

Teaching Computer-assisted Qualitative Data Analysis to a Large Cohort of Undergraduate Students

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Qualitative research is increasingly being conducted with the support of computer-assisted qualitative data analysis software (CAQDAS), yet limited research has been conducted on integrating the teaching of CAQDAS packages within qualitative methods university courses. Existing research typically focuses on teaching NVivo to small groups of postgraduate (primarily doctoral) students and mostly take the form of reflections of the trainers. In 2011, we implemented the teaching and use of a CAQDAS package, NVivo, within a large third year undergraduate psychology research methods unit. Sixty-seven students participated in an online survey evaluating the use of NVivo in the unit. In this paper we present quantitative and qualitative findings related to students' perceptions of the resources provided, their confidence in using NVivo, their satisfaction with the teaching and their intentions to use CAQDAS in the future. Student evaluations were generally positive, but highlighted the need for both increased class time and greater access to the CAQDAS program outside of class time to enhance opportunities for learning.

Keywords: CAQDAS; NVivo; qualitative; teaching qualitative research

Increasingly, qualitative research is conducted with the support of computer-assisted qualitative data analysis software (CAQDAS) for coding, collating, retrieving, searching and querying of data (Hoover and Koerber 2011). This type of software first emerged in the mid-1980s (Richards 2002), with a range of CAQDAS programs now commercially available supporting an increasing diversity of users within and outside of academia (Fielding and Lee 2002; Mangabeira, Lee and Fielding 2004). Shin, Kim and Chung (2009) examined CAQDAS use in articles published in *Qualitative Health Research* between 1999 and 2007, noting that almost one quarter (23%) indicated that CAQDAS had been used in the analysis. However, this increasing use of CAQDAS packages in the conduct of qualitative research is not reflected in the teaching of qualitative research in academia, particularly in undergraduate courses. In this paper we focus on the teaching of CAQDAS packages within methodology courses to large cohorts of undergraduate students. First, we outline the capabilities of CAQDAS packages and the perceived advantages and disadvantages associated with their use. Next we examine what is known about the teaching of CAQDAS packages within commercial and academic environments. This is followed by the presentation of the results from our mixed methods study examining undergraduate students' perceptions of the teaching of NVivo, a CAQDAS package, within a research methods unit. Finally, we build upon this research to offer recommendations in regard to the teaching of CAQDAS packages to undergraduate students.

CAQDAS packages have become increasingly sophisticated, moving beyond the 'code and retrieve' capabilities of early versions to incorporate a range of functions (Richards 2002). These include 'system closure' (the ability to use search results as further data; Richards 2002), editability, merging, memo-ing, visualization, linking, and the production of graphical displays and tables (Mangabiera et al. 2004; Richards 2002;

Seror 2005). The three main CAQDAS packages currently in use are NVivo, ATLAS.ti, and MAXQDA (Hoover and Koerber 2011).

The perceived advantages of using CAQDAS to support qualitative analysis centre on the storing, organizational and searching capabilities of software packages, which result in the ability to manage, access and query data from multiple sources (Garcia-Horta and Guerra-Ramos 2009) within shorter periods of time (Atherton and Elsmore 2007). Use of CAQDAS can increase the visibility and transparency of the research process (Crowley, Harre and Tagg 2002; Hoover and Koerber 2011; Ryan 2009), providing the perception of a 'more scientific' process (Atherton and Elsmore 2007). The ability to quickly search, access, order, manipulate and query data may reduce an over-reliance on first impressions (Garcia-Horta and Guerra-Ramos 2009) and result in more robust interpretations through the auditing of coding (Bergin 2011).

Despite the perceived advantages and increasing use of CAQDAS packages to support qualitative research, acceptance has not been universal. Perceived disadvantages of working with CAQDAS largely centre on the mechanization of the process of coding and analysis. One perceived disadvantage is a reduced proximity to the data associated with working with a computer rather than with paper documents (Bazeley, 2007).

