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Multidisciplinary graduate training in social research methodology and computer-assisted qualitative data analysis: a hands-on/hands-off course design

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ABSTRACT

Drawing on the experience of training graduate students and researchers in qualitative and mixed-methods analysis since the mid-1990s, the authors reflect on the evolution of a multidisciplinary graduate course developed in a Canadian university since 2007. The hands-on/hands-off course design based on the use of NVivo was developed in parallel with a conceptual and reflexive position on methodology and multidisciplinarity in the context of an action research supported by their institution. This article exposes the four basic components of the course and the constructivist assessment model based on a term-long team analysis of original data created specifically for this purpose. The balance between collective and individual work, in-class and online exchanges, hands-on experience with the software and hands-off reflection is described and compared to recent pedagogical literature on the subject. The interest of this blended approach in fostering the development of the methodological expertise expected from researchers and graduate students, as well as the main issues and challenges facing this type of training in a research environment characterised by new approaches and tools, are discussed.

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Graduate curriculum; teaching research methodology; qualitative analysis; mixed methods; CAQDAS; NVivo

Introduction

The research methods curriculum in social sciences and humanities generally includes the fundamentals of qualitative and quantitative analysis. These are complemented on occasion by a section on mixed-methods research, a methodological approach that has been gaining popularity in many fields over the last decade (Creswell and Plano Clark 2011; Johnson and Onwuegbuzie 2004). As qualitative and mixed methods are often used to explore and discern patterns in great quantities of data, researchers are increasingly turning to dedicated qualitative analysis software (Bourdon 2002; Crowley, Harré, and Tagg 2002; Smyth 2006; White, Oelke, and Friesen 2012). The methodological, technical and social factors that enter into these practices make for richer academic work, but also complicate the training of new researchers as more and more students opt for this type of tool. This is compounded by the fact that classes tend to be heterogeneous in their academic and research experience, computer skills and knowledge of epistemology, theory and methodologies (Coronel Llamas and Boza 2011; Jones 2013). Advanced training in methodology also represents an organisational problem at the institutional level. It might indeed be difficult to find experts in each department who

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possess the epistemological knowledge in which these new approaches are anchored and enough experience with the software to understand and be comfortable with a variety of project designs and complex analytical tools and procedures. It is in this context that a computer-assisted qualitative and mixed-methods course has been developed over the last decade for graduate students in social sciences and humanities in a Canadian university. Our general question was of a pedagogical nature: How can future researchers deepen their understanding of qualitative data analysis and its epistemological foundations while developing their skills in computer-assisted analysis? With funding from the institution's educational development fund, we performed a systematic critical analysis of the course and of the needs expressed by student groups and faculty. Rooted in constructivism considered both as a philosophy of knowledge and as an epistemic and practical learning dynamic (Floridi 2011), the resulting pedagogical model was progressively built on a dual 'hands-on/hands-off' dynamic. It is composed of four complementary sections that were developed through years of experience of teaching and doing research with qualitative analysis software as well as constant monitoring of relevant literature. In this article, our purpose is to introduce an innovative methodological research course model that constitutes our answer to our pedagogical question. We will first summarise the current and emerging trends in teaching computer-assisted qualitative analysis that were taken into consideration in the design of the course and describe the different facets of our pedagogical model and the tools we developed. This will be followed by a critical analysis of the model, with examples of the strengths of this approach for teaching computer-assisted research methods, the issues we encountered and some potential solutions. Finally, the limitations of the model as well as avenues for further developments will be discussed. Our objective is to share the lessons learned in developing and introducing this course model with faculties, methodology experts and graduate studies deans to provide concrete computer-assisted qualitative analysis theoretical and applied learning experience to future researchers in social sciences and humanities.

Literature on current and emerging trends

Many articles have already been published on the history and development of specialised tools in qualitative data analysis (Bazeley 2002, 2006; Berg 2004; Blank 2004; Hutchison, Johnston, and Breckon 2010; L. Richards 1999; T. Richards 2002; Séror 2005; Silverman 2004; Tummons 2014). This paper is not intented to justify the use of sofware over the traditional 'pen and paper' approach, a debate about which we refer the reader to the authors cited above. Our objective is rather to present an innovative approach to teaching how to work with this type of research tool. Because of its intrinsic qualities and popularity in the academic community, the authors have chosen NVivo for most of their qualitative research projects over the years, as well as for the course that is the topic at hand. Being one of the leading qualitative data analysis packages, it is designed to handle more or less structured data from a variety of sources (text, audio and video documents, images, spreadsheets, web content, etc.). Its features replicate most of the traditional research methods (codes, themes, memos) while allowing users to benefit fully from advanced computing power. In that sense, the software can be viewed as both a tool and a specialised work space, like MAXQDA or ATLAS.ti, which are also strongly associated with ethnographical methods, rich data and classic content analysis (Krippendorff 2004) and which incidentally can export and convert data for use in NVivo. Those software products differ from other offerings designed to deconstruct text on a lexical, statistical or semantic level for automatic content or linguistic analysis or to perform cognitive analysis. For this course, we focused on rich data analysis and induction of meaning (Miles and Huberman 2003; L. Richards 1999; Sinkovics and Alfoldi 2012). We also consulted the literature and participated in many international conferences (in Canada, the USA, France, the UK and Australia) to present our project and discuss best practices and innovations in qualitative research teaching in general and computer-assisted research training in particular. It should be noted that the design described in this article could be adapted for other similar software.

