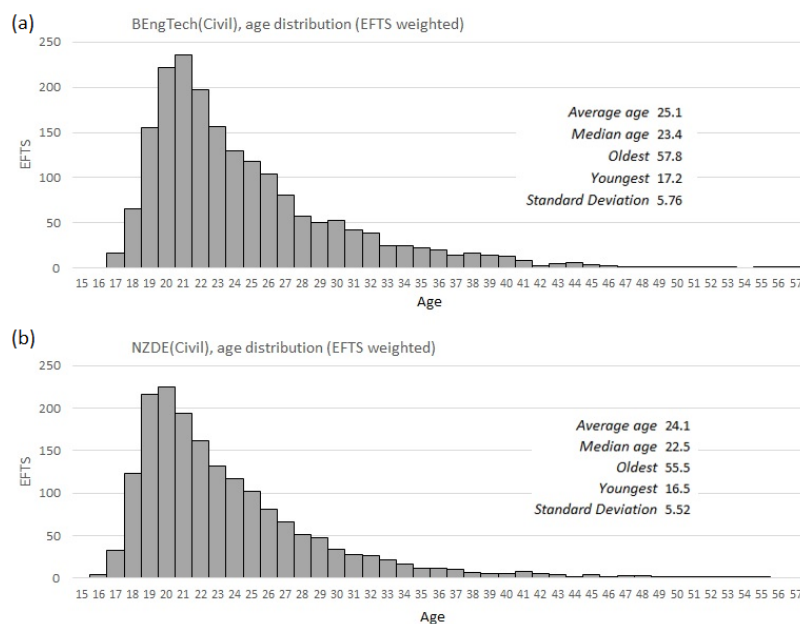
Figure 16. EFTS-weighted age distribution (at start of course) for (a) BEngTech(Civil) students, and (b) NZDE(Civil) students.

Success and GPA are plotted against age (excluding those age ranges with fewer than 30 enrolments) and presented in Figure 17. Age and educational performance are seen to be highly correlated.
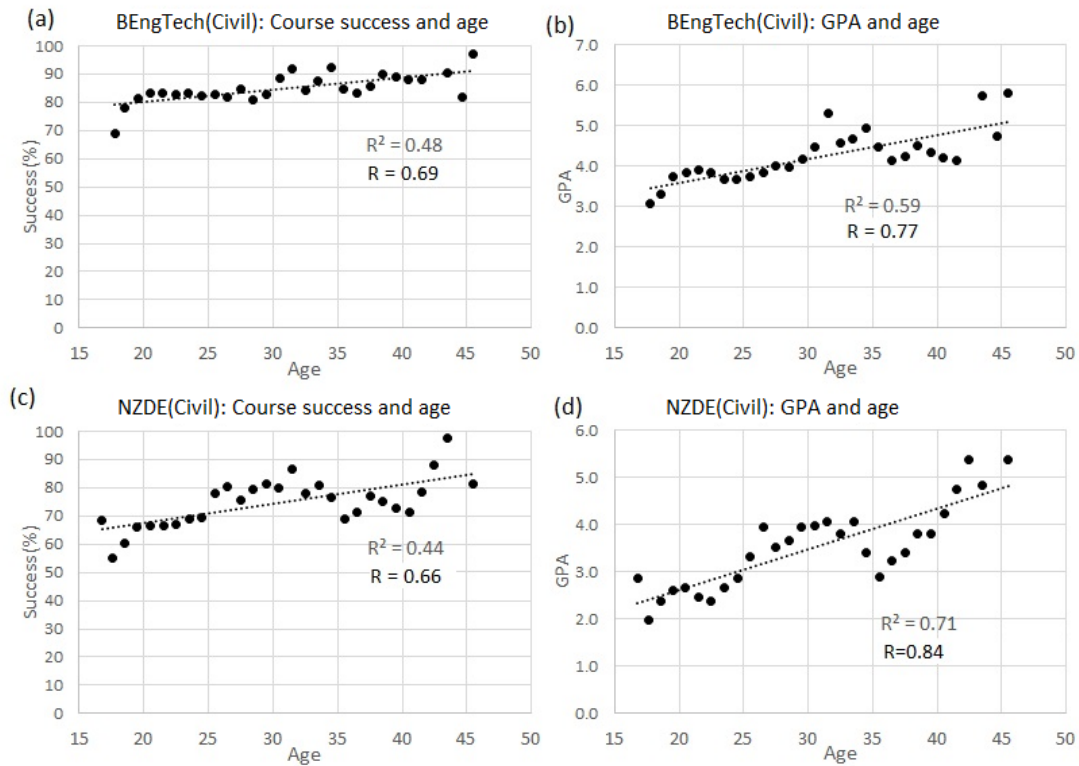
Figure 17. Educational performance and age for the BEngTech(Civil) in terms of (a) course success, and (b) GPA, and NZDE(Civil) (c) success, and (d) GPA.

Domestic under-25 students are a priority group when it comes to improving educational performance (Unitec, 2019–2020). There are significantly more students in this age range than older than this group. Enrolment figures in terms of EFTS are shown in Figure 18.
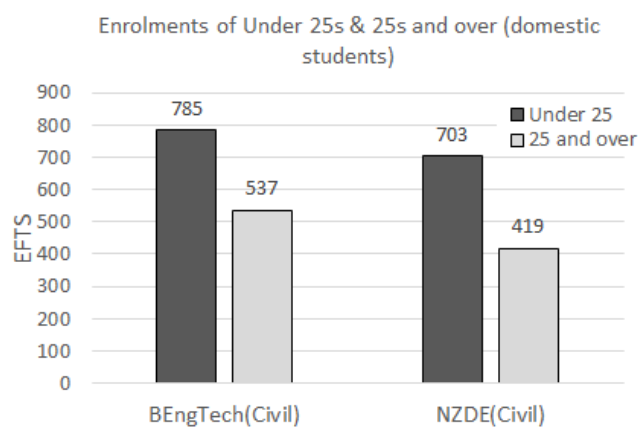
Figure 18. Domestic enrolments by age, for under-25s, and 25s and over.

Figure 19 compares educational performance for under-25s, and 25s and over.
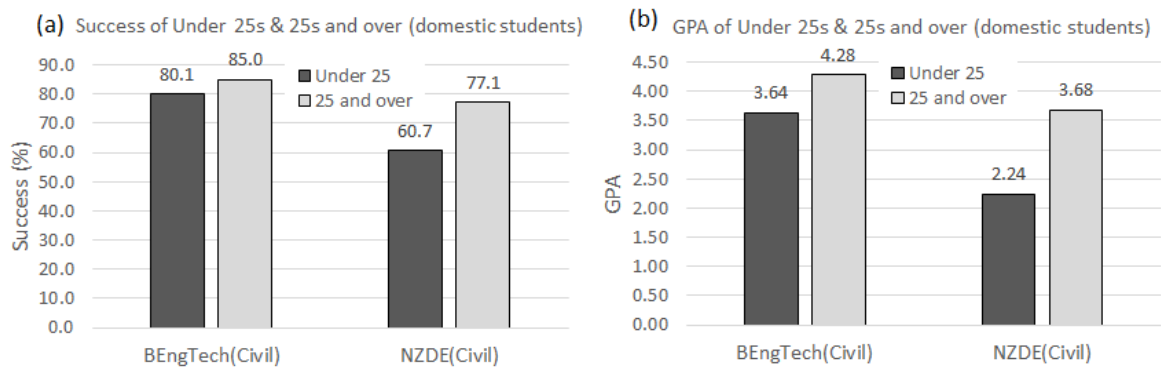
Figure 19. Educational performance for under-25s, and 25s and over.

As expected from the strong correlation of age with educational performance, under-25s underperform compared with their older counterparts.

Part-time or full-time study

Part-time students are those students who enrol in three or fewer 15-credit courses a semester. Full-time students are enrolled in four or more 15-credit courses a semester. The enrolments from 2010 to 2019 associated with part-time and full-time study are presented in Figure 20. Note that as international students are rarely involved in part-time study (just 125 of 1240 EFTS), only the figures relating to domestic students are displayed. Around 23% of domestic enrolments are of students studying part time.
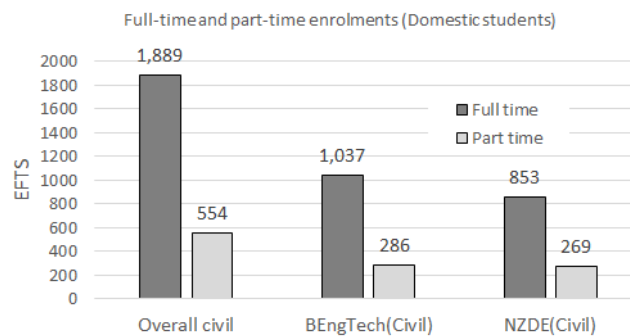
Figure 20. Domestic students in full-time and part-time study.

Figure 21 compares the educational performance of full-time with part-time students. Clearly, full-time students tend to perform better than part-time students, particularly those enrolled in the NZDE(Civil).
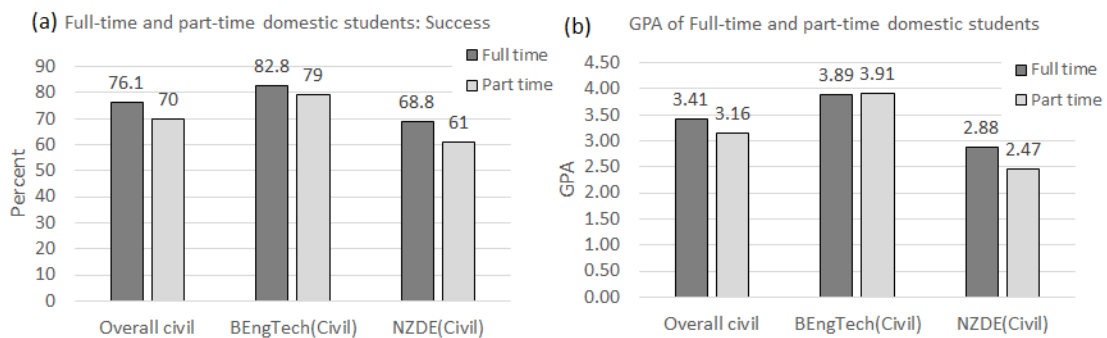
Figure 21. Domestic students in full-time and part-time study; (a) course success, and (b) GPA.

Educational performance and retention (2010 to 2019)

The relationship between educational performance and semester of study on the NZDE is shown in Figure 22. Figure 22 (a) shows the educational performance of students on the NZDE with increasing semester of study. Figure 22 (b) shows the same, but only for those students *who ended up studying for the minimum required four semesters* of the NZDE.
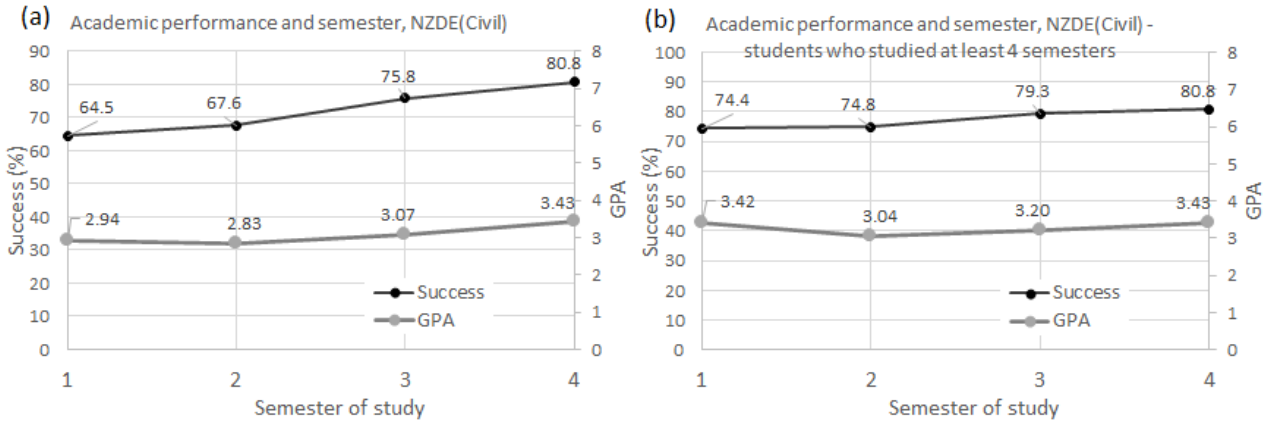
Figure 22. Educational performance and semester of study for (a) students who commenced studies at Unitec in the NZDE(Civil), and (b) only those students who commenced studies at Unitec in the NZDE(Civil) and studied for four semesters.

Educational performance, in the aggregate, increases significantly with increasing semesters of study (Figure 22 [a]). However, if only the results of students who ended up completing four semesters are included, educational performance appears to be consistently high over time (Figure 22 [b]). It would appear, then, that over time the performance of most students does not improve, but rather overall results are kept down in the initial semesters by poorly performing students. When these students drop out, the average performance subsequently lifts.

This is also seen for the BEngTech(Civil) (see Figure 23). Students in the first semester of study have an overall course success of 76.9%. This consistently improves with increasing semesters, to 92.4% in Semester 6 (see Figure 23 [a]).

However, if only the results of students who study the minimum six semesters required for completion are considered, educational performance over time does not improve significantly, but instead remains high over time (Figure 23 [b]).
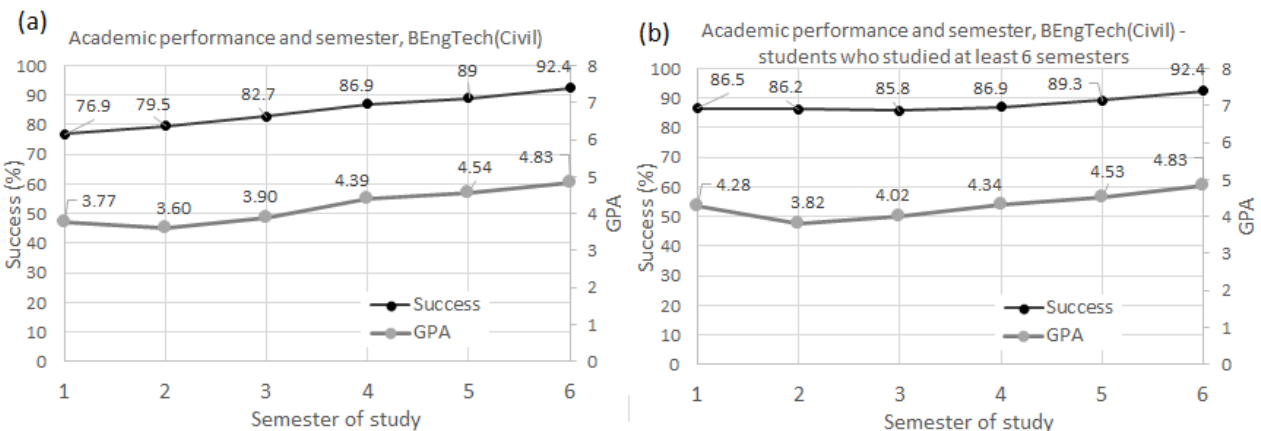
Figure 23. Educational performance and semester of study for (a) students who commenced studies at Unitec in the BEngTech(Civil), and (b) only those students who commenced studies at Unitec in the BEngTech(Civil) and studied for six semesters.

The retention rates of students who started a civil engineering programme during the period under study are shown in Figure 24.

Retention and semester of study (head-count)
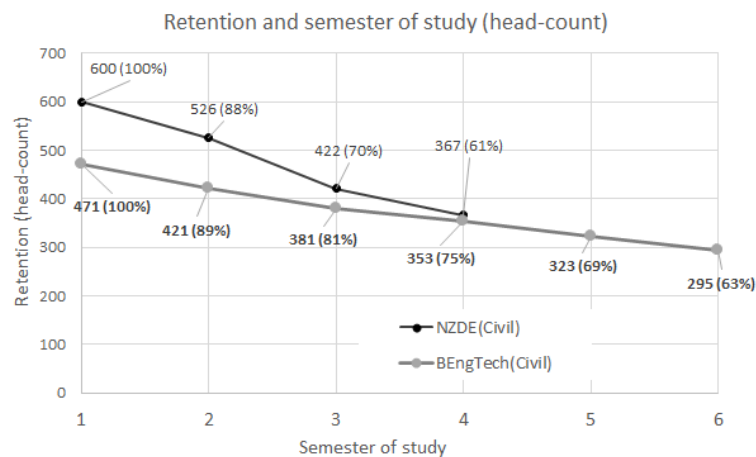
Figure 24. Retention of civil engineering students (2010 to 2019).

After two semesters of study, the NZDE loses 30% of its original cohort, and the BEngTech(Civil) loses 19%. The performance of the students who drop out after one or two semesters (within the first year) of study are shown in Table 4.