However, it has also been argued that in contrast to this, there is potential to be 'too close' to the data when using CAQDAS, focusing on mechanistic coding at the expense of analysis (the 'coding trap') (Bazeley 2007; Garcia-Horta and Guerra-Ramos 2009; Gilbert 2002) and reflexivity (Atherton and Elsmore 2007). Related to this are concerns that CAQDAS will be viewed as the method of analysis, rather than being a tool for use in the analysis (MacMillan and Koenig 2004); that qualitative research may be conducted outside existing qualitative methodological approaches (Bazeley 2007) or using only grounded theory because of the misperception that CAQDAS was developed

for use with this methodology only (Bazeley 2007). Reflecting these concerns, some researchers have called for the use of CAQDAS to be restricted to coding, and not used for analysis (Ahmad and Newman 2010; Roberts and Wilson 2002).

A further concern is the time investment required to learn how to use CAQDAS packages effectively. Auld et al. (2007) estimated 15 to 20 hours were required to teach graduate students working as research students the basic functions in NVivo (project set-up, coding attributes, searching and reports) with a further 20 plus hours to learn more advanced functions. Based on their experience, Auld and colleagues judged that the time investment to learn to use CAQDAS was only warranted for larger projects that would require 60 or more hours for coding and analysis.

Differences in the speed of learning NVivo have been noted with those with less IT experience or confidence taking longer (Tagg 2011). Working with a small group of PhD students, Davidson (2005) noted some students experienced difficulties in installing software and coping with the complexity of the software. However, younger students are increasingly comfortable with technology and working with digital information and may easily adopt CAQDAS (Kaczynski 2003).

These perceived advantages and disadvantages of the use of CAQDAS highlight the importance of critical thinking about the methodological implications of using CAQDAS (Carvajal 2002; Gilbert 2002) and how CAQDAS may be incorporated into the teaching of qualitative research methods. At the current time, most CAQDAS training is stand-alone. Carvajal (2002) noted the predominance of one or two day workshops that teach the use of a particular CAQDAS package, many of which have no requirement for attendees to have any knowledge of qualitative research. The focus of the training is on the use of the tool, rather than on the relationships between qualitative methodology and CAQDAS, separating methodological and technical learning

(Johnston 2006). In the United Kingdom in 2001 the Economic and Social Research Council called for the inclusion of qualitative software in postgraduate methodology training (Crowley et al. 2002), but did not highlight the need for integration of methodological and technical learning (Johnston 2006).

While the need to teach CAQDAS as part of qualitative research has been highlighted (Davidson 2005), the challenges in doing so have not been fully addressed (Johnston 2006). These range from timetabling issues such as determining the appropriate stage and proportion of the syllabus devoted to CAQDAS through to pedagogical issues involving developmental pathways and assessment (Davidson 2005) and resistance due to the dominance of positivism in some disciplines (Breen and Darlaston-Jones 2010). One option explored has been to have an external trainer provide the CAQDAS component of the course. Based on her experiences as an external CAQDAS trainer who teaches parts of academic units, Jackson (2003) highlighted the need to 'blend' technology and methodology in teaching CAQDAS within academic units, noting that the separation of teaching of methodology and CAQDAS provides an emphasis of the two as separate components rather than integrated elements in qualitative research.

The teaching of CAQDAS within academia is largely restricted to post-graduate and doctoral students (Darmody and Byrne 2006; Davidson and Jacobs 2008). Whilst there are books and resources available for individual users of NVivo (e.g., Bazeley 2007; Richards 2008, 2009) and step-by-step guides suitable for use in training (e.g., QSR International 2010a, 2010b) and a guide to teaching NVivo (QSR International 2008), limited research has been conducted on teaching students how to use CAQDAS packages. Publications typically focus on teaching CAQDAS to small groups of postgraduate (primarily doctoral) students (Davidson and Jacobs 2008; Durrant 2003;

Este, Sieppert and Barsky 1998; Fitzgerald, Kelly and Cernusca 2003; Johnston 2006; Kaczynski and Kelly 2004; Onwuegbuzie et al. 2012; Tagg 2011) and mostly take the form of reflections of the trainers.

Only two papers could be located that referred to teaching CAQDAS to undergraduate students as part of a methodology course. Carvajal (2002) introduced final year undergraduate psychology students, who had already completed a qualitative seminar, to four CAQDAS packages, emphasizing the role of CAQDAS as a tool to support qualitative analysis. Walsh (2003) taught NVivo to 10 upper undergraduate sociology students enrolled in an elective course. Walsh reported that students quickly picked up the basic functions. However, problems encountered included limited access to the software (available to students in labs but not at home) and time pressures to complete within the available time.

