

# Decision making in senior secondary school curriculum innovation

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## Abstract

*New Zealand has a flexible curriculum and assessment structure that enables unique courses to be offered in senior secondary schools. Five medium sized secondary schools that have developed unique courses were examined using a socio-material methodology to explore who was involved in the development and what considerations guided the decision making process. The principal and course developers from each school were interviewed and the data was analysed using Actor-Network Theory. It was found that each unique course was influenced by its specific context. Three conditions were identified across the case studies that enabled the innovative curriculum design: a perceived flexibility in national curriculum and assessment structures, a clear motivation or idea, and a passionate person (or people) to develop and maintain strong relational networks. School leaders can nurture these conditions by clarifying alignment between curriculum innovation, the school's strategic direction and values of the context, by strengthening the connections across the actors in the network and by encouraging flexible thinking about constraints and possibilities. This study provides an example of the use of Actor-Network Theory to explore curriculum innovation and explores the positioning of the environmental context as an actor within socio-material networks.*

**Keywords:** NCEA; Actor-Network Theory; curriculum; secondary school; innovation; New Zealand; course design; decision making

## Introduction

In the global context school leaders navigate powerful social, political and economic factors when supporting or initiating educational innovation. In a connected society these factors and the people within networks influence the decision making processes during the development and implementation of educational innovation. As education systems evolve (or devolve) school leaders are faced with a need, along with an opportunity, to innovate.

## Context

The school system in New Zealand is one of the most decentralised in the world, following the introduction of a policy of self-managing schools in 1989 (Nusche, Laveault, MacBeath & Santiago, 2012). The system enabled innovative decision making within each individual school context. This environment of flexibility has continued to evolve with the introduction of the National Certificate in Educational Achievement (NCEA) assessment system in 2002 and curricular redevelopment (Ministry of Education, 2007, 2008).

The two national curricular documents provide guidelines for what students should have the opportunity to learn at school. One curriculum document guides English medium education and the other guides Māori medium education. The national curriculum allows flexibility in the way in which it is interpreted and applied, enabling each school to develop their own curriculum appropriate for their context.

NCEA is the New Zealand qualification system offered in the final three years of schooling in New Zealand. In this system students receive recognition for demonstrating achievement of standards derived from the national curriculum or vocational pathways providing a flexible modular structure that, at least in principle, contains opportunities for local curriculum design right through to the end of schooling (Gallagher,

Hipkins & Zohar, 2012, p. 138). Students are awarded a National Certificate in Educational Achievement at levels one, two, or three when they have completed a sufficient number of standards at the corresponding level. The standards that make up a certificate can be derived from any subject area, allowing the development of programmes that use assessment standards from across curriculum areas. The structure of NCEA and the national curriculum allows flexibility in how New Zealand schools meet the needs of students during their last years attending formal secondary education. While secondary schools in New Zealand have traditionally had some flexibility to design and offer school based programmes to senior students, the introduction of NCEA provides a pathway where achievement in innovative programmes contributes towards national qualifications. It provides the opportunity for students in the senior schools to experience place-based learning.

National curriculum, assessment structures, and decentralised decision making policy have provided flexible conditions that enable unique programmes of learning to be introduced into New Zealand secondary schools. Schools are encouraged to offer programmes that suit their context and are responsive to their learners' needs. However, few schools have taken up this opportunity, with nearly all academic programmes taught in senior secondary schools falling within traditional subject areas (Educational Review Office, 2013). A small number of schools have been utilising the flexibility to create innovative programmes that contribute to NCEA qualifications (Hipkins, 2007; Hipkins & Spiller, 2012). The educational reforms of 1989 that initiated the decentralisation of education administration to schools included a policy of providing parental choice of schooling. This has resulted in an increased emphasis on schools maintaining or enhancing their academic reputation and is likely to have contributed to risk aversion to implementing an innovative curriculum that may be perceived as deviating too far from traditional curriculum expectations that parents may have of a secondary school.

The process of developing and implementing an innovative programme within this context can provide insight into how decision making occurs, who is involved and what influences the decisions within a school setting. Innovations in a devolved system are influenced by a range of people, ideas and structures within the context. Those influences can be considered to occur within a network.

### **Network theory**

Networks have been identified as an important organisational structure in the information age (Castells, 2011), and networks that span across organisations have been described as “a fundamental unit of analysis in the study of advanced industrial societies” (Benson, 1975, p. 229). Network theory is a relatively new frame within education (Muijs, West & Ainscow, 2010). The application and critique of network theory in education has predominantly focussed on the networks of educators within and between schools (Lima, 2010); however, networks can include actors beyond teachers and educational leaders.

An educational network has been defined as a set of actors connected through relational ties, which can be more or less formal in nature (Borgatti & Foster, 2003). There is diversity across educational networks which can have multiple purposes (Daly & Finnigan, 2011). They can be established as a result of school, district or national educational policy, around a focus (such as a subject discipline area) or be established ad hoc from ‘grassroots’ for a particular need. Hite, Williams and Baugh (2005) identified four types of networks from administrator relationships: the innovation network, the resource network, the social/emotional support network, and the university-school partnership network. The innovation network consists of actors who could think collaboratively, shared similar beliefs, and supported new ideas.

The research frame to examine networks has evolved over time as networks and networking became integral to schooling sector policies that focus on school culture change, educator collaboration, and professional learning. Lima (2010) lamented the lack of criticality in research and suggested that the examination of educational networks should occur in a systematic way, and went on to describe six

dimensions for the analysis of networks in education including the genesis, composition, structure, substance, effectiveness and dynamics. Research has explored aspects of educational networks for learning, fewer studies have examined networks for innovation.

