Journal of Research in Interprofessional Practice and Education

Template Analysis of a Longitudinal Interprofessional Survey: Making Sense of Free-Text Comments Collected Over Time

Melanie Brown, Sue Pullon, Eileen McKinlay, Lesley Gray and Ben Darlow

Volume 12, Number 1, 2022

URI: https://id.erudit.org/iderudit/1087102ar
DOI: https://doi.org/10.22230/jripe.2022v12n1a337

See table of contents

Publisher(s)

Canadian Institute for Studies in Publishing Press (Simon Fraser University at Harbour Centre)

ISSN

1916-7342 (digital)

Explore this journal

Cite this article

Brown, M., Pullon, S., McKinlay, E., Gray, L. & Darlow, B. (2022). Template Analysis of a Longitudinal Interprofessional Survey: Making Sense of Free-Text Comments Collected Over Time. *Journal of Research in Interprofessional Practice and Education*, *12*(1), 1–16. https://doi.org/10.22230/jripe.2022v12n1a337

Article abstract

Surveys are widely used in interprofessional education (IPE) research and these often collect free-text data. The potential contribution of free-text data to analysis and interpretation is often missed through separate reporting of qualitative and quantitative results, or free-text analyses being superficial or limited to subsets of data. There is little published guidance on how to maximize the use and integration of free-text comments with quantitative responses in large datasets collected over multiple years. Analysis of all qualitative comments, within the context of their related quantitative answers, enables exploration of changes in participants' construction of meaning over time. This article describes how we used template analysis to analyze 3,626 free-text responses, collected as part of a five-year survey exploring the impact of an IPE program on health professionals' attitudes to teamwork and early careers. We outline the main procedural steps undertaken by a team of researchers and we share our insights into the methodological challenges encountered. This article aims to inspire other researchers at the planning stage of research proposals, and assist them with practical ideas during data extraction, management, analysis, and reporting of large free-text datasets. We conclude that template analysis has methodologically sound, pragmatic utility in IPE longitudinal survey research.

JRIPE

Journal of Research in **Interprofessional Practice and Education**

Vol. 12.1
2022

Template Analysis of a Longitudinal Interprofessional Survey: Making Sense of Free-Text Comments Collected Over Time

Melanie Brown, MHealSc(Rehabilitation)[a], Sue Pullon, MPHC MBChB[a], Eileen McKinlay, MA(App)[a], Lesley Gray, MPH[a], & Ben Darlow, PhD[a]

a. Department of Primary Health Care and General Practice, University of Otago, Wellington, New Zealand

Abstract

Surveys are widely used in interprofessional education (IPE) research and these often collect free-text data. The potential contribution of free-text data to analysis and interpretation is often missed through separate reporting of qualitative and quantitative results, or free-text analyses being superficial or limited to subsets of data. There is little published guidance on how to maximize the use and integration of free-text comments with quantitative responses in large datasets collected over multiple years. Analysis of all qualitative comments, within the context of their related quantitative answers, enables exploration of changes in participants' construction of meaning over time. This article describes how we used template analysis to analyze 3,626 free-text responses, collected as part of a five-year survey exploring the impact of an IPE program on health professionals' attitudes to teamwork and early careers. We outline the main procedural steps undertaken by a team of researchers and we share our insights into the methodological challenges encountered. This article aims to inspire other researchers at the planning stage of research proposals, and assist them with practical ideas during data extraction, management, analysis, and reporting of large free-text datasets. We conclude that template analysis has methodologically sound, pragmatic utility in IPE longitudinal survey research.

Keywords: interprofessional education, longitudinal survey, survey methods, template analysis, free-text analysis

Introduction

The survey is a key health research method and is widely used in interprofessional education (IPE) research. Most surveys rely heavily on closed questions that are considered efficient because they yield data that are easy to collect and analyze [1]. Reliance on numerical survey data has been criticized for missing the interpretive value of descriptive comments [2]. Free-text survey data may offer useful insights, by adding further depth and richness or raising unexpected responses or issues not covered in the closed questions [1,3]. Four main types of open questions can be

Corresponding author:
Ben Darlow. Email:
ben.darlow@otago.ac.nz

www.jripe.org

Brown, Melanie, Pullon, Sue, McKinlay, Eileen, Gray, Lesley, & Darlow, Ben. Template Analysis of a Longitudinal Interprofessional Survey: Making Sense of Free-Text Comments Collected Over Time. *Journal of Research in Interprofessional Practice and Education (JRIPE), 12*(1), 1–16. doi:10.22230/jripe.2022v12n1a337

included in structured surveys: 1) extension, e.g., other, please specify; 2) expansion, e.g., please explain; 3) substitution, in which an open question is used instead of a closed question; and 4) general, e.g., any other comments? [1].

