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Teaching with biosecurity content in the social sciences learning area:
A year 13 social science teacher's experience

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Abstract

In this era of pandemics, asylum seekers, and conflict between super powers, social sciences are a critical subject that can help develop young people who can not only recognise racial and social discrimination but also injustices at a regional, national, and global scale.

Mainstream subjects, such as sociology, routinely support learning in the social sciences area. As a science/biology teacher, I wanted to find out whether biosecurity science could be used to support learning in the social sciences area. My interest in biosecurity stems from personal and professional experiences in New Zealand. Further, in my own pedagogical experience, teaching science/biology in schools, I found young people (15–18 years) were unfamiliar with the concept of biosecurity in New Zealand.

Considering my experiences, I set out to conduct research to look at the efficacy of using biosecurity in teaching and learning. This paper reports on the experience of one Year 13 social science teacher who used biosecurity content to teach in the social sciences learning area. Classroom observations and individual teacher interviews were used to gather data. The results show that biosecurity content engaged Year 13 social sciences students in the classroom and that the teacher used transformational learning theory to engage his students into undertaking social action related to biosecurity. Given the importance of biosecurity to New Zealand, this paper shows that social sciences as a learning area could support teaching and learning about biosecurity.

Key words

Social science; biosecurity; social action; teacher; young people

Introduction

This article is informed by data gathered from a follow-up case study of one teacher's personal understandings/pedagogic approaches to using biosecurity content for teaching and learning purposes in the social sciences learning area.

The social sciences curriculum in New Zealand sets out to develop in students' knowledge and skills to allow them to engage critically with societal issues from a local, national and international perspective with an informed opinion (Ministry of Education, 2007).

In New Zealand, the social sciences curricular includes knowledge from many different disciplines, like history, geography and economics. At senior levels (Levels 6–8), achievement objectives in the social science learning discipline can come from classical studies, media studies, sociology, psychology and legal studies but at respective schools' discretion (Ministry of Education, 2007). It is argued that learning in the social sciences discipline is as important as learning in mathematics, science or English because it provides a solid platform from which an understanding about the world can be developed (Abbiss & Kingston, 2016).

Although many studies report on young people's participation in active citizenship through mainstream social science subjects, such as history, geography and economics (Wood et al., 2013), very few studies report on using science content to engage young people in social sciences learning in schools in New Zealand. This paper reports on one Year 13 social sciences teacher's perspectives when using biosecurity as content to teach in the social science learning area.

Background

There are eight learning areas in the New Zealand Curriculum (NZC) and social sciences are one of them (Ministry of Education, 2007). In New Zealand, the National Certificate in Educational Achievement (NCEA) is the main qualification for secondary school students. Students are required to study a number of different subjects throughout the year. Students' skills and knowledge of subjects studied are assessed against achievement standards. Achievement standards are used to determine how well students meet the curriculum level in any learning area. Achievement standards can be administered by teachers, and are referred as internal assessments. However, when administered by outside examiners they are referred to as external assessments (New Zealand Qualifications Authority, 2017).

Social sciences as a learning area in New Zealand evolved over time and were influenced by global progressive movements and changing political affiliations (Abbiss & Kingston, 2016). To get an edge over trade partners, finding ways to increase economic competitiveness became very important in the 1980s and 1990s. Education was seen as an important aspect in promoting economic prowess leading to curriculum reform. During this time debates raged in the media, educational circles, and other public domains about the type of learning that should happen in the different learning areas of the NZC. For example, the social studies learning area document was rewritten three times to cater for the different ideas about the subject (Mutch, 2001). The current New Zealand Curriculum (2007) is a culmination of the reviews and directions during the 1990s through to 1993 that led to the New Zealand Curriculum Framework (Mutch, 2008). It represents tensions between behaviourist and socio-constructivist learning theories, a move from transmissive to modern transformative ways of learning (Abbiss, 2011). A shift to developing a conceptual understanding through conducting social inquiry rather than mastery of facts has become the focus in the social sciences learning area (Abbiss & Kingston, 2016).

