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The Challenges of Teaching Qualitative Coding: Can a Learning Object Help?

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Challenged by some of the inherent difficulties in teaching qualitative data analysis, three instructors created an interactive digital learning object entitled "Sleuthing the Layered Text: Investigating Coding." In this paper we assess the effectiveness of that learning object as a tool for teaching qualitative coding. On the face of it, learning objects—a form of instructional technology that has been criticized for tending to be objectivist and content-driven—would appear to be ill-suited for teaching qualitative analysis, an open-ended, interpretive and subjective process. However, based on student evaluations from two very different undergraduate courses, we found that the learning object did prove to be an effective medium for teaching coding. We attribute this success to its design, which incorporates best practices of classroom instructors, and also to the integration of the learning object into our courses. Nevertheless, student feedback cautions us that the learning object is not a technological fix. The degree to which students valued the learning object over other methods of instruction was moderate, and some were leery about this form of digital technology substituting for classroom teaching, even though this was not our intention.

Qualitative data analysis is notoriously difficult to teach and made even more difficult when taught in the learning environment of large, lecture-style undergraduate courses (Clark & Lang, 2002; Stalp & Grant, 2001). Conscious of this, three researchers who have all taught qualitative methods in various contexts—introductory methods courses, upper-year substantive courses and supervision—came together in response to a call for proposals for digital learning resources. We were looking for more effective ways to teach qualitative coding at all levels of undergraduate instruction, including large classes. The outcome of our collaboration was "Sleuthing the Layered Text: Investigating Coding," a unique interactive learning object.

Learning objects (LOs) are web-based instructional modules organized around specific learning objectives. Thus their purpose is to create self-contained, self-explanatory "virtual learning environments" (MacDonald et al., 2005, p. 81). Their design may incorporate various media including text, graphics, animation, audio and video, and any number of instructional elements such as tutorials, simulations, exercises, games, glossaries and quizzes. LOs are thought to enhance learning by being "engaging, interactive and fun" (MacDonald et al., p. 81). As web-based resources they are accessible at any time and can be used simultaneously by any number of learners. They are flexible, also, in allowing learners to navigate the content and activities at their own pace according to their learning needs.

In many cases, learning objects provide instruction on a clearly-defined subject matter or technique; however, in creating ours, we set out to impart a complex skill—that of taking loosely organized textual data from interview transcripts or field notes and, through qualitative coding and analysis, deriving well-substantiated sociological argument. In "Sleuthing the Layered Text," we likened qualitative coding to detective work; in this paper we make the LO itself the object of investigation as we evaluate its effectiveness in helping us teach coding.

The Challenges of Teaching Qualitative Coding in Undergraduate Classes

The challenges we faced as teachers of qualitative research to undergraduate students provided the impetus for us to create the LO. Four types of pedagogical challenges in particular brought us together, all of which relate to the complexity of qualitative methods and their unfamiliarity to many of our students who are better acquainted with quantitative methods. The first and perhaps the most basic pedagogical challenge is responding to the feelings of uncertainty and anxiety many students experience during the initial stages of coding about what the outcome of their analysis will be (Hein, 2004). Uncertainty is in the nature of qualitative coding. The process almost always delivers fresh insights, but researchers are rewarded only after an indeterminate period of slogging through data. This slogging typically unfolds slowly and iteratively, and sometimes it takes researchers down dead end paths. Just as some seasoned qualitative researchers admit to feeling daunted as they begin qualitative data analysis, students who are yet to experience 'ah-ha's' from this process are all the more likely to feel trepidation when first learning to code (Clark & Lang, 2002; Connolly, 2003). Our challenge as instructors is to impart confidence in the process without minimizing the intellectual work involved.