Optimal methods to qualitatively analyze free-text responses and integrate these into quantitative results are yet to be established with widely varying approaches described in the literature [4]. O'Cathain and Thomas [1] describe the data generated by open-ended questions as being "uncomfortable": neither strictly qualitative nor strictly quantitative. Consequently, despite many health surveys including open-ended questions, responses are often not examined beyond surface-level analysis, if at all [5]. Researchers often use light-touch strategies such as superficial attempts at content analysis [6] or over-reliance on automated text analyses that "quanticize" the data [4,5]. These strategies lack the depth of analysis and reflexivity that are hallmarks of qualitative research [1]. Furthermore, mixed-method studies that specifically mention free-text survey responses often combine (and subordinate) these data with qualitative interview data (e.g., Kelly et al. [7]; Surr et al. [8]) or report free-text findings separately rather than integrated with quantitative results. These approaches neither make best use of the free-text data nor capitalize on capturing a mixture of quantitative and qualitative data from all participants.

Longitudinal free-text survey data can explore changes in how participants construct meaning over time; however, this potential is rarely exploited [5]. The time-consuming nature of preparing and coding the volume of free-text data generated in large-scale multi-year longitudinal studies can be a significant barrier [3]. Strategies for deeper thematic analysis of large amounts of free-text data may involve analyzing only subsets of the data, rather than attempting in-depth analyses of all comments received at multiple time points [3]. These strategies do not allow for full expression of the richness and depth of data, nor analysis of the evolution of respondents' thoughts over time.

The focus of this article is a manual thematic analysis approach that the authors used to analyze free-text data from the Longitudinal Interprofessional Study (LIP Study) — a large-scale five-year survey designed to follow New Zealand health professionals during their final year of professional training and the first three years of professional practice [9]. We outline why the technique of template analysis [10] was useful for handling vast quantities of free-text responses that accompanied quantitative survey data. We discuss challenges when presenting themes and data extracts in response to our research aim of exploring changes over time. We also describe the main procedural steps undertaken in this approach.

The LIP Study

The five-week Tairāwhiti Interprofessional Education (TIPE) program involves a subset of final year pre-registration students from a mix of disciplines at the University of Otago, Eastern Institute of Technology, and Otago Polytechnic in New Zealand [11,12]. Disciplines include dentistry, dietetics, medicine, nursing, occupational therapy, oral health, pharmacy, and physiotherapy. The TIPE program is run in a region that has a high Māori (Indigenous) and remote rural pop-

ulation and low levels of income and employment. Students experience a variety of supervised clinical placements in interdisciplinary teams in different clinical settings, and work collaboratively on various tasks (e.g., a community education project). They live and socialize together in shared accommodation for the duration of the program [13].

The LIP Study aimed to explore changes in: 1) attitudes to interprofessional teams and teamwork abilities; 2) career intentions and choices related to professional setting and geographical location; and 3) vocational satisfaction in participants who did and did not attend the TIPE program. The study received approval from the University of Otago Ethics Committee (D13/019) and participants gave written consent.

Participants were recruited in three cohorts, with "non-TIPE" and "TIPE Cohort 1" recruited prior to the 2015 academic year, and "TIPE Cohort 2" recruited prior to the 2016 academic year [9]. Data were collected via written or online surveys at baseline (pre-final year) and four follow-up surveys at 12-month intervals capturing the final year of training and the first three years of professional practice (Table 1). The mixed-methods survey contained standardized questionnaires, quan-

Table 1. Longitudinal Interprofessional Study surveys

Survey	Components	Stage
Survey 1	ATHCTS TSS Demographic items	Before the final year of training (and prior to TIPE or control exposure)
Survey 2	ATHCTS TSS Clinical practice intention (quantitative and free-text items)	After the final year of training (and after TIPE or control exposure)
Survey 3	ATHCTS TSS Clinical practice characteristics (quantitative and free-text items) Satisfaction (quantitative and free-text items) Interprofessional practice (quantitative and free-text items)[1]	One year post-graduation (and end of first year of professional practice)
Survey 4	ATHCTS TSS Clinical practice characteristics (quantitative and free-text items) Satisfaction (quantitative and free-text items) Interprofessional practice (quantitative and free-text items)[1]	Two years post-graduation (and end of second year of professional practice)
Survey 5	ATHCTS TSS Clinical practice characteristics (quantitative and free-text items) Satisfaction (quantitative and free-text items) Interprofessional practice (quantitative and free-text items)[1]	Three years post-graduation (and end of third year of professional practice)

Notes: ATHCTS, Attitudes Towards Health Care Teams Scale; TIPE, Tairāwhiti Interprofessional Education; TSS, Team Skills Scale. [1] Free-text questions on interprofessional practice completed only by participants who attended TIPE.

titative items, and free-text items of all four types (extension, expansion, substitution, and general) based on the study's aims. Students who attended the TIPE program completed additional free-text items exploring the effects of TIPE on their careers. In total, 611 participants were recruited across three cohorts: non-TIPE ($n=481$), TIPE Cohort 1 ($n=61$), and TIPE Cohort 2 ($n=69$).

Unravelling the data: How to manage, code, and interpret 3,626 free-text responses

Template analysis

Template analysis is a flexible form of thematic analysis suitable for large datasets that organizes and analyzes textual data [14]. Template analysis can be used within a range of methodologies and epistemological positions. It provides a structured approach to data analysis that can be adapted to each study's needs [15]. Although commonly used to analyze interview data, it can be used with any kind of textual data including free-text questionnaire responses [16].