The Current Study

The increasing use of CAQDAS in qualitative research and concern over the teaching of CAQDAS highlight the need for further research into how the teaching of CAQDAS can be incorporated within qualitative methodology courses. Publications to date have largely focussed on educators' reflections on their experience in teaching CAQDAS to small groups of postgraduate students, with limited publications on teaching to large groups of undergraduate students. In this paper we present an evaluation of the implementation of teaching NVivo within a large mixed methods unit for undergraduate psychology students. The aim of our research was to evaluate student perceptions of the teaching and use of NVivo within this unit.

In 2011 the first author was awarded a \$10,000 in-kind grant from QSR International (the owners of NVivo) to support the implementation and teaching of NVivo software within the unit. The grant provided class sets of 60 x 2 step by step

guides to using NVivo books (QSR 2010a, b), a 2 day training course in NVivo for the three teaching staff (the authors) and advanced books on qualitative analysis for the use of teaching staff. The first author prepared instructional material for teaching NVivo at an introductory level. The key functions identified that needed to be covered in order to begin using NVivo at an introductory level were importing transcripts into NVivo, coding to nodes (repositories for all information relating to each code), displaying material under nodes, managing nodes (merging nodes, deleting nodes and setting up parent-child relationships that structure the relationships between nodes), working with memos to record working notes, ideas and decisions (creating memos and attaching memos to nodes) and exporting files from NVivo into Word for write-up. The instructional material was piloted with a small class of fourth year psychology student volunteers who were planning to conduct qualitative research for their dissertations. Minor modifications were made based on the feedback provided.

One hour NVivo labs were held in the 5th, 6th and 7th weeks of the 12 week mixed methods unit and taught by the second and third authors. Each of these 3 labs was repeated 5 times in order to cater for the 114 students enrolled in the unit. The labs provided an introduction to NVivo, focussing on project set- up, importing data, coding and analysing text-based data with NVivo as a tool for conducting thematic analysis. In labs prior to the introduction of NVivo, students gained experience in developing a research plan, writing interview schedules and information sheets, interviewing and manual methods of qualitative data analysis. Students also attended nine 2-hour lectures on qualitative research provided by the second author. The major assessment task for the unit required students to write a mixed methods research report, which included a partial write up of the thematic analysis conducted.

Method

Research Design

The research design for this study was a mixed-methods cross-sectional design utilizing an online survey to evaluate the teaching of NVivo to psychology undergraduate students.

Participants

The starting pool of potential participants comprised the 114 third year undergraduate psychology students in an Australian university who were enrolled in the research methods unit where NVivo was taught. Participation in the evaluation was voluntary, with 67 students answering at least one question in the online evaluation survey, representing a response rate of 59%. The survey was fully completed by 45 students, representing a 67.2% completion rate. Students who completed the survey ranged in age from 20 to 53 (Modes 20 and 21) and, reflecting the composition of the class, were predominantly women (80%).

Measures

An online questionnaire was constructed containing a mix of open and closed questions. Open questions addressed the best and worse things about using NVivo in the unit, the integration of NVivo in the unit, suggestions for change and reasons for wanting NVivo to be taught/not taught in the unit in future years. Closed questions addressed time spent using NVivo, resources accessed, whether the student would plan to use NVivo in the future and whether NVivo should continue to be taught in the unit in future years. In addition, we developed measures of perceived helpfulness of teaching resources and confidence in performing basic functions in NVivo for inclusion in the survey.

Perceived helpfulness of teaching resources. This measure consists of 4 items measuring the extent of agreement that the teaching resources provided were helpful in

learning to use NVivo. The resources were the lab slides used in class and available for downloading by the students, the NVivo book and the tutors, with the fourth item asking about satisfaction with the way NVivo was taught. Each item was responded to on a 5 point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5). An exploratory principal component analysis indicated that the 4 items loaded on a single factor accounting for 53% of the variance. However, the item assessing the NVivo book loaded weakly (.48) and was removed from the measure. The three remaining items were combined into a scale that had acceptable internal reliability (Cronbach's alpha = .71).

Confidence in performing basic functions in NVivo. This measure consists of 9 items measuring the degree of confidence in completing a range of NVivo functions. The nine functions were importing transcripts, coding to nodes, displaying material within nodes, merging nodes, deleting nodes, setting up parent-child relationships, creating memos, attaching memos to nodes and exporting nodes. Each item was responded to on a 4-point Likert scale ranging from 'not at all confident' (1) to 'very confident' (5). An exploratory principal component analysis indicated that there was one component underlying the items, accounting for 64% of the variance. The 9 items were combined into a scale with good internal reliability (Cronbach's alpha = .92).