	BEngTech(Civil)		NZDE(Civil)	
	Success (%)	GPA	Success (%)	GPA
Retained after 2 sems	84.1	3.96	72.4	3.17
Dropped out after 2 sems	39.2	1.73	45.8	1.98

Table 4. Educational performance of first-year retained students compared with non-retained.

As expected, the performance of the retained students is very much higher than that of the non-retained students. If the results of the non-retained students are removed from the dataset, first-year success would be as high as 84% for the BEngTech(Civil) and 72% for the NZDE(Civil).

An understanding of why students drop out of civil engineering, particularly in the first year of study, would be particularly useful in coming up with measures to improve overall success.

CONCLUSION AND RECOMMENDATIONS

Key findings on demographic characteristics and how they relate to educational performance (2010 to 2019) are presented below:

1. International students typically outperform domestic students academically.
2. International Pasifika perform the best among international students, while students from the Middle East struggle compared with students from other nationalities.
3. Of domestic students, students of Asian ethnicity are a plurality (37.4%).

4. Pasifika students' representation among domestics (12.8% of EFTS) is quite close to their representation in the West Auckland community (14%).

5. Māori comprise just 5.8% of the domestic cohort and appear to be underrepresented, given that 12% of West Auckland identifies as Māori.

6. The highest-performing group among domestic students is European.

7. Māori, despite their underrepresentation in the domestic cohort, consistently perform close to Europeans in terms of course success.

8. However, domestic Pasifika success lags significantly behind that of other ethnic groups. Within this group, Pasifika permanent residents outperform Pasifika New Zealand citizens.

9. Female students are significantly underrepresented in civil engineering, at around just 12% of overall EFTS (future research could focus on how Unitec fares in this regard compared with other New Zealand technical institutes and universities, and whether the number of female teaching staff is a factor when it comes to increasing female enrolments).

10. However, female students outperform their male counterparts academically, particularly international female students, who have a course success rate of 87.4%.

11. Most international students (around 70%) come directly from overseas prior to studying civil engineering at Unitec.

12. A significant proportion of domestic students arrives straight from the workplace – around 30% of enrolments for both programmes.

13. One quarter of domestic BEngTech(Civil) students comes directly from a New Zealand secondary school. The figure for the NZDE(Civil) is 24.5%.

14. Students arriving directly from the workforce perform well academically compared with other students. This applies in the case of both domestic and international students, and across both programmes.

15. Educational performance correlates strongly with age of students. Older students tend to perform better than younger students. For example, on the NZDE(Civil), 25 and older students have a course success rate of 77.1%. For under-25s it is 60.7%.

16. Full-time students on both programmes tend to perform better than part-time students. The gap in performance for the NZDE(Civil) is significant – 68.8% course success for full-timers compared to 61% for part-time students.

17. Students who end up completing either the BEngTech(Civil) or NZDE(Civil) qualification tend to perform consistently well academically, from the start to the end of their studies.

Future research on those students who drop out after one or two semesters of study is a possible 'low-hanging fruit' when it comes to improving overall educational performance of the two civil engineering programmes. Funding to comprehensively explore the background of these students before they start their studies, the reasons they leave their studies and their destinations after leaving their studies, could allow improvements to be made to selection criteria, and support of at-risk students during the early period of study.

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AUTHORS

Dr Wei Yuen Loo is a Senior Lecturer in Civil Engineering at Unitec New Zealand. He received his PhD in Civil Engineering from the University of Auckland in 2016. His main research areas are structural and earthquake engineering, with a particular interest in the numerical simulation of structures placed under seismic loading. Dr Loo has authored academic papers published in leading internationally ranked journals in the field.

Dr Lusa Tuleasca is a Senior Lecturer in Civil Engineering at Unitec New Zealand. She received her PhD in Structural Engineering at Gheorghe Asachi Technical University, Iasi, Romania, in 2000. Her main research interests are in the field of structural and earthquake engineering, including the assessment of buildings affected by earthquakes, and the performance of steel-fibre reinforced concrete. Dr Tuleasca has co-authored and published two technical books, and a number of journal and conference papers in the field of structural engineering.

HOW DO I TAKE STORYTELLING INTO THE DIGITAL WORLD?

JO PERRY

ABSTRACT

Stories are what we humans tell to make sense of the world (Lambert, 2012). They are how we come to understand the events we encounter and environments that we live and work in. This project came about as I recognised the changing teaching contexts of the past few years and reflected on how I continue to engage in storytelling, as I always have done in my teaching practice, in the blended and online environments in which I now find myself working. The intention was to explore whether and how the process of storytelling could be taken into the digital world or whether it was so dependent on being part of a relational, person-filled, face-to-face classroom that this crucial element of my practice must be left behind. It was initially an inquiry into personal practice and so was clearly consistent with self-study methodology. The methods used were a reflective journal, a group of critical friends and an anonymous survey to gather feedback from the students. The findings showed that it is possible to continue using this age-old strategy, however it is in a different style and format. The 'time' issues of putting teaching online in the short space of time demanded by the first Covid-19 lockdown of 2020 impacted on being able to more fully explore this topic but also offered an impetus to 'try things out' more quickly than might have otherwise happened.

KEYWORDS

storytelling, digital storytelling, self-study methodology

INTRODUCTION

Storytelling is part of the way humans interact with each other (Smeda et al., 2014). Lambert (2012) explains: "We are perpetual storytellers reviewing events in the form of relived scenes, nuggets of context and character, actions that lead to realisations" (p. 6). These traditions, both oral and written, have long been the way important events have been held in memory and folk lore. Schwartz (2012) also emphasises the human element, reminding us that "humans are the only species known to write and rewrite the story of their lives depending on evaluation of past events, the present and the anticipated future" (para. 3).

BACKGROUND

I learned about telling stories first from my father and grandmother, as they used stories to teach me about their families and the context and environment in which we were living. They produced many early photographs of life for them from the later years of the 19th century onwards. It had the effect of making me feel as if I belonged in a place where I could situate myself in time and history. Second, and at the same time, other people told me stories from their work as teachers, in their interactions with learners as well as the content they were trying to get across. These streams of narrative have influenced how I use stories in the classroom with colleagues and student teachers over the years. I have told such stories to explain, give examples in practice, or to introduce something new, in many classrooms. What I have come to know about this process is that always, somewhere in the room, one or two people start smiling and nodding and wanting to tell me similar events from their own lives. But more, they make eye contact and there is an instant sense of connection and familiarity from the same experiences.

What this shows is that I am a storyteller, I have always used stories and they are an integral part of the act of teaching for me. They aren't something I necessarily plan for as I consider the lesson, but in the discussions and amongst the content, they emerge as I remember parts of my practice I can use to better explain. Such stories have also been used as examples to teach about and learn from previous events. Nguyen and Nguyen (2018) tell us that "storytelling is a process where students personalise what they learn and construct their own meaning and knowledge from the stories they hear and tell" (p. 69).

However, in recent years, the move to online learning, where I am not engaging in physical classrooms in one-to-one conversations, has taken over the way that I operate as a teacher. It has led me to question and to reflect at length about how to take storytelling, as I have always used it, into this new way of being. As I began my investigation into the best way to digitise the stories I told and how to then narrate them, the world was swept up in a pandemic and New Zealand went into the first Covid-19 lockdown in March 2020.

LITERATURE REVIEW

The literature for this topic focuses on a number of themes, including: first, the definition of the term; second, the crucial link to the human experience; third, the creation of 'the other'; fourth, memory and sense making; and, finally, the digitisation process itself. In all of it, the important point is that storytelling is not new and is a core part of our social history and the way we learn in our societies and cultures.

First, the literature focuses on different elements of digital storytelling in developing definitions for what a digital story is. Normann (2011) suggests a "digital story can be viewed as a merger between traditional storytelling and the use of multimedia technology" (p. 125). Christiansen describes them as "short, personal narratives that use still images and music captured through the use of digital media" (2011, p. 290). She goes on to describe digital stories as "a learning resource … an emotional resource … a reflective experience … a transformative experience" (p. 291). Ohler, however, situates digital stories in their much older, very human history when he explains:

> … we use the powerful new tools we take for granted to satisfy our ancient need to give voice to our narrative, digital stories are simply the latest manifestation of one of human kind's oldest activities: storytelling. (2013, p. 9)

A second major theme in introducing this topic is its positioning as part of what it is that makes us human. Christiansen describes storytelling as "a uniquely human experience through which people make sense of past experience, convey emotions and ultimately connect with each other" (2011, p. 289). Kandal (2006) links stories to personal and collective values from the past that are applied to now and the future and new ways of living. In this point, he links together the stories of our pasts and how they have combined to create a personal identity. Hessler and Lambert also acknowledge stories that:

> … come from a place of deep insight, and with a knowing wink to their audience, and stories that tease us into examining our own feelings and beliefs, and stories that guide us on our own path. But most importantly, stories told as stories, that honour the simple idea that we want to relive what the author experienced in time and space. (2018, p. 54)

A third area in the literature is that the use of both storytelling and digital storytelling is strongly linked to documentation of social justice and the creation of 'the other' (Condy, 2015; Marsden et al., 2011). Engaging with digital stories also enables us to consider how understanding our sense of 'the other' impacts what we do in many areas of our lives. Documenting both the process of creation and the story itself leads to this new knowledge emerging. Carr calls this the "impact of social dislocation" (2010, p. 12) and a part of both our "rooted identity" and our "global identity" (p. 12). We encounter cultures and identities that are perhaps very different to our own, and in creating narratives of these events we "reframe how we see ourselves and our personal worlds" (p. 12). Christiansen also describes how digital stories can "draw us into the world of another [through] unsettling emotional experiences" (2011, p. 290), and in this way we come to see 'the other' through different lenses. Ladson-Billings describes this process with digital stories enabling "teacher candidates to reflect on their practicum experiences in

diverse classrooms" (2000, p. 209) and on the way they create themselves in terms of 'the other.' This links to how digital stories add to the way we remember, reframe and make sense of our lives. Stewart and Gachago suggest that "at the core of the digital storytelling process is the belief that telling stories can impact how people engage with each other across difference, which can lead to wisdom, compassion and awareness" (2014, p. 531).

Fourth, Ohler suggests that "stories allow us to take snippets of life and put them together in ways that make it possible for us to learn and remember new things" (2013, p. 9). More specifically for the teaching and learning process, Lynch and Fleming explain:

> … the flexible and dynamic nature of digital storytelling, which encapsulates aural, visual and sensory elements, utilizes the multitude of cognitive processes that underpin learning, from verbal linguistic to spatial, musical, interpersonal, intrapersonal, naturalist and body kinaesthetic. (2007, p. 7)

In other words, it is not just the single voice narrating the events, but many other elements drawn in to give the story depth and breadth and to reach out to the affective in the audience. Kandal reminds us that learning is partly about creating retention of the content, and that it is "stronger with affective connections" (2006, p. 9). Finally, educator Daniel Meadows suggests, "In a digital story, photographs discover the talkies, and the stories told assemble in the ether like pieces of a jigsaw puzzle." He goes on to say that digital stories are a "gaggle of invisible histories which, when viewed together, tell the bigger story of our time." The beauty of them being digital is that we can share them all over the world and in this way they "define who we are" (Educational Uses of Digital Storytelling, n.d., para 4). Condy (2015) also describes digital stories as characteristically just a few minutes long but able to reach a wide audience.

The seminal work on digital stories came from Lambert (2012) when he put forward the idea that digital stories lend themselves to capturing small individual stories but the patchwork of multiple stories that can then be pieced together creates history, tradition and community. He suggests that such stories are a one-way process in which one side is a passive receiver of content, ideas and concepts that need to build in a step-by-step process that sticks closely to the message being given. However, in reviewing this idea of passivity in the process, it may be possible to see digital storytelling more as a two-way process, with the creator telling the story and the audience listening and reflecting on the events and creating meaning for themselves.

In this way, for both narrator and audience it becomes more of a synthesis of emotion and individual, personal change as the listeners make connections to their own experiences and recognise the familiarity of responses in the story. In this process, the listener creates and recreates their identity as they reflect on and describe experiences to others. Carr also suggests that:

> … the process of identity construction in the 21st century will be accelerated, fluid and dislocating as has been virtually all aspects of our current economic and social experience within our societies. Digitizing the process of storytelling then adds wider layers of possibility where once the only canvas was imagination. (2010, p. 12)

He goes on to describe a process of "reframing personal myths" (2010, p. 12) in many different possible identities that are very much open to personal choice and perspective.

In summation, the literature supports the idea that digital storytelling, part of the storytelling tradition, can open new perspectives, content and ways of seeing the world that are useful in the classroom.

METHODOLOGY

Methodology is a system of ways of finding out something and is chosen to support what the investigator wants to know. The intention with this project was to explore an area of my own practice. The focus was on whether and how the process of storytelling could be taken across the divide between face-to-face and online classrooms. I wanted to find out whether storytelling, this crucial part of my practice, was either too dependent on being part of a face-to-

face classroom to survive the move to online learning or whether I could develop a strategy to enable the move. The project was then about my practice and adding elements to it that would improve it moving forward. This made it consistent with self-study methodology. Loughran and Northfield (1998) explain that:

> Reflection on practice and self-study are becoming important components of the push for close scrutiny of an individual's pedagogy in teaching about teaching, and they are linked to ideas about the development of knowledge through better understanding of personal experience. (p. 7)

Samaras suggests that building such knowledge "may be initiated when teachers pose purposeful and applicable questions about their practice that empower a reforming change in the first person" (2011, p. 42). She goes on to say that "self-study teachers initiate questions about their own practice, which they generate from observations of and personal experiences within their classrooms" (p. 43). My focus on exploring how to take stories into the digital environment was also supported by Hamilton and Pinnegar, who explain, "Research on teaching practice by teachers holds invaluable promise for … producing new knowledge about teaching and learning" (1998, p. 243).

The research question was: "How do I take storytelling into a digital world?" At the start of the lockdown I added a sub-question: "What is the best way to create digital stories to support teaching and learning in fully online environments?"

I used a research journal to capture my thinking about the process I was working with and how I evaluated it. Research journals are an important element of self-study as they enable the practitioner to capture what happens and subsequent reflections on the events (Loughran & Northfield, 1998). As self-study methodology focuses on a single perspective, critical friends added their voice to the conversation about the best process to enable storytelling (in the way that I engage with it) to work in the digital sphere. They also empowered critical questions about what I was thinking, instead of just accepting my own perspective. I also invited feedback from the students through an anonymous survey, to answer whether what I was doing had some validity for their learning. Ethical approval for the project was given at the end of 2019.

PHASE ONE: WHERE TO START

Narrative of the cycle

Having worked out what I wanted to know and how to find out, the next question became where and how to start. I knew there were probably many different pieces of dedicated software but, given the speed of the pandemic's impact and the very short time-frames until teaching online began, I wanted something simple and familiar. PowerPoint seemed the easiest, as I used it all the time and knew how to make it into a video. I started with one person's learning journey as an example for one of the students' assignments. The topic was a story I knew about and had the still images that Christiansen (2011) importantly talks about and so it was simple to chose the ones that might fit into the PowerPoint. However, it took a whole day to get the animation and the design right for one two-minute video, which seemed a long time for something so short.

Findings

As I played the video back and reflected on what I could see, I journaled what I knew at that point:

- "I hadn't really planned it so it took a long time to create" (Research Journal [R. J.], p. 16).
  This was important, as there were many other demands both at that particular time and in preparation for 'normal' teaching, so it needed to get faster to be useful.
- "The story was in my head but clearly not in the video" (R. J., p. 17).
  Meadows (Educational Uses of Digital Storytelling, n.d.) discusses the importance of the story itself, and it was very clear at this point that I needed to make it all much more systematic and the elements of the story clearer.

My role as a storyteller in a physical classroom meant I could add and change things as I went along depending on the response of the audience. I needed to think very carefully about the elements that made up a story for the online environment as there would be no visible immediate response to guide me.

- "It was very flat. I usually tell stories using tone of voice, gestures and facial expressions that reach the affective zone for my listeners and make it three-dimensional" (R. J., p. 19).

  That clearly wasn't present in that first video, which was nothing like I had imagined. In terms of my research question, I had not really given enough thought to the differences between the physical and online classrooms in terms of storytelling. It was clear that I needed to think the whole story through, decide on the important points and find relevant pictures before I began.

PHASE TWO: THE ELEMENTS OF THE STORY

Narrative of the cycle

Based on the first cycle, I went back to the same PowerPoint, but before starting anything, I planned what I wanted it to look like. The process of 'storyboarding' was simply to think about each part/slide of the video as an individual element. For this video, I wanted to introduce a content topic so we could get into discussion straight away in the online session. To do this, I went back to how I teach this part of the class and the questions I usually start with in a face-to-face environment. As a result, I used the 'callouts' in MS Word Shapes to add a narrator or 'voice' for the story on each slide, and as a simple way of actually 'telling' the story. The learner was a doodle character who added the voice and emotions of the audience responding to the narrator (Rohde, 2012). Music was also part of this video, which made a noticeable difference to the finished article (Ohler, 2013).