Brooks, McCluskey, Turley, and King [14] and Brooks and King [16] outline the background of template analysis and the main procedural steps to apply it to various study types [14,16]. Researchers develop an initial coding template either a priori or from preliminary data coding. This template organizes themes and represents the relationships between themes [16]. Template analysis emphasizes hierarchical coding to allow the researcher to analyze texts at varying levels of specificity, with broad higher-level codes giving an overview of the findings while detailed lower-level codes allow fine distinctions to be made [10]. There can be as many levels of coding as the researcher finds useful [10]. Unlike many other qualitative approaches, such as thematic analysis that typically has only one or two levels of coding, it is common in template analysis to use four or more levels to capture the most detailed aspects of the data [14].

Identifying themes *before* constructing the initial template is a useful approach when a study has clearly defined research questions and written questionnaire data, and when the researchers have an idea about how they wish to interrogate the data [17]. Pre-prepared questions can be used as a starting point, but the technique allows for a priori themes to be changed iteratively in response to the data [14]. A template evolves as data are coded not only into the a priori themes, but also into new themes and sub-themes not conceived at the outset of the research [17]. The flexible nature of template analysis allows templates to be regularly modified as the analytic process develops [17], with successive versions of the template numbered and saved for auditing [15]. Templates may be displayed either as a mind-map to show lateral links between themes, or as a list with levels indicated by indentation, typography, and/or numbering [15].

In the LIP Study, the free-text analyses were undertaken by a team of qualitative researchers experienced in reflexive thematic analysis. Template analysis allowed in-depth analysis while providing a systematic way of approaching the data. This approach assisted the team of researchers to undertake qualitative analysis together in this large-scale project [14].

Applying the template analysis technique to the LIP Study data

Developing and testing the a priori template

The LIP Study survey included 18 free-text items regarding influences on career choices and trajectories. Six of these 18 items were asked only of participants who took part in the TIPE program, because these related to participation in TIPE and other pre-registration IPE. There were a mix of stand-alone items and those expanding on responses to quantitative items (Table 2). An analysis team of four researchers (R1, R2, R3, R4) undertook the bulk of free-text analysis, with the remainder of the research team involved in reaching consensus of the final theme template and interpreting how this fitted with the quantitative findings.

Table 2. A priori template for testing a subset of Longitudinal Interprofessional Study data

Free-text survey items	1. Explanation of response *"Not working or training"* 2. Explanation of response *"Other health profession"* 3. Comments on responses to the *"Attitudes Towards Health Care Teams Scale"* 4. Comments on responses to the *"Team Skills Scale"* 5. Explanation of response *"Other practice setting/professional area"* 6. Explanation of response *"Other practice setting/professional area—most of time spent"* 7. Explanation of response *"Working or training in practice setting / professional area"* 8. Explanation of response *"Other location type"* 9. Explanation of response *"Other location type—most of time spent"* 10. Explanation of response *"Choosing to work in location type"* 11. Comments on response *"Job and career satisfaction"* 12. [TIPE participants only] Comments on response *"Function and purpose of this interprofessional team"* 13. [TIPE participants only] Explanation of response *"Other types of interprofessional team disciplines"* 14. [TIPE participants only] Description of response *"How this interprofessional team works and your role"* 15. [TIPE participants only] Comments on response *"Experience of working or collaborating with different disciplines or health profession"* 16. [TIPE participants only] Comments on response *"Aspects of interprofessional education that prepared you for working in interprofessional team"* 17. [TIPE participants only] Comments on response *"Influence of TIPE on career choices"* 18. Other comments
A priori themes and sub-themes	**All participants** General details of current work *Reason for choosing clinical setting (Items 1, 2, 5–7)* *Reason for choosing location (Items 8–10)* *Job satisfaction (item 11)* Interprofessional team in current job *Function and purpose (Item 12, 13)* *How it works (Item 14)*

Table 2 (continued)

A priori themes and sub-themes	**Participants who attended TIPE** Attitudes or experience regarding interprofessional teams or skills *Attitudes toward collaborating (Item 3)* *Ability or experience collaborating (Items 4, 15)* Beliefs regarding the influence of interprofessional education *Pre-registration training preparation for interprofessional teams (Item 16)* *Impact of TIPE on career (Item 17)*

Note: TIPE, Tairāwhiti Interprofessional Education

When embarking on a topic-based analysis in a large-scale longitudinal study, it is important to consider which surveys to examine [3]. Due to the LIP Study's aim of exploring changes during early career, the analysis team selected Surveys 3 to 5 because these data were gathered at the end of the first, second, and third years of professional practice; free-text data in earlier surveys captured only intentions for future professional practice, not outcomes (Table 1). Likewise, a decision rule was made to code only data related to outcomes (e.g., I am working in a rural hospital), not statements of intentions (e.g., I plan to work in a rural hospital in the future).

Table 3. Initial template (V1) for coding the Longitudinal Interprofessional Study full dataset (all levels of codes)

Initial themes and sub-themes	**All participants** To be coded (free node) Reason for choosing clinical setting *Job reasons* *Personal reasons* Reason for choosing location *Job reasons* *Personal reasons* Job satisfaction *Satisfied* *Dissatisfied*
	Participants who attended TIPE Attitudes or experience regarding interprofessional teams or skills *Ability or experience collaborating* *Attitudes toward collaborating* Beliefs regarding the influence of interprofessional education *Pre-registration training preparation for interprofessional teams* *TIPE influence on career*
Free-text items not coded (descriptive-only answers)	Interprofessional team in current job (Items 12–14) *Function and purpose* *How it works*

Note: TIPE, Tairāwhiti Interprofessional Education

The analysis team developed an a priori template, comprising three themes (each with one or two levels of sub-themes) relevant to the 18 free-text items (Table 2). Given the volume of responses in this large-scale study, it was decided to first apply the a priori template to a subset of respondents (Survey 3, TIPE Cohort 1, $n = 51$) to assess how to best manage the full dataset.