Learning by doing

Many authors emphasise the importance of learning by doing, as 'qualitative data cannot easily be learned by reading books' and students 'cannot easily learn to do good qualitative analysis without hands-on practice in a setting in which they receive systematic feedback and guidance' (Blank 2004, 194). In this type of setting, the teacher takes a key role facilitating the development of a relevant research approach for the students, which makes the course more dynamic and rooted in the principles of project pedagogy and 'learning by doing' (Anzai and Simon 1979; Blank 2004; Quintana et al. 2004; Raddon, Nault, and Scott 2008). This 'hands-on' approach is appropriate for teaching computer-assisted analysis, as this form of learning can only be fostered through practice in a master-apprentice type relationship (Breuer and Schreier 2007). It also compels the cognitivist perspective in the integration of information and communication technologies (Basque 2004; Spector 2002), as well as experiential learning techniques (Hamer 2000; Hopkins and Hogg 2004). Students learn by doing and by exchanging with their peers to find solutions to problems and engage in critical reflection (Becker 1998) in order to develop their skills beyond the data collection, initial treatment and coding processes usually taught in formal methodological courses (Basit 2003; Humphrey and Simpson 2012; Ryan et al. 2012; Wolcott 1994). This enables students to better resolve coding issues, grasp consistency and reliability and understand the amount of thought and time they should invest in their analysis and interpretation (Bazeley and Jackson 2013; Compton, Love, and Sell 2012; Fram 2013). The pertinence and effectiveness of this approach in teaching methods have been demonstrated, but so have some of its common limitations: (1) time issues, due to the amount of knowledge and skills that have to be acquired in a limited time, and (2) group composition issues, such as class size and heterogeneity. This demands a significant commitment from the instructors, strong experience with a wide range of research designs and the capacity for adaptation, flexibility and creativity (Coronel Llamas and Boza 2011) to meet the needs of very different graduate students (Jones 2013).

Multidisciplinarity

Multidisciplinarity is also a key issue in the teaching process. Its crucial role at the graduate level is increasingly reflected in innovative models based on the principles of learning by doing, mentoring and collaborative work (Arvaja 2007; Chipperfield 2012; Coronel Llamas and Boza 2011; Humphrey and Simpson 2013; McAlpine and Norton 2006; Ryan et al. 2012; Walker et al. 2009). Some authors note the growing consensus on practical hands-on learning across disciplinary boundaries (Hopkins and Hogg 2004) and the effectiveness of software in teaching the systematisation of operations without sacrificing the subjective fluidity that is so crucial to qualitative analysis: 'The qualitative studies I admire are systematic, but they are not only systematic, they mirror the creativity of the researcher as well as the information from study participants. They do not mindlessly follow someone else's recipe' (Blank 2004, 188). Others insist on the importance of the methodological journal to account for the creative research and learning processes in qualitative or mixed analysis (Johnston 2006), but also for the development of methods and collective learning in heterogeneous and transdisciplinary teams (Curseu and Pluut 2013; McClam and Flores-Scott 2012). In many fields of applied social sciences, the need to improve qualitative analysis skills has been expressed (DeLyser 2008; Thorne, 2011), especially in the context of multidisciplinary approaches (Jakobsen and McLaughlin 2004; Reason and Raynolds, 2010). This tendency to seek optimal learning settings for future scientists in dynamic and collaborative groups is important in all sectors of science (Louis et al. 2007; Wildschut, Insko, and Gaertner 2002). It meets the demand for improved educational experiences and for more flexibility in the context of the emerging professional doctorate programmes (Kot and Hendel 2012). It also answers the needs expressed for high quality training in research skills by doctoral students who 'place a high priority on abstract academic qualities such as academic rigour and critical thinking' (Morrison et al. 2011, 558) as they develop their academic identity in a changing institutional environment (Delanty 2008; Kiley 2009).

Critiques of analytical approaches

Students must be aware of and understand common critiques concerning the lack of rigour of some qualitative research, which computers, while not a panacea, can palliate. For example, it is useful to know that the idea that qualitative analysis is an 'art', an 'intuitive process' that uses methods assumed to be irreducible, even incommunicable, is not accepted by everyone and can be harshly opposed: 'we do not really see how the researcher got from 3600 pages of field notes to the final conclusions, as sprinkled with vivid illustrations as they may be' (Miles and Huberman 2003, 13). Blank (2004) issued a similar critique, insisting on the importance of documenting the analytic process. Others call for caution in quantifying qualitative data, reminding us that 'presenting qualitative data in a quintessentially quantitative manner obscures the key strengths of qualitative research' (Pratt 2009, 858). Being often associated with grounded theory, computer assisted analysis also calls for a critical examination of what is at stake in the different interpretations of the analysis and theorisation embedded in this method (Reichertz 2010) as well as some of its alternatives (Fram 2013). When used properly, software ensures a transparent and traceable analytical process, and students must understand the pertinence of those concerns in order to obtain optimal findings and avoid the trap of over-interpretation or misquantification (Bong 2007; Sinkovics and Alfoldi 2012). Yet, as noted above, the debate over the use of computers in qualitative analysis still represents an obstacle that researchers should be ready to face, even though most projects now capture and store data in some digital format (transcripts, audio and video files, Internet content, etc.) in larger volume than ever before, requiring computers. Most arguments against the use of specialised software in qualitative analysis are rooted in the fear that the analyst's judgment is removed and that the subtleties of the analytical process are lost in a questionable mindless routine (word counts, basic inventories of terminology, automatic word associations, etc.). These arguments reflect a lack of familiarity with recent versions of qualitative analysis software like NVivo, which do offer automatic treatment possibilities, but also a variety of tools meant to reproduce the traditional pen and paper processes and assist the analyst in thoughtful reading, coding, categorising and theorising of the data. They might sometimes also stem from a more general uneasiness about working with computers in terms of technology dependence or perception of self-efficacy (Shu, Tu, and Wang 2011).