A second set of pedagogical challenges relates to the readiness of our undergraduate students to embark on qualitative coding. Most students show up in our courses with an engrained sense of research as hypothesis testing. By the time they are asked to perform qualitative data analysis, most have already taken or are concurrently enrolled in a course in statistics. Their experience of research has entailed the progressive mastery of a set of standardized techniques that produce a single correct answer. As they are introduced to qualitative methods, they learn that the unitary epistemological framework of positivism, on which they may have relied in other courses, does not always hold sway in this research context. Epistemological debates abound in qualitative research, and to compound this complexity, the criteria for authorizing research findings as valid and reliable are also debated. As Hein (2004, p. 27) comments, the struggles of his graduate-level students to understand the diversity of approaches to qualitative inquiry are linked to their prior training in the quantitative research paradigm "and its criteria for evaluating research. These beliefs in quantitative research are often so ingrained that students are unaware of just how deeply they are held." While methods courses and textbooks address key differences between qualitative and quantitative research paradigms, it is in the actual hands-on practice of qualitative analysis that students often struggle the most to grasp this new way of thinking about research (Raddon, Nault, & Scott, 2008).

The interpretive and subjective nature of coding introduces a third pedagogical challenge because it means that coding must be guided by a researcher's theoretical understandings and research questions. While there are a number of philosophies to coding, the general pattern requires that researchers read through a transcript multiple times, with each pass through the data taking the researcher into more abstract observations. One common way to approach this procedure is to distinguish descriptive, open, low-inference, or manifest codes from abstract, focused, axial, high-inference, or latent codes. Ultimately these focused codes lead to the development of over-arching themes. Sometimes researchers approach a data set with 'sensitizing concepts,' which are interpretive devices that help bridge the gap between evidence and theory, that is, between the concrete data and the more abstract, conceptual framework that emerges from the analysis (Bowen, 2006). Students who are still gaining a conceptual vocabulary and familiarity with social science debates will have a smaller repertoire of sensitizing concepts to use as starting points for qualitative analysis (Taylor & Bogdan, 1998, p. 140). Also, because of a lack of exposure to theoretical thinking, some students have difficulty grasping the distinction between a descriptive code and an abstract one (Blank, 2004). In the same way, when students move between concrete and abstract levels of analysis, they may have difficulty explaining their inferences. They may fear they are being too subjective in their interpretations, or they may be troubled by the multiple possibilities of coding. So, to teach coding is to teach theoretical thinking as well as the ability to handle complexity and ambiguity (Hein, 2004; Hopkinson & Hogg, 2004).

Imparting confidence and a certain degree of independence is important, too, since even procedurally there is no single way to code (Esterberg, 2002). Ideally we would want students to feel free to practice a variety of techniques. However, instructors are often faced with a dilemma; as soon as they model one coding technique, this is the one the students emulate. So, the pedagogical challenge of coding is to convey to students not only that there is not 'one answer' that they must discover but also that there is not 'one procedure' to arrive at that answer.

While we hope that our students will be excited by the creativity of coding, the reality that we have experienced is that they need encouragement to endure the meticulous work and intellectual risk-taking that coding requires. They also need many opportunities for hands-on practice, to learn from others, and to receive feedback and direction. Indeed, this is how many of us have learned—as graduate students working with our own data with the support of supervisors, or by apprenticeship through working as research assistants on the projects of more senior researchers (Breuer & Schreier, 2007).

Limitations of Available Resources and Strategies

In developing strategies to address these challenges, the resources at our disposal frequently provide a limited form of help. For instance, the substantive qualitative research articles that we give students to read are of limited value in teaching qualitative coding because researchers seldom publish their data or write in detail about the process of data analysis (Barrett, 2007). While qualitative methods textbooks are widely available, we noted that these books emphasize qualitative research design and data collection much more than they do qualitative data analysis. To confirm this impression, we took a convenience sample of 10 qualitative methods textbooks that at least one of us has used in our teaching or as a reference book. We found that among all 10 books, a total of only 52 pages, or 2 percent, were dedicated to qualitative coding. A larger proportion of the books was dedicated to qualitative data analysis, but even this amounted to only 13 percent of the books' total page count (see Table 1).