R2 extracted free-text survey data from the original Excel (Microsoft, Redmond, Washington, USA) spreadsheet into a Word (Microsoft, Redmond, Washington, USA) document. R1 imported the document into NVivo 12 (QSR International, Melbourne) and organized respondents' free-text survey responses into the a priori themes and sub-themes, and generated newly identified codes. Links were made across and deeper within the hierarchies, modifying the template as necessary.

Next, the analysis team met to discuss the subset coding and review modifications to the a priori template. It was challenging to analyze the free-text responses without being able to refer to the respondents' demographic characteristics or the quantitative responses upon which these data expanded, nor being able to identify responses from the same respondent across items. Therefore, it was

Table 4. Number of free-text comments: Tairāwhiti Interprofessional Education program cohorts and those who did not attend the program

Survey	Total # survey respondents	Clinical Setting*	Location*	Satisfaction*	IP attitudes / experiences*	Pre-reg preparation*	TIPE on career*	Other*	Total data entries
3/Non-TIPE	320	294	310	38	24	NA	NA	22	
3/TIPE Cohort 1	51	44	46	6	43	38	41	2	
3/TIPE Cohort 2	66	59	64	10	69	59	60	0	
Total Survey 3	*437*	*397*	*420*	*54*	*136*	*97*	*101*	*24*	*1229*
4/Non-TIPE	305	290	299	41	33	NA	NA	14	
4/TIPE Cohort 1	52	48	50	7	47	43	46	2	
4/TIPE Cohort 2	63	61	62	7	70	55	58	1	
Total Survey 4	*420*	*399*	*411*	*55*	*150*	*98*	*104*	*17*	*1234*
5/Non-TIPE	298	282	289	34	28	NA	NA	15	
5/TIPE Cohort 1	52	44	47	5	36	42	46	0	
5/TIPE Cohort 2	61	57	57	9	58	53	57	4	
Total Survey 5	*411*	*383*	*393*	*48*	*122*	*95*	*103*	*19*	*1163*
Total all surveys	N/A	1179	1224	157	408	290	308	60	3626

Notes: * Participants could make more than one free-text comment within an item response. IP, interprofessional; Pre-reg, pre-registration; TIPE, Tairāwhiti Interprofessional Education

decided that the respondent's survey year, cohort, study ID, relevant demographics, and (where applicable) related quantitative responses should be included with each free-text response. This enabled the free-text data to be interpreted in context; for example, a response to the location question was "Good work and life balance with more future opportunities" and the identifier was "Survey 3, TIPE-2, ID#ABC1234, Female, 28yrs, Physiotherapist in primary care/community, Lives in major city."

The analysis team agreed upon a V1 template relevant to 15 of the 18 free-text survey questions for application to the full dataset (including re-extraction and recoding of the subset data with identifiers included). Three free-text questions were excluded from the V1 template (Table 3) because these were simple descriptive responses about health team composition that did not relate to participants' career choices or attitudes to interprofessional practice.

Extracted data were collated into one document per cohort (three cohorts) per survey time point (three surveys), resulting in nine documents. These were imported into NVivo12 as separate source files. This enabled comparison of data from each cohort (TIPE Cohort 1, TIPE Cohort 2, and non-TIPE) and at different time points (Surveys 3 to 5). In total, there were 3,626 free-text responses, with high response rates to most of the free-text items (Table 4).

Applying the template

R1 applied the V1 template to responses by analyzing per survey, per cohort, and per item. Each item was coded separately; for example, responses to the item "For what reason/s have you chosen to work or train in [clinical setting]?" were coded under a separate grandparent node to responses to the item "For what reason/s have you chosen to work or train in [location]?"

NVivo software enables systematic analysis using a hierarchical "tree" structure, which labels nodes as grandparent/parent/child and so on, to denote levels. Data were managed in three NVivo projects (one for each survey) because this negated the need for an additional level of grandfather node in the hierarchy to specify "which survey." Some hierarchies were up to seven levels deep and this caused NVivo software to run slowly; NVivo recommends that node hierarchy should be limited to three levels to optimize performance [18]. Each project contained separate source documents for each cohort of participants to allow comparisons between these cohorts.