Findings

My journal entry for this moment focuses on my response:

- "By adding a 'voice' element, music, and beginning with storyboarding the story element came through and the final artefact was much more three-dimensional" (R. J., p. 24).

  In some ways, in thinking about the way I told stories in the classroom, it occurred to me that I had not considered the process I went through to develop them. I only knew that this process consisted of a lengthy telling and retelling of the story in my head to choose the right words in each part.

- "It still took a very long time to make something really short in the overall teaching plan" (R. J., p. 26).

  Time was still very much an issue in a very pressurised environment.

Returning to the research question at the end of this second cycle, it was becoming evident that the process of creating a story for the online environment was a precise and conscious one. This was very different from the face-to-face versions that emerged to give examples or to explain, and then faded back into the conversation. Online stories would have to stand alone.

PHASE THREE: HUMAN VOICE

Narrative of the cycle

One weekend I found some very evocative digital stories using single photographs and a human voice to tell personal stories about family. To try out this idea, I wanted to use a topic where the personal voice would be very important to the story. I decided on making a mihi (a formal Māori greeting) into a digital narrative so that I could

introduce myself to my new learners if we were still online at the beginning of the next semester. In this phase, I started with single photographs, including one of me, and added quiet music and my own voice.

Findings

My journal at this time records the following:

- "Creating a video with two audios was by far the most complex to accomplish and, yet, it seemed the closest to traditional storytelling that I had found" (R. J., p. 28).
  The two audios made the finished product very personal and exactly how I would want my mihi to be. The impact of the human voice made the digital story dramatically different.
- "In this version, I was consciously aware of using all of the traditional elements of telling a story" (R. J., p. 28). In terms of the answer to my research question, realising this was very comforting as I could now see that storytelling could be brought into the digital environment, but it was going to look different. In particular, it needed to be incorporated into the content but also to stand alone and have enough included for learners to be able to follow easily. It couldn't be the more dynamic version that I often changed as I went along.

THE STUDENT VOICE

The research plan had also involved an anonymous survey of the students to gauge their thoughts about the little videos, at the end of the first semester of teaching and learning online. There were 30 students in this Level 4 class, with many different age groups (school leavers to grandmothers) and ethnicities including Māori, Indian, Chinese, Sāmoan, Fijian and European.

I asked one question in the survey:

- "Did the videos help you to understand the content of the class?"

I received eight replies to the survey, and although this was a small sample the range of feedback was similar in content:

- "The video presentation about Dispositions is really helpful to give more understanding about it" (Student 1)
- "It was simply and easy to understand" (Student 2)
- "Videos are very helpful and a more exciting way of gathering information instead of having to read things all the time" (Student 3)
- "I loved them, they were amazing, easy to understand and delightful" (Student 4)
- "It was nice to experience more outgoing things" (Student 5)
- "Very informative! Also the pictures with the words is great" (Student 6)
- "I enjoyed it and found it helped for me to have a better understanding" (Student 7)
- "[I]t was good and made my understanding more clear and easy" (Student 8)

It was clear from the positive nature of the comments and their focus on how much the learners understood from watching, that the videos helped them better understand the content for the class. Importantly, this was the very reason I have always used stories in physical classrooms. Although it was still taking time to make something quite small it was clearly a valuable way to support understanding.

DISCUSSION

In this project, the importance of the findings for my practice were really clear. First and foremost, I had found a way of recreating the same little stories that I had always used in practice. However, now they looked very different. Instead of emerging from the unplanned flow of conversation as they had done in physical classrooms, they were now a very specific, intentional and planned process, much as Hessler and Lambert (2018) describe. They emerged from a different part of the planning process in the time before the class, rather than as the class went along.

Second, stories could still be utilised as examples of content-in-action as previously but, again, they had to be part of the pre-session planning, not something that just emerged from the conversation. In this way, they could be set up for specific points in the lesson: at the beginning as the introduction, for example, the first part of flipping the classroom (Bergmann & Sams, 2012), or at the end as a synthesis of the session. They also didn't need to be tied to the students' Learning Management System. As short videos they could be sent to the students using mobile technology.

Third, the important point is that the use of 'voice,' or, as Alismail calls it, "the gift of your voice" (2015, p. 127), really personalises the point the story is trying to make. The human voice brings back the idea of the human narrator and links back to what storytelling has always been before the digital environment invaded classrooms.

Fourth, stories also met the needs of learners with different learning styles, as the feedback from the students indicated. The visual nature of the presentation of the content seemed to help the students understand what the sessions were about better than just reading. Ohler suggests that "they combine traditional and emerging literacies" and, in this way, reach out on many levels to the students (2012, p. 12). As Christiansen suggests, "Their creation requires patients [learners] to actively engage in making sense of their experiences but also enables them to present a point of view to be communicated" (2011, p. 290).

CONCLUSION

This research project was about an integral part of my practice that was changing as the digital world gradually emerged in my classroom. However, storytelling was more than just a teaching approach, it was a core part of both my personal and teacher identities and without it, both would be devalued. The first lockdown of 2020 meant that the project took on new importance as teaching moved fully online. Drawing from the literature for some guidance, it was clear that digital storytelling was just the newest reinvention of an age-old tradition, and one that could add many more layers of nuance with music and visuals stitched together in different ways to act on the physical, cognitive and affective responses. It could also engage with issues of 'other' by reimaging personal perspectives. The three phases of research showed the importance of the elements that make up a story and how the story itself must be clear enough to easily engage with. There were also ways of reaching out to affective responses from the listeners, as with the effect of adding music. However, more than anything, the continuing use of the human voice talking to the audience created the most powerful version of this teaching tool.

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AUTHOR

Jo Perry is a Senior Lecturer and Academic Research Lead in the School of Education at Manukau Institute of Technology. She teaches in two early childhood teams in the Certificate Level 4 and the Bachelor of Education. Her research interests are the processes of teaching and learning, educational technologies and teaching in the 21st century, and research pedagogies.

MUTUAL FUND RESOURCE MOBILISATION AND PERFORMANCE – BEFORE AND DURING COVID-19

SWATI KUMARIA PURI

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ABSTRACT

This study provides an analysis of the flow of funds and the performance of top-performing mutual funds and index funds in the New Zealand mutual fund industry before and during Covid-19. The paper examines the initial impact of Covid-19 on resources mobilised and on the performance of mutual funds and index funds in New Zealand by using a variety of statistical tools. The empirical results exhibit that the impact of Covid-19 could be seen on the inflow of funds when the pandemic was declared as there was a sudden downfall in funds mobilised, breaking the increasing trend of previous years. However, the drop was not dramatic and the funds deployed in the mutual fund industry continued to rise again in the next quarter. Findings related to the performance of selected mutual fund schemes reveal that there was a tremendous fall in the average return and performance of funds in March 2020, indicating the impact of Covid-19, but the returns increased in the next quarter with funds starting to perform above the selected benchmark. The study reveals that although the pandemic led to an initial decrease in the performance of selected mutual funds, investors continued to make investments, indicating ample trust in managed fund companies and sustainability in the mutual fund industry.

KEYWORDS

mutual fund industry, risk–return analysis, performance evaluation, funds mobilised, Covid-19

INTRODUCTION

There was a widespread panic across the global financial markets when the World Health Organization (WHO) declared Covid-19 a pandemic. Zhang et al. (2020) reported a substantial increase in volatility in global markets. Goodell and Huynh (2020) studied the US industry-level market reactions, which led to an increase in risk in the US in the face of the Covid-19 pandemic and Covid-related news announcements. Yarovaya et al. (2020) analysed the response of various investments, such as equity, bonds, precious metals and cryptocurrency markets, to the Covid-19 shock, and concluded that there were different patterns of reaction and recovery across different asset classes and within each class of asset. Rizvi et al. (2020) reported that there has been a change in investment styles of fund managers and mutual funds' performance in the EU during the Covid-19 outbreak.

Although the New Zealand mutual fund market is one of the smallest markets in the world, and the number of mutual fund schemes in New Zealand is below international averages, there was a downfall in the performance of mutual funds in New Zealand during Covid-19. This paper explores this further and investigates the performance of mutual funds and resource mobilisation in the mutual fund industry in New Zealand before and during Covid-19.

LITERATURE REVIEW

Studies relating to mutual fund performance

The majority of early studies on mutual funds assessed funds based on the return they provided to investors. It was not until the 1960s that the portfolio theory was developed, and quantification of risk was carried out, and since

then various studies have been undertaken that have evaluated the performance of funds not only in terms of rate of return but also in terms of risk-adjusted rate of return.

Treynor and Sharpe measured the performance of various mutual funds based on risk. Sharpe (1966) used total risk to evaluate the performance of mutual funds. He used a statistical technique that has a multi-index model which states that the return of a portfolio is linearly related to a series of factors, and concluded that mutual fund performance is inferior to market performance when expenses related to mutual funds are taken into consideration. Treynor (1965) gave a framework of measuring risk, mainly systematic risk, to evaluate the performance of equity funds and gave an index, termed as a reward to volatility ratio. The higher value of Treynor's ratio indicates better performance of a mutual fund.

Henriksson (1984) based his study on market timing. He took a sample of 116 open-ended investment schemes and evaluated their performance. He reported that the fund managers had unsatisfactory market-timing skills while making investments. Fama and French (1992) studied the cross-sectional variation in average stock returns in relation to size, leverage, book-to-market equity, earning–price ratios and market beta. They found that the relation between market beta and average returns is flat when the tests allow for variation in market beta that is unrelated to size.

Ferson and Schadt (1996) developed a model to understand the performance of mutual funds. They suggested that the excess returns are associated with three variables: benchmark market index; lagged dividend yield; and lagged Treasury bill rate. Zheng (1999), in his study on the performance of mutual funds, found that the mutual fund portfolios that receive more money perform better than the ones that lose money.

Carhart (1997) found that there was no persistence in the performance of mutual funds in the long term. Further, lowest decile funds were poor performers for a continuous period of time. His study supported Hendricks et al.'s (1993) results of a short-term persistence in stock returns. Grinblatt and Titman (1989) studied the holdings of various mutual funds to determine the performance of the funds. They found that correct choices made by mutual fund managers, especially in growth funds, resulted in positive returns. Carhart (1997) reported that there is a difference in the performance of various funds because of their relative size and value. Chan et al. (2002) found in their study that mutual fund companies while making investments adopt those positions that are close to the index. Those who take positions away from the market benchmark are the ones who favour growth stocks or the ones who have emerged as winners in the past. There is evidence that growth managers outperform value managers.

Studies relating to mutual fund flows and stock market returns

Warther (1995) examined the relationship between funds mobilised by mutual funds and security returns. He propounded that fund inflows and returns are highly correlated. Potter (1996) studied the relationship between returns and fund flows of different categories of mutual funds. He used Garner causality tests and provided the evidence that stock returns can be used to predict flows into growth funds but this does not apply to income funds. Gruenstein et al. (1997) also undertook a study to examine the effects of market returns and flow of funds. Unlike Warther, they used instrumental variables to examine the effects of market returns on aggregate fund flows. They concluded that equity fund flows were not affected by stock returns and the bond funds were affected by the bond returns. Fortune (1998) used VAR models and monthly data for the period January 1984 to December 1996 in order to study the relationship between the flow of funds and market returns, and propounded that there is a positive relationship between the two. Edwards and Zhang (1998) also examined the relationship between monthly bond flows and monthly bond returns. They propounded that the amount of money that flows in stocks and bonds is significantly affected by market returns. Lynch and Musto (2000) found evidence of less flow of funds in mutual fund schemes when the past return of funds is lower and past returns contain less information useful to the future performance of funds. Oh and Parwada (2007) and Cha and Kim (2010) found, in their respective studies, that flow of funds reacts strongly to changes in market returns of the previous day. Quereshi et al. (2019) found a correlation relationship between mutual fund flows and market returns due to macroeconomic information. They found a bi-directional causality between stock-market returns and mutual fund flows. Jank (2012) suggested a

positive relationship between equity mutual fund flows and stock-market return that is explained by a response to macroeconomic news. He concluded that mutual funds are forward looking and contribute to real economic activity.

Studies on the effect of Covid-19 on the economy

There have been a few academic studies recently on how Covid-19 has affected the economy and capital markets all across the globe. Ramelli and Wagner (2020), in their studies, concluded that there was an initial reaction in financial markets to Covid-19 in March 2020 but later the markets adjusted. Gormsen and Koijen (2020), and Pagano et al. (2020), found, in their respective studies, that the risk level of all countries increased when Covid-19 spread to more than 200 locations. Beck et al. (2020) and Gopinath (2020), in their studies, observed how the economy responded to changes in polices during Covid-19 that helped in mitigating risk during crises. Boone (2020) and McKibben and Fernando (2020) studied the economic repercussions of the spread of coronavirus and the appropriate policy response, and concluded that an outbreak could impact the global economy in the short run. Elgin et al. (2020) and Nicola et al. (2020) examined the ways in which the introduction of new policies by governments helped in slowing down the impact of Covid-19. Pastor and Vorsatz (2020) concluded that investors retain their commitment to sustainability during major financial crises.

Studies on mutual funds in New Zealand

Studies on the mutual fund industry and performance in New Zealand are few. Boustridge and Young (1996), in their study, found that selecting funds on the basis of past performance does not guarantee a good performance in the future. They examined the risk-adjusted performance of New Zealand funds from 1989 to 1995 using the Sharpe ratio, and concluded that more than 80% of funds underperformed their benchmarks. Vos et al. (1995) studied 14 New Zealand and Australian equity funds from 1988 to 1994 and found there was no short-term persistence in mutual funds in New Zealand. Bennett and Young (2000), in their paper on determinants of mutual fund flows in the New Zealand market, found there was a negative relationship between equity-fund flows and short-term interest rates and exchange rates.

Disclosures from the literature review

There have been studies on the performance and flow of funds in the mutual fund industry during Covid-19, but most of the studies have been done in the developed markets. The studies so far have focused on the performance of mutual funds and the impact of Covid-19 on financial markets all over the world and governments' response to it, but none of the studies has discussed the impact of Covid-19 on the New Zealand mutual fund industry. The purpose of this study is to investigate the total funds that have been mobilised in the mutual fund industry and to compare the performance of selected mutual fund schemes before and during Covid-19 in New Zealand.

OBJECTIVES

Based on the gaps identified, the following objectives have been underlined in this study:

1. To analyse the trend of resource mobilisation in the mutual fund industry in New Zealand before and during Covid-19.
2. To compare the flow of funds deployed by various sources in the mutual fund industry before and during Covid-19.
3. To compare the performance of selected mutual fund schemes before and during Covid-19.
4. To compare the performance of selected mutual fund schemes before and during Covid-19 with the selected benchmark.

HYPOTHESES

On the basis of the stated objectives, the following hypotheses were tested:

- H_1: There is no significant difference between the flow of funds before and during Covid-19
- H_2: There is a significant difference between the flow of funds before and during Covid-19
- H_3: There is no significant difference between the returns of mutual fund schemes before and during Covid-19
- H_4: There is a significant difference between the returns of mutual fund schemes before and during Covid-19
- H_5: There is no significant difference between the Sharpe ratio of selected mutual fund schemes before and during Covid-19
- H_6: There is a significant difference between the Sharpe ratio of selected mutual fund schemes before and during Covid-19

DATA AND METHODOLOGY

Data

The data for the study was collected through various secondary sources which include the Reserve Bank of New Zealand (RBNZ) and websites Morningstar, MSCI (Morgan Stanley Capital International) and InvestNow.

For the first part of the analysis, that is, to determine trends in resource mobilisation in the New Zealand mutual fund industry, a period of seven years has been selected, from June 2014 to March 2021. For the second part of the analysis, the sample consists of top-performing mutual funds and index funds in New Zealand published on InvestNow. The range of funds selected includes high-performing New Zealand funds from various sectors including international equities, Australasian equities, property and diversified. Based on the data availability, the number of funds selected in each quarter has been stated for each quarter. Quarterly returns are taken after fees and before tax.

The MSCI World Index is taken as the benchmark index. The MSCI World Index is an equity index of 23 developed markets that represents large and mid-cap equity performance. Quarterly returns are taken that represent the index's cumulative return from 3-month prior end date to current date.

To make comparisons between the flows of funds before Covid-19 and during Covid-19, to examine trends in individual investors and wholesale funds in the mutual fund industry, and to analyse the performance of mutual funds, ten quarters of data have been taken, five before and five during Covid-19. The first period is from December 2018 to December 2019 and the second period is from March 2020 to March 2021. The second period incorporates the flows and returns from mutual fund schemes when Covid-19 was at its peak in March 2020.