Social networking analysis is a research method within network theory. It consists of four features. It is structured and focused on ties between actors rather than attributes of actors; it is based on systematic collection of data about those ties; it relies on graphics and mathematical tools are used to make sense of the information about those ties (Freeman, 2004). Knoke and Yang (2008) characterise three main underlying assumptions within social networks concluding that structural relations are important for understanding observed behaviour, social networks affect perceptions, beliefs and actions, and structural relationships should be viewed as dynamic processes.

When considering curriculum decision making in schools there are many contributing agents that influence the processes and outcomes. A large number of these actors will be people; however the ties that exist within networks are not exclusively between people. Socio-material is a term cautiously used by Fenwick, Edwards and Sawchuck (2011) to describe research approaches which bring the material influences to the foreground. The material broadly refers to influences within a network that are not social or human. Actor-Network Theory is a material-semiotic theory of social action derived from complexity theory that can be applied to examine the conditions for the emergence of innovation (Latour, 2005). It is characterized by its treatment of people, things, and ideas as actors within a network, recognizing that each is capable of initiating and sustaining an action. It also emphasizes that actors are incapable of performing most actions by themselves, but require the support through relationships between actors within a network.

Actor-Network Theory was applied to examine how decisions were made around NCEA programme design.

## **Methodology**

Schools are complex organisations (Morrison, 2010). To understand how curriculum innovation occurred and who or what influenced decisions, five case studies were examined using an Actor-Network Theory analysis. This article reports on a study focused on the decision making process leading to National Certificate in Educational Achievement (NCEA) programme innovation in medium sized New Zealand Secondary schools.

A purposeful selection of participating schools was undertaken from information and volunteering through an initial survey about programme innovation sent to all mid-size secondary schools (401 to 700 students). Schools of this size sit approximately within the second quartile of schools within New Zealand; there are slightly less than 25% of schools smaller and slightly more than 50% of schools larger (Education Counts, 2014). Medium sized schools are able to teach a range of senior secondary programmes without relying on external expertise, yet are also restricted by resources and student numbers in the programmes they are able to offer. The organisation responsible for assessing quality within New Zealand schools, the Educational Review Office (ERO), commented in 2013 on the difficulties for smaller secondary schools to offer a broad range of programmes. This report also recommended the Ministry of Education “support schools to develop more responsive school curricula” (Educational Review Office, 2013, p. 26). By investigating programmes created at schools of this size, any findings could apply to the less resource-constrained, larger schools.

This research examined recently developed innovative programmes in five medium sized schools that are assessed using standards which contribute to NCEA. The principals of the participating schools and the developers of the innovative programmes were interviewed through semi-structured interviews to explore who and what influenced the design and development of the programme. The developers were identified by the principals. Ethical implications were considered and informed consent gained. There are limitations with the data collected, particularly as the questions asked participants’ view of past events and programmes they had a vested interest in.

This research examined the network of actors which influences the decision making process within the case studies. Within the network the actor or group of actors who determine the presence and design of the programme are identified as the *Executive*. The boundary of the networks were the actors that were identified by the Executive as influencing their decisions. Within a network the concept of a black-box was adopted. This is a network within a network which behaves as a single actor (Fenwick & Edwards, 2012). For example, a curriculum committee at a school may influence a programme design. The committee itself is a network but for the purpose of analysing the effect on the programme design, the curriculum committee behaves as a single actor. The Executive was identified through discussions initially with the school's principal and those involved in initiating the innovation.

Data analysis including laying out the actors in an interconnected network diagram. No arrows were placed on the connections as there is insufficient information about the volume and importance of each interaction. It was only reasonable to demonstrate a link.

The research did not include the mathematical component of social-network analysis. Given that the decision to implement a new programme was historic, during data collection it was not realistic to expect an accurate recall by participants of the strength or frequency of interaction with a factor in the decision. It would also have been a subjective rating and would not have offered a reliable comparison with other participants. The mathematical component of social-network analysis as offered by Knoke and Yang (2008), did not offer any reliable contribution toward answering the research questions.

The research investigated the following research questions. Who are the main decision makers for innovative programme development within New Zealand medium sized secondary schools? And what considerations guide the decision making process? The term 'innovative' refers to programmes that were locally developed and unique to what is usually offered in New Zealand secondary schools.

## Findings

Each case study is described below to identify the actors in the network, the innovative programme and the process that was followed during development. Each case study includes an Actor-Network diagram derived through analysis of interviews with the Executive. The programmes developed in each case study consisted of one or more course that students studied alongside other subjects to gain NCEA qualifications.

### Case study one: Sea Sports

The first case study is a network in which a programme was developed that reflected the physical and social context of the school community. The Deputy Principal and a physical education teacher were identified by the Principal as the Executive in the development of this programme and the network included a range of human and material actors (Figure 1).

The school is located in a coastal context where sea sports are a popular pastime; therefore the coastal environment was identified as an actor in this network. The Deputy Principal was an outdoor marine enthusiast and joined the school at the same time as a world class sailor became the chair of the Board of Trustees. It was reported that the Deputy Principal, chairman of the Board of Trustees and another teacher with a strong interest in sailing, met and talked about the possibilities for a programme drawing on a network of local resources and expertise. They intended that the programme be for all students; from university track to disengaged students. The Principal reported support for the concept of the programme and entrusted the development to the Deputy Principal.

The interview data revealed that the Executive consciously aimed to build the network by establishing relational ties with members of the community. Requests for support were sought via public meetings advertised at a school prize giving and in the local newspaper. Through community participation the Deputy

Principal identified expertise available to teach snorkelling, scuba diving, and windsurfing and developed a programme based on this. They then explored assessment standards that could be used to gain qualifications and extra content was added to the programme including reading the weather, VHF radio operation and first aid.