Procedure

The study was approved by Curtin University Human Research Ethics Committee. The survey was developed by the authors and hosted online by Qualtrics. The information page and debriefing page were hosted on a university server, in line with recommendations for best practice for outsourced survey hosting (Allen and Roberts 2010). Recruitment for the survey was undertaken in the five labs conducted during the last week of semester and through advertisement on the student discussion

board for the unit. The survey remained open for a period of three weeks. After this time, completed survey responses were downloaded from the Qualtrics site into SPSS v18 for the analysis of closed questions.

Thematic analysis (Braun and Clarke 2006) was used to analyse the responses to the open-ended questions. First, the responses were coded on a question-by-question basis. Next, the codes were collapsed into themes across questions. These themes were named and checked for independence. Finally, quotes from the participants were chosen to illustrate each theme.

Results

Quantitative and qualitative survey results for the 59% of students who participated in the evaluation are presented below. This response rate should be kept in mind when viewing these results as previous research suggests that student non-response is associated with a range of demographic, personality and academic factors including academic ability, level of engagement and survey salience (Adams and Umbach 2012; Porter and Whitcomb 2005). As such, our findings may largely reflect the views of the more motivated, academically able students.

Descriptive Statistics

Attendance

Students were expected to attend each of the 3 labs on NVivo, although attendance was not mandated. Students responding to the evaluation survey ($N = 61$) indicated they had attended between 1 and 10 NVivo labs, suggesting that some students had attended the labs multiple times. Tutors confirmed that some students had attended individual labs multiple times. The majority of students (77%) stated they had attended 3 labs.

Teaching Resources

Students ($N = 61$) were asked whether the resources provided were helpful in learning to use NVivo. The results are presented in Table 1. The students perceived the lab slides and the tutors to be the most helpful resources. Other external resources accessed by students ($N = 55$) included the free trial version of NVivo for use at home (36.4%), the NVivo tutorial (18.2%) and FAQ (18.2%) on the QSR International website, and NVivo books from Curtin library (5.5%). The majority of students agreed (47.3%) or strongly agreed (23.6%) that they were overall satisfied with the way NVivo had been taught (14.5% disagree, 4.5% strongly disagree). Scores on the perceived helpfulness of teaching resources scale ranged from 6 to 15 ($M = 12.0$, $SD = 2.1$)

<insert Table 1 about here>

Confidence in Using NVivo

Students ($N = 47$) indicated how confident they would be now to complete a range of activities in NVivo if they had their lab notes and NVivo 9 Basics book beside them. The results are presented in Table 2. While the majority of students were at least somewhat confident in their ability to complete most of the listed activities in NVivo, the results highlight the need for further training in setting up parent-child relationships, working with memos and exporting from NVivo. Scores on the confidence scale ranged from 9 to 36 ($M = 26.5$, $SD = 6.7$).

<insert Table 2 about here>

We conducted exploratory analysis to examine the relationship between perceived helpfulness of teaching resources and confidence in using NVivo. A bivariate regression was conducted. Perceived helpfulness of teaching resources was a significant predictor of confidence in using NVivo, accounting for 20.5% of the variance in confidence scores; $F(1, 45) = 11.6$, $p = .001$.

Future Intentions

The majority of students ($N = 45$) were either in favour (64.4%), or unsure (26.7%) if NVivo should be taught in this unit in the future. Less than one in ten (8.9%) thought that NVivo should *not* be taught in future years.

Open-ended Questions

Analysis of the open-ended responses yielded two themes. A summary of the themes and subthemes is presented in Table 3.

<insert Table 3 about here>

Features of the NVivo Program

Four subthemes related to the program emerged from the data. These were Speed, efficiency and use, Systematic data storage and display, Comparison with manual analysis, and Time-consuming to learn, and are described below.