Working with computers obviously does not exclude abstraction and reflexivity. As others have reported, we saw that students who had had prior experience with the software underutilised it and did not fully understand its strengths and limitations (Bazeley and Jackson 2013; White, Oelke, and Friesen 2012). Therefore, students must put some thought into their choice of using analysis software or not and learn more about the characteristics of the different products available to choose the most appropriate. They should also think about the appropriateness of qualitative or mixed methods for their project, instead of considering them trendier and thus better. In reality, researchers are expected to develop a critical point of view and to situate themselves and their project in a coherent methodological design (Brannen 2005; Johnson and Onwuegbuzie 2004). Overall, the training should help any participant become 'an informed and knowledgeable researcher', defined as someone who 'would be able to indicate their understanding of how, and on what basis, a particular application orders and hence shapes the management and analysis of data' (Atherton and Elsmore 2007, 75).

Writing as analysis

In order to prevent obstacles further down the line, it is also important for researchers to begin writing and producing meaning while working with raw data. The course contributes to the development of these specific writing skills by making the process more systematic and pragmatic (Aitchison et al. 2012). Using the software's integrated writing tools, such as memos, students can learn to write what they think and not just verbalise it (Ryan et al. 2012). More fundamentally, in applied social sciences where experts in sociological, anthropological and ethnographical methods are rare, we observe in the initial writing exercises some marked weaknesses in the students' basic understanding of epistemology and theory, which come to light as soon as they begin interpreting raw data. Thus the need to present

students with a broader range of literature and interpretive approaches in this course, but also in the general curriculum (Coronel Llamas and Boza 2011; Delyser et al. 2013; Fram 2013; Hall, Griffiths, and McKenna 2013; Navarro 2005; Poulin 2007; Raddon, Nault, and Scott 2008; Urquhart and Fernàndez 2013), while explicitly and strategically stimulating their capacities for reflexivity and analytical thought (Becker 1998; Ryan and Ryan 2013).

Research context and methodology

Since 2007, we have been responsible for the development, update and delivery of an advanced qualitative data analysis course. Our instructional design process was prompted by the need to develop efficient tools that could easily be adapted to new versions of NVivo (upgraded almost yearly during that period). The main challenge was to help students go beyond a basic grasp of the software to gain practical insight into qualitative analysis, while adapting our teaching to the heterogeneous nature of multidisciplinary groups. Our two specific pedagogical objectives were to provide deeper insights on the basics of qualitative research and to develop skills that could readily be deployed in a real research project.

The critical analysis presented here is based on a variety of sources: course syllabus and lesson plans, teachers journals and notes about the course, and the students' formal evaluations of the course gathered from five cohorts (2010–2014) (25 masters' students, 26 doctorate and postdoctoral students in the fields of Education, Management, Psychology, Health Sciences, Anthropology and other majors). The material analysed does not include interviews, formal class observations or student productions as, from an ethical standpoint, we did not want to burden participants in this already demanding course. We divided the contents of our notes and documents into three broad themes: multidimensionality, multidisciplinarity and the stakes of the hands-on/hands-off approach (defined as tensions created by the choices we and the participants have to make regarding the content and evaluation requirements of the course). Throughout the implementation of the training mechanisms, we used a continuous process of student evaluation and feedback, and iteratively developed a methodology that helped us refine our analysis over the years. Triangulating our data sources (prescriptive course content, evaluations, synthesis and reports), we successfully validated our interpretations. This is common practice in education research when evaluation is concerned, for more transparency on credibility, dependability and confirmability issues is needed as results may influence policy and structural or curricular organisation (Anfara and Brown 2002; Halfpenny 1979; Tummons 2014). Our general analysis and practice development was done using the basic principles of McKernan (1996) situating qualitative curriculum action research as a form of self-critical inquiry. More specifically, we worked with a scientific-technical view of problem-solving: identifying problems, planning and formulating hypothesis, fact-finding and data interpretation, execution/implementation and analysis/evaluation. The continuous evaluation process was undertaken to improve the quality of the course as we developed and refined our design.

It should also be noted that for this analysis, qualitative in essence, we did not use any specialised software as it did not appear necessary. The corpus under analysis was not particularly abundant and a good part of it consisted of handwritten notes that did not easily lend themselves to digital treatment. This example illustrates our pragmatic approach to qualitative analysis software, which can be a very useful tool in some contexts, yet not necessarily pertinent in every case.