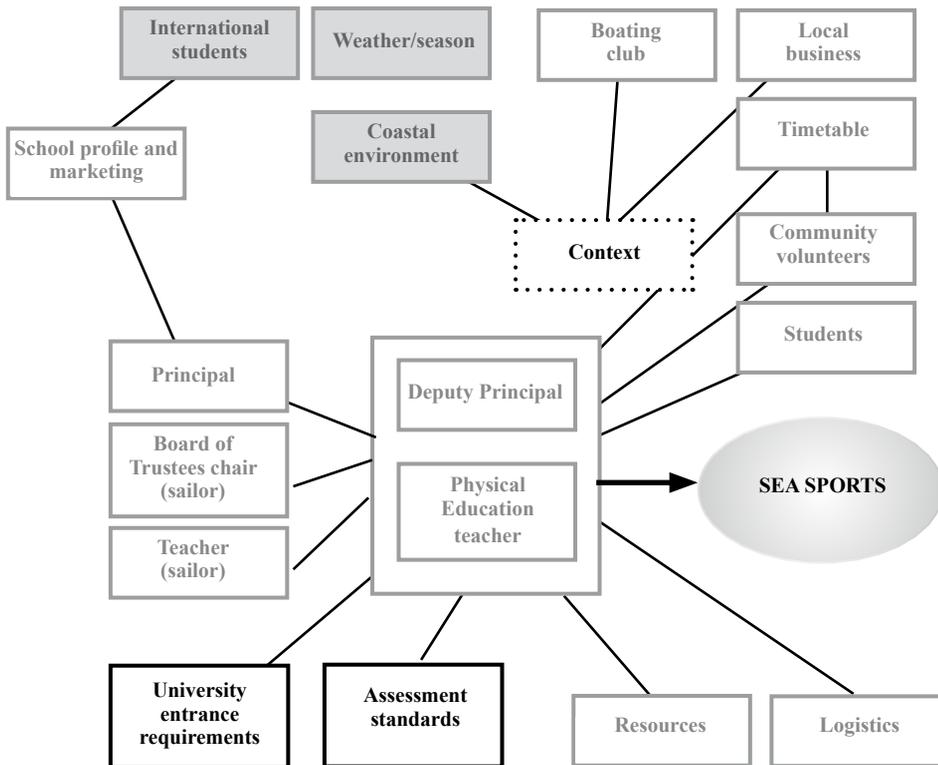


Figure 1. Network and actors in the development of Sea Sports programme

In considering the material actors of the network, the Executive reported that initially there would be a limit of 12 students to ensure adequate safe supervision of students in a marine environment. The programme required special consideration to enable enough time on the water and the timetable structure of the school was adapted to meet the needs of the programme. This could be interpreted as a strong tie between the Executive and a material actor in that the timetable was not a constraining factor but able to be adapted.

The school gained accreditation from NZQA to teach snorkelling, first aid, kayaking, pleasure craft, windsurfing and range of maritime activities to level two NCEA. Volunteers were identified as an essential part of the programme, providing expertise to teach highly practical skills and supplement the skill base of the teachers. Analysis of the data found that the programme evolved through various influences of actors within the network. For example, the aspects of the programme taught by outside providers decreased as the staff gained expertise and found which activities were most suitable. Windsurfing was discontinued because it was too weather dependent. It was replaced with paddle boarding/surfing which incurred less cost and could be included at any time of the year. The ties with the community across the programme reportedly remained strong as the programme evolved.

Members of the Executive said that they considered the academic implications for potential qualifications the students undertaking the programme could receive, and this was done through the network. The staff negotiated

with students what a final year programme would include and how this could meet assessment standards and university entrance requirements.

*We would like to see sea sports as an academy but it is hard for a clever kid to do. If they are very clever, and they know they can get UE from their other four subjects, fine. It was designed for all kids, not just kids that don't want to go to university. (Deputy Principal)*

Considerations identified in the design of the programme included resourcing and logistics, as sea sports equipment is expensive and requires time on the water. In the first year all 12 students were sponsored by local businesses, requiring strong ties to the business community. The idea had been that the students would report back and maybe work part-time for the businesses. This was found to be not sustainable. Over time the number reduced with the local boating club remaining as the only sponsor, supporting one student. International students who pay fees to study at the school were enticed in part by this programme; this source of income was identified as contributing a large proportion of the costs of running the programme. A significant number of students in the programme were reported to be international students.

The school was reported as considering offering marine studies and developing a marine academy, which reflects the continuing strength of ties across the network. This would include the environmental, biological, geographical and economic side of things along with sea sports. There is aqua culture locally and controversy over extending local marine reserves.

### Case study two: Viticulture

The second innovative programme studied (Viticulture) had an Executive of one teacher with both strong ties to the community and strong trust and tie with the Principal (Figure 2). The physical and social context of the network was influential in the decision to develop the programme.