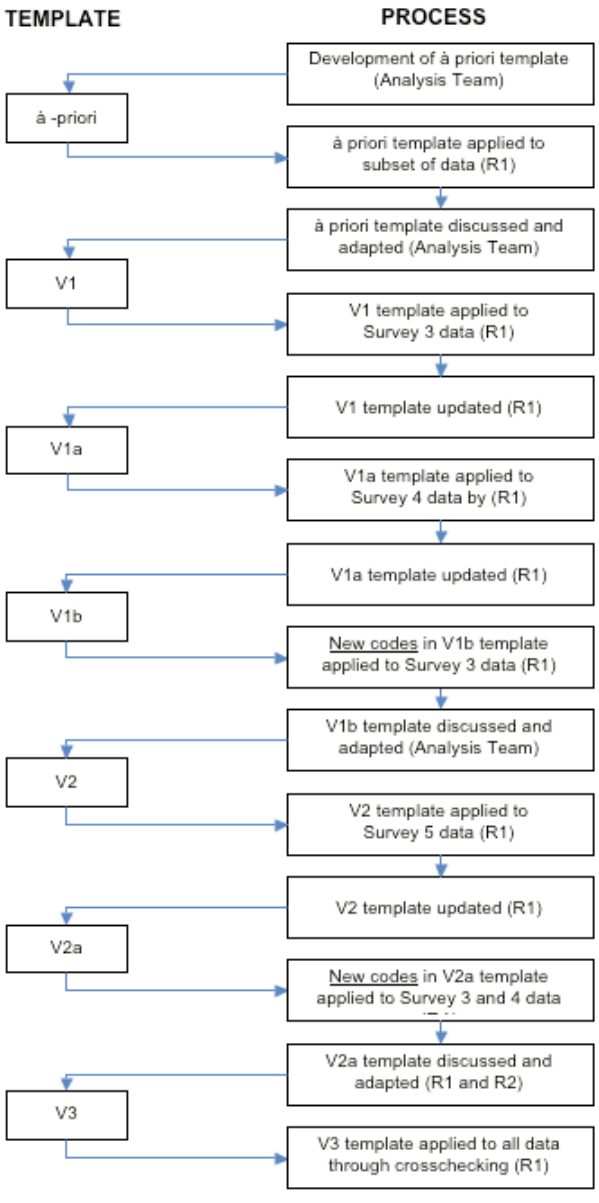
A single response to an item could contain different segments of data requiring multiple codes. Parallel coding, whereby the same segment is classified within two or more codes at the same level, was strictly avoided despite being permitted in template analysis [10,15]. Parallel coding results in single segments of data counted twice and therefore would inflate these frequencies, preventing exploration of changes in relative code frequency over time.

Responses ranged from a single word to full paragraphs, but usually contained short incomplete sentences of several segments. These often contained multiple distinct concepts (e.g., a single response might be: "Job availability. My skill sets. Good pay, work hours and work-life balance. Like working in a team. Practice both scopes"). To manage this, the analysis team created a coding rule:

> "A segment is considered a single sentence. If one segment contains two coding concepts within a single hierarchy (i.e., both parent and child nodes) it is coded only once. However, two or more sentences are considered multiple segments, and therefore each segment can be coded within the single hierarchy."

An example was the parent node "Type of patients/cases" and its child node "Challenging, full scope of practice." For instance, if a respondent wrote one sentence such as "I love working with acute care patients, I enjoy the challenge of complex cases," then this was coded once in the child node. However, if the response was "I love working with acute care patients. Flexible hours. Enjoy the challenge of complex cases," then "acute care patients" and "complex cases" were considered two segments, and thus coded in both parent and child nodes. This rule was needed because of the difficulty researchers faced when interpreting the context of a response: was the second example saying the same thing as the first example? Or was the second respondent enjoying working with acute care patients for other reasons not elaborated on in the first segment of data? Although not perfect, this rule ensured consistency of coding.

Figure 1 provides a visual representation of the coding process. The V1 template was applied by R1 iteratively survey-by-survey, firstly to all items for all cohorts in Survey 3, modifying where needed into a V1a template. Next, in a separate NVivo project, the V1a template was applied to all items for all cohorts in Survey 4, again modifying where needed into a V1b template. R1 then went back to the Survey 3 coding to check whether any new codes identified in V1b template were relevant for extracts coded earlier in the Survey 3 data; the Survey 3 NVivo project was updated with the new codes and saved as a new version.



Notes: R1 = Researcher 1; R2 = Researcher 2

Figure 1. Longitudinal Interprofessional Study: Iterative data analysis (survey-by-survey)

A reflexive approach was taken to coding and thematically analyzing the data, going beyond counting and description to provide a more theorized and interpretative account of the data [19]. Free-text responses were contextually explored in relation to their identifiers (i.e., survey year, cohort, study ID, demographics, and related quantitative responses).

At this point, the analysis team met to review and discuss coding progress, and agreed on a V2 template. Next, in a separate NVivo project, the V2 template was applied to all items for all cohorts in Survey 5, once again modifying where needed into a V2a template. R1 went back to the Survey 3 and Survey 4 coding to check whether any new codes identified in the V2a template were relevant to extracts in the earlier surveys' data; once again, new codes were updated in the Survey 3 and Survey 4 NVivo projects and saved as new versions.

At this point, R2 reviewed the coding of a subset of data (Survey 3, TIPE Cohorts 1 and 2) to identify missing codes or alternative interpretations of the data. R1 and R2 met to discuss coding and resolve areas of disagreement. New codes and adjustments to existing codes were made, and node names were tweaked for consistency (where appropriate) across all three of the most recent NVivo projects (Surveys 3, 4, and 5) in order to form a V3 template.