Learning in the social sciences involves building understanding according to guidelines as they appear in achievement objectives in the social science learning area of the New Zealand Curriculum. Achievement objectives focus on using a social inquiry approach to build understanding. This involves effecting change in young people's understanding of social phenomenon through prompting them to

> ask questions, gather information and background ideas, and examine relevant current issues; explore and analyse people's values and perspectives; consider ways in which people make decisions and participate in social action and reflect on and evaluate the understandings they have developed and the responses that may be required. (New Zealand Curriculum, 2007, p.30)

Theoretical frame

In this era of pandemics, asylum seekers, and conflict between super powers, few would argue against producing socially active young people that are, for example, able to distinguish between countries exercising soft power and others with malign intentions who seek to create subservient societies through mis- and dis-information campaigns. This paper draws on critical theorists such as Freire (1970) and Giroux (1988), who used critical pedagogy to challenge the concept of education. They advocated for pedagogies that allowed students to question rather than accept what was being taught. Considering this, a recent atrocity unfolding that young people as global citizens must understand is the unprovoked war and consequent invasion of Ukraine, a sovereign nation, by its neighbour Russia, a nuclear armed super power leading to senseless loss of human lives (United Nations, 2022). Russia's pretext for invasion was to stop the targeted killing of Russian nationals in Luhansk and Donetsk regions of Ukraine that Russia recognised as separate after supporting an uprising.

Another issue that has led to the unprecedented loss of human lives, and would require critical pedagogy to allow young people to develop an informed opinion, is the outbreak of Covid-19, a pandemic, and now in its third year (WHO, 2020). Also known as SARS-CoV-2, Covid-19 is a viral infection caused by a biosecurity breach first recorded in Wuhan, China in 2019 (Alanagreh et al., 2020; Maragakis, 2020). Since its initial outbreak and classification as a pandemic by the World Health Organisation (WHO, 2020), misinformation about Covid-19 has been increasing. For example, fact checking organisations reported that since the outbreak of Covid-19, 52 million engagements have been recorded with sites that misinform the public about Covid-19. These conspiracy sites provide among other misleading information, fake news about prominent actors involved, news about a lack of public preparedness, conspiracies around vaccine development and misinformation about Covid-19 origins (Mian & Khan, 2020).

Having understanding, ability and capability to make an informed decision about Covid-19 such as getting vaccinated or wearing masks, is a critical issue for young people given that Covid-19 is five times deadlier than the flu, has caused over 6 million deaths worldwide, and 1,064,975 deaths to-date in the US (Centres for Disease Control, 2022).

In New Zealand, 2,154 people have thus far died from complications caused by or related to Covid-19 (Ministry of Health, 2022a) compared to over a million deaths in the US. For a young person it is important to critically understand this phenomenon. One key reason New Zealand was able to control the spread of Covid-19 in 2019 was because the government used emergency powers to put restrictions in place to control the spread of the virus, and the majority of people complied (Jefferies et al., 2020). A possible reason for accepting restrictions placed by the government could be that people in New Zealand critically evaluated information related to Covid-19 spread and saw it necessary to follow instructions.

On the contrary, a young person should also be able to comprehend whether the use of emergency powers by the New Zealand government was a pretext for what followed—vaccine mandates. For example, state workers in education, health, disability and other government agencies were required by law to get vaccinated. Further, young unvaccinated school-aged children were barred from playing team sports and public movement restricted through vaccine passes (Ministry of Health, 2022b). Comprehending this discourse, a young person may decide not to support Covid-19 related measures, such as vaccinations.

Many people in New Zealand opposed and continue to oppose lockdown rules and other measures to control the spread of Covid-19. These people to some extant were encouraged by politicians who used their public platform to peddle controversial theories such as lockdown rules are used as a means to further control the citizenry by the state (Scotcher, 2020). Given this narrative, using critical pedagogy which stems from constructivist learning theory (Freire,1970; Giroux, 1988) can help young people make informed decisions by critiquing information put out in the public about salient societal issues.

Constructivism

The use of constructivist learning theory has become a major component of modern teaching (Jarvis et al., 1998). Constructivism has greatly contributed to the experiential learning concept in that experientialists such as Kolb (1984), Dewey (1963), Lewin (1951), and Vygotsky (1978) saw experience as a social construct and believed that individuals carried with them, their own life experiences which they used to interpret and construct new experiences (Mughal & Zafar, 2011 p. 28). Given that biosecurity is a key concept in New Zealand, making meaning from direct biosecurity experiences, like understanding the reasons behind declaring food at international airports, may help young people become more informed about biosecurity.