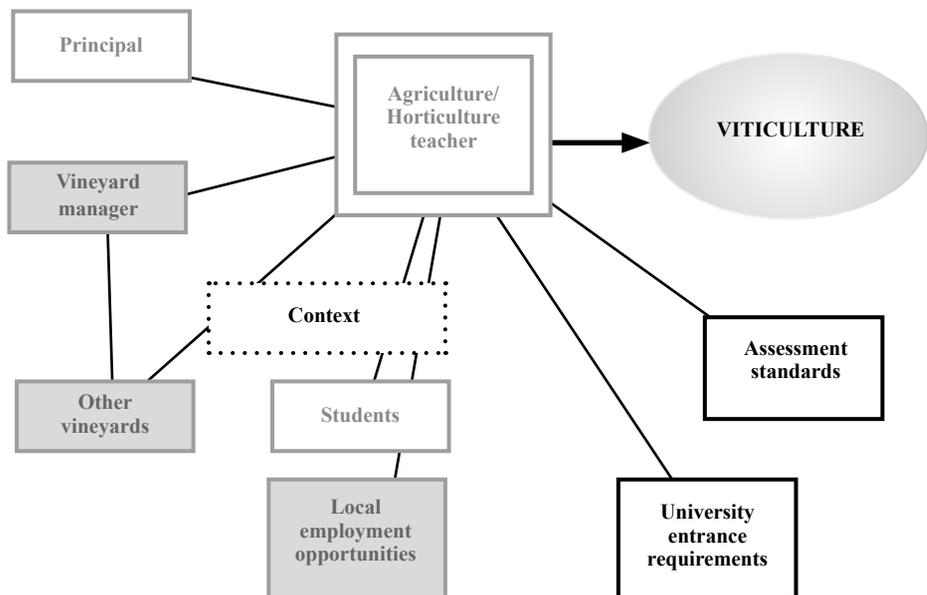


Figure 2. Network and actors in the development of the Viticulture programme

This Executive was a horticulture/agriculture teacher with a background in working with marginalised teenagers. He said that when he joined the school the Principal asked him how the school could re-engage some of their students. “And I said we need to look at the surrounding areas; what the community is, what they want and what they need” (Horticulture/Viticulture teacher).

The school was reported as being situated in a context with two thirds of the houses being holiday homes that are unoccupied for much of the year. Building, landscaping, viticulture and hospitality are the main local industries. As with the first case study, the geographical region could be considered a socio-material actor within this network, influencing the development of the innovative programme. The new programme included Horticulture as an alternative to studying Science at level one, then Viticulture at level two and level three, contributing to university entrance qualifications.

*Just completing [marking student work] now; most of them looking at [achieving] merit. They will fly through that because they are doing it. They've done the picking, pruning, everything. They actually know it inside out, they can actually write it on the bits of paper; not in perfect English, but they know what's happening. So that's the main goal.* (Horticulture/Viticulture teacher)

The programme included experiential learning within the vineyards. The Agriculture teacher reported that this was initially difficult as the relational ties with the vineyard owners had been damaged through behavioural incidents resulting in students not being welcome at the vineyards. It took the new teacher several years for the relationships (ties) to be rebuilt with the local industry. He did this through a long standing rugby connection with a vineyard manager who agreed to participate in the programme. The new teacher said he had very clear expectations of the students, which the students responded to. This has helped grow the reputation of the students in the programme and the vineyards began approaching the school to get the students on their vineyards. The students go on extensive field trips to vineyards at no cost, funded from their picking. This money also pays for logistics and equipment.

*We are seen as skilled cheap labour force. I mean the way it works is, they [the students] did 34 tonnes, they [the vineyard] give a donation to the school, they get tax back for that donation and it goes into the Viticulture budget.* (Horticulture/Viticulture teacher)

Developing and maintaining the community ties with the vintners was seen as time consuming.

*There's people involved in working outside who don't like talking on the phone. You've got to go out and talk to them. So I would spend at least two hours a week visiting vineyards, even with no agenda – just to have a catch up and talk. Like now [vineyard name] now want to do something with their composting on a large scale and they want us involved.* (Horticulture/Viticulture teacher)

To maintain sustainability should the Executive be replaced, the programme organisation and systems have been recorded; however it was noted that maintaining the relational ties with the vintners would be crucial.

### **Case study three: Pasifika Studies**

The Pasifika Studies programme focuses on learning the language and cultural practices of the Pacific Islands. The Executive was one teacher who had strong ties to an extensive network within the Pacific Island community across New Zealand (Figure 3).

The idea of the initiative was reported as beginning between 2010 and 2013 when many Pasifika (and other) students from the school participated in a non-competitive festival showcasing Polynesian culture

(Polyfest). The History teacher (the Executive) said that the teachers at the school commented on how committed these students were to their performance and noted a corresponding improvement in personal discipline to their schoolwork. Alongside this, the teacher had observed Pasifika students with a lack of cultural identity. She discussed this with a Samoan colleague who had a deep understanding of the local students. Therefore the programme was developed with the aim to have students: "... value their own identity and appreciate themselves; building their own characters, not just at school but when they leave. The kids here are lacking cultural identity big time" (History teacher).