Speed, efficiency and use. The program was described as *'quick and efficient'*, *'tidy'*, and *'easy to use.'* Students described the *'simplicity of nodes'* and the ease of *'mak[ing] up the nodes as you went along and could put certain quotes into two nodes.'* One student stated that the *program 'was difficult to use and I could hardly find any good answers to my 'help' questions in the tutorial online,'* and another commented, *'I did not find it particularly easy to use; I only got as far as merging nodes in my analysis and then I stopped being systematic about my approach.'* However, the students generally reported that NVivo was user- friendly, due to its familiar interface and help options:

It's easy-to-use software. It's intuitive and works similarly enough to MS Office (which students are familiar with) that there's no learning challenge. Even if you

don't know how to do something (or whether or not that can even be done) it's easy enough to play around for five minutes and work it out!

Systematic data storage and display. The students characterised the program's data storage and display features as useful in providing an organised and systematic approach to working with qualitative data. For instance, students appreciated *'being able to store all the data in one place and easily compare different themes'* while others commented that the program's display features assisted their analyses. For example, a student stated, *'It was easy to see what you had coded and it was good that you could merge nodes and create relationships between them.'*

Additionally, some students commented that the program was especially useful in analysing multiple interviews and large data sets common to qualitative research. The data storage and display features were also considered useful to the students in writing-up their analyses. One student asserted, *'It makes integrating qualitative research into a research report easier and more organized so you can easily see and describe the relationships between the dominant themes,'* while another commented:

It provided a useful means of displaying and editing your data when analysing for the purposes of the assignment, especially when writing the report – it was good to be able to quickly flick through the hundreds of nodes/codes that had been created to search for specific words or key ideas.

Comparison with manual analysis. In their responses, many students compared data analysis using NVivo with manual analysis. Although the students had limited experience in manual analysis, several mentioned that the process of analysis using NVivo requires less paper and would therefore be easier and more efficient than manual analysis. One student wrote, *'It's easier to have everything saved on a computer than have notes scribbled everywhere on all different pieces of paper.'* Additionally,

two students thought that quality of data interpretation is improved with NVivo than compared with manual analysis. One wrote, *'When your [sic] analysing transcripts you can get lost in the themes and categories that jump out at you and this offers a neat way to get your head around things'* while the other asserted:

Having all the quotes in one place under a node, rather than on separate bits of paper was really easy to handle. Also, because changing names of nodes, their relationships and the quote in them is so easier than when doing it by hand [as] you are less invested in a theme that you have already created and can think more freely.

However, not all students were convinced of the benefits of NVivo over manual analysis. One wrote, *'[I] could have done it easily by hand'* and another asserted:

I can't see all the transcripts at once and compare them. I would rather print them all and look at them... NVivo [is] really useless and time-consuming, allowing you to just look at one thing at a time. I can use it and I did but I hated it.

For these students, any advantage of NVivo was negated by the necessity to sit at a computer looking at a computer screen. For example, one emphasized, *'I hate having to read information, especially long pieces of text, on a screen but I know in order to use such technology it has to be done... I'm just old school and like the hard copy in front of me...to write on.'* One student commented that the computer interface reduced accessibility to the data and the ability to 'get to know' the data:

If you stop, it's a hassle to find where you stopped. When you look at the information under each individual code, you don't see the context around it as you would if it was on paper and you were able to look at different interviews at the same time. You can either see what you highlighted when coding, or only one

interview at a time. Memoing and notes are not as easily and quickly written and accessible as on paper.

Some students commented that the use of analysis software technology added validity and credibility to their analysis. One student commented, *'NVivo makes the process of qualitative research seem much more manageable. It adds structure and makes qualitative research seem more valid,'* and another wrote, *'It makes qualitative analysis a lot less intimidating.'* One student observed that the use of NVivo facilitated them to better understand the underpinnings and processes of qualitative research:

By using the software, although I sort of learnt while doing, it actually helped me better understand the theory behind what I was doing, too. Actually working with the data in such a way taught me a deeper understanding (and application) of the theory.

Other students did not see any analytical benefits of NVivo. One stated, *'[NVivo] did not enhance the coding process of the interviews'* and another commented, *'although it's simple to aggregate information (i.e., quotes), most of its features are redundant.'*

Time-consuming to learn. The students stated that learning NVivo, and qualitative research generally, were time-consuming tasks. In particular, they were nervous about simultaneously learning a new form of research and a new software program. One student stated *'it was really hard to use for the first time'* while another described:

At first I was like 'oh no I'm going to have to learn to use a whole new software package, and OMG it comes with a bible, it's going to be like starting with SPSS all over again, how am I going to do this in one unit?!' So initial shock, but it turned out to not be like that at all.