The main goal with learning using the constructivist theory is to encourage learners to think critically (Taylor et al., 1997). Modern societies have modern problems, solutions to modern problems require the active involvement of citizens and students; this participation is a key component for critical thinking and learning because it prompts students to take other people's views into consideration. The active involvement of students is critical in constructivist learning theory because the theory holds that learners are key in constructing knowledge for themselves and building new ideas or concepts based on interactions and experiences, past and present, within their sociocultural environment (Nie & Lau, 2010; Tenenbaum et al., 2001). Considering this, engaging young people with constructivist learning theories may create a more critical global citizen; one able to distinguish between fabricated evidence as a pretext for invasion and war to mis- and dis-information about Covid-19 origins and/or vaccinations.

Constructivist learning theory bestows on the teacher a different role to that implied by behaviourist learning theories. Because learning is seen as a dynamic process in the constructivist paradigm, learning happens within a socially dynamic environment, where students are constructing and reconstructing knowledge for themselves through interaction with peers, teachers and media to make meaning. The teacher's role is that of a facilitator, who encourages and, at times, directs students to make meaning for themselves by tackling real-world problems (Ozkal et al., 2009). Learning that supports students to act with an informed opinion should be the main purpose for education (Eames et al., 2008). In this way, learning using a constructivist lens enables/scaffolds student to build meaning and understanding about issues such as biosecurity. Teaching by enabling students to discover and reflect can bring about transformation.

Introduction to research: Transformative learning

Critical pedagogy that aims at transformative learning provides a solid base from which not only social sciences but also biosecurity issues can be discussed in the classroom by teachers and students through a socially critical approach. Critical pedagogy enables educators and learners and their parents to be active, critical participants in a democracy through identifying and critiquing frameworks and/or policies and existent power structures that seek to influence policies that protect people in societies (Giroux, 1997). Transformative learning is different in that it "is the process of effecting change in a frame of reference" (Mezirow, 1997 p.5), a move away from accepting knowledge to challenging knowledge, similar to critical pedagogy because it prompts people to look at something in a new way. However, some posit that transformative learning is more a conceptual metaphor than it is a theory because it is applied and used in a wide variety of settings, without critical inquiry (Howie & Bagnall, 2013).

Nevertheless, Mezirow (1990) claimed that transformative learning engenders an ontological change through "critical reflection on the assumptions upon which our interpretations, beliefs, and habits of mind or points of view are based" (Mezirow, 1997 p. 7). Assumptions play a great part in how individuals perceive or understand a concept, and this can lead to decisions or predispositions that are

conducive to reinforcing stereotypes. Habits of mind are more cemented than points of view because they are a result of the gradual accumulation of ideas supporting or refuting a concept.

Transformative learning from a student's perspective would entail questioning accepted rhetoric, problematising solutions offered by organisations, accepting critique and being reflective of their own ideas (Sass et al., 2020; Eames, 2009; Greene, 2001). From a biosecurity perspective, this means critically examining rhetoric. For example, rhetoric that Covid-19 did not originate in China but the US or, that Covid-19 was introduced into Wuhan, China by American soldiers during a sporting event (Wong et al., 2021); critically examining scientific narratives about society and why politicians tell white lies to sway public opinion; critically examining educational perspectives; critically examining the tendency of science and quantification to simplify messages and the need for education to manage complexity and uncertainty in a postmodern world (Hart & Nolan, 1999; Rorty, 1998). Transformative learning can empower students to act through seeking relevant knowledge related about an issue should they choose (Sass et al., 2020). The social sciences learning area is one place where critical action orientated pedagogy that aims at transformative learning can be effectively utilised.

A biosecurity case study in the social sciences learning area

Logan and Skamp (2008) posit that "science [happening] in society" (p. 508) was better at engaging young people with education in schools rather than school science textbook learning. Considering this, a qualitative approach using case study methods was taken to see whether science happening in society could engage young people in learning.