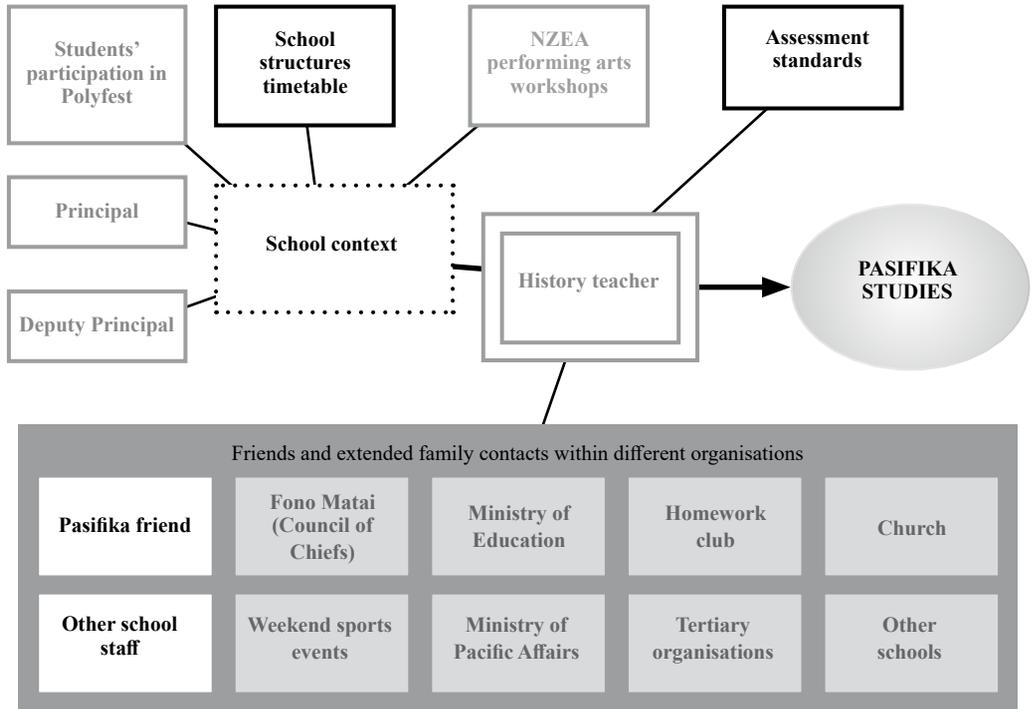


Figure 3. Network and actors in the development of the Pasifika Studies programme

The students’ futures were an important driver for the innovative programme. The Executive reported that she did not want to just inspire these students to pass the programme; her concern was centred on students developing their own cultural identity and confidence to enable them to participate in the Pasifika community. Therefore she developed the programme to include understanding of matai ceremonies, Pasifika churches, proverbs, history, language and performance. The aim would be to maintain Pasifika traditions so students could comfortably participate in their cultural context in the future.

*We will probably start each class with a prayer or a hymn, so the kids are familiar with them. Just prepping them up for whenever they go to different scenarios after school. Because there is nothing worse than going to a conference or stuff and seeing an Islander that doesn't know the songs.* (History Teacher)

The programme development was informed through network ties. The parameters for the programme were reportedly influenced by the assessment standards, the opportunities for performing arts workshops and the Executive’s extensive network within the Pasifika community. She was active in the Pasifika community,

attending church, homework club at the local primary school, weekend sports and has friends and extended family in other schools, tertiary organisations and government departments. Each was an opportunity to discuss and influence the programme design.

*They're all mates; it's like over league or something or at netball, or all our kids are together and we will talk about it over a feed. That's what we want the next generation to have. We want to have a bunch of educators working together; their kids will grow up and see success.* (History Teacher)

The trust and ties within the network extended to the management team. The History teacher discussed the proposed programme and the rationale with the Deputy Principal responsible for curriculum and with the Principal. The senior leadership reported that they had observed a lack of success within the NCEA system for many Pasifika students, particularly the boys (not gaining NCEA qualifications and leaving school early) and were supportive of the initiative as a way of engaging students into learning and gaining qualifications.

Socio-material actors within the network included structures such as the timetable within the school system. Initially the programme was pitched at NCEA level two. The Deputy Principal reported that he thought level one would be more appropriate to catch the students before experiencing qualifications failure. Once the number of possible students at level one and two were looked at it was decided the school couldn't sustain both levels and settled on a level two programme only. Expanding the programme on the timetable to the equivalent of two other subjects was considered and rejected. It was decided this would limit the students' academic pathway to level three which could hinder them from gaining University Entrance.

The network was strongly reliant on the Executive of one person who had strong ties with the community. Continuity and development of the programme may be at risk if that person was unable to continue as the Executive in the network.

#### **Case study four: Fitness for Living**

The fourth case study is an innovation that is the least radical departure from existing programmes offered in secondary schools. The Executive consisted of a middle manager who had responsibility for the physical education and health programmes at the school and a teacher from within the department (Figure 4). The innovative programme was a combination of two traditional programmes; physical education and home economics and named Fitness for Living.

The head of the PE department said that the idea for the programme emerged from an examination of achievement results, and the physical education staff expressing concern at a department meeting that there were many students with literacy issues in physical education classes, who took the subject for the practical lessons and did not want to study anatomy or theory. The physical education staff also recognised a group of students who were highly physical and had literacy support. Prior to the innovation the physical education department taught two types of programmes in senior secondary school. One type of programme included anatomy, which was considered as more academically demanding, and one without anatomy, which was considered as more suited to the students focussed on the practical aspect of physical education. It was suggested in the meeting that maybe they could introduce another programme with minimal theory component, combining with practical home economics, as the head of department had previous experience teaching home economics. The idea was presented to the department head meeting and Deputy Principal for approval.

The actors within this innovation were predominantly within the school and the network ties appeared weaker than in the other case studies. For example, the Principal said he became aware of the innovation through reading the physical education meeting minutes, and during the introduction process the Executive encountered misunderstandings or miscommunications about the intent of the new programme.

