

HACK EDUCATION

CROWDSOURCING THE FUTURE OF EDUCATION IN NEW ZEALAND

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ABSTRACT

Crowdsourcing is a twenty-first century phenomenon that relies on Web 2.0 technologies to enable the public to contribute to data gathering by organisations. It offers new ways of researching emerging topics that leverage the wisdom of crowds. Crowdsourcing originally developed as a way of identifying one or more 'winning' solutions from a crowd of contributors, and tended to be product focused. Over time, however, a variety of definitions of crowdsourcing has evolved, differing in terms of the specific types of crowd, initiator and process.

In this article, we explore the use of crowdsourcing as a research methodology, which involves outsourcing research tasks to large groups of self-selected people, both lay and expert. Unlike traditional surveys, crowdsourcing allows for a more iterative, idea-generating process, which can be more effective than other methods in future-focused research. We illustrate this approach using a case study – a project called Hack Education that was used to gather ideas about the future of education in New Zealand. This project used crowdsourcing both to gather and to analyse data.

Our case study reveals that crowdsourcing can provide different perspectives and other ways of analysing the same domain of interest. In particular, our data suggests that the crowd is able to give a somewhat broader, overarching set of ideas than is available from other channels. As such, crowdsourcing may provide a useful complement to more traditional research methods.

CROWDSOURCING AS A TERM

Crowdsourcing was originally posited as a way to tap the latent talent of the crowd through the internet (Howe, 2006a). Its key characteristics are an open call for contributions and a large network of potential contributors, or 'labourers' as originally stated (Howe, 2006b). In these early definitions, there is some concept of a winning contribution, that out of the crowd there emerge only a few winners who receive financial gain. This is in contrast to other crowd activities in technology, such as open-source software development, where there is no expectation of financial gain by the participating crowd (Brabham, 2008). However, in the related concept 'the wisdom of crowds', the emphasis is on aggregation of individual contributions (Surowiecki, 2005).

Estelles-Arolas and Gonzalez-Ladron-de-Guevara (2012) note that there is a variety of definitions of crowdsourcing, and identify several variations in crowd, initiator and process that lead to these multiple interpretations. They propose a set of criteria that can be applied to activities to indicate if they can be classified as crowdsourcing. This classification is comprised of three main elements (crowd, initiator and process), and within these elements there are a total of eight characteristics. For the crowd, the characteristics are who forms it, what it has to do and what it gets in return. For the initiator, the characteristics are who they are, and what they get from the crowd. Finally, for the process, the characteristics are the type of process, the type of call and the medium used.

The structuring of a crowdsourcing process was explored by Thuan, Antunes and Johnstone (2017). Their process model comprises three high-level activities: the decision to crowdsource, technical configuration and design. The design activity is further separated into the components of task definition, workflow design, crowd management, quality control and incentive mechanism.

Combining the work of Estelles-Arolas and Gonzalez-Ladron-de-Guevara (2012) with Thuan, Antunes and Johnstone's (2017) provides a useful set of tools for designing and managing a crowdsourcing activity.

CROWDSOURCING AS A RESEARCH METHODOLOGY

Crowdsourcing may be a valid form of acquiring goods or services, but in this article, we are more concerned with its role as a research methodology. Crowdsourcing research is defined by Williams (2013) as outsourcing research tasks to large groups of self-selected people, both lay and expert. Crowdsourcing as a research methodology offers some new and useful ways of accessing data, working with data, and democratising data collection and analysis. Employing crowdsourcing as a research methodology draws on some of its potential to conduct research differently. Drawing on crowds for data collection and analysis can release researchers from certain constraints such as time and cost, and allow projects to be extended or increased in scope. For example, Williams (2013) sees crowdsourcing as being able to extend current methodologies by helping to triangulate data through accessing other large data sets that would not normally be included because of their size or a lack of research time.

Crowdsourcing data has some similarities with that of survey methodologies, but differs in several important ways. Surveys look for answers to specific questions on predetermined subjects, and the nature of feedback is controlled. Data is often used for statistical analysis, since much survey data is quantitative. Crowdsourcing differs in that it allows the participants to *open up* questions as well as providing answers, and the crowd leads the discussion. There is a continuous cycle of interaction between previous and current contributions, since crowdsourcing platforms make the contributions of others visible (Day, 2014).