Methodology

The return and risk of the selected mutual fund schemes have been calculated using different statistical tools. As annual return cannot be solely used to evaluate the performance of different mutual funds, other empirical tools like standard deviation, comparison against a benchmark and Sharpe ratio have been used. Standard deviation determines the risk and volatility in a mutual fund scheme, whereas Sharpe ratio and comparison with the benchmark are calculated to validate performance results of various mutual fund schemes.

Empirical tools used

Returns – Returns, after fees and taxes, have been taken for the purpose of analysis. These represent the reward for selecting an investment. Usually, the higher the return, the higher the preference for that investment.

Standard deviation – Standard deviation is used to measure the overall risk. It quantifies the total dispersion of data. The higher the deviation, the greater the difference of values that make up its means. Lower standard deviation maintains data homogeneity. Higher standard deviation indicates higher risk and volatility in the expected returns.

Standard deviation $(\sigma) = \sqrt{\dfrac{1}{n-1}\{Rp(t) - Rp}$

where:

- $Rp(t)$ ırn on fund scheme
- Rp Mean rate of return on net asset value (NAV) of mutual fund

Sharpe ratio – Sharpe ratio is an important measure that evaluates the return that a fund has generated relative to the risk taken. Risk here is measured by standard deviation and Treasury Bill (Primary) Yield is taken from the RBNZ website, as the risk-free rate of return to calculate the Sharpe ratio.

The formula to calculate the Sharpe ratio is:

Sharpe ratio = $\dfrac{(Rp - Rf)}{\sigma}$

where:

- Rp eturn on mutual fund
- Rf isk-free rate of return
- σ standard deviation of MF

The 90-day Treasury Bill is taken as the risk-free rate. The Sharpe ratio gauges the connection between the portfolio's extra return over risk-free return and total risk, which is estimated in terms of standard deviation. A high Sharpe proportion shows the positive and superior risk-adjusted performance of the fund over the market, while a low Sharpe proportion proposes that the asset returns are lower than the market. The model assesses the fund based on returns per unit of risk.

T-test – To test a hypothesis, a t-test has been used to compare means and determine whether the means are statistically different or similar to each other. The t-value is compared to the t-critical value to attest null hypothesis. If the value of the t statistic is less than the t-critical value, the null hypothesis is accepted, which states that the means of the sample are similar to each other.

P-value, or probability value, is another variable to attest null hypothesis. If the p-value is greater than the alpha level or level of significance selected, the null hypothesis is accepted, or otherwise rejected. Further, if the t statistic value is large in absolute value, the p-value will be small, and vice versa.

EMPIRICAL RESULTS

Presentation of results proceeds as follows. First, the trend of resources mobilised in the mutual fund industry from June 2014 to March 2021 in New Zealand is shown in Figure 1. Comparison of flow of funds from various sources before and during Covid-19 is presented in Table 1. Table 2 shows the flow of funds in the mutual fund industry in New Zealand before and during Covid-19. Table 3 captures the performance of mutual funds before and during Covid-19. Table 4 shows statistics for the sample of New Zealand growth mutual funds, based on whether the fund managed to beat the MSCI World Index return.
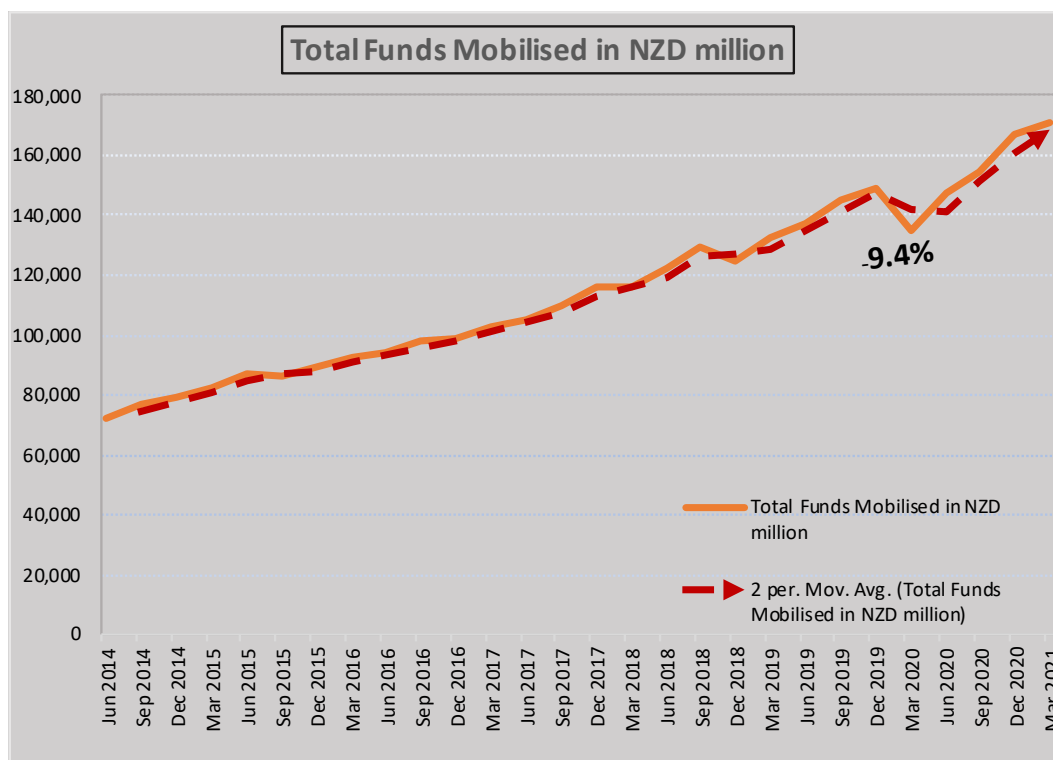
Figure 1: The trend of resources mobilised in the mutual fund industry from June 2014 to March 2021.

Trend analysis

Moving average trendline is used to show the trend of the flow of funds with period set to 2. As seen in Figure 1, the moving average trendline has smoothed out fluctuations and has captured the aggregate movement of trend. We can see that there has been a steady increase in the funds mobilised between June 2014 and December 2020. The gross mobilisation of mutual funds was $72,371 million in June 2014 and $170,849 million in March 2021, showing an increase of 136% in seven years. There has been a break in the growth trend by 9.4% in the total funds mobilised in March 2020 from December 2019, showing the sudden impact of COVID-19 on total funds invested in the mutual fund industry. There has been an upward trend after the March 2020 dip, with an increase in investments in the mutual fund industry by 26.4% in March 2021 from March 2020. Overall, the trend is bullish, showing an increase in the flow of funds in the mutual fund industry.

Flow of funds from various sources before and during Covid-19

	Before Covid-19					During Covid-19			
	Total managed funds	Wholesale managed funds	Individual managed funds	Overseas managed funds		Total managed funds	Wholesale managed funds	Individual managed funds	Overseas managed funds
Dec 2018	-4.15	-3.8	-4.69	-2.22	Mar 2020	-9.40	-8.5	-12.5	0.40
Mar 2019	6.4	6.9	6.4	4.3	June 2020	9.32	9.33	17.5	-2.18
June 2019	3.77	4.04	4.2	16.2	Sep 2020	4.56	4.4	6.6	1

Before Covid-19				During Covid-19			
Sep 2019	5.58	5.34	3.8	4.5	Dec 2020	7.94	3.7	9.4	8.3
Dec 2019	2.82	3.38	3.3	22.4	Mar 2021	2.4	3.9	2.3	6.2

Table 1: Comparison of percentage change in flow of funds from various sources before and during Covid-19.

Before Covid-19
As seen in Table 1, there was an increasing trend in the consolidated assets of managed funds from December 2018 to December 2019. The increasing trend can be seen in various categories of the managed fund industry from December 2014 to December 2019, with total managed funds changing from -4.14% in December 2018 to 2.82% in December 2019. Wholesale managed funds, individual managed funds and overseas managed funds all show an increasing trend and upward movement, with an increase in flow of funds from negative in December 2018 to positives of 3.38%, 3.3% and 22.4% respectively in December 2019.

During Covid-19
There is a fall in the total invested funds in the mutual fund industry in March 2020, with total managed funds falling by 9.40%, wholesale managed funds falling by 8.5%, individual managed funds by 12.5% and overseas managed funds by 0.40%. Interestingly, investor confidence was restored quickly, with the next quarter showing an increase in the fund flows from all sources except overseas managed funds. In June 2020, total managed funds increased by 9.32%, individual managed funds by 17.5% and wholesale managed funds by 9.33%. The only dip was in overseas managed funds, which fell by 2.18%. There has been a positive change throughout after March 2020 in the flow of funds from the previous quarter.

Hypothesis testing

- H_1: There is no significant difference between the flow of funds before and during Covid-19
- H_2: There is a significant difference between the flow of funds before and during Covid-19

Before Covid-19 (NZD million)		During Covid-19 (NZD million)	
	Total managed funds		Total managed funds
Dec 2018	124,394	Mar 2020	135,100
Mar 2019	132,361	June 2020	147,695
June 2019	137,356	Sep 2020	154,440
Sep 2019	145,030	Dec 2020	166,730
Dec 2019	149,122	Mar 2021	170,849

Table 2: Total flow of funds in the New Zealand mutual fund industry before and during Covid-19.

T-test result: T-test results show t = 8.33, p = 0.0011, which is less than the significance value of 0.05. Hence, the alternate hypothesis is accepted and it can be concluded that there is a significant difference between the flow of funds before Covid-19 and during Covid-19.

Performance evaluation of selected schemes

Before Covid-19					During Covid-19				
	N	Mean %	SD	Sharpe ratio		N	Mean %	SD	Sharpe ratio
Dec 2018	93	-7.06	6.1	-148.1	Mar 2020	132	-12.84	8	-159.4
Mar 2019	99	8.4	4.1	159.02	Jun 2020	141	11.18	6.8	160.29
Jun 2019	102	4.5	2.7	107.4	Sep 2020	145	4.44	5.5	75.27
Sep 2019	119	3.84	2.6	103.4	Dec 2020	149	8.53	9.1	90.87
Dec 2019	129	1.98	3.1	24.19	Mar 2021	149	2.41	2.08	40.78
Average		2.33	3.72	49.1	Average		2.74	6.29	41.5

Table 3. Comparative analysis of percentage quarterly mean returns, standard deviations (SD) and Sharpe ratio of a sample of mutual fund schemes before and during Covid-19. N represents the number of mutual fund schemes taken in the sample in each quarter.

Returns
Table 3 summarises the returns of the selected growth schemes for two periods, before and during Covid-19. Returns from mutual funds dropped suddenly when the pandemic was declared, with negative mean returns of -12.84% in March 2020. After March 2020, there was a positive trend, with June 2020 showing a high positive mean return of 11.18%. The average mean returns before and during Covid-19 are comparable, with 2.3% before Covid-19 and 2.74% during Covid-19.

Risk and volatility
The second analysis is to determine the risk and volatility in mutual funds, which have increased when 2020 is taken into consideration. The March 2020 standard deviation increased to 8% from 3.1% in December 2019, and to 9.1% by December 2020. The average standard deviation increased from 3.7% before Covid-19 to 6.2% during Covid-19. According to the table, one can clearly see that standard deviation, which measures risk and volatility in expected returns, increased by 1.5 times from December 2019 to March 2020, indicating that the unsystematic risk of selected mutual fund schemes rose during Covid-19.

Sharpe ratio
The Sharpe ratio determines the excess return a mutual fund earns over the risk-free return per unit of risk, which is the standard deviation. A higher and positive Sharpe ratio shows good performance. According to Table 3, except for December 2018, the Sharpe ratio had been positive in the pre-Covid-19 period. However, the Sharpe ratio started declining in March 2020, indicating a drastic impact from Covid-19 on mutual fund performance. There was a sudden drop in the Sharpe ratio, which fell to a negative value of -159% in March 2020. The schemes recovered in the next quarter with a tremendous increase in the Sharpe ratio in June 2020 to 160%. The average Sharpe ratio was higher before Covid-19 (49%) than it was during Covid-19 (41.5%).

Hypothesis testing

- H_3: There is no significant difference between the returns of funds before and during Covid-19
- H_4: There is a significant difference between the returns of funds before and during Covid-19

T-test result: T-test results show $t = 2.33$, $p = 0.827$, which is greater than the specified level of significance of 0.05. Hence, null hypothesis is accepted and it can be concluded that average returns from the selected managed funds before and during Covid-19 are similar to each other.

Hypothesis testing

- H$_5$: There is no significant difference between the Sharpe ratio of selected mutual fund schemes before and during Covid-19
- H$_6$: There is a significant difference between the Sharpe ratio of selected mutual fund schemes before and during Covid-19

T-test result: T-test results show t = 0.94, p = 0.39, which is greater than the specified alpha of 0.05. Therefore, null hypothesis is accepted and there is strong evidence to conclude that the Sharpe ratios from selected managed funds before and during Covid-19 are similar to each other.

Comparison of mutual funds with the MSCI World Index

Before Covid-19					During Covid-19				
	MSCI World Index (%)	Mean (%)	Below MSCI (%)	Above MSCI (%)		MSCI World Index (%)	Mean (%)	Below MSCI (%)	Above MSCI (%)
Dec 2018	-13.7	-7.06	17	77	Mar 2020	-21.4	-12.8	12	88
Mar 2019	3.9	8.4	27	73	June 2020	18.8	11.1	87	13
June 2019	0.6	4.5	0.1	99	Sep 2020	7.52	4.4	81	19
Sep 2019	0.08	3.8	5	95	Dec 2020	13.6	8.5	43	57
Dec 2019	8.1	1.9	50	50	Mar 2021	4.52	2.4	63	37

Table 4. The percentage quarterly mean returns for the sample of New Zealand mutual funds and comparisons with the MSCI World Index. 'Below' represents the percentage of schemes performing below the MSCI World Index and 'Above' represents the percentage of schemes performing above the MSCI World Index.

In general, mutual fund schemes performed well in the pre-Covid-19 periods. As shown in Table 4, most of the selected funds have been performing above the MSCI Index before Covid-19 as compared to during Covid-19. An interesting finding was that 88% of selected schemes outperformed the benchmark in March 2020, when the pandemic was announced. After that, the performance of mutual funds declined, with 87% and 80% of them performing below the MSCI benchmark in the following two quarters, that is, June 2020 and September 2020 respectively. A bit of recovery occurred in December 2020, with 57% of funds outperforming the benchmark. Nevertheless, performance decreased in the following quarter with 63% of schemes performing below the benchmark in March 2021

ANALYSIS AND DISCUSSION

This study shows that resource mobilisation in the mutual fund industry and the performance of growth mutual fund schemes is market sensitive. The main findings of the research are four-fold.

First, there was a shock impact of Covid-19 in the New Zealand mutual fund industry, with a decrease in the flow of money in the mutual fund industry and a downturn in the performance of mutual funds in March 2020. This indicates the initial effect of the news of the pandemic on resources mobilised and returns. The results are consistent with those of other researchers, arguing that Covid-19 has triggered a severe pandemic leading to an initial economic slowdown, which is in support of studies done by Gormsen and Koijen (2020), and Zhang et al. (2020).

Second, the mutual fund market showed a reaction to Covid-19 with a fall in investments in March 2020 in the short run, but soon recovered in the next quarter, in June 2020. Findings show signs of recovery in June 2020, with an increase in investments from various sources of mutual funds. This is in line with the findings of Ramelli and Wagner (2020).

Third, the flow of funds in the mutual fund industry in June 2020 and high performance by funds in the quarter immediately after the pandemic were seen to indicate the trust of investors in financial markets. This is in line with the studies carried out by Zhang et al. (2020), Elgin et al. (2020), Nicola et al. (2020) and Gopinath (2020), which all found that stated governments and central banks across the world were able to restore investor confidence.

Fourth, there is strong evidence of an increase in resources mobilised in the mutual fund industry during Covid-19. The study of trends in flow of funds in the mutual fund industry from various sources proves that investment in the mutual fund industry has been increasing during Covid-19, and even the poor performance of mutual fund schemes in March 2020 during the pandemic did not deter investors from investing in mutual fund schemes in June 2020. Assets under managed funds, individual investors and overseas investors have contributed a sizeable amount of funds to the mutual fund industry during Covid-19. There was an initial dip in the funds mobilised, which shows the impact of Covid-19, but the recovery in the next quarter indicates investors remained committed and sustainable during the financial crisis. This supports the findings of a study done by Pastor and Vorsatz (2020), who propounded the trust of investors during financial crises.

CONCLUSION

Despite the decrease in the flow of funds and the poor performance of mutual funds in March 2020 due to the shock effects caused by Covid-19 in New Zealand, the capital market experienced a rise in resources mobilised. Continued investment in mutual fund schemes during this time demonstrates the confidence of investors in future earnings of the funds and their faith in financial markets.