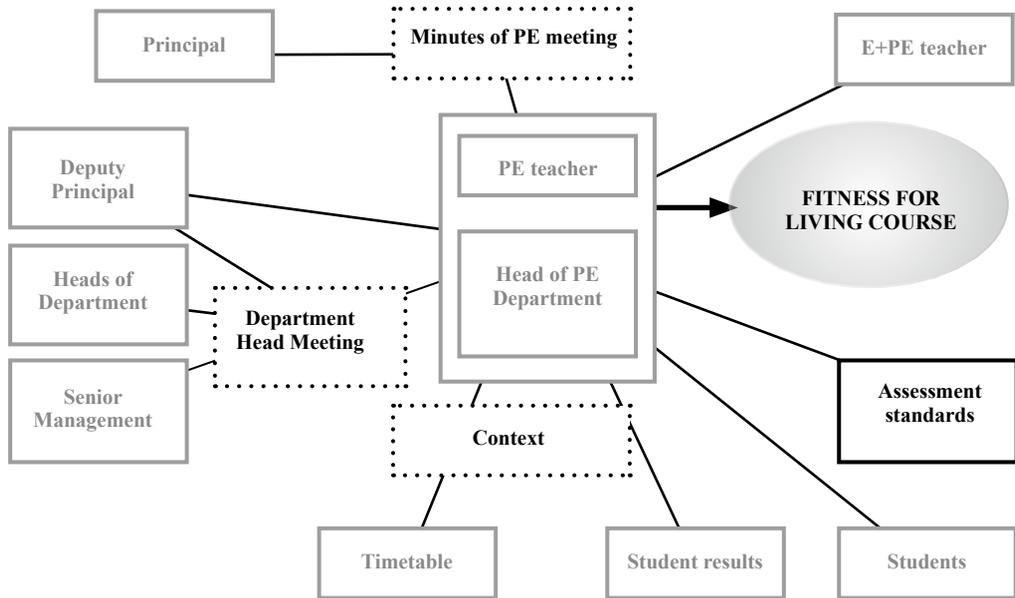


Figure 4. Network and actors in the development of the Fitness for Living programme

*I didn't have any input as to who was going to do the programme; which students were going to do it. They came down to [senior dean].... When we got the list there was 30 kids in the class and I thought some of them should be doing PE 202 programmes and not that programme because their reading was fine. (Head of Department)*

The students' significant lack of literacy skills was underestimated in the context of the demands of home economics curriculum, including aspects like being able to read and understand a recipe. The home economics curriculum component requires some theory and the timetable allocated 25% of weekly time to this and 75% to physical education. The students were initially unsuccessful in achieving qualifications for the home economics aspect of the programme. It was unclear whether this innovation would continue in the future.

#### Case study five: Agribusiness

The final case study developed an Agribusiness programme that has become a high profile feature of the school. The Executive consists of the school leadership team who have developed strong ties with the actors in the network that include industry partners (Figure 5). Agribusiness was first taught in 2014 at NCEA level two. The Deputy Principal was one of the teachers for the first year of the programme in 2014.

The physical and social context of the school community were identified as important actors within this network, as they were in the Sea Sports and Viticulture case studies. The development reportedly began when the Executive, who were both newly appointed to the school, noted that approximately 50% of the school's parent community were employed in the agriculture sector, yet agriculture was not a subject taught at the school. The Executive said they made a decision to introduce a level one Agriculture and Horticulture programme and this was developed and taught by a science teacher with previous farming experience. This was consequently expanded to level two. This type of programme is taught across a number of schools in New Zealand and would not fit the definition of being innovative. There was a significant uptake for these programmes demonstrating interest amongst students.

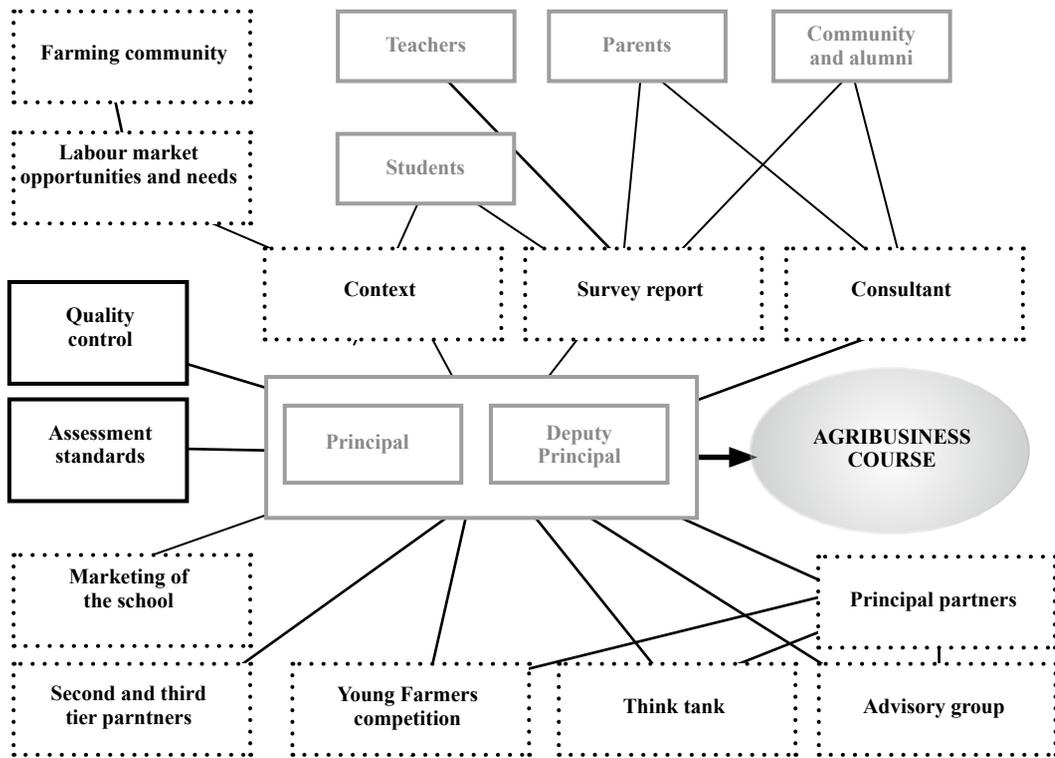


Figure 5. Network and actors in the development of the Agribusiness programme.

The second event identified that expanded the network and led to innovation occurred when the school employed a consultant to survey the school community, covering the performance and potential improvements of the school. The results indicated a desire by the community to widen the selection of programmes offered and a strong interest in the agriculture area. The consultancy firm was then employed to canvass the community concerning the willingness to assist in funding a variety of programmes at the school. The feedback for this was positive and identified a particular interest in assisting further advancement in the agricultural curriculum area.