Hands-on/hands-off design

Our findings are embedded in the course design we developed, its current form a reflection of the best solution we found to address the problems and meet the needs of students as well as our institution's expectations for advanced training of graduates in qualitative computer-assisted analysis. This design was developed iteratively, from a preliminary canvas stemming from a literature review through refinements brought about by constant movement between theory and experimentation of the model with different groups. In this sense, the results presented as a course design in this section are based both

Table 1. Course components, dynamics and workload.

Components	Dynamics	Sequence	Hours in class	Hours of work for students	Percent of instructor's teaching workload	Evaluation (details in Table 2)
Lectures	Hands-off	First third	9	9–18	15	Reports and reflexive analysis
Lab exercises	Hands-on	First half	15	15–30	20	NVivo database and reflexive analysis
Mini research project	Hands-on/ hands-off	Last two-thirds	18	18–36	50	Research design, reports, NVivo database, presentation and reflexive analysis
Use of interactive platform	Hands-on/ hands-off	Throughout	3	Indeterminate (free consultation and contribution)	15	Participation

on actual assessment data and on the literature that supports the specific components we developed and tested.

The course follows two complementary axes: a section of hands-on practical work with the software, and another of reading, thinking and exchanging ideas about theory, conceptualisation essentially conducted without the computer. This dual dynamic runs through all components of the curriculum, which is offered in a standard 45-hour, three-credits graduate-level course over one semester (approximately 15 weeks) or in an intensive summer course programme with 12 to 20 students registered for each course on average. Table 1 introduces the four components of the course, namely lectures, applied lab work, a mini research project and an online interactive platform. For each of these components, we listed the dynamics at work, the order in which the components are addressed in the semester, the estimated number of hours in class, the number of hours of work for students (in and out of class), the proportion of the instructor's workload it requires and the work to be submitted for evaluation.

Lectures

This first component of the course is meant to impart students with the theoretical and epistemological knowledge that will enable them to differentiate analytical approaches and identify their characteristics. The emphasis placed explicitly on analytical methods, which is still often underplayed relative to data collection and processing in methodological curricula, takes on all its significance in the light of the great variety of directions qualitative research can take. For example, Tesch (1990) has identified no less than 27 types of qualitative research, using categories based on the objectives of the research. Jacob (1987), for his part, proposed a typology of qualitative research traditions based on whether features of language are regarded as culture or communication. Regardless of their choice of approach, students must understand the importance of an authentic quest for meaning and significant constructs, whether or not they opt to use computers to achieve it (Marshall and Rossman 2011; Maxwell 2005). This dimension of the design goes beyond technical software training and typically falls into the hands-off dimension of the course. We found that taking the time to share a variety of references helps students consolidate their basic methodological training while developing the critical skills necessary to autonomously further their methodological culture. Students quickly reinvest those readings and the complementary sources they find and consult in the course.

Lab exercises

This hands-on component of the course puts students in direct contact with the software to familiarise them with the interface and help them develop a solid understanding of the basic functions (what to do) and the different operations and processes (how to do it). We teach students to conduct the analysis through the processes of decontextualisation and recontextualisation of the corpus (Tesch 1990). First, the data is decontextualised as units are isolated and rendered semantically independent when coded under themes or categories (Deschenaux and Bourdon 2005). Those units can then be recontextualised, as the software allows the data to be restructured by viewing side-by-side snippets from various sources. Of course, these processes presented as distinct phases are almost always done iteratively. Students come to understand that, in practice, researchers often go back and forth between steps in order to validate, consolidate, refine and complement preliminary findings.

Lab work includes demonstrations and practical exercises structured in three broad phases: (1) learning the basic features of the software, (2) coding techniques and integrated writing tools, (3) querying and handling results (queries, reports, models). For the exercises, students use step-by-step tutorials and content created specifically for the course, as suggested in the literature (Walsh 2003). This includes all the material required to simulate a real research project, with original data collected in open interviews with 19 master's and doctoral volunteer students in two different universities. Entitled 'Studying in University' (SIU), the sample project includes an important volume of data in different formats ready for processing and analysis: transcripts of individual interviews and focus groups (text), tables of sociodemographic and academic data (spreadsheet), avatar pictures of participants (.jpeg) and institutional documents (.pdf and .mpeg).

During labs, instructors go from student to student demonstrating features and giving hints and advice when required. Students also invest time practicing outside supervised lab hours and are very active on the web platform sharing mistakes, problems and solutions with other students. Almost all of them insist on the usefulness of this time spent practicing basic operations like importing documents, coding, creating codes and coding trees or tweaking the project's architecture.

Mini research project

In small teams of two to four, students conduct a full analysis from problematisation to final findings (skipping data collection), a marked difference from the 'all in one' methodological course given in many graduate programmes. This seems unrealistic and is in fact criticised as a methodological weakness in applied social sciences (Coronel Llamas and Boza 2011; Raddon, Nault, and Scott 2008). By creating an original NVivo project from scratch and defining their analysis strategy, students explore both the hands-on and hands-off tasks of analysis as they discover different ways to code and work with nodes (creation, aggregation, node hierarchies, etc.) and learn to use different types of queries (word frequency, text search, coding queries, matrices, etc.). This helps them reach a deeper level of analysis that goes beyond the description of the ideas or themes present in the data (Bringer, Johnston, and Brackenridge 2006) and develop their capacity to control the quality of their work (Compton, Love, and Sell 2012).