Because crowdsourcing as a research methodology seeks participants to undertake research, it does raise questions of sampling quality and bias. The nature of the research tasks in crowdsourcing is often quite menial and does not interfere with the higher-order analysis or discussion. However Sabou, Bontcheva, & Scharl (2012) note that some overzealous or 'lazy' contributors could add bias to any crowdsourced research. In terms of sampling, we see crowdsourcing as much more than a sampling strategy. Drawing on the resources of crowds to engage in research is harnessing the intrinsic motivations in many individuals to contribute to further understanding, effecting what could be thought of as "altruistic crowdsourcing" (Sabou, Bontcheva, & Scharl, 2012, p. 2). As well as providing access to data collection and analysis that is beyond the scope of a single researcher or small team, crowdsourcing also supports a more iterative and generative approach to research, where analysis and reporting can proceed beyond the initial scope of the project (Williams, 2013). This was a feature we drew on in the case study described in this paper, where different groups of participants were able to help to code the data iteratively. Because crowd-based resources for analysis were available, the iterative and ongoing analysis of the case study was given more attention in our report.

Crowdsourcing as a research methodology can introduce dimensions of democratising data collection and provide an opportunity for more voices to be heard on a topic. Tourle (2017) noted how crowdsourcing, when applied to heritage studies/education, encouraged members of the public to engage in decisions on future options for heritage organisations. However, one pitfall of crowdsourcing for research purposes is that the collective voice may exclude others at the margins. Paulin and Haythornthwaite (2016), who looked at crowdsourcing the tertiary curriculum in a digital networked age, also shared concerns about how crowds and crowdsourcing can reinforce homogeneity in data and opinion, and by working independently of traditional sources of data. Other concerns raised by Sabou et al. (2012) note how issues of consent (what crowd participants are knowingly consenting to) and acknowledgement in terms of authorship needs considering for future crowdsourcing-research ethics processes.

INTRODUCTION TO THE HACK EDUCATION CASE STUDY

This article explores a crowdsourcing case study that set out to capture public opinion on some aspects of the future of education in New Zealand. Hack Education was a marketing project that was launched in 2016 through The Mind Lab by Unitec to crowdsource ideas from the public about its vision for what New Zealand education could look like in the future. A dedicated website was made available for public responses to three trigger statements about the future of education. In the following sections we explain the crowdsourcing method used, the results gathered, and the insights gained from this process.

Question	Responses	Codes generated from responses
"In the future education will be..."	362	Inclusive, Relevant, Responsive, Flexible, Personalised, Technology-focused, Fun, Innovative, Collaborative, Engaging, Twenty-first century, Accessible, Global, Future-focused, Digital, Real-world
"In the future education will not have..."	214	Assessment, Barriers, Places, Learning environments, Paper and pens, Philosophy, Environment, Curriculum
"I wish education..."	312	Future-focused, Individualised, Equity, Problem-based Learning, Differentiation, Engaging, Real world/ Twenty-first century, Agency, Cost, Authentic, Better funding, Inclusive, Student-needs-driven
Total	888	

Table 1: Hack Education data and codes.

RESEARCH METHOD

Data was gathered and analysed for this study using an approach that we have categorised according to the characteristics of crowdsourcing outlined by Estelles-Arolas and Gonzalez-Ladron-de-Guevara (2012). In our study, the crowd was the general internet public, who were asked to generate ideas, and recompensed through satisfying their desire to share knowledge. It should be noted that although the call to participate was public, and mostly distributed through online marketing channels, the site was specifically publicised to our student body of around 900 in-service teachers undertaking postgraduate study. There is no data on how many of these teachers and other stakeholders answered the questions, as participation was anonymous. However, we can assume that the proportion of educational stakeholders in the data was higher than in the general population.

The initiator was an educational institute, seeking to gain insights into future education for research and marketing purposes. The process might be described as open innovation (but with no specific products). The type of call was open – any interested party could participate – and the medium used was a Web 2.0 website, hosted at hackeducation.co.nz (not to be confused with other sites with similar names). The Hack Education website asked the public to complete any, or all, of the following sentences:

- In the future, education will be...
- In the future, education will not have...
- I wish education...