The third event identified was the school hosting the finals of the regional ‘Young Farmer of the Year’ competition that was classified as an actor as the event itself influenced the network. During this event the Principal and Deputy Principal took the opportunity to speak with representatives from the agricultural sector attending the event about an intention to develop an agricultural science and business curriculum. It was at this point the Deputy Principal described the programme as a “seed of an idea”. Through these informal conversations interest from the industry was identified, network ties were established, and programme content suggested.

The Principal said the network was developed through inviting key industry stakeholders to attend a meeting to determine the needs of the wider sector to inform the programme design; following this an advisory group was formed as an actor in the network. This group included representation from tertiary education institutions, NZ Beef and Lamb, Dairy NZ, banking, communications, veterinary, farm equipment and farmers. The reported intent was to refine the shape of the curriculum of the Agribusiness programme. From these meetings the concept of having principal partners was developed. These partners offered a higher level of financial and curriculum support and would have their brands associated with the programme. For this, partnerships were developed with two national industry organisations motivated by improving outcomes in their overall industry.

The need for easy access to industry advice was through a dedicated point of contact between the Deputy Principal and a person within the industry organisations.

*We've succeeded in tying in two principal partners... They have ... strong feelings about what shape the curriculum should be to best serve the sector. And we've also, at this stage linked up with five business partners and also have an influence if you like at what are the key things we want young people to come out with and have experienced during their time at high school. (Principal)*

The network was then developed as a hierarchy with the introduction of second and third tier partners. The second tier comprised business partners whose ties have some perceived benefit to their business (ultimately profit motivated). The third tier are scholarship partners who provide scholarships to individual students to attend the school (the school is independent of state funding and has boarding facilities).

With the introduction of partners came the need for quality control across the network. The organisations associated with the programme have vested interest in ensuring that the quality of the programme meets their expectations and consequently protect their brand's reputation. This included the release of information to the public and other schools and a requirement to work within the marketing goals of the organisations.

The innovations emanating from the network were not restricted to the development of the programme. Industry ties were integrated into the programme and to accommodate the learning a new facility was planned with contemporary conferencing technology (a communications company is a second tier partner). This was said to provide access to expertise with less disruption to learning through travel time: "It's really hard to take kids out of school when they are also doing other subjects, so we want to bring the sector into us and that is the virtual classroom idea" (Deputy Principal).

The Executive and the network became ambitious about the influence they could have. A specific intent was to develop Agribusiness assessment standards that have the same recognition within qualifications as traditional subjects in the curriculum. This would require expanding the network ties to Government levels to secure a change in assessment standards. The other case studies had taken the assessment standards as an enabling or constraining actor, this case study saw them as something they could alter. The Executive believed that as the initiator and driver of a national curriculum change and centre of excellence there should be significant benefit to the school's reputation and demand for future student enrolments.

*It's sort of fortuitous; that what's happened is you've had people in the industry connected to a school that's highly focused... branding itself as a leader in the rural area.... The industry are really supportive of funding, so you sort of have a three way thing ... the perfect storm. (Principal)*

## **Discussion**

Actor-Network Theory provided a framework to examine emergence of innovation in school based curriculum decisions. Each case study could be described as an innovation network, a term suggested by Hite et al. (2005), however in addition to people in the network were the material actors that influenced the curriculum development.

Lima (2010) suggests that the examination of educational networks should occur in a systematic way, suggesting six dimensions drawn from studies on networks developed for school improvement or professional learning. However, the focus of this study was the networks involved in innovative curriculum design examined through Actor-Network Theory which provides a different research perspective. While this doesn't negate the need for systematic research, the focus was on the ties between the actors within a network and the innovation rather than the network as a whole. Across all five case studies there were three conditions that enabled innovation. The first was the idea or motivation underpinning the change, the second was the Executive operating within a relational network and the third was the perceived flexibility in curriculum and assessment.

The first condition was a clearly articulated motivation or purpose; this was the idea behind the innovation. The underpinning purpose or motivation for innovation varied for each case study. Fitness for Life was developed to provide a pathway for successful learning in physical education for students with under developed literacy skills. The Pasifika programme was to provide cultural knowledge, skills and experiences for students to take with them into their life beyond school and in doing so gaining qualifications. The Sea Sports sought to make use of the environment surrounding the school and expertise of the community. Viticulture aimed to provide a career pathway for disengaged students in the local community and the most ambitious, the Agribusiness aimed to not only provide career pathway but also develop a model curriculum with industry partners that would develop knowledge and skills across the country for school leavers entering the agriculture industry.

The physical and social context of the school was a significant actor in curriculum development. The definition for inclusion in the Executive in this research was *the actor or group of actors who determine the presence and design of the programme* which may reflect a bias towards to social actors within the network. A pure socio-material stance that places equal prominence upon social and material actors as advocated by Fenwick, Edwards and Sawchuck (2011) might have seen the context being included in the Executive in at least the Sea Sports and Viticulture case studies. This has particular relevance when considered in light of research into the importance of context or place in the educational context. For example, Penetito (2009) offers a New Zealand perspective on place-based education recognising the positive outcomes for the students and the community. He identifies the particular benefits to Māori, who have a strong connection to place and a long history of place-based education within their culture. Penetito expands this to identify the benefits to all students participating in the compulsory New Zealand Education system.

School leaders can play an important role in developing the first condition for curriculum innovation. From a position within or alongside the Executive they can identify how the curriculum innovation fits within the strategic direction of the school and aligns with the core values of the context. This provides the basis for the clear articulation of the purpose of the curriculum innovation.