At the same time, they practice integrated writing (memos, project notes, definitions, etc.) and log details of the technical aspects of the process, their thoughts and the evolution of their analytical framework in their journal. Through exchanges with their peers, they also learn about the organisation and planning involved in teamwork, such as secure and functional archiving, merging projects and supporting arguments (selecting quotes, references, models, tables, figures and graphs from the database, etc.). On this last point, we encourage thoughtful use of supporting materials like diagrams (Buckley and Waring 2013), and we emphasise that the convenience of those tools should not be an excuse to 'gadgetise' the analytical process or the presentation of findings. The instructors are there to advise throughout the process, but teams are given time to develop autonomy and share their solutions to the issues they encounter with the group. The emphasis placed on the analytical process is very much appreciated by those students with research assistant experience and those at the doctorate level, since

Table 2. Evaluation components, relative values and descriptions.

Components and value	Description
Research design 10%	The research proposal (4–5 pages) is submitted early in the semester (around week-4). It sets the foundation of the project (problem, question, objectives, concepts, strategy, data, work plan)
Preliminary coding report 20%	The report (10–12 pages) is submitted around mid-term. It provides an overview of the coding process (codes, definitions, hierarchies, inter-coder reliability testing, report)
Final report 20%	The report (20–25 pages) is built on previous work and feedback and it includes a brief review of literature, a description of the research problem, the methodology used, the results and a discussion
NVivo database 20%	An individual copy of the NVivo database to assess the quality of the overall architecture and the exhaustiveness of the different techniques used
Presentation 10%	The digital presentation is submitted by the team after they present their findings in a conference held during the last day of class
Reflexive analysis 15%	The individual essay (5 pages) is submitted at the very end of the semester. This exercise aims to reflect on the learning process and express critical opinions on qualitative analysis and the pertinence of using software (NVivo or other) for future projects
Participation 5%	Participation on the interactive platform (questions, exchanges, etc.)

most have basic data gathering skills (mostly interview techniques) but lack a direct experience or feel insecure about the analytical process. Many have expressed that the course helped them develop the skills and confidence to start working with their own data with a clearer understanding of 'what to do with all that'.

Assessment

The evaluation of students' work is based on six documents meant to assess students' progress and ensure they are meeting different learning milestones throughout the semester. These also help students plan their work to progress at a regular pace without getting stuck in one phase, as time management is crucial when attempting to complete an entire project in one semester (Delyser et al. 2013; Raddon, Nault, and Scott 2008; Walsh 2003). Given that the course focuses on practical experience with the software, the evaluation components described in Table 2 were designed so that students can benefit from summative and evaluative feedback adapted to the different stages of the process and to their individual needs (Gardner 1992; Hopkins and Hogg 2004; Rust, O'Donovan, and Price 2005).

Using the details in the syllabus, participants easily understand what is expected in the works they have to submit and the balance between individual and team evaluation. As they progressively build on their projects, they are reassured at every step and end up submitting quality documents for evaluation.

Interactive web platform

The course also involves ongoing collective learning via an interactive web platform (Moodle) that we consider to be an intrinsic dimension of the model supporting both hands-on and hands-off learning experiences. There, students can find the syllabus and other logistical information, suggested readings and tutorials (guides, exercise briefings) as in many courses. But what is most important is that it serves as a discussion forum where they can share their problems and solutions as a community of practice (Wenger 1998). The instructors act as facilitators, adding documentation, suggesting discussion topics and framing exchanges. We found that Computer Assisted Qualitative Data AnalysiS (CAQDAS) training could not be offered completely online, since it requires concrete demonstrations, a lot of on-the-spot troubleshooting and intensive interactions between students and instructors. But in general, although we were aware that student performance seems to be weaker online than in person for younger and less experienced students (Xu and Jaggars 2014), we found that complementary online training was a

very powerful learning resource for graduate students. The older, more mature students attending the course probably have a better sense of responsibility, more motivation and better time management skills (Yen and Liu 2009). Not only do all students participate regularly in the different forums, but they also expect others to do so and carry over discussions in class and in the lab. Similarly, many threads on the platform flow from topics discussed in class as students share their reflections on their readings and the results of their experimentation with the software. We could see this particular integration of online and in-class exchanges begin right after the first meeting and intensify as the semester progressed.

Discussion

This discussion, based on the critical analysis of the course, outlines the most productive and useful aspects of the course design. We grouped the main themes emerging from the transversal analysis of the data in three general categories: multidimensionality, multidisciplinarity and stakes and challenges.

Multidimensionality

We find that the blended hands-on/hands-off model combining theory and applied learning as well as individual and collaborative work and exchanges in class and online meets the students' needs and provides a complete and engaging learning experience. In an iterative reflection dynamic, we operationalised more precisely our vision of constructivism (Floridi 2011) by turning to Ares (2011) explanation of multidimensionality as a cultural essence of the content and learning context of the course. This helped us capture the complexity emerging from our data analysis and transform it into a more dynamic and hybrid form of practice. Linking the course design to literature on the use of technology in research instruction (Basque 2004) and hybrid pedagogical designs (Hamer 2000; Hopkins and Hogg 2004; Spector 2002), it appears well balanced and sparks dynamic and pertinent learning processes.