Notes: TIPE, Tairāwhiti Interprofessional Education

Figure 2. Longitudinal Interprofessional Study: Iterative data analysis and crosschecking (item-by-item)

Thus far, codes had been applied vertically survey-by-survey (i.e., all data from one survey were analyzed before moving to the next survey). R1 then applied the V3 template horizontally item-by-item, by checking each item across all surveys before proceeding to the next item.

Figure 2 provides a visual representation of the crosschecking process that was undertaken to increase rigor.

It was easiest to manage the data and crosscheck for consistency by having all three NVivo projects (Surveys 3, 4, and 5) open at the same time, using two computer monitors. Minor alterations were made to the V3 template to ensure consistency of code names and coding levels across Surveys 3 to 5. At this point, to further

crosscheck codes and coding accuracy, R2 independently checked all coded extracts in the full dataset. Minor coding adjustments were suggested relating to theme names or structure and individual data coding. R1 and R2 met multiple times to discuss data coding, and disagreements were resolved through discussion.

Throughout the entire coding process, the analysis team met on multiple occasions to discuss coding and the evolving templates. Coding of the final template was agreed upon after discussion by the full research team. The team also agreed on final names and definitions of each theme and sub-theme (updating these from their working titles) (Table 5).

Table 5. Final themes and sub-themes in the Longitudinal Interprofessional Study (higher-level codes only)

Themes (Level 1)	Sub-themes (including higher-level codes only)
Theme 1: Current Work	Reason for choosing clinical setting *Job reasons* Requirement for career path Availability of job or opportunities Nature of the job *Personal reasons* Family Partner Friends Reason for choosing location *Job reasons* Requirement for career path Availability of job or opportunities Nature of the job *"Nature of the location"* reasons *Personal reasons* Home, where I live Family Partner Friends *Job satisfaction* [Coded, but results not reported due to low response rates]
Theme 2: Attitudes/experiences related to interprofessional teams or skills	*Benefits of working in interprofessional teams or collaboration* *Varies: challenges of working in interprofessional teams or collaboration* *Health practitioner interaction but not part of team*
Theme 3: Influence of interprofessional education	Pre-registration preparation for working in interprofessional teams *Participated in interprofessional education* *Choice of clinical setting* *Collaboration and teamwork* *Hit the ground running* Influence of TIPE on career *Choice of clinical setting* *Choice of location* *The way I do my job* *No influence*

Notes: Detailed lower-level codes (≥ level 5) are reported elsewhere (manuscript of results in review); TIPE, Tairāwhiti Interprofessional Education

Reporting the LIP Study findings

After coding and theme development were completed, the themes and sub-themes were further examined to find and interpret patterns and outliers, as is typical in reflexive forms of thematic analysis. In addition, the research team compared themes and data extracts with the quantitative survey results to find and interpret commonalities and differences—that is to say, instances where the free-text responses supported or expanded on the closed-question answers, and instances where contradictions existed. In order to address the research aim of exploring changes over time, it was necessary to gain an indication of the relative frequency of themes within and across the longitudinal surveys. The study's quantitative and free-text findings are reported elsewhere (manuscript under review).

Discussion

Survey free-text comments are a valid and useful source of data, particularly when collected over time [5]. Template analysis offers a balance between structure and flexibility [15] that makes it a pragmatic technique for teams of researchers doing in-depth analysis of large amounts of textual data.

Interpreting and reporting the way in which the final themes fitted with the research question and quantitative data presented some challenges. It is often debated whether frequencies of theme occurrence should be reported [3]. On one hand, some contend that theme frequencies are meaningless because the self-selected nature of free-text comments means that data are derived from a non-representative sample; little is known about the respondents compared to non-respondents in terms of representativeness of responses [5]. Therefore, it is thought that themes should be presented as equally important regardless of their frequency of occurrence [3]. This is particularly relevant when a minority of respondents write comments, as this may reflect these people being more articulate or having strong views. It also cannot be assumed that an issue raised by one respondent is not important to others who did not raise it at the time of completing the survey [3,5].

King [15] cautions against treating coded segments in template analysis as units of analysis because assumptions cannot be made that the frequency of a code in a particular text corresponds to its salience. Qualitative reporting commonly uses "quasi-statistics" with simple counts of things to make statements such as "some," "usually," and "most" [20]. Qualitative researchers tend to prefer figures of speech over figures, and tableaux of experience over tables of numbers [21].

On the other hand, others counter that data from a subset of respondents to a structured survey can be meaningfully interpreted because quantitative responses enable the composition of this subset to be characterized [1]. Frequency of theme occurrence can give a broad indication of which topics are important to respondents, drawing attention to particular themes if they are mentioned by all, or almost all, respondents who commented, or by only one or two; such striking differences in frequency may be important [3]. In particular, using frequency and numerical data within a contextually based interpretation, such as template analysis, helps readers

get a sense for how often such themes and concerns arose and how they changed over time—a finding that is clearly important in a longitudinal study.

Our research team had robust discussions about numeric reporting of free-text findings. Ultimately, variations in theme frequencies across surveys were crucial to understanding how different factors varied in importance to the participants over time. However, we were cautious not to use these frequency counts to make comparisons between those who participated in TIPE and those who did not. We considered that inferential statistics from the quantitative data were more appropriate for this purpose.