Case study method allows phenomenon to be investigated in unique settings (Punch, 2005). This case study was about investigating the perceptions of a social sciences teacher and was bounded by his understandings and experience when using biosecurity as content to teach a Year 13 social sciences unit. Tatum (pseudonym), a Year 13 social sciences teacher in a Decile 1 secondary school [School A] in Auckland, had entered his students in a National Certificate of Educational Achievement (NCEA) social sciences Level 3 (Level 8 NZC) course. Learning at Level 8 in social studies requires young people to "understand how policy changes are influenced by and impact on rights, and responsibilities of individuals and communities and understand how ideologies shape society and that individuals and groups respond differently to these beliefs" (Ministry of Education, 2007 p. 45).

Tatum was using content (biosecurity) that aligned with the outcomes of the social sciences curriculum. Biosecurity is an expansive topic and covers vast areas, from the protection of economy, human health, social and cultural well-being of New Zealanders to the protection of the environment. Tatum particularly looked at how biosecurity related policies and economic ideology impacted individuals and communities. Tatum had previously seen biosecurity posters on the ferry he took from Wellington to Picton. Further, in 2015 a breeding population of the Queensland fruit fly, a horticultural pest, was discovered in the suburb of Grey Lynn, Auckland which resulted in restrictions placed on the movement of fruit fly related host material in the Auckland area (Ram, 2021). This event had widespread coverage in the media. It is plausible that Tatum's encounter with biosecurity related public material could have influenced him to consider using biosecurity as content for his Year 13 social sciences class.

Methods

The purpose of this research was to investigate one New Zealand secondary school teacher's experience when teaching with biosecurity content to senior (Year 13) social sciences students.

Biosecurity science was used as content to examine personal involvement of students in social action that aimed to influence a public and/or an environmental policy change as directed by the internal assessment AS91599. The assessment task required Tatum to use social sciences concepts as required by the curriculum and assess his students' ability to:

- describe an issue and the policy the action aims to influence
- develop a plan for a social action(s) that considers ethical implications
- justify … the selected social action(s) taking into account the points of view, values and perspectives of self and others
- give an account of personal participation in planning and carry out the social action (NZQA, 2017, p. 1)

An interpretive mode of inquiry was chosen for this research because it allowed the collection of personal perspectives and the interpretation of their meaning by finding relationships within data and linking them to understanding (Neuman, 2003). Research about New Zealand teachers' perspectives relative to social sciences has previously been conducted using the interpretivist frame. For example, (Wood et al. (2013) used the interpretivist frame to investigate how teachers could foster active citizenship in young people when teaching social sciences in New Zealand. The interpretivist frame has also been previously used to uncover knowledge about biosecurity in students (Ram et al., 2016), used to investigate students understanding of biosecurity advertising (Ram,2020) and investigate changes in students psyche as a result of coming into contact with biosecurity learning material (Ram, 2019).

Tatum was interviewed five times over a period of eight months. Further, three classroom observations (May 16; July 4; October 27, 2016) were conducted while Tatum was teaching his Year 13 social sciences class using biosecurity content. Tatum's Year 13 social sciences class had eight students, three male and five females. Most of the students were 17 years of age and turning 18 within the year 2016.

Participant observation is a key tool through which data are gathered in social research and is described as observing the behaviour of members of a group with the goal of deriving meaning from the group interactions (Bryman, 2004). In this study, the interactions between Year 13 students and their teacher was observed during the teaching of the biosecurity topic. Tatum's responses were used to investigate a teacher's perspective of using biosecurity as content through which to teach a social sciences achievement standard titled, "Examine a campaign of social action to influence policy change".

Following approval from the University of Auckland Human Participants Ethics Committee (Ethics approval number: 017009) to conduct research. Five interviews (May 3, June 7, August 24, September 28 and November 11, 2016) were conducted with Tatum. The interviews were conducted during Tatum's non-contact period in his classroom. The research commenced with a 60-minute interview, reviewing Tatum's intentions for the course, the source of his educational values and how he planned to maintain intellectual quality around biosecurity discussions. Four additional 45–60-minute interviews were conducted with questions designed to discuss how Tatum was able to stimulate educational engagement with the biosecurity topic with his students. Statements that formed the basis of interviews with Tatum were as follows:

- The nature of academic authority used in lessons as evidenced in teacher utterances.
- The use of research evidence and how this was managed and presented to students.
- The teacher's management of intellectual quality in class.
- The level of learner autonomy fostered by classroom interactions and independent research by the students.