The research findings indicate investors should continue investing in mutual fund schemes. However, they should take a cautious approach by continually reviewing their portfolios and investing in diversified portfolios to minimise risk and maximise returns.

SCOPE AND LIMITATIONS

The study was limited to the performance of high-performing mutual funds and index funds in New Zealand. The study could be extended to other categories of mutual fund schemes. The comparison between before and during Covid-19 has only been done for five quarters, and extending the time period would offer a more realistic comparison and capture the long-term perspective.

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AUTHOR

Swati Kumaria Puri is a lecturer at Wellington Institute of Technology's School of Business, with 15 years' experience teaching accounting and finance in business schools in New Zealand and India. Having done an MBA in Finance, a Pre-PhD in Research Methodology, and a New Zealand Certificate in Adult and Tertiary Teaching, she has developed strong academic skills to cater to students from diverse backgrounds. Being passionate about tertiary education, she encourages collaborative learning and research among students. She is a keen researcher and has published numerous papers and articles in journals and print media. Her research interests include corporate finance, investment management and corporate governance.

INTRAPRENEURSHIP IN THE TIME OF COVID

MARIANNE CHERRINGTON
DAVID AIREHROUR
DAVID CAMERON-BROWN
JOAN LU
QIANG XU
AORANGI STOKES

Business / Covid-19

ABSTRACT

For individuals and firms, traditional sources of competitive advantage are being eroded. Competitive advantage today is not built upon product markets, but in upstream markets of expertise, with control of key intangible assets, alongside dynamic capabilities. Intrapreneurship is seen as an important method for organisations to simultaneously nurture existing business while developing new business creatively and strategically. Covid-19 restrictions have forced organisations to look to their 'intangible capabilities' to reassess and redeploy them for transformational, value-added outcomes. An underutilised ally is intrapreneurship, where individuals in an organisation break convention to create opportunities and revenue streams. An intrapreneurial culture can be the foundation of sustainable competitiveness for both firms and their business ecosystems, and even the communities they impact. This paper re-investigates intrapreneurship in this new Covid era as a source of new, sustainable opportunity and competitive advantage; in this time of Covid, a contextual orientation approach to intrapreneurship offers organisations new solutions guided by expertise within the firm. We find that now is the time to foster intrapreneurial processes to leverage internal strengths, resource access and expertise.

KEYWORDS

intrapreneurship, competitive advantage, intangible capabilities, sustainability, innovation

INTRODUCTION

Competitive advantage is a state that puts a company in a favourable or enhanced business position. The global Covid-19 pandemic gave rise to responses that included lockdowns, social distancing, home isolation and work-from-home situations; economic disorder varied by industry and sector, but the businesses that survived are operating in the context of a new Covid era. For example, firms that were cash strapped now face shortages in the labour market (Keall, 2021). Many customary and predictable management methods are producing questionable or lacklustre results. Many organisations have struggled to survive and adjust to factors that update over days and even hours; the pace of change and our ability to be resilient in the face of adversity is such that organisational potential often lies in the expertise, creativity and tenacity of people. Managing innovation and change through adversity is so prevalent it has become a constant in growing organisations.

Intrapreneurship in its widest context is an economic driver, an employment creator, and it elevates our personal and professional lives. Since our economy is based on the seeds of intrapreneurship, it would be wise for all of us to know the disciplines of innovative, intrapreneurial thinking that fuel our organisations, in order to restart economic growth as the turbulence of the pandemic wanes.

Searching for the right answers to the new problems we are facing, especially in unsettled sectors such as the airline and travel industries, education, health and medical sectors, logistics and supply chain fields, can create bold, new opportunities. Agile firms that build new mindsets, test assumptions, or assess norms and culture can move beyond 'failure' to become organisations with viable offerings capturing new value (Ciaramella & Dall'Orso, 2021). Perspective can be transformative, and challenging discourse can generate value for firms that are willing to look inward and face the challenges that are ahead (Zaffron & Logan, 2011).

Intrapreneurship uses the existing knowledge management and organisational culture to jump-start into networks, expertise and trusted relationships that can get ideas to markets and competitors. Technological expertise and technologies may already be available to support within-firm innovation.

In some sectors, innovation has largely 'failed to launch'; government intervention and funding often fails to 'pick winners' (Creutzberg, 2011), but policy can shape new opportunities for international connection, capital growth, greater competition and transformative innovation (Conway, 2016). Of late, mature firms are gaining competitive advantage not with product realignments and new markets, but with tacit control of key intangibles and dynamic capabilities where co-operation can be a means to accumulate, pool and disseminate knowledge and complementary assets (Caloghirou et al., 2004).

Intrapreneurship, as organisational innovation or active entrepreneurship while working in a large organisation, can be viewed as small groups generating opportunities and revenue streams within an organisation (Elsbach & Stigliani 2018). Intrapreneurship includes five different streams (Blanka, 2019):

- Individual Level, with operational-level employees and middle-level managers
- Organisational Level, with structure and processes, support, promoters, rewards and culture
- Contextual Level, depending on type of firm, national characteristics and technology
- Outcome Level, including behavioural outcomes, intrapreneurial activity and performance
- Promoter Level, with Individual Level outcome and behavioural processes, entrepreneurial self-efficacy, and developmental support

Intrapreneurship can shift an existing ethos to create a tactical and risk-taking innovative culture where skills are designed and refined, experientially. Intrapreneurship can be a basis for sustainable business, ecosystems and lively communities. The internal commercialisation of a business ecosystem produces valuable knowledge that can be modelled dynamically, with a focus on the people and stakeholders that move through various stages of an entrepreneurial lifecycle (Cantner et al., 2020).

This paper investigates recent intrapreneurial scholarship in light of the new Covid context, as a source of new, sustainable opportunity. Innovation can be learned or sparked with modes and entrepreneurial mindsets, using management methods applied to fuel new opportunities that jump-start economic growth (Kumar, 2012). We begin with methodology, followed by a scoping review of nascent research in intrapreneurship. The competitive advantage borne of intrapreneurship is appraised in order to develop the concept of intangible capabilities. Nascency is evaluated in the context of the uncertainty of the Coronavirus pandemic and seven categorisations are explored. The paper concludes with new mindsets, skillsets and cultures required to establish more sustainable intrapreneurial opportunities.

RESEARCH METHODOLOGY

A scoping approach was employed with a selection of recent scholarly journals published from 2000 to 2021; this research was undertaken in the field of intrapreneurship, with its foundation built upon extensive entrepreneurship study. This review focuses on intrapreneurship as it relates to innovation, and the creation of new value.

A Google Scholar search was undertaken using phrases such as 'intrapreneurial theory' and 'strategic intrapreneurship.' A representative, filtered review of sourced papers was undertaken to provide a referenced overview. Relevance to nascent topics in innovation was used, integrated with these factors:

- Dynamic capabilities relating to intrapreneurship were included
- State-of-the-art techniques used in value creation were prioritised
- Technology as a support for an innovative approach was preferred
- Recency of publication was fundamental, especially highlighting the Coronavirus context

Selected management case-studies were also considered, to seek creative mindsets and restorative modes of application, especially in conjunction with in-depth reviews from management experts and using respected management publications. This was done to exemplify applications of leveraged value in innovative intrapreneurial activities, even within conventional organisations.

This paper aims to summarise scholarship around a structure relating to intrapreneurship as a source of inspiration and ideation in uncertain times. This focus allows a basis upon which to scaffold contemporary applied management examples from firms not necessarily considered to be traditional technological firms. Transformative approaches are exemplified that develop intangible organisational capabilities. This methodology permits a contextual review as well as a more progressive and structured approach to intrapreneurship and its processes.

THEORETICAL BACKGROUND: INTRAPRENEURSHIP

The term 'intrapreneur' was coined by Gifford Pinchot in his landmark 1985 book *Intrapreneuring: Why you don't have to leave the corporation to become an entrepreneur*. Pinchot stated that an "intrapreneur may be the creator or inventor but it is always the dreamer who figures out how to turn an idea into a profitable reality" (1985, p. 2). Whereas entrepreneurship is "the activity of setting up a business, taking on financial risks for the reward of profit," intrapreneurship is "entrepreneurship inside a firm" or "organisational innovation" (Pinchot, 1985, p. 2). The two can be compared and contrasted, as in Table 1 (Cadar & Badulescu, 2015).

	Distinctions	Parallels
Entrepreneur: A person who sets up a business or businesses, taking on financial risks in the hope of profit.	**Activity:** Creative character. **Obstacles:** Sees only the market as an obstacle – a powerful one. **Funding:** Seeks personal funding at the risk of losing own assets or ownership/control of the start-up. **Risk:** Personal money and time.	**Innovation:** Innovative traits, seen via creation of an original product or service, technological process, or superior management method. **Value creation:** Is a fundamental goal; alteration must be novel. **Risk tolerance:** Is high or view of risk is probabilistic and balanced with the hunt for greater reward. **SWOT:** Views external threats as opportunities and turns internal weaknesses into strengths by various means and partnerships.
Intrapreneur: An entrepreneur inside a firm, or an organisational innovator.	**Activity:** Restorative character. **Obstacles:** The company culture is often the main obstacle. **Funding:** Uses the company's time, capital and extensive resources. **Risk:** Company's money and time.	

Table 1. Parallels and distinctions of entrepreneurship and intrapreneurship.

In some respects, an intrapreneur is like an entrepreneur in that they exploit opportunities and know how to structure business within particular contexts and environments (Jack & Anderson, 2002), or launch a business via recognition and exploitation of an opportunity. The next stage is growth and development via explicit capability (Timmons & Spinelli, 2003), although intrapreneurship often follows a more nonlinear process (Russell, 1999). Therefore, owners of start-ups can be thought of as leaders, who enhance and progress their business until they exhaust their motivation to continue managing a growing company. They may lack expertise needed within the organisation and be unwilling to 'let go' of control, as their ability and entrepreneurial intuition begins to falter (Begeç & Arun, 2020).

The entrepreneur as protagonist can be viewed through Schumpeter's production function lens, where managers combine production factors and functions to achieve technical efficiency (Iversen et al., 2008). Entrepreneurs look beyond the production function via innovation (technical or otherwise). The entrepreneur innovates or disrupts the economic system out of equilibrium, by means of new products or service formation, or by utilising novel processes of production. Nowadays a technological twist is used; some mature firms have been disrupted, although technologies and data utilisation can turn the tide for established firms (Ryder, 2018). The process of 'creative destruction' is the Schumpeterian vision that propels economic development (Schumpeter, 1942). Thus, the ability to co-ordinate and reallocate is a behaviour associated with entrepreneurs as well as intrapreneurs. When resources are recombined or used with improved efficiency, the result can be a leap in profitability and/or growth.

Intrapreneurs are often decisive and expert communicators (even if only viewed in a technological or visionary sense) (Zenovia & Maier, 2011). They are influential and skilled at crafting value judgements (Casson, 2003). This allows them to see new sources of value via intelligent use of scarce resources, or waste, beyond a Total Quality Management view of 'muda' (Deming, 2018). Certainly, there is scope for organisations to compete within themselves, and successful firms like Haier have taken this 'to the extreme' using competition within the company (Lewin et al., 2017; Jiang et al., 2019). In this way intrapreneurs can be internal leaders, driving better use of resources such as capital, knowledge and process (Baumol, 2002).

The intrapreneur can be viewed as a charismatic enigma, making independent decisions within the confines of an organisation in rapidly changing environments, with dogmatic persistence, expertise and leadership personality; this can clash within organisational settings (Johnson, 2001). Pinchot uses the phrase 'intra-corporate-entrepreneur' (Pinchot, 2010, p. 2), as one who:

- Gives full credit to people with similar personality to innovate quickly in large organizations
- Values individual and/or team action to reinforce entrepreneurial behavior independently

Intrapreneurs are proactive; they create novel ventures and businesses, often with novel product, service and process innovations. They redefine risk taking within the cloak of the company and by turning risk into viability (Antoncic & Hisrich, 2003). Hathway suggests they are more than 'freeholders' that grab intra-property and intra-money; they are highly committed (Hathway, 2009). Likewise, intrapreneurship can be facilitated by external entrepreneurs and agents; franchising, subcontracting and strategic alliances can begin the external search for new sources of finance (Chang, 2001). 'Frantrepreneurs' are intrapreneurs that exploit the process standardisation of a franchise; this can perpetuate a limiting mindset, but the approach can expose innovative opportunities (Hathway, 2009). New value is found in the mindset of sustainability intrapreneurs (Badulescu & Badulescu, 2016); as climate action accelerates, a counter view is that "the world is not exactly lacking … big ideas about what other people should do, or who think technology can fix any problem" (Gates, 2020, p. 5).

We can develop the skills of intrapreneurship. We know the processes; we can quantify the time inputs (Puech & Durand, 2017). Intrapreneurship is an under-utilised but powerful tool that can be learned, cultivated and emboldened through process. The new opportunities created can even transform the very idea of why and how we work (Prats & Kislenko, 2015). Process models begin with recognition:

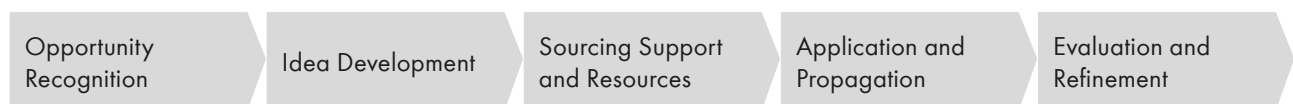Figure 1. Five-step Process Model for Organisational Intrapreneurship (Hecker, 2017).

Intrapreneurship has been linked to seven characteristics in the research, linking it to particular models: innovativeness, risk-taking, proactiveness, autonomy, new business venturing, self-/strategic renewal and competitive aggressiveness. The traits link to strategic intrapreneurship, and are desirable and key for organisational

growth and even survival, especially in times of upheaval and change (Guven, 2020). For organisations that have an agile culture, intrapreneurship is a more viable option.

Perhaps the ultimate opportunity that distinguishes organisational intrapreneurs is 'suitability,' because the resources and capabilities within an organisation, as well as their availability, are known to be a critical factor in intrapreneurial uptake. There must also be 'space' within the culture of the organisation for the approach to succeed (Urbano et al., 2013). Dynamic capability is "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Teece, 2009, p. xxiiix). Contemporary dynamic capabilities frameworks can be used as tools for managers to improve cultivation and management of intrapreneurial proficiency (Table 2).

Contributions to intrapreneurial capabilities scholarship	
Spill-over theory relating to labour mobility for holistic picture of value of context, knowledge and networks for intrapreneurial capabilities	Audretsch, D. B., Lehmann, E. E., Menter, M., & Wirsching, K. (2021)
Corporate venturing as used in selection and funding of intrapreneurial start-ups; finding that clarity and concise description is critical	Masucci, M., Parker, S. C., Brusoni, S., & Camerani, R. (2021)
Environmental uncertainty and institutional forces relating to dynamic capabilities; agendas and normative practice are time-wasting barriers	Honig, B., & Samuelsson, M. (2021)
Absorptive capacity at individual/group level as predictors and effects on innovation and performance within an organisation	Yildiz, H. E., Murtic, A., Klofsten, M., Zander, U., & Richtnér, A. (2021)
Capability comparison with direct and indirect effects on outcomes at university, entrepreneurial outcomes via massive open online courses	Guerrero, M., Heaton, S., & Urbano, D. (2021)
Capabilities development using an empirical model on open-source ecosystems and network ties with open-source ecosystems	Faridian, P. H., & Neubaum, D. O. (2021).
Innovative behaviour on an individual level, with self-leadership strategies as well as perceived organisational innovativeness	Kör, B., Wakkee, I., & van der Sijde, P. (2021)

Table 2. Intrapreneurship linking dynamic capabilities (Teece, 1990; Klofsten et al., 2021).

Even for small business, it is imperative to practice intrapreneurship, to help evolve, be more agile and more competitive (Aguilar et al., 2019). Consequently, in the new Covid era, the mantra 'innovate or die' is a realistic and necessary disposition, rather than a manifesto, because alignment with strategic goals is vital when implementing new products or services, particularly in turbulent times.

Even when a culture of agile intrapreneurship is not prevalent in an organisation, intrapreneurial champions with expertise and drive can be activated, especially because resources must be husbanded. New products often originate from innovative side-teams within organisations (Chaston, 2014). Such methods can smooth out the stress of change in the marketplace (Prieto et al., 2020). For many firms, engagement of employees is a bonus that intrapreneurship can deliver; the psychological lift and capital gained within organisations is increasingly important in modern retention schemes (Pandey et al., 2020). Companies that employ intrapreneurship can better survive threats and obstacles, often with improved company performance, with growth and profitability upshots (Aina & Solikin, 2020).

ANALYSIS OF FINDINGS

Considering the Coronavirus context, a Google Scholar search of 'Intrapreneurship and Coronavirus,' including the year 2020 and January 2021, yielded 316 results in seven broad categories (Figure 2).