Importantly, the site allowed for an iterative process of idea generation from the crowd. Unlike a standard online survey, visitors to the site were able to view previous responses by question, by popularity and by most recent, as well as being presented automatically with some random selections from previous submissions.

The website was opened to the public in March 2016. The 888 responses used in this study were collected over a nine-month period and put into a master spreadsheet for analysis. Data was reduced and analysed through a process of collective coding and theming of the responses. This data analysis was performed through crowdsourcing by about

four hundred teachers on the Postgraduate Certificate in Applied Practice programme as part of their studies at The Mind Lab by Unitec. In groups of four, these teachers were given around ten lines of responses per group and asked to create “descriptive codes” (Miles, Huberman, & Saldana, 2014, p. 74) that would identify key themes in their data, and then enter these into a collaborative spreadsheet.

The codes that were produced through this crowdsourcing process were read by the researchers who authored this article, and the frequency of the codes were noted. Codes that occurred with a frequency of more than ten responses were included in the final list. Table 1 summarises the numbers of responses to each statement and the codes identified for each.

The next stage of the analysis focused on only two of the statements that had been presented, namely “In the future education will be...” and “I wish education...”. The reason for excluding the statement “In the future education will not have...” was to enable focus to remain clearly on the crowd’s positive visions of the future. Analysis of what should be excluded was left for a separate study. We merged the coded responses to the two statements to generate the following list of 13 concepts:

- Collaborative
- Digital
- Diverse
- Equal
- Flexible
- Future-focused
- Individualised
- Innovative
- Personalised
- Real-world
- Responsive
- Technology-dependent
- Twenty-first century (skills)

This list provided an idea about what the crowd identified as the core conceptual values of future education, but did not independently provide a view of what the overall domain might look like. In order to approach this question, another process of crowdsourced analysis was undertaken, whereby another cohort of about four hundred teachers, again in groups of four, were asked to link together pairs of concepts. This resulted in every pair of concepts having a number of linked statements that indicated how they might be related to one another in the context of the future of education. This gave a very large set of linking statements (n=833), which underwent another stage of data reduction and coding to try to identify the most important ideas that had surfaced around these concepts.

The final stage of the analysis was to integrate the set of 13 concepts identified in the first stage of the analysis with the most significant relationships between these concepts that had been identified in the second stage of the analysis into a domain model. A domain model captures the core concepts and their relationships in a specific domain. Figure 1 uses the domain model notation outlined in Unified Modeling Language (UML) (Jacobson, Booch, & Rumbaugh, 1999), where diamonds represent ‘part of’ relationships and arrowheads represent ‘is a’ relationships. These relationships are important where concepts have a relationship that is more closely integrated than simply having peer-to-peer links. In Figure 2, ‘Individualised’ is identified as a subset of ‘Personalised’, since personalisation is generally seen as a more generic concept of learner agency that detailed individualisation can support (Basye, 2016). Similarly, ‘Future-focused’ is seen as a subtype of ‘Twenty-first century skills’, in that ‘Twenty-first century’ is both present and future, but ‘Future-focused’ is a specialisation of that concept. ‘Digital’ is simply identified as ‘part of’ ‘Technology-dependent’ since not all technology is digital.