Braun and Clarke's (2006, 2013) six-phase thematic analysis framework was used to guide the analysis of the data used in this research. As advocated by Braun and Clarke (2006, 2013), it is important to tell the reader what the researcher wants to know, relative to their viewpoint. This was a case study bounded by Tatum's perceptions of biosecurity and his use of biosecurity content to teach a social sciences unit to a class of Year 13 students. Data analysis was not a linear analysis. I had to move back and forth between the different phases for data I analysed.

Data was first transcribed. Following this I read through the data numerous times to familiarise myself with it. The next phase included open coding, to identify clusters of ideas. In the next phase,

themes were identified, and in the final phase themes were reviewed to ensure coded data matched the themes.

Discussion and results

The interviews and classroom observations with Tatum were conducted to investigate his experience of teaching using biosecurity content in the social sciences learning area. It was envisaged that the data would not only reveal Tatum's perceptions of biosecurity but also how he went about building an understanding of biosecurity when teaching through a social sciences unit and the appeal of biosecurity as a topic when used to engage senior social sciences students in teaching and learning.

Tatum revealed that he was on a journey as he navigated through teaching social sciences using biosecurity content. The notion of a journey captures his successes and doubts as he guided his Year 13 class through three terms using biosecurity as an integrating thread for this social sciences topic.

Three main themes emerged from the data about Tatum's experiences: personal connections with biosecurity issues/challenges, understanding biosecurity within the New Zealand Curriculum and teacher recommendations on how to approach biosecurity teaching.

Personal connection with biosecurity issues/challenges

Tatum had a connection with biosecurity which he had not quite understood until he started teaching with biosecurity content, as he revealed in the first interview. Tatum, a New Zealand citizen, was brought up in Southland. He trained to become a teacher in the United Kingdom (UK), where he also taught for 10 years. What he vividly remembered, which has significance for biosecurity, was that as a boy, while taking his dog for a walk, he came across people shooting rabbits for a job. "There was an authority, the Rabbit Board," he mentioned. Tatum did not understand why rabbits had to be culled:

> We used to have a Rabbit Board so I understood why people were employed, so I used to say what a great job, you drove around shooting rabbits. You know, as a kid, going out in the country, walking dogs, every time wherever you looked there was a bloody rabbit.

Reflection on his experience appears to have transformed Tatum's thinking about rabbits. It was only after he started teaching with biosecurity content that transformation in his understanding occurred; he realised that rabbits were shot because they were a biosecurity pest. "I can understand why it is necessary to control it now; you know we were trying to eradicate [the rabbits]." Reflection, particularly self-reflection, is a critical and ongoing process for all educators and can be linked to critical social theory and hence to transformational learning (Gur-ze'ev et al., 2001).

Tatum reflected back on how he had become aware of biosecurity issues by chance. While travelling between Wellington (North Island) and Picton (South Island), he had come across advertising related to an invasive freshwater diatom, didymo, that had infested rivers in Southland. "All I knew about was didymo [sic] when I used to come back from the South Island."

During the first lesson observation, Tatum used a word-find exercise to help students remember key terms related to ideologies, followed by the card-sorting exercise. Tatum mentioned that the exercises were designed to help students become familiar with contrasting ideologies. Tatum said that the whole idea of starting with the word-find exercise was to get the students thinking about ideologies. "I think at this stage, I really want to get their head around the issue." Tatum discussed different ideologies and people's rights with students. Tatum mentioned capitalist, democratic and environmental ideologies.

Tatum explained that a "person's point of view can be influenced by what that individual values. Students needed to get other people's points of views about biosecurity. This could be in the form of

opinions expressed in news or articles about biosecurity." In other words, an aim of the curriculum was for students to make informed decisions by taking other people's points of views about biosecurity into account. He mentioned:

> They've got to speak to someone, so to get your point of view and then someone else's point of view. That could be a government member, or minister, or someone that lives in Epsom and then their own opinion. And using those different points of view, values etc. [to inform a social action]. Then this is how we justify our social action because these people have said this and these people have said that.