Intrapreneurial interest increased in the education sector because of Covid-19, perhaps because 'survival via innovation' became a key organisational problem to solve, with urgency (Guerrero & Urbano, 2021). It is noteworthy that intrapreneurial links to workforce support were sizeable; although 'business survival' was newsworthy, researchers still connected intrapreneurship with 'people, planet and profit' or 'social, sustainable and profitable' solutions in business. Digitisation was so prevalent it was given its own category; if rightly combined with innovation and models, it would have become the foremost category for scholarship linked to intrapreneurship and the pandemic – an interesting finding.
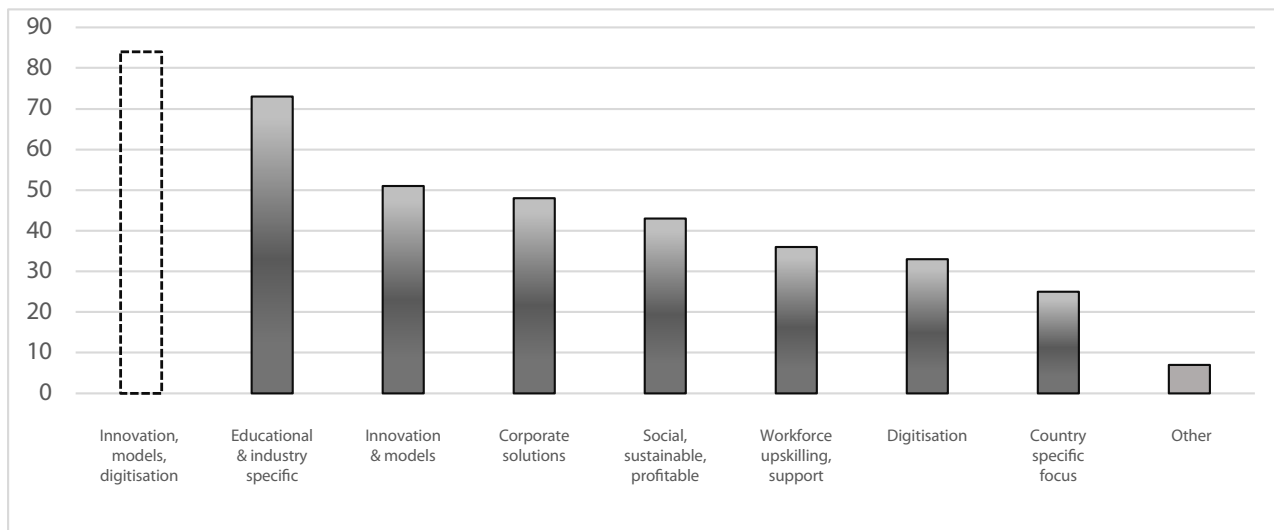

Figure 2. Prevalence of categories linking intrapreneurship in the Coronavirus context.

Digitisation and innovation can be accelerated with intrapreneurial disciplines, modes and models. Our economy is based on entrepreneurship (Drucker, 1984), so it would be wise for businesses to pilot intrapreneurial initiatives now; uncertainty has surpassed risk as a barrier to proactive performance. With training and sustainable processes, organisations can reboot and restart their economic growth (Timmons, Spinelli, & Tan, 2004) (Figure 3).
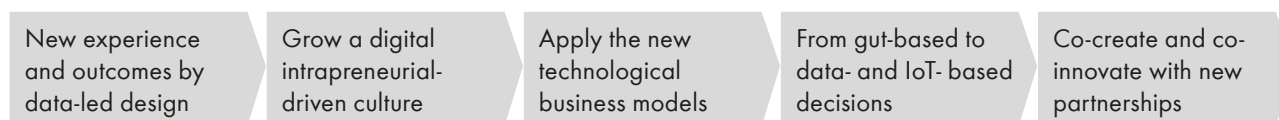

Figure 3. Five steps to begin an intrapreneurial data-driven organisational transformation (Wang, 2020).

Dynamic capabilities can be exploited with digitisation. Most new and incumbent firms are drowning in potential data sources; some are erratic, but data-driven decisions are fuelling transformation that leaves competitors behind. Applied data insights drive dynamic pricing models, novel products and customer experience, and detect supply-chain opportunities. Intrapreneurs are the drivers, rethinking resource allocation and team work with data and technology (Wang, 2020). Big data must come under organisational control; it is 'real time,' automated and high volume (Cherrington et al., 2019a, 2019b). Using data to drive decisions can create proprietary and innovative models with new paths for growth (Airehrour et al., 2020). Consumption is shifting; products and service are now shifting to Internet of Things outcomes.

Educational and industry solutions are in demand. Vis-à-vis dynamic capability, intrapreneurs are often mavens, strategically producing, circulating and creating knowledge in organisations. They break down silos and barriers

to productivity (Perez-Uribe et al., 2018). The diversity offered in organisational asset pools can be critical to co-creation and co-capture for intrapreneurs (Faridian & Neubaum, 2021).

Intrapreneurship is a means for employees to stay relevant as others are made redundant (Chamorro-Premuzic, 2020); they can use the valuable skills gained within a safe organisational environment to become their own boss, entrepreneurially. They can build their own firm's dynamic capabilities, underpinned by organisational routines and managerial skills, even integrating and reconfiguring internal competencies to realign with former networks (Pace & Cherrington, 2020).

Corporate solutions are now initiated with future-thinking tools. Organisational growth is no longer a certainty; intrapreneurship sparks a use of unproductive resources with innovative or data-driven transformation (Cherrington et al., 2020). Since 2010, 61% of Fortune 500 companies were acquired, merged, bankrupted, or fell in rankings, frequently due to digital disruption (Wang, 2020). Digitisation can create new products and transform growth with new business models, pricing models, experiential offerings and strategic differentiation. In new sustainable supply chains, the marketing cachet is enormous. Companies who prepare and invest will gain exponential capabilities.

Sustainability and climate-change policies are being mandated by stricter policy; targets and deadlines are looming. There are calls for organisations to hit the Covid restart button so that solutions become sustainable opportunities. Intrapreneurship can help (Dentchev et al., 2016). Key benefits are:

- Competitive advantage and resilience, brand identification and increased stakeholder loyalty.
- Increased business capability alongside compliance, with better productivity or cost reduction.
- Redeployment of assets, efficiency gains and reduced waste or 'waste as an asset' initiatives.

Intrapreneurial factors such as proactiveness, risk taking and autonomy can connect to sustainability, to exploit latent, synergistic economic, environmental and social innovation (Widya-Hastuti, 2016). This can also be instigated with the often-unappreciated tools of process innovation and experimentation, and small-team thinking can support a green, circular economy (Zhukov & Cherrington, 2020).

Workforce upskilling and support can stave off competition. Intrapreneurial creative and restorative traits in intrapreneurs are vital. Organisations cannot afford to turn over their workforce; they must hire great people and take them on transformative journeys. Intrapreneurship can support the culture shift required. Intrapreneurship can use under-allocated resources in novel and relatively low-risk ways, while the profit-generating heart of the business continues to operate (Kocjancic & Bojnec, 2013). Even as businesses redefine themselves, struggle to keep employees, or mitigate cashflow or supply chain issues through a global pandemic, intrapreneurship can generate differentiation and create newsworthy marketing and public-relations possibilities.

A country-specific focus is vital. Coronavirus impacts are affecting resource acquisition with growing uncertainty; new winners and losers are being created and the major factors shifting business are not made with years of data but now, with 'a single data point' (Zhao et al., 2021). When organisations are forced into recency and survival mode, valuable effort, resources and people can get lost in the tumult.

The disciplines of intrapreneurship can mitigate key concerns. Small, agile experiments can tolerate failure as a pathway to success; they are the stuff of intrapreneurial DNA. Partnership can lower costs, and collaboration is behind some of the greatest global technological companies (Wang, 2020).

CONCLUSION

The changing demands and uncertainties of business have never been greater; the last great pandemic was a century ago and this pandemic has created upheaval. Organisations must envision innovative, sustainable and technological transformation while evolving existing business models. Ultimately, a generative intrapreneurial culture will seek innovation and entrepreneurial ecosystems to influence government, industry, universities and

society. The particular structures and dynamic processes of sustainable innovation are fluid; additional research and experimentation is needed in this discipline.

In this time of Covid, firms are searching to reorient themselves with technological solutions, or market reorientation, or process innovation. Intrapreneurship is often transformational, as an untapped source of opportunities; if agile organisational practices and design-thinking expertise exist within a firm, internal solutions can be exploited in the face of external instability and uncertainty.

An intrapreneurial culture is atypical, yet expertise within a firm and technological support take the risk out of intrapreneurship. When firms are cash strapped, intrapreneurship is an easier and less costly means of growing more sustainable initiatives that are customer-centric, with community focus. The intrapreneurial process correlates with this era, and it can be a liberating organisational strength.

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AUTHORS

Marianne Cherrington is a Principal Lecturer at Otago Polytechnic Auckland International Campus with a focus on sustainability, applied management and business analytics. A lecturer in disruptive innovation, her research into machine learning feature selection algorithms applies in many fields, disciplines and industry sectors.

David Airehrour is a Senior Lecturer in Analytics in the School of Applied Business at Unitec New Zealand. His specialisations include the Internet of Things, big data analytics and wireless sensor networks.

David Cameron-Brown is principal of Cameron-Brown Corporate Advisory and specialises in strategic, financial, capital markets and corporate governance services.

Joan Lu is a Professor of Computer Science at the University of Huddersfield, UK, and has published seven academic books and over 200 peer-reviewed academic papers. She is a founder and has been a programme chair for the International XML Technology Workshop for 11 years and serves as chair of numerous international conferences

Qiang Xu is a Senior Lecturer in Mechanical Engineering at the University of Huddersfield, UK and is a specialist in computational creep damage mechanics, which has been internationally recognised and cited worldwide. He is an active consultant in industry and manufacturing processes as well as specialising in various advanced computational techniques.

Aorangi Stokes has worked in recruitment co-ordination at NorthTec and is involved in project management work at Ngāti Hine Health Trust.

SUSTAINABILITY PERCEPTIONS AND PRACTICES OF VIETNAMESE ECOLOGICAL PRACTITIONERS

ANGIE DANG

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ABSTRACT

This paper analyses sustainability perceptions and practices using data from in-depth interviews of 15 Vietnamese ecological practitioners in 2020. It shows that agency, environmental and social learning and location are key factors in the formation of these perceptions and practices, which, in turn, offer validated solutions for sustainable development in Vietnam. The paper highlights the essential roles and contributions of ecological practitioners to sustainable development. It calls for more enabling support from various stakeholders in society to these practitioners in sustainability endeavours. It also discusses potential use of research results, implications for New Zealand and areas for further research.

KEYWORDS

Vietnamese ecological practitioners, sustainability perceptions, sustainability practices, sustainable development

INTRODUCTION

The detrimental impacts of the climate-change crisis on the environment and human society, and its causes, such as unsustainable modes of production, consumption and lifestyle, have been well discussed in the literature. Sustainable-development trends have emerged to cope with this crisis and involve, among others, more sustainable, renewable, low-carbon energy and better relationships between the individual, society and nature (Ripple et al., 2019).

Vietnam is experiencing the same environmental and social-degradation trends and threats as the rest of the world (Chu, 2018; Chu, 2020; Wells-Dang & Vu, 2019). Economic growth has taken priority and caused much environmental degradation in the last few decades. For example, mining, farming, factories, craft villages and hospitals have polluted the environment with toxic waste. Quality of soil and surface and ground water have declined. Forests have diminished, resulting in biodiversity loss and ecological imbalance (ADB, 2013; Chu, 2016). The climate-change crisis is demonstrated in rises in temperature and sea level, and rainfall changes. There have been extreme weather conditions such as intense heat or cold weather, heavy rain or long droughts, or high tides. In affected areas the damage has been extensive and multi-faceted and the population has suffered from health, social and economic consequences (ADB, 2013; Chu, 2016).

Vietnam is making changes to cope with the crisis (Martin & Mazzanti, 2021; Thong et al., 2017). The state has set up laws, rules, standards, regulations and enforcement systems for environmental protection, use and management of natural resources, environmental justice and social security (Chu, 2020). These measures, however, are slow and ineffective. Sanctions are too light to deter people from non-compliance. Public awareness is poor and there is a lack of commitment, capacity and resources (Chu, 2020; Nguyen, 2020; Thong et al., 2017).

Meanwhile, the civil and private sectors have made important contributions to environmental protection and social development. Non-governmental organisations have provided social services and support to the poor and disadvantaged groups (Duong, 2017). Models of sustainable, green and clean production, distribution and services have been developed in agriculture, horticulture, forestry and tourism, among other sectors (see Westphal et

al., 2015, for example). Environmental activists have campaigned for social and environmental justice (Nguyen & Datzberger, 2018).

How do ecological practitioners perceive and practice sustainability in this context? Why do they do so? What implications are there? Answers to these questions are essential for an understanding of the process in which sustainability perceptions and practices have evolved. This will offer insights into influencing factors and ecological practitioners' roles and contributions to sustainability in Vietnam, and will suggest possible interventions to foster sustainability in this country. Furthermore, the approach could be applied to other countries to gain understandings of key players' sustainability perceptions and practices.

This paper examines the findings of an inquiry into ecological activities and movements in Vietnam to find answers to the above questions. It focuses on sustainability perceptions and practices of Vietnamese ecological practitioners who participated in the study. It firstly outlines the key concepts of sustainability perceptions and practices, and the social-practice theory that illuminates the mutual relationship between perceptions and practices. It then provides a brief on research methods. This is followed by the main findings of the analysis and their implications. The conclusion summarises key points raised and identifies areas for further inquiry.

SUSTAINABILITY PERCEPTIONS AND PRACTICES, AND SOCIAL-PRACTICE THEORY

Sustainability is a complex concept. It involves interventions and/or individual behaviour changes that are maintained or developed to generate ongoing benefits for individuals or systems over time (Moore et al., 2017). Sustainability is, therefore, both a goal and a process (Barbosa et al., 2014). As a goal, it aims at "sustainable development" that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations General Assembly, 1987, p. 43). Sustainability also aims at environmental preservation, quality of life, justice and equity, and solutions to social issues such as discrimination, poverty and unemployment (Barbosa et al., 2014).

As a process, sustainability requires deep actions to change social structures and conditions to make them sustainable (Degenhardt, 2016), with more cohesive, economically efficient and ecologically viable ways of production, distribution and consumption of existing resources (Barbosa et al., 2014). This is because the current capitalist mode of production, distribution, consumption and lifestyle is inherently destructive, as demonstrated in the climate-change crisis (Wright & Nyberg, 2015). Sustainability involves multiple dimensions such as cultural, economic, environmental, social and political, among others (Bossel, 1998). What dimensions should be prioritised, how and why, remain contested by nations and groups with conflicting interests and diverse interpretations of sustainability (Barbosa et al., 2014).

Perceptions are knowledge and beliefs about the external world and are products of the perceptual experience of the subject with all involved senses (Siegel, 2016). Experience is the result of the interaction between the person, society and environment, and the cognitive process that occurs within the person. Such a process might be basic, such as "sensation, attention, and perception," or complicated, such as "memory, learning, language use, problem solving, decision making, reasoning, and intelligence" (Smith & Kelly, 2015, p. 1). Sustainability perceptions include, but are not limited to, understanding about the climate-change crisis and its causes, sustainable-development trends and models, and how individuals and society should behave so that they are in harmony with nature.

If perception is about thinking, practice is about doing. Sustainable practices connote actions, activities, lifestyles and ways of doing things in this field. Examples include renewable-energy production and use in place of fossil fuels, waste reduction, reusing and recycling, and promotion of welfare, democracy and participation (Sodiq et al., 2019).

Practice is informed by perception, particularly knowledge of theories, principles and rules (Schmidt, 2014). A person's awareness, motivation and action taking (or agency) are essential for practice development. The person is active and able to perceive responsibilities to act (Eden, 1993), the level of difficulties and their ability (Ajzen, 1991),

and control factors and constraints (Kollmuss & Agyeman, 2002). The person might calculate costs and benefits using available information, and weigh available options to make rational choices (Jackson, 2005). They rely on their thoughts, beliefs and preferences to guide their decision making (Wilson & Chatterton, 2011). They act with a belief that their action will be effective (Ballard & Ballard, 2005).

Both perception and practice are contextualised by the person in their relationship with society and the environment. The cognitive and action processes allow the person's effective engagement with the environment and its changing conditions (Archer, 2003). In this engagement, the person learns about society and the environment and how to work with them. Learning occurs for individuals, wider groups and communities (Reed et al., 2010). The person internalises social pressure, values and norms that contribute to their rational decision-making (Jackson, 2005) to take actions that either repeat or replace their old habits (Darnton, 2008). Practice can be initiated, learnt, adapted or changed as the person develops and applies their ideas, reflects on, identifies and tries ways to improve their actions to gain better results (Schmidt, 2014).