However, some students reflected that the time-consuming nature of the process resulted from the analysis rather than the program itself. For example, one student commented the process was *'very time-consuming; however, if you were analysing interview transcripts without NVivo I guess that would be time-consuming just the same.'*

Integration into the Unit and Course

Three subthemes related to integration of the program into the unit and course emerged from the data. These were Access to the program, Class time and structure, and Relevance to undergraduate psychology, and are described below.

Access to the program. A key issue faced by the students concerned the restricted access to NVivo and related resources, such as the NVivo manual, outside of lab time. The program was only available in the psychology computer lab and was not available on other university computers. This was described by students as *'extremely annoying'* and *'a psychological barrier to doing my assignment because of where and when the program was available to use.'* Several students downloaded the trial version to their personal computers only to find incompatibility between the university and trial versions and were thus not able to continue working on their analyses in class time. One student described the situation in the following manner:

When I downloaded the trial version at home, I was able to save my work.

However, when I had tried to open the file at the uni[versity] computers it did not work. This was very, very annoying. I also had to do the memos by hand since I couldn't open up anything I had saved at home at uni.

Several students wrote that the unit would be improved with greater access to NVivo. For example, one student recommended that, *'the program should have been installed to all the computers at uni before the integration [of] NVivo in the unit.'*

Another recommended that, *'it would be very beneficial for students to have a copy of the program at home that can match up to the program at university as there is way too much work to do just in class time.'* One student reported attempting to purchase the full version of NVivo but the cost was prohibitive.

Class time and structure. The students thought that NVivo would be better integrated into the unit if there was more class time, particularly lab time, devoted to the program, as there was *'not enough time in labs to become familiar with it.'* Students commented that longer labs *'could ensure more time to learn how to use NVivo as I felt it was a bit rushed'* and provide *'more time with the tutor to ask questions'* while another described:

We had to start merging nodes and making memos before we had finished initial coding. And although the handbook was issued to every student, we didn't even open them, we just followed along with the tutor and lab slides because there was insufficient time to make use of the book in the labs, so no one bothered with this resource.

In addition to more time, the students recognised that the successful integration of qualitative analysis and NVivo would also require additional resources and information such as *'having a practise tute on NVivo before it is used for their assignments'* and qualitative analysis/NVivo software requiring a presence in the course equal to quantitative analysis/SPSS. For example, one student suggested that NVivo should be *'spread over a few more tutorials [to] even it out with quantitative data tutes.'* Similarly, some students reflected on the utility of the book, in light of their SPSS manual, and wrote, *'Maybe if we had a copy of the book as we do with the book for quantitative analysis so we had easy access to the information'* and another

commented, *'Maybe put the book and or software on the book list similar to SPSS book and software?'*

Related to more lab time was the suggestion of greater structure to the labs and better management of the students' pace in order to scaffold their learning. This issue was described by one student in the following way:

The first lab using NVivo was really helpful and structured, but then [in] the next two labs I didn't really know what was going on. I think it made it harder because people were in different parts of the process but more structure was definitely needed in teaching the second two labs (the slides were still good).

Several specific suggestions were made, including, *'learning step-by-step how to code as a class, making sure that everyone can do the available things before moving on,' 'so that everyone is up to the same part, make it compulsory to have it completed',* and *'thoroughly go through each student's progress if possible to ensure everyone is on the same page and is on the right track with qualitative analysis.'*

Finally, some students shared that they would have preferred the choice of conducting their analyses manually or with the assistance of NVivo. For instance, one student asserted, *'Students should be given the option, because some find it easier to code manually.'* Similarly, another student reflected:

I feel that coding on paper may have been less boring and tedious. But it is good to teach us how to use it! Perhaps giving the students the choice is better. Obligated to know how to use both, but can choose for their assignment.