The students were given a card-sorting exercise and pictures related to foot and mouth disease in the UK. Students appeared to be concerned about the pictures. Tatum mentioned to students that their "reaction to seeing pictures showing animals being burned could be a result of their own personal values about how animals in general should be treated. The card-sorting activity has been said to be an excellent hands-on activity for developing shared understanding of conceptually complex ideas (Conrad & Tucker, 2019). Constructivist learning theory appeared to be at the forefront of Tatum's pedagogical technique. In constructivism, construction and reconstruction of knowledge through interaction with fellow students, teachers and the media in a socially dynamic environment is key to transforming students from "absolute learners to contextual learners" (Yilmaz, 2008).

Understanding biosecurity within the New Zealand Curriculum

Tatum's experience with working within and being guided by curricula from both the UK and New Zealand may have helped him design and use biosecurity as a topic with his class. For example, he mentioned that in the UK, where he had taught for 10 years, the curriculum directed teachers more clearly than did NZC. "I found working in the UK was very academic, quite prescribed in some ways." In comparison, he said, when working with the NZC there was more freedom to choose a topic:

> In New Zealand the curriculum to me is not as prescribed [especially] the social science [curriculum] which is my area … There is a little bit more autonomy and you can choose topics … you could look at the [NCEA] standard and put something in the standard that could interest you, what you thought was important for the kids to learn.

One of Tatum's goals was to familiarise students with news that was biosecurity related. During the lesson observation, he gave students a sheet of paper with biosecurity headlines that had some parts taken out. The goal of the exercise was to match the headlines to the news that they had originally appeared with. In order for students to complete the exercise correctly, they had to read the news with the respective headlines removed and consult with each other. Students were trying to pull out ideas from the articles that they were given and categorise them into groups.

Tatum said that education should reflect important issues for New Zealand. He advocated for issues such as biosecurity being included in the curriculum because he believed that we should live up to the image of our nation that we are portraying to the rest of the world.

> It is an important part, especially in our country, because we tend to present ourselves such as a clean, green way and also in my last school a lot of kids tend[ed] to go into the tourism jobs. What I think, if you go into the tourist industry, you need to understand why it is important to have New Zealand as we would like it to be.

Tatum believed that he needed to teach content but found it was challenging to work from the students' ideas first, rather than a more transmissive approach. Tatum had previously mentioned that the NZC offered teachers more freedom; he was now realising how the social sciences curriculum he was teaching directed him. He particularly pointed out that the social sciences Achievement Standard 91599 recommends teachers draw out students' personal experiences about topics first, and this did not sit well

with him because it contradicted how he was taught to teach: teach knowledge first then relate it to student experiences:

> I am saying you can teach them the skills about social action and points, views, values and perspectives but you['ve] got to teach them something about biosecurity because I haven't actually done a lesson where I am teaching them about biosecurity because that's not the way I have been taught to teach.

Tatum wanted to make sure his students clearly understood what they were doing in terms of the curriculum requirements. Following the second classroom observation, he was asked how the teaching around biosecurity was going. He mentioned, "I think at this stage I really want to get their head around the issue." Further, he believed that teachers teaching biosecurity need some expertise about the topic before they embark on a journey of teaching and learning with biosecurity content. As he continued with the topic he said:

> I realised on my own, trying to keep a step ahead of the kids and be the professional, or the teacher with expertise. We've got to be the experts about biosecurity before you can get the kids to toddle and find information about it.

Tatum appeared to believe that teachers need to be experts before they venture out and teach, and this troubled him.

> At the moment I am not an expert in biosecurity. I am in terms of what I have read. Now I am realising, especially for something like this, that I probably should be a lot more knowledgeable about biosecurity because they're going to be asking me a lot of questions, and I feel that I should be able to not tell them but I should be able to say, right, if you read this source or read in that area, that's where you can find that information rather than saying just Google it.