Care is needed during the analysis and reporting of qualitative data using numbers. Formal analysis must be rigorous so that findings are useful and convincing. When reporting responses to free-text items, it is important that the numbers of respondents making each comment are displayed. It is also important that written accounts of the analysis acknowledge the limitations inherent in the data to avoid any risk of misinterpretation [3]. This can be done, for example, by: highlighting that numbers show context rather than generalizability; avoiding mechanical linking of isolated variables out of context; and excluding numbers that are not critical to supplementing conclusions [20]. With care, numbers can be used in ways that produce both trustworthy findings and quality reporting [21].

Our study had high response rates to the free-text items in all surveys (see Table 4), meaning the data could more likely be viewed as representative of the population surveyed. Only one free-text item (regarding job and career satisfaction; see Table 2, Q11) received low response rates, and we decided not to report these free-text findings. We could not be confident that the responders' comments represented the views of the large number of non-responders, and we decided that conclusions were better informed by the Likert scale responses to which these comments related.

Useful insights can be gained from free-text data that show discrepancies to closed-question answers [5], adding information while demonstrating the complex nature of measuring certain concepts. Our study uncovered many instances in which free-text findings appeared to contradict the related quantitative responses, highlighting that these were used to expand on the numeric data and could be misinterpreted if left to stand alone. Consequently, we decided to present quantitative results and related free-text findings in the same manuscript.

Our study had a key limitation in its qualitative analysis. The volume of free-text responses, with multiple data collection and analysis points, meant that we performed analysis item-by-item. For example, answers to the item "For what reason/s have you chosen to work or train in [location]?" were coded separately to answers to the item "For what reason/s have you chosen to work or train in [clinical setting]?", with separate source documents for each item rather than keeping each respondent's answers together. It is possible that respondents viewed their answers as a "continuous" narrative and therefore did not mention the same factor twice (e.g., not mentioning a factor that influenced their choice of location because they already recorded it in relation to "clinical setting"). Inevitably, some meaning was

lost from individual participants' voices across their answers to different items within a single survey, and to their different surveys across the course of the study. It simply was not feasible to track individuals' responses within and across surveys when coding data from 3,626 free-text answers.

Another limitation was the brief and sometimes disjointed nature of segments in the responses (as in the earlier example, enjoying working with acute care patients and the challenge of complex cases). This made it challenging at times for the analysis team to interpret respondents' meaning. This confusion is less likely in other sources of qualitative data, such as in-depth interview transcripts, because a good interviewer would have prompted the participant to expand upon their answer [3]. Nevertheless, only rarely were we unable to code responses due to complete lack of clarity. Ultimately, useful information was gained from the themes and prevalence of themes within and across surveys. This, together with the quantitative results, allowed conclusions to be drawn about changes over the first three years of health professional practice.

There is little published guidance demonstrating how to maximize the use and integration of free-text data in multi-year mixed-methods surveys. The approach we used is one way of manually managing, analyzing, and interpreting large quantities of free-text data within the context of the related quantitative data, when the research question examines change over time. Given the paucity of information in the literature on how to do this, we hope our description of the data management and analysis process is helpful for other researchers.

Although manageable, it is worth noting that the process was complex, time-intensive, and required experienced qualitative researchers to navigate the volumes of data. In order to do template analysis well, particularly in a large-scale longitudinal study, researchers must already have a thematic analysis skillset. The ability to identify relationships in the data and create meaningful themes ensures that the template is neither too simplistic/structural nor has an explosion of many small but related themes.

It is possible that other studies will not require all of the steps that we used. For example, the extraction and preparation of the survey data before coding was a time-consuming but vital step, whereas linking the participant characteristics and quantitative responses to the appropriate free-text data for context was an additional step that might not be required in other studies. The process of iteratively coding and thematically analyzing the data was also a vital and time-consuming step; however, the additional crosschecking process to increase rigor might not be deemed necessary by other researchers. Future researchers should consider these resource needs at the planning stage of research proposals and when designing their data management systems.

Conclusion

Analysis of free-text survey responses in longitudinal studies can demonstrate changes in how participants construct meaning over time. Template analysis is a useful technique for manually organizing and thematically analyzing a large qualitative dataset

by a team of researchers. We have outlined the way in which we used template analysis to elicit, analyze, and interpret themes within the context of the quantitative results in a large-scale longitudinal mixed-methods interprofessional survey. We have shared insights into the challenges we overcame in interpreting patterns and anomalies, and in reporting findings to answer our research questions that explored health professionals' early careers. We conclude that template analysis has methodologically-sound, pragmatic utility in interprofessional longitudinal survey research.

Acknowledgements

The research team gratefully acknowledges the support of Michael Fauchelle, reference librarian at the Wellington Medical and Health Sciences Library, University of Otago, for his contribution to the literature search. We also thank Amanda Garnett, IPE programme manager at the University of Otago, Wellington, for her expertise and assistance with the survey data extraction.