All the programmes were developed from a perceived opportunity or need within the context of the school environment where the resources available could be used to improve the learning experience or outcomes for their students. It should be noted that the motivation or purpose changed over time as the programmes or ideas developed through the interactions across the networks. Being part of a network influenced the perspectives of the Executive altering the ideas or ambitions of the innovations as they developed. For example, over time the original idea for the Agribusiness expanded from the school context to one of national ambitions. Researchers have reported that social networks affect perceptions, beliefs and action (Knoke & Yang, 2008) and there is an interplay between the psychology of the individuals and the complexities of the networks in which they develop relationships (Balkundi & Kilduff, 2005).

The second condition was the Executive working within a relational network. The networks varied in scale and relational strength of the ties between the Executive and other actors in each network. Borgatti and Foster (2003) noted that networks can be formal and informal. It appears that the more ambitious programme innovations (and arguably the ones more likely to be sustained) developed more formal and complex networks with defined strength of ties than the less ambitious ones. The Agribusiness Executive had developed a strong national network that included business leaders with a strategic focus, it had formalised the network structure with specific roles identified for actors. Sea Sports, Viticulture and Pasifika Executives had strong relational ties within the local community which developed from a social relationship to one with a community focus with some formality developed around the roles that actors play in the curriculum development, delivery or resource access.

The Fitness for Life relational network appeared to have the weakest ties, although the ties could be considered formal within the roles each actor had within the schooling system. While the Executive was aware

of flexibility in the structures, the innovation development was hindered by a perceived lack of procedural systems or knowledge by the Executive and across the network, thus weak ties within the network can hinder innovation. There was minimal involvement from the Principal. Daly and Finnigan (2012) suggested that weak network ties and low level of trust hindered school improvement. This conclusion could be extended to innovation networks.

School leaders can nurture this condition for innovation through identifying the actors (material and social) needed for success, what their respective roles are and strengthening the connections across the network. This strengthening can occur through clarifying how communication, structures and processes occur within the network to enable the innovation to develop.

The third condition is the belief that there was sufficient flexibility within the structures or regulations to allow the innovation to occur. The structures within which senior secondary schools operate include a national curriculum and assessment system which were identified as actors by each participant in the research. The sample of case studies were selected from similar sized schools who identified themselves as having innovative programmes that contributed towards national qualifications for their students. Each Executive believed they could innovate within the structures of regulations and guidelines that existed within the national and local systems. It is therefore expected that material actors identified by the Executives included assessment standards that lead to the qualifications. However, the role that these had in the networks varied. The assessment standards were the starting point in the Fitness for Living programme and the curriculum built around them. In the other four programmes, programmes were designed first, then the assessment standards matched to the identified content. Sea Sports was an extended programme to include additional content based on available standards and the timetable was altered to cater for the innovation. The Executive in one of the case studies (Agribusiness) believed they were able to influence a change to existing regulations and assessment standards. Thus material actors, as well as human actors, in a network are subject to change as a result of the ties and ideas developed through the network. This extends the interplay between the psychology of the individuals (Balkundi & Kilduff, 2005; Knoke & Yang, 2008) to include material actors as subject to change by the interplay of ideas or innovations through network ties.

School leaders play a role in influencing the perspective of flexibility in each network and by supporting or leading the Executive through the process of change and encouraging trust and building strong network ties. Educators can learn how to network (Evans & Stone-Johnson, 2010; Fox, Haddock & Smith, 2007). The role the Executive took on in the developing the innovative programmes is one that would require support, and differing types of support in each case, such as financial support, time to focus on the innovation, positive encouragement or introductions to key people. Evans and Stone-Johnson (2010) suggest that networking can be learned and a support system for network leaders may enhance the effectiveness of participation. While the development of the new programmes tended to begin as an ad hoc innovative idea, each has benefited from explicit or implicit support of school leaders and/or the broader school community.

## **Conclusion**

The decentralisation of structures including the devolution of curriculum implementation and development of a flexible assessment system has provided the opportunity for innovative programme design and implementation within senior secondary schools in New Zealand. The five medium sized schools developed different programmes for students in their final years of study at school using resources in the school community to meet a perceived need or opportunity for the students' learning. The use of Actor-Network Theory included asking research participants to identify people, ideas and materials that had influenced the design and implementation of the innovative programme being studied. This provided conditions that were common across all case studies: clarity of the idea upon which the innovation is predicated, the perceived

flexibility in structures that enables the innovation to occur, and the strength of the relational ties of the 'Executive'. Each of these conditions in a particular setting will change over time and it may be that a change in one could alter the programme or it may cease to exist.

School leaders can nurture the conditions for curriculum innovation through clarifying the alignment between the curriculum innovation, the school's strategic direction and values of the context, by strengthening the connections across the actors in the network and by thinking flexibly about constraints and possibilities.

Actor-Network Theory was critical in the development of this study of innovation networks. There were limitations due to the retrospective nature of the decisions and the potential inaccuracy in the recollections of what was considered. Viewing decision making in education with the principles of Actor-Network Theory offers new insights when applied contemporaneously to decisions being made, as it focuses thinking in an objective way towards what is important in achieving outcomes and therefore influential to this decision. This approach can remove assumptions of people, including principals, as being the sole actors behind innovation, and considers the role of the broader network including aspects of the environmental or social context in influencing change.

Actor-Network Theory can also redefine how collectives impact on a decision; there may be a group of actors but if they behave as one influence they can be viewed as a single actor in the network (they also may expand to a collection of actors or contract to a single actor over time). The perspective that networks are dynamic as applied in this research could also be a beneficial way of understanding a changing, complex system. This study focused solely on how the programme was developed by different influences. The way in which this occurred can inspire a change in thinking or use of the actors which go on to influence other interactions. This could be an insightful avenue to investigate in further research; how exposure to innovation ripples through to other decisions in overlapping networks.

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