Tatum appeared to have some doubt about his own knowledge of biosecurity. However, teacher doubt can be beneficial during teaching and learning because it helps address uncertainty, and effect change, that leads to teacher reflection, instil a desire, and motivation to learn, and collaborate (Wheatley, 2002).

In the third lesson observation, students were given an article about an aggressive weed that had spread around South Island farms. The conversation was around the invasive nature of certain species and their ability to spread quickly from one area to the next. The conversation moved on to students discussing how important it was to have people educated about biosecurity. Students began discussing that as more and more people immigrate to New Zealand, they need to be educated about biosecurity. They discussed how the whole country might be educated. Tatum mentioned the need for social justice in the sense that people have the right to know and be educated about risks.

As time passed, Tatum appeared reassured. He stated that prior to the third interview he had worried that students would not appreciate the topic but now he was thinking positively. In Interview 3 he commented:

> Biosecurity—it's them, its New Zealand, students in a country that relies heavily on agriculture and tourism and to have an understanding of the issue and be able to say and contribute to a discussion about it. I was really pleased about the fact that we could have the students contribute. I think they certainly appreciate and understand what biosecurity is … I think they appreciate the risks and the potential threats.

Tatum's fear that students might not appreciate the relevance of the topic, or understand what he was teaching, decreased during the last two interviews. The air of reassurance came from conversations he was having with students. One of the students revealed that she was talking about what she was learning in class—biosecurity—with her boyfriend:

> Just in conversation, a student mentioned she discussed it with her boyfriend. She said something along the lines [of] "a small thing can impact a bigger thing". I didn't realise she was saying to me of how wide the impact [of biosecurity incursions could become].

In another example, Tatum mentioned that a student became very passionate about the topic and wanted to take action. "It was her getting passionate, I guess is the word, or heated up about the issue, but also feeling the need to take action, which is what the whole standard is about." He described other evidence about how much his students were connecting with the topic. In one conversation he had with a student, he found out that the student was discussing biosecurity at home. "One of the students was quite forthcoming. I recall her saying how she had spoken to her family about it, about the biosecurity issue." Tatum also added that a student mentioned that she had realised that her grandmother was into buying stuff made from endangered animals.

Teacher recommendations on how to approach biosecurity teaching in the social sciences learning area

Biosecurity has a very expansive role because it covers many different domains. Using biosecurity as a topic for teaching may be difficult because biosecurity may play a different role in different industries. Tatum appeared to have encountered this problem and revealed that he approached the issue by

> putting boundaries [in place] because I think if you remove the boundaries it just falls apart. Especially with an issue like biosecurity, if you can put it into departments and they can look at it from that point of view or ideology or whatever. Then it doesn't seem so abstract because it's such a massive thing and as one of the students said, the impacts are wide but I think if you can, not narrowing down but break up the wideness into departments then and as long as they can see that the economic relates to the social, the social relates to the political, and everything relates to the environment. The economic losses will impact on the social community that will impact on the political because laws and regulations have to be put in place.

In the final interview, Tatum revealed that he thought biosecurity should become a compulsory part of the New Zealand curriculum. "Like I said earlier, biosecurity should be a compulsory component for curriculum." However, biosecurity wasn't the only subject he wanted included in the curriculum. He also believed that politics could be part of the curriculum since the social sciences curriculum required students to engage in social action which is political action. "It's always been there. It's getting them engaged in a political process and democracy; it would also be something about politics. Do you know what I mean?"

Tatum mentioned that the nature of the NZC meant that politics and biosecurity can be brought into teaching if a teacher chooses. "Like we have discussed, the New Zealand curriculum, it's open to whatever teachers choose to put in there as long as it meets the achievement objectives." Further, he believed that education about politics would make students become better contributing members of society:

> I think in terms of education I think it's enabling kids to become, I don't mean this in a bad way, but politics, just understanding it, and they have a voice, knowing how important it is to vote, to know that you are within your electoral boundary you have somebody representing you in parliament.

As part of the social sciences curriculum requirements, his students had to take part in social action. They did this by approaching their local member of parliament in person and presenting them with a formal letter advocating for biosecurity education to become part of the NZC as part of their social sciences assessment.