Generally speaking, having the course evolve around an original analysis project appears to have a great impact on the students' learning experience. Faced with the realities of application, students have to learn how to work under strict deadlines and understand workflows and procedures that will eventually help them when planning 'real' analytical processes. It is a meaningful experience that mirrors, on a smaller scale, the common reality of teamwork. This approach is not a technological innovation in itself, but one of the recognised pillars of qualitative research instruction that is not radically transformed in a computer-assisted approach (Johnston 2006; Marshall and Rossman; Walsh 2003). Students who are less at ease with computers or feel a little 'technostress' (Shu, Tu, and Wang 2011) develop confidence remarkably quickly. Not only do they learn to use the different functions of the software, but they have a chance to face their problems and find solutions more easily in a collective and collaborative learning environment (Chipperfield 2012; Curseu and Pluut 2013; Hämäläinen 2012; Louis et al. 2007; Wildschut, Insko, and Gaertner 2002). Interestingly, younger students who are more at ease with computers tend to be much quicker to explore the features of the software and ask a lot of questions on the production of visual elements (3D matrix, models, clusters, etc.). They appreciate being given the space and the support they need to come to understand that the work is first and foremost conceptual, that rigorous interpretation is more important than fancy graphical representations, and that the computer should be, in the end, completely subordinate to the analyst (Buckley and Waring 2013). In that sense, we remind students that as researchers, teachers and consultants in methodology, we have often read excellent research done 'by hand' and seen many project designs based on computer assisted analysis that needed a lot of corrections to meet the scientific level and depth expected in qualitative analysis.

Aside from the conceptual dimensions of the project, it is mostly the tasks of coding and querying that help students understand the process of decontextualisation and recontextualisation (Deschenaux and Bourdon 2005; Tesch 1990). Students who had previously only worked with word processing software confirm that they were able to go beyond the limitations of keyword searches, described long ago by Miles and Huberman (2003). They appreciate the concrete experience of working with meaning emerging from the data and from the analysis, which echoes the literature associating the added

capabilities of computers with qualitative work (Basit 2003; Bazeley and Jackson 2013; T. Richards 2002; Sinkovics and Alfoldi 2012; Walsh 2003).

The online discussions and step-by-step original tutorials found on the Internet platform have the benefit of constant availability, allowing students to participate at their own rhythm and on their own time. This emerged as a necessity given the diverse profiles of graduate students, who are often juggling work-school-family priorities and living very different personal contexts (Jones 2013). While the platform remains a complement to class work, students do request that more supplementary material be made available online (Xu and Jaggars 2014; Yen and Liu 2009). This is a trend in qualitative research training that will be explored in coming semesters, although we still feel that supervised work in the lab is essential, as many of our participants have very limited training and experience in research.

Evaluations designed for constructive feedback are useful for both the students and the instructors, as they help measure progress and adjust the pace of the course in consequence (Rust, O'Donovan, and Price 2005). The submission of a research design proposal and a preliminary coding report marks the end of the planning and coding phases. It imposes a clear deadline that gives plenty of time to learn and practice different coding techniques, to understand how to build and work with evolving nodes structures as the analysis progresses, to refine nodes by 'coding on' (L. Richards 1999), to become more familiar with the integrated writing tools and to produce enough material to run different types of queries. The final report includes all the work previously accomplished, but must also account for the methods used to explore the data and present conclusions with supporting elements (citations, diagrams, figures, models, tables, etc.). The visual support elements are also used in a conference-style presentation on the last day of class. The reflexive analysis essay submitted at the end of the semester relates to the requirement for researchers to take a position on their findings and analytical approach. Special attention is paid to this document, as it is important for students to have the ability to clearly articulate and justify their choices in future projects. It is also useful for instructors to understand how students' expectations and needs were met, as well as their thoughts on qualitative and mixed analysis in general (Creswell and Plano Clark 2011; Maxwell 2005; Smyth 2006) and CAQDAS in particular. In this sense, we have noticed that students appreciate the value added by integrated writing they produced throughout the semester with relevant quotes to support their findings. We found that this reflects the growing importance of writing pedagogy in graduate teaching (Humphrey and Simpson 2012, 2013; Morrison et al. 2011; Navarro 2005; Ryan et al. 2012). The methodological journal turns out to be very pertinent. Students get to experience first-hand how useful journaling can be to remember the steps of the analysis and check accuracy in order to build stronger arguments from a traceable empirical process. This supports the propositions on transparency and journaling strategy posited by Blank (2004) and by Quintana et al. (2004).

From a situated-sociocultural approach to literacy and technology (Gee 2010), the appropriation of research methods can be viewed not only as a psychological process, but as a social and cultural practice unfolding in a specific context. From this perspective, the different meanings taken from the artefact at the heart of these practices, texts or technologies, are never detached and absolute, but they are mediated by the social practices in which they are embedded (Barton 2007). The hands-on/hands-off design takes this into account by combining and alternating direct analysis experience with the software and reflection on the process. Instead of presenting research methods as static, neutral artefacts, it brings students to experience them as practices and helps them acquire the critical thinking skills necessary to think them as such. The additional attention brought to the process and its transparency supported by the software in that social practice encourages students to think 'outside paradigmatic boundaries' (Tummons 2014) and move from simple method acquisition to methodological thinking development.