Relevance to undergraduate psychology. Some students thought that NVivo was relevant to and *'well-integrated'* into the course, which was *'done succinctly and comprehensively.'* Some students questioned why NVivo was introduced late in the course (third year) compared to the introduction of quantitative analysis software in first

year. This was compounded by the size of the assignment. One student wrote, *'It was a bit daunting being told we were going to have to analyse 10 transcripts while being introduced to this program!'* and another student reflected, *'It felt a bit like a whole new program was just sprung on us.'*

However, the teaching was described very positively, variously described as *'excellent,'* *'very competent,'* *'very good,'* and *'very well done.'* One student commented that, *'the labs took a really excellent, step-by-step approach towards how to use NVivo and its benefits.'*

Several students described their NVivo experience as an addition to their growing repertoire of skills relevant to their future research aspirations and employment. One student wrote, *'It is a great program and I hope to get a real hang of it before I do my qualitative dissertation next year,'* while another commented, *'It is a very useful tool. Knowing how to use research software like this makes us more employable, and prepares us for future research.'* Other students did not think the program would be useful to their future but were still glad to have been introduced to it. For example, one was *'glad to have used relevant and up-to-date technology'* while another reflected, *'I think it is a valuable tool to know how to use, even if you never do any further qualitative data analysis.'*

Discussion

Past research into the teaching of CAQDAS packages is limited by (a) the focus on small groups (e.g., Walsh 2003), typically comprising post-graduate and doctoral students (e.g., Darmody and Byrne 2006; Davidson and Jacobs 2008) and (b) the focus on the teacher's perspective (e.g., Davidson and Jacobs 2008; Durrant 2003; Este et al. 1998; Fitzgerald et al. 2003; Johnston 2006; Kaczynski and Kelly 2004; Onwuegbuzie et al. 2012; Tagg 2011) with little consideration for the perceptions of learners.

Furthermore, there is a dearth of formal evaluations of CAQDAS teaching on outcomes such as attendance, helpfulness of teaching resources, confidence in the use of programs, and future intentions. This study addressed this paucity in the literature by investigating the implementation of CAQDAS in a large undergraduate mixed methods research unit.

Our practise with all core psychological science units taught within an undergraduate psychology curriculum is to integrate the teaching of method with analysis, including the integration of computer data analysis tools. Our study demonstrated the possibility of successful integration, rather than separation, of research methodology with CAQDAS technology (see Jackson 2003) in teaching undergraduate students, with the integration of NVivo into the course generally being reported, by students, as a worthwhile experience. Students described teaching in the unit in positive terms. Ponterotto (2005) suggests that utilizing staff who are experienced with qualitative research methods will strengthen qualitative research teaching. The teachers involved in this unit not only have practical experience in using NVivo and applying qualitative methodology, they also have the expertise to relay this in an academic manner. This combination ensured that the learning was based on the integrated nature of methodology (qualitative) and technology (CAQDAS) (Jackson 2003; Johnston 2006) and provided depth and credibility to the learning experience. The teachers also exhibited a belief in the worthiness of qualitative methods in research, thereby adding credence to the methodology. This commitment and belief appears to have impacted on the students evidenced, not only by the positive reporting of the teaching in the unit but also, by the increase in uptake of qualitative projects in their fourth year research.

One question in our survey specifically asked students for comments about the way the use of NVivo was integrated into the teaching of qualitative research. While the

responses to this question have been integrated into the themes presented in the qualitative results, it is notable that while a minority of students expressed their dislike of the program and/or qualitative research in general, only one student queried the need to learn NVivo. This increases our confidence that NVivo can be an integrated component of the teaching/learning of qualitative methods.

In contrast to previous reports of teaching CAQDAS to postgraduate students (Davidson 2005; Tagg 2011), the undergraduate students in this study appeared to have little difficulty in adapting to the use of a new computer program, perhaps reflecting their younger age and computer proficiency (Kaczynski 2003). Postgraduate students tend to vary in their research abilities and experiences (e.g., Kaczynski and Kelly, 2004; Tagg, 2011) which can create difficulties in teaching, something not experienced in our teaching of undergraduate students who all enter the unit having completed three previous units in research methods, providing a common shared understanding of research and familiarity with computer assisted data analysis. The focus within the unit on teaching the skills of qualitative analysis (thematic analysis) further reduced the variability that teaching staff were required to accommodate. This 'standardisation' in terms of previous experience and material taught makes the teaching of qualitative methods and CAQDAS packages to large cohorts of undergraduate students manageable.