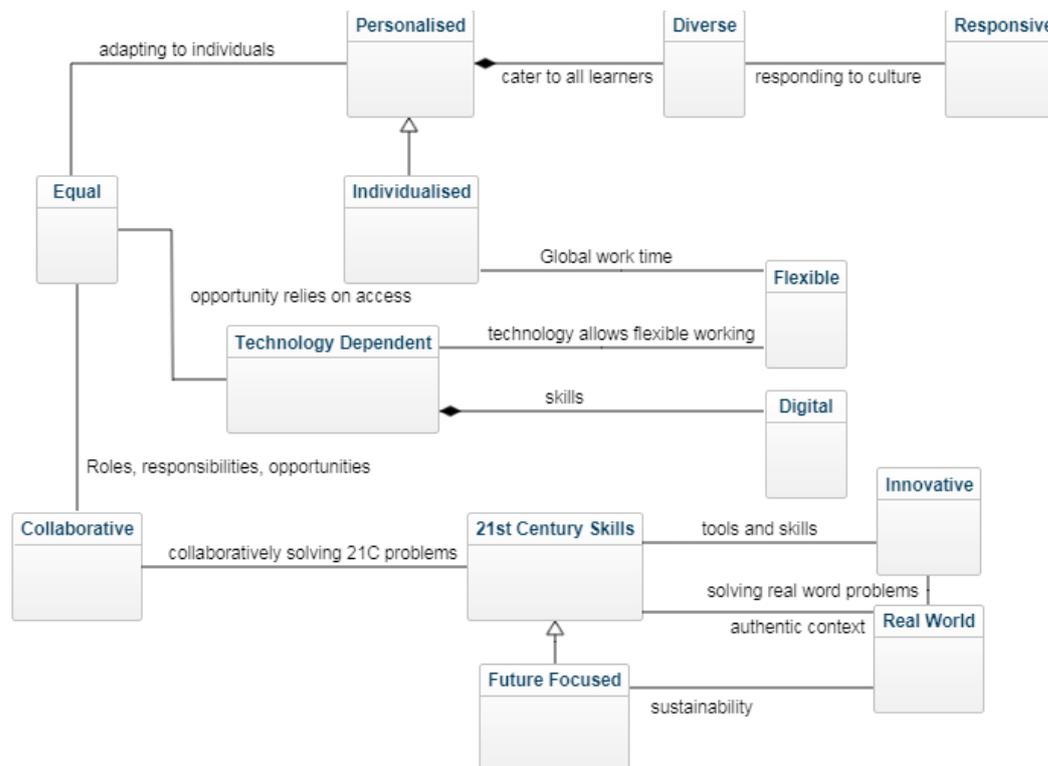


Figure 1: Domain model of future education using UML notation.

It should be noted that this part of the analysis was somewhat subjective, and the same dataset could have been used to generate a number of different domain models by emphasising different relationships. However, this interpretation is one that seeks to reflect the most common and insightful suggestions from the crowd. The domain model produced focuses on three core areas: the individual learner, the role of technology and the contemporary world. These core areas are linked together through concepts of equality and collaboration.

COMPARING MODELS OF FUTURE EDUCATION

This research project used a crowdsourcing approach to create one indicative model of views on the future of education. This section compares the key concepts in the domain model with three other views of the future of education. There are, of course, many views that could be used for such a comparison. However, in an effort to address a broad range of perspectives, we have chosen to include one national view (from the New Zealand Ministry of Education), one international view (from the Organization of Economic Co-Operation and Development [OECD]), and the other, a bi-cultural view of importance in New Zealand, a Māori perspective from Professor Sir Mason Durie of Massey University. These three documents were used in the analysis as comparisons to the crowdsourced data. In the analysis, we sought to explore whether crowdsourcing provides unique or contrasting views. This was structured in tabular form, using the crowdsourced data as the initial starting point, and then comparing each of the other sources to identify similarities and differences between each perspective (Table 2).

We drew on these three documents in the analysis in the following ways. The document *New Zealand Education in 2025 – Lifelong Learners in a Connected World* (Ministry of Education [MoE], 2012) presents a connected, decentralised vision, with a focus on STEM skills and authentic learning. This provided a national state viewpoint on the future of education. The six OECD schooling scenarios for 2020 (OECD, 2017) are in three categories: the status quo, re-schooling and de-schooling. We confined the analysis of this document to the re-schooling category since it is the