By making deeper connections between theory and concrete analysis, students come to understand that every step of the way, it is the researcher who is in control of the analysis, just as writing is done by the author and not the word processor. Working with the software in the reflexive approach we propose, many students come to realise that they have managed to avoid reifying their theoretical framework, codes and raw data (Bazeley and Jackson 2013; Bong 2007; Brannen 2005; Sinkovics and Alfoldi 2012). Like many researchers who have gone from pen-and-paper to computers (Bazeley and Jackson 2013;

Berg 2004; Blank 2004; Bourdon 2002; Crowley, Harré, and Tagg 2002; Séror 2005; Silverman 2004; Walsh 2003; Weitzman and Miles 1995), students appreciate having more control over their work and more freedom to explore hypotheses or intuitions.

Multidisciplinarity

The course was developed to meet the particular requirements associated with its multidisciplinary nature, which implies that participants develop a capacity to think and learn outside their own discipline perspective (McClam and Flores-Scott 2012; Ryan et al. 2012; Walker et al. 2009) and to develop a critical perspective on methodology and research in general (McKernan 1996; Pratt 2009). The conceptual diversity of the themes and theoretical frameworks used in the students' projects reflects the orientation of current developments and innovations in research and research training (Hutchison, Johnston, and Breckon 2010; Jakobsen and McLaughlin, 2004; Kot and Hendel 2012; Poulin 2007; Reason and Reynolds 2010). Even though the teams worked with the same data, they all used different angles as we encourage them to base their choice on their interests and objectives. A few of them chose grounded theory, which remains associated with NVivo in many researchers' ideas of computer-assisted analysis. But they usually opt for theories or concepts coming from a wide variety of approaches, all compatible with qualitative analysis and mixed-method analysis (e.g. identity, reproduction and cultural capital, symbolic interactionism, cognitivism and learning theories, concepts of skills, etc.) (Jacob 1987; Tesch 1990; Tummons 2014). Not only is this diversity considered favourable to productive exchanges and to the development of an academic identity (Delanty 2008; Kiley 2009; McAlpine and Norton 2006), but it also facilitates knowledge transfer across disciplinary boundaries within the pedagogical framework of the course (Anzai and Simon 1979) and without requiring major changes to institutional structures (Pharo et al. 2012). In this regard, we found that from one year to another, the course gained a very good reputation and witnessed a constant increase in registrations from students coming from other departments and even other universities.

Stakes and challenges

The main issues we identified relate to the students' expectations and level of preparation, the heterogeneous nature of groups and projects, time management and technological changes. With regards to expectations, many students need more prescriptive teaching and supervision to develop their understanding of what analysis really is, which is only natural as most of them are just beginning to gain autonomy as graduate students. More personal attention in the lab, open access to the online platform and a challenging yet supportive attitude from the instructors usually help them experience success and gain confidence. The problem is more acute for students (usually at the doctoral level) who expect to fully analyse their dissertation data in the span of the course. They have to be coaxed into reducing their expectations and anxiety level by working on more neutral data (such as the SIU project material), and we advise them to develop their doctoral research design in parallel with our support.

We observed that students, who most often come from undergraduate professional programmes, tend to have had limited exposure to the diversity of theoretical and methodological options available when they enrol in the course. As others before us (Coronel Llamas and Boza 2011; Hall, Griffiths, and McKenna 2013; Urquhart and Fernàndez 2013), we noted that the students' lack of preparation stems from the curriculum, which tends not to include introductory courses or one single course presenting only one specific approach. For example, many students do not really understand the epistemological basis of grounded theory and the nuances between fundamental concepts such as abduction, deduction and induction (Reichertz 2010). Some of them spontaneously adopt it, sometimes because of their superficial knowledge of this approach, as it appears easier to them than mastering other complex theories, but they find it difficult to justify their choice convincingly. They are often strongly influenced by one or two manuals they only partially read and sometimes by the preferences of their committee or other researchers they work with. Of course, those choices are legitimate, but it seems crucial for