Perception and practice as actions form a continuing loop where they are mutually dependent and co-ordinate with each other intrinsically (Gibson, cited by Lobo et al., 2018). Humans learnt about and interacted with the environment to survive in pre-historical times. As they accumulated knowledge and capacity such as language, sciences and technologies, there were attempts to control and exploit the environment. The resulting capitalist system led to the climate-change crisis, and people perceived the needs and started to search for and adopt more sustainable practices for self-preservation (Scott & Vare, 2020).

Social-practice theory illuminates the ways in which perception and practice mutually evolve in different environmental and social settings. It recognises that individuals play a central role to practice; they carry, sustain and develop practice, and exercise their agency through recurrent performance of practice (Welch, 2016). Individuals also incorporate into their practice contextual factors such as norms and values, social institution, technologies, knowledge and skills (Shove et. al., 2012), the ecology, climate conditions and landscape (Wang, 2015). Practices are, therefore, constantly changing, dynamic and interconnected (Shove et al., 2012); their longevity, transformation or termination depends on these factors.

Understanding of the climate-change crisis, its causes and consequences, has underpinned Vietnam's actions for environmental protection. As previously mentioned, different players have their own measures. State measures mainly control, with issuance and implementation of relevant legislation and policies. The civil and private sectors' measures mainly provide support and supply of alternative, more sustainable practices and promote them, as in public campaigns (Nguyen & Datzberger, 2018).

This study focuses on ecological practitioners who have been involved in these actions. Social-practice theory allows an understanding of how and why they have initiated and developed sustainability perceptions and practices. It considers factors which might hinder, support or shape these practices and perceptions, and thus allows prediction of future development. Therefore, it could allow practitioners, policy-makers and stakeholders to identify measures to support and promote sustainability in this country.

METHODS

The inquiry used a qualitative approach and in-depth interviewing to collect rich and deep data on the research topic. Fifteen ecological practitioners from the Center for Development of Community Initiative and Environment (C&E) network participated in these interviews. The practitioners come from across Vietnam. Their expertise and practice spans agriculture, architecture, education, fashion design and production, forestry, handicraft, hospitality, tourism and waste treatment. Each of them has ten years or more experience in these fields.

Narrative and thematic analysis were employed. The narrative analysis focused on the development of the respondents' sustainability thoughts and actions. This attended to the continuity and process as well as to special

events that occurred across their lifespan, along with the changing contexts. Thematic analysis teased out major and sub-themes of sustainability perceptions and practices.

List of interviews

Interview	Location[1]	Interviewee's gender, expertise and current position
1	Tay Nguyen	Male, permaculture and ethnography
2	Quang Nam	Male, organic farming
3	Quang Nam	Female, forestry garden and solid-waste management
4	Quang Nam	Male, eco-tourism
5	Thua Thien Hue	Female, organic produce shops and restaurant
6	Dong Nai	Male, sustainable farming and farm-stay tourism
7	Long An	Male, traditional handicraft shops
8	Thua Thien Hue	Male, community tourism
9	Lao Cai	Female, social tourism enterprise
10	Ha Tinh	Female, human ecological practice
11	Thua Thien Hue	Male, education
12	Hanoi	Female, playground
13	Hanoi	Male, zero-waste shop
14	Hanoi	Female, fashion design
15	Quang Nam	Male, bamboo-handicraft workshop and community tourism

1   These are provinces in Vietnam.

FINDINGS

Experience of the climate-change crisis and motivation for action-taking

The practitioners experienced the climate-change crisis in the form of negative, drastic changes in society and nature that occurred in Vietnam from the 1990s. Before this, Vietnam was predominantly a close-to-nature, self-sufficient, rural society which was closely knit and community oriented. In their childhood and teenage years, some resided with their extended families. From adults in their families and communities, they learned how to grow and harvest crops and gather wildlife for food. The practitioners perceived that the environment and nature were intact, beautiful, essential for life and were treasured.

> As a child, I … helped parents growing rice, potatoes, corns, squash, gourd, beans and others …. Life in the countryside was very beautiful. While parents worked in the fields, the children play rural games such as building a hut, pretending to sell and buy things in fairs, which were very interesting. The countryside environment was nice …. There were mango, plum, grapefruit and all sorts of fruits. Wild fish, shrimp, crab and snails were abundant. (Interviewee #6)

The above version could be nostalgia, because environmental degradation was observed in Vietnam much earlier. Since the 1950s, heavy industries have been developed, followed by light industries with an export orientation and ongoing urbanisation (O'Rourke, 2002). However, the degradation between the 1950s and 1980s was minor compared to what occurred between the 1990s and now. Indeed, as the practitioners grew up and transitioned into adulthood, rapid industrialisation and modernisation took place (Asian Development Bank, 2013; Chu, 2018; Chu, 2020). Cities and industrial parks developed, expanded and attracted young labour from rural areas with perceivably better and more stable incomes (Vo, 2021; Pham et al., 2018). In rural areas, intensified farming and heavy use of chemical fertilisers and pesticides severely polluted the environment (Asian Development Bank, 2013; Chu, 2018; Chu, 2020). Interviewee #6 observed that wildlife, the source of natural food, disappeared. Fisheries and aquaculture were affected. Food was poisoned with preservatives and pesticides, which harmed people's health. The rural community was broken up. The caring and community tradition was replaced with money- and market-oriented practices.

> The canal environment was polluted with deposited herbicides and pesticides from the field. We do not see fish and crabs anymore …. Children cannot play like us in the past. There is no such connection between the villagers like that in the old days …. Durians and jackfruits were injected with chemicals. Other fruits were soaked in chemicals to make them beautiful and shiny …. People spray certain chemicals to make vegetables grow three times faster [than they usually do]. (Interviewee #6)

Social disparities and poverty grew among the disadvantaged groups such as farmers, ethnic minorities, the elderly, women, children and people with disabilities. Interviewee #10 pointed out that economic development did not solve poverty but exploited farmers. Interviewee #6 observed that farmers' income was low and unstable as the crop price was in inverse proportion to the crop yield. Farming traders, however, became richer from the profits they made. Interviewee #9 observed that land development destroyed historical and natural heritage and the livelihoods of ethnic groups. Interviewee #14 was shocked at the illiteracy rate among disadvantaged children and youth across the country, and that their only wish was to have enough food.

> I met many kids across Vietnam who were 14 years old but could neither read nor write and to me, it was a shock …. [They said that they] had no dream at all and just wanted to have enough food to eat. (Interviewee #11)

Besides the crises to their communities and society, some interviewees experienced personal crises caused by various life stressors. Interviewee #1 had stress, an accident and health failure. Interviewee #5 suffered from domestic violence. Interviewees #2 and #6 were concerned about the bad impacts of herbicides and pesticides on health. Most interviewees perceived a lack of happiness and satisfaction, and the neglect of self-cultivation, connection, relationship and collectivity in their adult life.

Overall, the crises and associated negative, sad experiences motivated the practitioners to pause, reflect and search for solutions. Interviewee #1 delayed his study and career plan as he healed from an accident. During this time, he attended to man-made environmental disasters. Interviewee #5 resigned from her old job, moved to a different city and looked for a new career that could benefit not only herself but the community. Interviewees #2 and #6 were looking for alternatives to intensive farming. Interviewee #7 revived a traditional handicraft trade, creating local jobs, caring for nature and contributing to his homeland.

> I want to take care of [nature] again and contribute to the homeland that has nurtured me since my childhood. That was the reason why I wanted to come here to develop a job for me first, then for others if possible. (Interviewee #7)

Taking actions

To deal with the crisis, practitioners engaged with the environment in a search for more sustainable practices. They then developed and tested sustainable models, dealt with resource shortages, engaged with stakeholders, developed long-term visions, planned and took step-by-step actions, and learnt to problem solve. These actions are elaborated below.

Searching for, developing and testing sustainable practices
The practitioners sought for existing sustainable practices in the locality, the nation and other countries. They formed and tested sustainable models of production, distribution and consumption in place of the current unsustainable practices. These models covered organic farming, permaculture, forestry, gardening, social tourism and hospitality, ecological education, ecological production and distribution, and waste management. Interviewee #6, for example, visited and studied existing organic farms before developing his team's organic farm. Interviewee #11 pioneered in mindfulness and social–emotional education for school children. He drew on the connection between self, others, society and nature to create specific exercises for his education programme, which teaches children to care for themselves, other people and the environment. Interviewee #4 focused on the local and national population and their littering behaviour, and organised regular waste-collection activities to educate and engage local people in behaviour change.

The search involves learning about existing sustainable practices and conditions for translation into the practitioners' settings. Interviewee #6, for example, evaluated to tease out the good practices from the existing organic farm models and applied them on his farm. Interviewee #3 replaced food crops with traditional herbs, while creating a whole system of flora to enhance soil stability and nurture the ecosystem to deal with huge shifts in sunshine and rain patterns. Interviewee #7 found that waste treatment was not a holistic solution so he considered zero-waste production and chose to revive traditional trades using local natural grass.

Solving the resource shortages
A few years were needed to fully develop a product or service and its clientele. The practitioners' capacities and resources were limited, as was external support. Major obstacles included financial constraints, human-resource issues and a lack of support from authorities and consumers/the public.

> [W]ithout money [to hire more staff] I have to [be solo at first] … most of the staff are also solo. They are on their own doing their specialised areas …. [There is] a lack of support from the authorities …. People are not well aware of clean and organic products and very few people are willing to pay for them. (Interviewee #5)

To resolve the above issues, the practitioners developed their models at small scales and shared responsibilities among involved partners. For example, in a traditional handicraft production model, groups of local handicraft masters and pupils were responsible for gathering materials and making products while the practitioner ran quality control and product delivery. This reduced dependency on external funding and support. The initiative required less than US$100 of investment from the practitioner. It promoted co-operation and ownership, and increased self-sustainability.

> I only work to my ability, capacity, experience and resources … the responsibilities are equally divided among everyone in the production chain … everyone sees themselves as a part of that production. (Interviewee #7)

The practitioners allowed flexibility within their models and incorporated diverse activities. For instance, they combined the production and distribution of organic produce with education, tourism, community development and other services. Interviewee #5 added a restaurant to her organic produce shop to attract more clients and generate more revenue. Because of this, the models were easy to replicate and had the potential to reach a large audience to initiate a positive transformation of attitudes and behaviour and pull together more resources.

> When I do my part well and share the ways I do, many people can learn and imitate. I accidentally have a lot of allies who work together with me. It will create a greater amount of resources than I do all by myself, managing staff, resources, facilities and much more. (Interviewee #7)

The practitioners connected to form a community of practice where they could access peer support and resources as and when needed. They maintained regular contacts to share information and other resources, seek and offer advice, and support and celebrate progress. They led and provided emotional and material support for people who worked with them, and empowered them.

> [W]hen I heard that a neighbouring farmer was sick in the hospital, I was very worried so I went to visit him. I also helped to water his vegetable bed when it was dry. If I do not see a farmer in his garden, I would telephone him to check if he was sick or not and to offer support and encouragement immediately. (Interviewee #2)

> Every one or two weeks, we have a group meeting for relationship building and development of our love of nature. (Interviewee #6)

When needed, they turned to spiritual sources such as Buddhism, which is commonly practised in Vietnam, as Interviewees #1 and #6 did.

Engaging with stakeholders
The practitioners involved different parties, for example, the market, the community/society and authorities. For customers, they ran marketing activities to attract and build their clientele, and educate and motivate them to change their consumption patterns. They provided education and co-operated with the authorities to mobilise their support and for policy changes. They fostered community development and collectivity, and managed relationships with both external and internal partners to ensure that efforts were well orchestrated. Interviewee #3 identified potential green, organic producers and worked with them to improve their products. Interviewee #5 networked with various ecological producers for her organic produce distribution business. Interviewee #11 co-operated with schools, teachers and students to develop lectures and lessons for his education programme. In planning for a clean model of coffee production, Interviewee #1 envisioned the need to build trust so that he could mobilise resources and support from the community and local authorities. He then designed and ran suitable activities to engage the community and local authorities. Interviewee #2 ran marketing activities to attract and build his clientele, and educate and motivate them to change their consumption patterns.

The practitioners endorsed a careful selection process in recruiting partners and participants to their initiatives to fit their purposes. Interviewee #6 explained the interest, potential and contribution criteria for his farm:

> [W]e tend to recruit new members or new residents only when they directly work with the farm …. You have to be in charge of something, or a certain stage and have a working schedule of a certain number of days per week. You should contribute to more strength [for] the farm, not simply money …. We select [tourists] …. We asked about their visit purposes and expectations. If their said purposes and expectations match ours and we can meet them, we agree for them to come. If they just came for a birthday party, a celebration, a lunch or so, we would not agree. (Interviewee # 6)

Interviewees #3, #5 and #14 reached out or planned to outreach to national and international communities. Interviewee #14 developed an international clientele for her traditional clothing enterprise as she built a reputation in the global fashion industry. This was an important survival strategy in the market competition with existing environmentally unfriendly models of production, distribution and consumption.

Long-term vision, planning and step-by-step actions
A long-term vision, planning and step-by-step actions were implemented in the practitioners' projects, given the time required, and involved tasks.

> [W]e go step by step …. The agricultural system should be the foundation and soil should be improved. Tourism is an added service …. Visitors can come to have a better understanding and spread [the news]. They could bring a little income …. We also welcome educational organisations …. For farming households who want to follow our model, we would share experiences and link to find a market for their products. More farmers are following this. (Interviewee #6)

Learning to problem solve
The practitioners acquired and applied knowledge and skills to solve arising problems in their initiatives. Business knowledge and skills, such as understanding of the relevant supply chains and their positions in the chain, or the role of quality assurance and standards, were essential for running successful businesses, enterprises and organisations. They set realistic goals and used rational thinking in planning and implementing, using existing

resources and strengths and creating initiatives based on information and feedback. Interviewee #7, for example, set his position as a supplier of handicraft products and worked with the producers and shops. He attended to the economic, ecological and social impacts and benefits of the activities and operation. His guiding questions were: *What shall I do next? How long could I maintain this activity?* Interviewee #11 incorporated environmental protection contents into mindfulness and social–emotional education when he realised this gap.

Interviewee #13 started with selling reusable straws and expanded the range of products offered in his shop to include bamboo brushes, sugarcane packages, organic foods and beauty products, based on inquiries and feedback from his customers and his networks of providers. He stressed the importance of quality products, which included good impacts on the ecosystem. As a distributor, he worked with producers towards quality goals. However, he had to sell environmentally unfriendly products so that his business could survive in the short term, while being able to introduce and build a market for environmentally friendly products.

> I have to classify which products are profitable for me to live on and which ones take time to grow [for a better lifestyle] …. If I refuse this, both will die. I have to achieve my goal … I have to choose …. Because lifestyle cannot be (formed) overnight …. I need to work for long and I still retain my value. But I survived [based on] … less-sustainable products …. There has been much self-argument when I have to choose. (Interviewee #13)

Sustainability perceptions

Practitioners hold strong beliefs in the need for sustainable practices. They view sustainability as a gradual, multi-faceted and multi-staged process which involves different layers and stakeholders in society. Balance and harmony among them are essential. Sustainable development targets equity and benefits for the disadvantaged, community development, cultural and heritage conservation. Perseverance and persistence are needed to deal with obstacles to sustainability. These beliefs and ideas are discussed in detail below.

Beliefs in the needs for sustainable practices
The practitioners strongly and firmly believe in the need to live, produce, distribute and consume in a way that is friendly to the environment and society. That means conservation of the ecosystem and the creation of a good living environment for humans.

> I conserve … the environment and the ecosystem and create a good living environment for as many people as possible …. [In ecological agriculture] we need to think a little bigger …. We acknowledge and restore the ecosystems of native trees, replant forests and do organic, safe farming. (Interviewee #10)

Sustainable development is gradual, multi-faceted and multi-staged
The move toward sustainability has been a gradual process. As life continually evolves and people need to adapt to these changing conditions, flexible interpretations, adaptation and change based on personal circumstances and preferences should be allowed.

> [I]t depends on each person. Each person has their own way of defining and their own experiences …. Individual perspectives and plans differ. And we can only examine one in its very specific contexts. (Interviewee #3)

The practitioners' initiatives were multi-faceted, with economic, social, cultural and environmental dimensions, among others. They were multi-staged and included setting up, testing, running, reviewing, improving and replicating. They were circular, and required revisiting and reinforcement of achievements in the previous stages during implementation of actions for the current stage. Unknown factors and changes had to be allowed for. To build his permaculture enterprise, Interviewee #1 worked with ethnic minority people and authorities, which had economic, cultural, environmental, ethnographical, social and political dimensions.