Category	Crowdsourced data	MoE	OECD re-schooling	Hui Taumata Mātauranga IV
The individual learner	Diverse	Diverse	Diverse	
	Equal	Inclusive	Equal opportunity	
	Individualised			
	Personalised			Personal
	Responsive	Empathetic		Inclusive
		Self-directed		
			Non-formal learning	
The role of technology	Digital			Digital networking
	Flexible		Flexible (facilities)	Connected
	Technology-dependent		Extensive ICT	Virtual classroom
		Open resources		
		Online profiles		
The contemporary world	Collaborative	Collaborative		Collaborative
	Future-focused			Future-focused
	Innovative	Innovative		Flexible
	Real-world	Authentic problem-solving	Local decision-making	
	Twenty-first century skills			Knowledge-building
		STEM foundation		
			Shared responsibilities	Flexible
			New forms of evaluation	
The physical environment		Adaptable, technology-rich	Flexible, state-of-the-art	Centres of excellence
		Learning centres for all ages	School and community	School as community hub
				Flexible
				Virtual classroom
Cultural responsiveness				Cultural concepts and processes
				Importance of language
				Cultural identity/confidence
				Indigeneity
The international context			International networks	International currency
				International benchmarks

Table 2: Contrasting visions of future education.

category most concerned with future education emerging from the current system. Finally, the third document was used in the analysis because it anticipates a learning environment for future Māori achievement, as outlined by the fourth Hui Taumata Mātauranga (Durie, 2004). This document asserts that such a learning environment will have dual responsibilities to Māori learners to prepare students to fully participate both in wider society and in te ao Māori (the Māori world).

Table 2 maps the various concerns of these three documents against the main themes that emerged from this project's data in order to see the scope and limitations of the crowdsourcing approach. These have been grouped into the three broad categories identified in the domain model, along with three additional categories (the physical environment, cultural responsiveness and the international context) that were identified in the three other sources analysed.

From the data in Table 2, it appears that the crowdsourced approach provides new insights into the heart of contemporary educational values, freed from infrastructural, political or administrative concerns. One example from the individual learner category suggests employing a crowdsourcing methodology might facilitate the collection of data that is independent of institutional forces (Williams, 2013).

The crowdsourced data on 'individualised' and 'personalised' was not noted in the institutional perspectives of the MoE nor OECD. This may be due to the freer nature of the data collection process at work. There were other significant omissions, this time in the crowdsourcing data where there were no entries in the categories of 'physical environment', 'cultural responsiveness' and 'international context'. It is hard to quantify why these occurred but, returning to Sabou et al. (2012) and their work on crowdsourcing in research, perhaps this was an example of the data being homogenised and differences being occluded? Perhaps, as Williams (2013) alludes to, the crowd may represent the views and associated bias of the general population, and that the lack of crowdsourced data on these categories is a reflection of this? Or it could simply be that they do not occur in significant enough numbers to appear in the most common themes identified in the data set. In essence, this crowdsourced approach captures a set of high-level concepts around educational values that do not occur consistently in the other models analysed.

CONCLUSIONS

This article has explored the use of crowdsourcing as a research methodology, illustrated with a case study. Crowdsourcing can provide different perspectives and other ways of analysing the same domain of interest, potentially giving a broader set of ideas than are available from other channels, so it may provide a useful complement to more traditional research methods. Crowdsourcing varies in terms of crowd, initiator and process, and has been defined in a number of ways. Further, technical configuration and design of crowdsourcing process can vary widely. Nevertheless, the core concept of crowdsourcing as a research method is clear: outsourcing research tasks to large groups of self-selected people, both lay and expert.

It has some advantages over other research methods, such as gathering data through surveys, partly because of the potentially larger scale but, more importantly, because it allows the participants to open up questions as well as provide answers through a continuous cycle of interaction between previous and current contributions.

We have illustrated these ideas of using crowdsourcing as a research methodology through a case study called Hack Education, that aimed to gather visions of the future of education via a public website that supported interaction between previous and current contributions. As well as crowdsourcing the original data, we also crowdsourced the analysis of the data in two phases. The main concepts derived from this process were compared with three other visions of future education from national, international and cultural perspectives. This comparison suggested that the vision of education gathered from the respondents, and the crowdsourced analysis, provided some unique perspectives on what the future of education might be.

Although the crowdsourced data filtered out some important factors, including cultural, infrastructural and international contexts, it provided further contributions to multiple views of how education will evolve. We therefore conclude that crowdsourcing provides a valuable complementary research tool that can help to triangulate data from other sources. In subsequent work, we have begun to build on these contributions in a project that captures video vignettes of teachers reporting on how they have implemented the crowdsourced concepts in their teaching.

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