graduate students to be exposed to a range of approaches. This helps them develop the competence needed to make informed choices without automatically relying on concepts and theories inherited from their mentors. This is important in order to avoid two common pitfalls: (1) throwing themselves into a research project aimed at developing new theory when they have very little research experience and do not master the literature on their topic, (2) using their theoretical framework only as the foundation for a purely descriptive analysis of the data, rather than developing a truly dynamic conceptual model, as recommended by Bringer, Johnston and Brackenridge (2006).We must therefore go through a lot of 'deconstruction' of preconceived ideas rooted in common sense or a rigid conception of analysis in order to open the minds to the exploration of different processes and methods and to the balance between methodological traditions and creativity. In this regard, we see that many students struggle to develop a critical epistemological distance. The main challenges they face are to accept that the data they work with or the codes they create are not the only 'Truth' and that the interpretive freedom they allow themselves, while ontologically acceptable, has to be supported by a real process of validation and justification in order to produce scientifically sound findings (Krippendorff 2004). The course favours unlocking the students' minds to make them more critical and autonomous, qualities emphasised in traditional and contemporary literature (Atherton and Elsmore 2007; Becker 1998; Blank 2004; Gardner 1992; Jacob 1987; Rust, O'Donovan, and Price 2005). However, there are limits to the extent to which the foundation for sound theoretical and epistemological reflection can be assimilated in the 15 weeks dedicated to applied technical learning. Still, through dialogue in person and online, reading and exploration of different approaches using the software, students do gain a broader and deeper understanding of qualitative analysis. This is a crucial part of the hands-off dimension of the course built around the literature (Delyser et al. 2013; Fram 2013; Raddon, Nault, and Scott 2008; Ryan and Ryan 2013). The need to include more training in foundational knowledge from sociology, ethnography and anthropology for students in applied social sciences was identified long ago. Our experience confirms this should be a priority when developing quality graduate curriculum in applied social sciences (DeLyser 2008; Navarro 2005; Thorne, 2011).

Class heterogeneity explains the varying levels of preparation of students from one year to the next, but it also impacts on other aspects. Flexibility is therefore needed to adapt the content and the pace of the course to different rhythms, but as others have noted, the extra effort this requires stimulates collaboration and results in satisfactory learning outcomes (Arvaja 2007; Hämäläinen 2012). Extra lab workshops offered by appointment and use of the online platform facilitate pacing, but some participants may feel held back by the group or by their teammates, while others will have trouble keeping up. Supplemental readings for the former, step-by-step tutorials for the latter, and open discussions in class and online are the most concrete and effective solutions we could come up with to meet these differentiated needs.

This course requires a greater investment of time from students and instructors than many others. Rigorous planning is the best solution to tackle time management issues. Requiring a research design and a preliminary coding report early in the semester has had a very positive impact on pacing. By forcing students to establish clear and realistic objectives early on, we allow them to develop a work plan they can refer to if they drift off course or if their enthusiasm makes them lose sight of deadlines. In those cases, it can be useful to sit with the professor to realign their project on more preliminary or exploratory objectives, but it can take time for the students to accept the changes in direction and strategy this requires (Delyser et al. 2013). However, some remain too ambitious and unfortunately experience anxiety and disappointment when, despite our warnings, they continue to push through with their initial objective. We note that those students often have no prior research experience (either as part of their education or as a research assistant, for example), which probably explains their unrealistic vision of the complexity and workload involved in qualitative and mixed analysis. Anticipation of potential crisis and timely adjustments of requirements by the instructors acting as facilitators and masters can foster the development of autonomy in planning and carrying through a project (Aitchison et al. 2012; Breuer and Schreier 2007).

Finally, the rapid succession of new software versions poses some logistical and programmatic problems. Since 2007, there has been a new version of NVivo almost every year (or even twice a year, counting incremental updates to multilingual packages), so the step-by-step tutorials have to be constantly revised to reflect changes in the software. Furthermore, at the institutional level, the impact is important as there are dozens of computers in research and teaching labs that must be updated each time. The best efforts are made to plan ahead, as instructors are notified and given access to new versions before they are made publically available, but in reality the technical part of the upgrade cannot always be performed in a timely fashion.

Conclusion

In this article, we have described the hands-on/hands-off pedagogical approach and the tools we developed for this multidisciplinary graduate social research methodology course. In our critical analysis of the course, we have shown the main strengths and limitations of the approach as well as the solutions we implemented to improve the quality of the course.

Overall, the dual hands-on/hands-off dynamic was developed to ensure that students will leave the course with a solid experience in qualitative analysis and advanced skills with NVivo that can at least partly be transferred to other software of the same category. In this sense, the quality of the students' grades, the students' evaluations and the growing popularity of the course in other departments and other institutions are three indicators that confirm we reached our pedagogical objectives. We consider that the most important, original and relevant contribution of this course to the graduate learning process is achieved by encouraging applied and concrete work with the software while stimulating some reflexive distance to see the 'bigger picture' of the analytical process. The objectives of the course are clearly met and most of the students understand that qualitative analysis software offers a lot of benefits, but does not change the foundations of this approach. The analysis cannot be made subordinate to the software, as it dominates and subjects it to the epistemological and scientific principles that guide the approach, which is always selected and lead by the researcher and not the tools. We also wish to emphasise the importance of working with pre-existing data and of restricting the scope of the class to the analytical dimension in order to reach the depth and quality of instruction expected at the graduate level. It is thus very important from a curricular perspective to make sure other training is offered for producing data. It should also be noted that the instructors for this type of class have to be very experienced not only with NVivo, but with a wide range of qualitative and mixed-methods as well as conceptual frameworks and theories to meet students' expectations and needs in the diversified field of social sciences. Our experience may help those involved in social research curricular planning, supervising and teaching to consider offering inter-departmental courses in methodology, making the most of the resources and experts available for as many students as possible. Such courses might also lead to a higher quality of teaching with a multidisciplinary experience for graduate students in social sciences and humanities. It is our hope that this enriched learning experience and the deepening of the epistemological reflection can contribute to make research methodology a more accessible, pertinent and engaging part of the graduate curriculum.

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