References

1. O'Cathain, A., & Thomas, K. (2004). "Any other comments?" Open questions on questionnaires — a bane or a bonus to research? *BMC Medical Research Methodology*, *4*, 25. doi:10.1186/1471-2288-4-25
2. York, G., Churchman, R., Woodard, B., Wainright, C., & Rau-Foster, M. (2012). Freetext comments: Understanding the value in family member descriptions of hospice caregiver relationships. *American Journal of Hospice and Palliative Medicine*, *29*, 98–105. doi:10.1177/1049909111409564
3. Garcia, J., Evans, J., & Reshaw, M. (2004). ''Is there anything else you would like to tell us'' — Methodological issues in the use of free-text comments from postal surveys. *Quality & Quantity*, *38*, 113–125. doi:10.1023/B:QUQU.0000019394.78970.df
4. Rohrer, J., Brümmer, M., Schmukle, S., Goebel, J., & Wagner, G. (2017). "What else are you worried about?" — Integrating textual responses into quantitative social science research. *PLoS ONE*, *12*, e0182156. doi:10.1371/journal.pone.0182156
5. Rich, J., Chojenta, C., & Loxton, D. (2013). Quality, rigour and usefulness of free-text comments collected by a large population based longitudinal study — ALSWH. *PloS ONE*, *8*, e68832. doi:10.1371/journal.pone.0068832
6. Krippendorff, K. (1980). Validity in content analysis. *Computerstrategien für die kommunikationsanalyse*, 69–112. URL: https://repository.upenn.edu/asc_papers/291/ [December 10, 2021].
7. Kelly, M.A., Mitchell, M.L., Henderson, A., Jeffrey, C.A., Groves, M., et al. (2016). OSCE best practice guidelines — Applicability for nursing simulations. *Advances in Simulation*, *1*, 10. doi:10.1186/s41077-016-0014-1
8. Surr, C.A., Parveen, S., Smith, S.J., Drury, M., Sass, C., et al. (2020). The barriers and facilitators to implementing dementia education and training in health and social care services: A mixed-methods study. *BMC Health Services Research*, *20*, 512. doi:10.1186/s12913-020-05382-4
9. Darlow, B., Brown, M., Gallagher, P., Gray, L., McKinlay, E., et al. (2018). Longitudinal impact of interprofessional education on attitudes, skills and career trajectories: A protocol for a quasi-experimental study in New Zealand. *BMJ Open*, *8*, e018510. doi:10.1136/bmjopen-2017-018510
10. Cassell, C., & King, N. (2004). Using templates in the thematic analysis of text. In C. Cassell, & G. Symon (Eds.), *Essential guide to qualitative methods in organizational research* (pp. 256–270).. London, UK: SAGE Publications Ltd. doi:10.4135/9781446280119.n21
11. Pullon, S., Gallagher, P., McKinlay, E., Gray, L., McHugh, P., & Skinner, M. (2015). Interprofessional education in a rural clinical setting: A quick start innovation for final year health professional students–case study. In K. Bin Abdulrahman, S. Mennin, & R. Harden (Eds.), Handbook of Medical Education (pp. 197–199). New York: Routledge International.
12. Pullon, S., Wilson, C., Gallagher, P., Skinner, M., McKinlay, E., Gray, L., & McHugh, P. (2016). Transition to practice: Can rural interprofessional education make a difference? A cohort study. *BMC Medical Education, 16,* 154. doi:10.1186/s12909-016-0674-5

13. McKinlay, E., Gallagher, P., Wilson, C., Gray, L., McHugh, P., & Pullon, S. (2016). Social learning, shared accommodation and interprofessional education: I think those conversations that you have at the dinner table. *Journal of Interprofessional Education & Practice, 5,* 1–6. doi:10.1016/j.xjep.2016.07.001
14. Brooks, J., McCluskey, S., Turley, E., & King, N. (2015). The utility of template analysis in qualitative psychology research. *Qualitative Research in Psychology*, *12*, 202–222. doi:10.1080/14780887.2014.955224
15. King, N. (2012). Doing template analysis. In G. Symon, & C. Cassell (Eds.), *Qualitative Organizational Research: Core Methods and Current Challenges* (pp. 426–450). London, UK: SAGE Publications Ltd. doi:10.4135/9781526435620.n24
16. Brooks, J., & King, N. (2014). Doing template analysis: Evaluating an end-of-life care service. In *Sage Research Methods Cases* (pp. 1–16). SAGE Publications Ltd. doi:10.4135/9781446273050 13512755
17. Cassell, C. (2011). Template analysis. In R. Thorpe, & R. Holt (Eds.), *The SAGE Dictionary of Qualitative Management Research*. London, UK: Sage Publications Ltd. doi:10.4135/978085 7020109
18. QSR International. Optimize project performance. URL: http://help-nv11.qsrinternational.com/desktop/procedures/optimize_project_performance.htm [November 12, 2020].
19. Braun, V., Clarke, V., Boulton, E., Davey, L., & McEvoy, C. (2020). The online survey as a qualitative research tool. *International Journal of Social Research Methodology*, 1–14. doi:10.1080/13645579.2020.1805550
20. Maxwell, J.A. (2010). Using numbers in qualitative research. *Qualitative Inquiry*, *16*, 475–482. doi:10.1177/1077800410364740
21. Sandelwoski, M. (2001). Real qualitative researchers do not count: The use of numbers in qualitative research. *Research in Nursing & Health*, *24*, 230–240. doi:10.1002/nur.1025 [December 10, 2021].