Students expressed concerns relating to the time pressures and access to the program. Several students accessed a trial program at home which resulted in them being unable to access their data on the university computers due to incompatibility issues. This reportedly restricted their learning experience leaving them somewhat 'out in the cold' with regard to assistance in analysing their data. These issues have been raised in past research where Auld and colleagues (2007) and Walsh (2003) suggested

that inadequate time allocated to learn the basic functions of CAQDAS packages and limited access to the software inhibits the learning process for students. Timely allocation to resources may be a particular issue for undergraduate teaching, which tends to be governed by strict policies and therefore there is a trend towards less flexibility when compared to small postgraduate classes (e.g., inflexible due dates for assessments).

Suggestions for future teaching arising from this research are to ensure broader access to CAQDAS packages and to allocate more time to the teaching of CAQDAS within qualitative methods courses. An imperative for further teaching incorporating CAQDAS is to ensure that the program is available to students, both within computer labs and at home. Our inclusion of teaching CAQDAS within a 12 week unit that attempted to cover both qualitative and mixed methods research, coupled with difficulties in accessing the program outside of scheduled labs, did not provide optimal 'practise' time for students. The findings from this study lend support to curriculum changes occurring with the psychology program at our university. Specifically, the program is in the process of adding another advanced psychology research methods unit devoted to qualitative research, which will be run as a precursor to the current mixed methods units. All research methods units will adopt a new tuition pattern with increased lab time to enhance student learning of computer data analysis packages (quantitative and qualitative).

In addition to addressing access and time issues, we would recommend educators considering implementing the teaching of CAQDAS to large cohorts of undergraduate students ensure adequate resourcing is available. It is important that all teaching staff members are proficient and comfortable with the use of CAQDAS and have been trained in the version of the CAQDAS package to be used. Further, ready

access to resources to support the use of the particular CAQDAS package selected will be beneficial. This may include articles, books, online tutorials and FAQs. A limitation of the current research was that the sample was drawn from one undergraduate psychology stream within one university; therefore these results cannot be generalized to all undergraduate classes or across disciplines. Although the response rate of 59% is high, the respondents may have been biased towards those interested in qualitative research, thereby under-representing students who are not considering qualitative methods in the future.

Three avenues of future research are recommended. First, further research is required to explore the optimal conditions for teaching CAQDAS as part of methodology courses to undergraduate students across a range of disciplines and class sizes. Second, an in-depth qualitative approach is required to further explore and understand students' perceptions of the relationships between method and CAQDAS tools and how these perceptions might change over time. Finally, pre-post research designs could be used to examine changes in attitudes towards both qualitative research and the use of CAQDAS software after completing a qualitative course that include a CAQDAS component. While it is not expected (nor desired) that all undergraduate students participating in a qualitative methods course will be 'converted' to qualitative research, a realistic aim might be to increase appreciation of qualitative research.

In summary, the research presented in this paper has demonstrated that it is possible to successfully integrate the teaching of CAQDAS within a large undergraduate research methodology unit. Student evaluations were generally positive, but highlighted the need for both increased class time and greater access to the CAQDAS program outside of class time to enhance opportunities for learning.

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Table 1

Extent of Agreement that Teaching Resources were Helpful in Learning to Use NVivo

(%)

Resource	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
NVivo book	5.5	21.8	41.8	20.0	10.9
Lab slides	-	3.6	9.1	60.0	27.3
Tutor	-	3.6	7.3	50.9	38.2

Note. N = 61.

Table 2

Confidence in Abilities to Complete a Range of Activities in NVivo (%)

Skill	Not at all confident	Somewhat confident	Confident	Very confident
Import transcripts	4.3	10.6	27.7	57.4
Code to nodes	2.1	4.3	38.3	55.3
Display material within node	2.1	10.6	36.2	51.1
Merge nodes	6.4	19.1	34.0	40.4
Delete nodes	2.1	8.5	38.3	51.5
Set up parent-child relationships	23.4	21.3	23.4	31.9
Create a memo	25.5	31.9	19.1	23.4
Attach a memo to a node	25.5	29.8	23.4	21.3
Export a node	31.9	19.1	31.9	17.0

Note. N = 47.

Table 3

Themes and Sub-themes Concerning the Use of NVivo

<i>Themes</i>	<i>Subthemes</i>
Features of the NVivo program	Speed, efficiency and use
	Systematic data storage and display
	Comparison with manual analysis
	Time-consuming to learn
Integration into the unit and course	Access to the program
	Class time and structure
	Relevance to undergraduate psychology