> What's pleased me is at least they have done the social action. I have had one written report from Student A and the others are in the process of writing at various stages. The only thing I thought was that we should have sent it to Mrs. Hekia Parata being the minister for education. It's a curriculum thing, and for them I suppose they were a little bit funny about it, sending something to an MP [member of parliament] when I said, that's their job, they are here to represent you, you can't go into parliament, you have got to go through them.

Tatum believed that his students gained valuable experience as a result of completing the biosecurity-related social sciences assessment which would potentially make them better contributing members of society.

> If anything, they got other things from that as well. For example, democracy, your voice and what the role of the MP is. It was really cool yesterday when Student B … I think a couple [of] weeks ago she mentioned an MP's electoral office in Botany and she said "oh, I walk past it every day, do you think I should drop a letter in?" I said "yes, yes, absolutely" and again there is extra learning as well because now they realise that the local MP has clinics every Saturday and they can go and speak to the MP. They have to book through the electoral secretary.

In mentioning how citizenship education was addressed in schools in the UK, Tatum made a clear link between biosecurity and citizenship. In linking citizenship education to biosecurity education, it can be said that Tatum was advocating that biosecurity could be included in teaching and learning in New Zealand schools just like citizenship education is in the UK:

> Citizenship isn't just about voting you know, values … come into it but I think having an awareness of this whole impact that some people becoming lax about things is about citizenship, global citizenship. Citizenship is about environmental issues as well; it relates to environmental issues like recycling and sustainability all comes into citizenship.

As Term 4 was coming to an end, Tatum revealed how much he himself had learned while using biosecurity as content to teach his Year 13 social sciences class:

> I totally get it; I do see the importance of it to our economy. I can see how vulnerable we are. I think looking at it from the Southland's perspective. Actually, finding the sources of information that I gave to the kids made me aware.

Teachers' doubts about their own knowledge may lead to guilt over their perceived ineffectiveness as the data related to Tatum appeared to show. However unpleasant, this is a powerful motivation to learn and upskill as the data related to Tatum also showed (Wheatley, 2002).

Tatum was asked in the final interview what his views were on biosecurity as a topic within the curriculum. He replied:

> For me it's been a good learning. There are times when I hear biosecurity on the radio. I heard Nathan Guy on the radio, and your ears prick up. You know, you want to know what that is all about …

Conclusion

This research was conducted with one secondary school teacher and his class of Year 13 students to investigate the appeal of biosecurity content for teaching and learning in the social sciences learning area. Data that informed this research was gathered via five personal teacher interviews and three classroom observations conducted over eight months.

Data showed that biosecurity content can be successfully used to engage Year 13 students in teaching and learning in the social sciences learning area of the NZC. Personal connections and/or understanding of biosecurity may help better prepare teachers to use such content in the social sciences learning area as data revealed. However, Tatum had doubts about his own knowledge of biosecurity. Although Wheatley (2002) posited that teacher doubt can lead to a desire to learn, and data from this study appears to support this claim.

A good grasp of the NZC was key in allowing Tatum to use biosecurity content with social studies in the classroom. Particularly, Tatum was able to address the expansiveness of the biosecurity topic through breaking it into "departments" and focusing on connecting each department through ideologies as guidelines in the social science learning area advocates. Overall, it appears that Tatum, with direction from the social sciences curriculum, was able to engage his students' interest and spur them to move beyond their opinions by engaging in social action in the biosecurity area.

By challenging students to transform their knowledge, and taking a critical approach to teaching and learning, Tatum led his students to build knowledge about New Zealand's dependence on biosecurity and consequently act as informed citizens. From the Year 13 students' perspective, the transformative learning pedagogy used in the classroom allowed them to critique and reflect on their own views about biosecurity (Sass et al., 2020; Eames, 2009; Greene, 2001). In this way, it can be said that transformative learning pedagogies can be used when teaching with biosecurity content in the social sciences learning area of the NZC because they engender ontological change through "critical reflection" (Mezirow, 1997).

Further research with teachers teaching in different regions and at different curriculum levels in the social sciences learning area would give a more comprehensive picture of the appeal of biosecurity content for teaching and learning purposes in the social science learning area of the New Zealand Curriculum.

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