> [The dimensions] are unpredictable …. We have to start with small tasks which allow interactions and then issues emerge and transform …. I could not control or imagine them. I see it in a more impermanent state … our team

expected up-and-down stages …. It continuously loops …. Internal and external issues are … closely linked. (Interviewee #1)

One of the things that I learn from nature and the ecosystem … [is] that everything is moving and transforming. Nothing stands still …. We need to observe how they are moving. In my observation [of a phenomenon], I would identify the problem, the plants, the animals. Then I started to have a plan for adaptation and coping with them. (Interviewee #10)

Sustainable development involves different layers and stakeholders
Sustainable development is multi-layered as it spanned across micro, mezzo and macro levels. Individuals, groups, communities, consumers, markets, authorities and policymakers, to name a few, and the environment, are all part of it. International organisations have funding, scientific and policy-making roles at macro levels. Authorities have power, resources and policy-making roles, also at macro levels. Local organisations, community and enterprises are working at the mezzo and micro levels. They should work together.

The government does a lot about general policy issues. The large organizations [like IUCN] have the resources. The approaches of the community, enterprises, and social enterprises, for example, are both very practical and specific …. Everyone needs to work together …. IUCN plays some roles in scientific development and policy influence and has funding resources. (Interviewee #3)

Interviewee #11 appreciated the roles and contribution of authorities, schools, teacher-training colleges and his team in developing a practicable, workable sustainability-promoting education programme for Vietnam.

The team, the provincial Department of Education and Training … and the Teacher Training University … connected and created mutual support. The university is stronger in the theoretical framework. [My] team is very strong in the practice. The department is the state authority managing education. (Interviewee #11)

Balance and harmony are essential
The practitioners emphasised a balance among the individual, community/society and the environment. Individuals should have good health, proper work, income and housing, and be happy and satisfied fulfilling their purpose and contribution to society. However, they should not cause any harm, but bring benefits to nature and others in society. They should attend to, care about, understand and fit in with the environment. People who take things away from the environment should be made responsible to repay.

[S]ocial and ecological problems are human–human relationships, how we exchange information, how we interact with each other so that we look at each other, we listen to each other, we try to understand our partners …. What they expect, hurt, stumble on, and want. Well, then I started to form [the actions] to meet each other's needs. Ecology is the same … I think that humans have to observe the natural system more … we have to nurture the soil. (Interviewee # 10)

The practitioners attach importance to happiness, responsibilities, self-satisfaction and sufficiency. Happiness goes along with self-satisfaction and responsibilities and involves the fulfilment of one's wishes. These are helpful for the environment and society. Sufficiency means having enough resources to live healthily, such as proper nutrition, clothing and shelter.

I only want a sufficient amount of food with enough nutrition for good health …. My clothing should keep me warm, protect me against the [weather conditions] …. The accommodation should have proper ventilation and be weatherproof …. The job I do should be my favourite … I can see the plants and focus on more useful stuff. I find such a life is happy. (Interviewee #6)

Positive thinking and emotion, and sound spirituality, contribute to self-cultivation. There is a strong attachment among the practitioners to the homeland, and adherence to good values and norms for the community and society.

Interviewee #10, for example, stressed the importance of soul-nurturing with passion and the practice of giving things away. She valued all people who came to her and maintained good relationships with them so she received support from many people. Relationship development and maintenance is an important feature of Eastern culture.

> People still follow me and love me. It is all because of me. In Eastern culture interpersonal behaviour and relationship are important … I value everything that I came across in my life … all [people] have a unique … contribution to society. (Interviewee #10)

Sustainable development targets equity and benefits for the disadvantaged, community development, cultural and heritage conservation
The practitioners' sustainability initiatives targeted equity and benefits for socially disadvantaged groups. These groups included, among others, farmers, ethnic minorities/ Indigenous people, the poor, socially deviant youth, women and the elderly. In various environmental initiatives that the interviewees undertook, these groups participated and demonstrated behaviour changes, contributed labour, special skills and knowledge, and advocated for sustainable development to the public. Some poor and disadvantaged youth were trained in urban gardening. A group of women with disabilities was employed in a recycling business. Ethnic minorities became partners in sustainable education, tourism and organic-produce enterprises. Their abilities, motivation and potential to contribute to sustainability were used and recognised.

Community development was another objective of these initiatives. According to Interviewee #3, the community was diverse and included various groups such as laypeople, artists, educators, development workers and others who could gain benefits or provide resources for sustainable development. Community development entailed education, development of collectivity, and development, mobilisation and deployment of resources to meet community needs and purposes. It started with getting to know the community, engaging with them, building relations, providing support and guidance. Interviewee #1 asserted that each actor required a particular approach in engagement, motivation and relationship building to gain support. Such an approach should fit their perspectives and levels of education, and awareness and understanding of sustainability.

> Villagers are at a different level of education and ability to absorb information so I split the information and presented to them properly …. In the meantime, I became a part of the community. I started to develop activities so that the project gradually grows upwards from the lowest. (Interviewee #1)

In addition, the efforts involved cultural and heritage conservation. Interviewees #1 and #7 worked with local people to revive their traditional trades and farming. Interviewee #2 and other farmers tried to encourage and involve their children and grandchildren in the farms by building a close relationship with them and creating opportunities for them to contribute to farming so that they would take on their farming tradition and assets in the future.

The move towards sustainability included changes in the way people behaved towards and worked with each other. They demonstrated better awareness of and more humane treatments towards themselves, their society and the environment. For example, Interviewee #11 observed that in his sustainable-education programme, participants connected better. They became more mindful and internally motivated, and adopted behaviours that were friendly towards other people and nature.

> The children do stuff such as collecting rubbish or cleaning their classrooms, not because their teachers instruct them to but because they are willing to do [it] themselves …. I see the [growing] confidence of teachers …. It involves quality change. Sometimes the teachers stood, watched the students talking to them, told them that they were very good and if they could see the teachers. That was when people turned to each other and made connections. (Interviewee #11)

Perseverance and persistence to deal with obstacles in sustainable development
The move to sustainability had obstacles. For example, certain individuals or groups might be against sustainable

actions and thoughts or misinterpret them, and this should be accepted as part of the transformation process (Interviewee #1). Forces majeur such as Covid-19 brought businesses to a halt due to lockdowns, economic downturns, lower incomes and thus people's lower purchasing power. This required the leaders and followers to persevere and persist.

> In this special circumstance with the global pandemic, people might give up in two weeks or a month … but I will persevere till the end. I mean that by all means, I will reach my set goals, no matter how slow or fast I am. (Interviewee #5)

DISCUSSION AND RECOMMENDATIONS

Sustainability in learning and action

Sustainability demonstrated its complexity firstly in the increasingly sophisticated learning and cognition of the ecological practitioners (Smith & Kelly, 2015). When the practitioners first noticed and observed negative changes in their localities, they gained mostly basic, simple understanding of environmental issues and their observable impacts at personal and community levels in their localities.

With inquiry and further observation, they acquired more comprehensive understanding about unsustainability and its causes in Vietnam. The causes included the particular social structures and phenomena such as the market-oriented economy, industrial production, intensive farming, urbanisation and associated human behaviours such as increasing consumption. There was increasing awareness and understanding about alternative, more environmentally friendly options.

Later, in the deeper learning-in-doing process, the practitioners accumulated more complex knowledge and skills to set up, develop and maintain these structures and practices in their localities. They answered complicated questions such as how to operate a model successfully, how to mobilise enough resources and support in a sustainable way, and how to deal with the complex issues of an organisation or a business. Sophisticated thoughts, ideas and skills formed and learning deepened as the practitioners sought solutions to these issues.

Along with learning, the complexity of sustainability was obvious in the practitioners' actions (Moore et al., 2017). The practitioners had to select several from many sustainability targets. They also had to choose among the multiple dimensions and levels of sustainability to be the focus (Barbosa et al., 2014). Sustainable production, consumption and lifestyles received much attention, while sustainable politics and governance appeared to be absent from the ecological practitioners' agenda. This was probably because the communist regime discourages democracy and political actions in Vietnam (Nguyen & Datzberger, 2018). Their models of sustainable production and distribution attended most to the economic and environmental dimension, given the urgency of environmental degradation, while attempts were also made to cover social and other dimensions. Their actions were usually limited to individual and group level and localities. Their models were small in scale to cope with limited capacity and resource shortages.

The practitioners juggled to find a balance among competing targets of enacting and promoting sustainability, and surviving and being well in the present market- and capital-orientated society. The juggling meant the incorporation of both sustainable and unsustainable features in these models to make them workable in the current settings. This compromise was made with a hope and a plan to gradually replace the unstainable features with sustainable ones, as in the case of selling both sustainable products to change consumers' behaviour in the long term and unsustainable products to generate enough revenue to run the shop.

Agency, learning and location

The perceptions and practices have mutually evolved as the practitioners engaged in ongoing learning, creating, experimenting and improving their sustainable initiatives and reflecting on them. In this process, agency, environmental and social learning, and location were the key factors.

Agency was demonstrated by the practitioners' awareness, motivation and action-taking (Welch, 2016) to initiate and maintain sustainable changes. The practitioners were aware about environmental degradation and its causes and impacts at personal, commune and social levels. Their dissatisfaction and crisis motivated them to act to solve these issues. They realised problems, and knowledge and skill gaps, which fed into their motivation to learn and apply learning to problem-solve. Agency, therefore, was enhanced along with intensified learning and action.

Agency was also shown via the practitioners' making choices throughout their learning. They chose to act, for example, on specific sustainability issues and in particular ways based on their rationale of what would work. This, in turn, was based on their past learning and experience. They adapted and adjusted their choices depending on the outcomes of their practice trials to make them work better.

Learning consisted of social and environmental learning. Both types of learning were guided by the question of how to solve local-specific environmental issues. Environmental learning occurred as the practitioners interacted with the environment (Archer, 2003). This involved observation, experimentation, evaluation and reflection on their ecological practices and their impacts on the environment and its changing conditions.

Social learning occurred in interactions with others in society (Reed et al., 2010), including peers, team members and stakeholders. Interactions were intertwined with knowledge creation and practice development for the practitioners, other involved persons, groups and communities. Social learning explained why the sustainability perceptions and practices shared common features with global sustainability thinking and practice such as environmental protection and human rights. This, in turn, demonstrated the universality of these features.

Social learning explained the unique features of these perceptions and practices. They included, for example, ideas about sufficiency, community and human relations, or Eastern cultural practices of preserving and valuing people and relations. These features reflected the upbringing, history, qualifications and professions, personal experience and purposes of the practitioners and the Vietnamese contexts. This uniqueness contributed to the global diversity of sustainable development.

The practitioners' beliefs, ideas, knowledge and practices developed in a mutual relationship (Gibson, as cited by Lobo et al., 2018). Many practitioners had basic, simple perceptions of sustainability and a naïve intention to do something when they first engaged with sustainability. As the practitioners searched, learned from other places or people, and tried to apply some simple ideas, their sustainability perception and practices grew. The growth brought more complex questions. These consisted of, for instance, how to operate a model successfully, how to mobilise enough resources and support in a sustainable way and how to deal with the complex issues of an organisation or a business. This further engaged the practitioner in their learning-in-action. Answers to these questions helped form sophisticated perceptions and practices accordingly.

Location sets the contexts for the practitioners' agency and actions. The living environment was an essential part of life and a major source of awareness and motivation for the practitioners. Localities were the medium for them to test and refine good practices. The practitioners built up their support and learning networks from their local bases. They drew learnings that worked in their localities and contributed to the learning of their community of practice with their local perspectives. The engagement, practice performance and development were ongoing, as the settings were constantly changing.

The interaction between agency, learning and locations contributed to the hybrid, continually evolving nature of the ecological practitioners' sustainability perceptions and practices. The practitioners played the key, formative role with their motivation and efforts. They found out about, selected, tested and validated global, national and local knowledge and practices to fit the local contexts. They incorporated knowledge and skills from economics,

sociology and other fields, social norms, values and institutions, and the environmental conditions (Shove et al., 2012; Wang, 2015). They constantly reviewed, adopted and adjusted their perceptions and practices to the changing local, national and global conditions. In this way, contextual factors contributed to and shaped these perceptions and practices.

Use of findings

The findings can be useful material for future sustainability efforts. For example, a comprehensive and holistic approach, a long-term vision and planning, step-by-step actions, regular review, evaluation and reinforcement are required, along with flexibility, diversity and adaptation to allow for unknown factors and changes. A trial-and-error process with small scales is advisable in the development of a sustainable model. This is because it helps to realise widely workable and replicable models with limited capacities and resources. It shares responsibilities among involved parties and enhances ownership, reduces dependency on external funding and supports high resilience.

The identified pathways of the practitioners interviewed for this study could be streamlined and applied to the selection and training of future ecological practitioners. Their in-depth knowledge and practice in their areas of specialisation, and practice development and reflection process, provide insights into sustainability issues in Vietnam and offer effective solutions to them. Their inspiring narratives, positive thinking and emotion could be used to engage people.

As the knowledge and practices focused on micro levels, future sustainability efforts should consider outreach to the national and international communities, political actions, and working with authorities on policies, legislation and nationwide sustainable activities. Possible interventions could be to educate and encourage ecological practitioners to use existing policy channels and forums to promote their models and initiatives. They could also voice their opinions on related legislations and policies, given that these areas are still under-developed in Vietnam. Political lobbying could also be considered, along with the influence of international organisations and foreign countries with policies that support sustainability. Lessons could also be drawn from models that have reached national and international communities.

In Vietnam, the public and authorities play important roles in sustainable development but their perceptions and awareness of sustainable development are under-developed (Chu, 2020; Nguyen, 2020; Thong et al., 2017). Therefore, provision of practice examples or models, engagement, connection and education, campaigns and awareness raising are needed across sectors for policymakers, authorities and the public.

Practitioners play various roles and have great potential to contribute to sustainability, so their roles should be encouraged and facilitated. This could be done via providing resources for their activities, networking for the development of a community of practice, engaging them in sustainable development and acknowledging, celebrating and making their efforts widely known via public-awareness-raising campaigns and events.

Ecological practitioners are facing, and will continue to face, the climate-change crisis and its negative impacts at personal, community, societal and environmental levels. Crises offer challenges, opportunities and motivation for changes. For example, stress should be dealt with by stress-reduction and management strategies (Sanson et al., 2019). The global Covid-19 pandemic requires states, communities and individuals to practice social distancing and elimination of travel (Ritchie et al., 2020). Future sustainability efforts should encourage people to reflect on the causes of the crisis and sustainable development as the overall solution. In addition, they should build capacity for crisis management programmes for stakeholders.

Vietnam has much in common with New Zealand in terms of the climate-change crisis. Unsustainable economic practices in New Zealand have resulted in the country's very high greenhouse gas emissions per capita (Hopkins et al., 2015), deforestation, significant soil erosion, loss of biodiversity and poor water quality (Meister & Beechey, 2012). There are multiple social issues such as multiple inequalities across demographic groups in various sectors, poverty, homelessness, poor mental and physical health, and domestic violence (Greer & Morris, 2019). The climate-change

crisis is also posing huge risks to New Zealand with rising sea level and temperature, heat extremes and shifting patterns and amounts of rainfall (Hopkins et al., 2015).

The study findings from Vietnam have important implications for New Zealand. They suggest that ecological practitioners could and should play a key role in creating and promoting changes towards sustainability in New Zealand. Priority, therefore, could be given to supporting ecological practitioners to take more active roles. Funding could be provided to encourage development of sustainable models of production, delivery and consumption in areas that are currently short of such models, as in the case of the fashion industry (Albertson, 2020). The ecological practitioners could work with various stakeholders to promote sustainability efforts as suggested by Norton et al. (2020). For example, they could be involved in efforts to educate and share best practices with producers who are not well informed of these practices and their benefits (De Silva & Forbes, 2015).

CONCLUSION

This inquiry confirms the key roles of agency, environmental and social learning, and locations in the formation of sustainability perceptions and practices of Vietnamese practitioners. It explains the continually changing, dynamic, hybrid nature of these perceptions and practices. It draws lessons and offers recommendations for future sustainability efforts in Vietnam. Implications of the findings for New Zealand are also discussed.

The inquiry is qualitative, so findings that are time and context specific cannot be generalised for other practitioners in Vietnam in different times and contexts. Younger generations in Vietnam, for example, are living in a different time and setting. They have experienced increasing environmental degradation and social disparities associated with an industrialising society, but there are validated sustainable models and practices. Therefore, continuing observations are necessary to identify the pathways and milestones for subsequent cohorts of ecological practitioners to ensure that sustainability efforts meet their characteristics, needs and aspirations.

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AUTHOR

Angie Dang is a Lecturer in Social Work at NorthTec, Whangārei, New Zealand. She has a Bachelor of International Relations, a Master of Applied Social Work, a PhD in Education and a Graduate Certificate in Health Science – Addiction. She has an academic background in education, social sciences, addiction studies and social work; and a practice background in community development, community corrections, education, health social work, social research and victim support.

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