Table 1
Coverage of Coding in Qualitative Methods Textbooks

Author	Total pages	Analysis pp	Coding pp
Berg (2007)	366	36	11
Bogdan & Knopp Biklen (2003)	235	37	5
Creswell (1998)	229	25	3.5
Esterberg (2002)	256	47	5
Glesne (2006)	220	25	4
Kirby, Greaves & Reid (2006)	257	35	10
Maykut & Morehouse (1994)	163	45	5
Schram (2003)	134	0	0
Shank (2002)	208	19	5.5
Warren & Karner (2007)	294	32	3
Total page count:	2362		

Total page count dedicated to analysis: 301 (13% of total pages)
Total page count dedicated to coding: 52 (17% of analysis and 2% of total pages)

Before beginning work on the LO, we also considered using qualitative data analysis software for teaching coding. However, we doubted that the tutorials distributed by software companies could teach coding as both an analytical and a creative process, considering that, as Johnston (2006) points out, such tutorials are "specifically designed to teach *software processes*, not qualitative research methods per se" (p. 386). After looking at demonstration versions of two software packages, we concluded that they tend to give an impression of coding as a mechanical, linear, and algorithmic operation, whereas we wanted to convey that coding can be an open-ended activity for seeing meaning in data and something that may be done without specialized software.

And so this is how we came to the project of creating our learning object. With a desire to teach coding experientially at the undergraduate level but faced with the difficulty of apprenticing an entire class or even managing students' anxieties, we were looking for new pedagogical strategies and teaching tools to incorporate into our courses. But why create a learning object, what would it look like, and how effective could it be in helping us teach coding, given the challenges we have identified? We answer these questions in the following sections with a review of the literature on learning objects and on classroom-based strategies for teaching coding. We then describe the learning object we developed and present the results of quantitative and qualitative student evaluations of its learning value and functionality. These evaluations help us answer the following:

1. Did students learn what we hoped they would learn about qualitative coding by using the learning object?
2. Did students find value in the learning object as a teaching tool?
3. Was the learning object a useful medium for teaching students about qualitative coding?

Can a Learning Object Help?

An integral aspect of the concept of LOs that appealed to us is their reusability (Barritt & Alderman, 2004; D. A. Wiley, 2000). Their on-line storage makes them retrievable for use with successive groups of learners in the same course, and their focus on discrete learning objectives makes them resources for use in different courses in which those learning objectives are relevant, such as our qualitative research methods courses and subject-area courses requiring qualitative analysis located in different departments and disciplines. To facilitate reuse, each LO is encoded with information about its characteristics (title, author, format, and so on). International standards prescribe the categories for this descriptive information, known as "metadata," to ensure that LOs may be identified through searches of on-line repositories. Once located, LOs may be made available to learners through course management system software such as Blackboard, WebCT, and Sakai.

The potential utility of LOs in multiple educational and training contexts has generated a sizable industry around their creation and reuse, along with a burgeoning literature, mostly technical and promotional in orientation. Most champions of instructional technology tout LOs as cost-effective vehicles for creative and effective learning (see Bennett & McGee, 2005), but a handful of authors resist the notion that LOs can be a technological fix for the pedagogical challenges of higher education and the fiscal constraints of academic institutions. These critics raise a number of points, ranging from concerns deriving from the funding of LOs by the US Department of Defense for the purpose of 'anytime/anywhere' military training, to doubts that LOs will meet the promise of reusability (Friesen, 2004; Parish, 2004). While we shared many of these concerns at the outset of this project, within this paper our focus is on the suitability of LOs for the challenges of teaching qualitative analysis. We were drawn to the concept of an LO but had to ask, is there

anything inherent in the LO model that would limit their effectiveness for teaching qualitative coding?

This question arose for us out of skepticism triggered initially by the very term 'learning object,' which, as we later learned, originated in a specialized area of software programming that involves generating standardized code to be borrowed by other programmers. Debate about the appropriate name for and definition of LOs suffuses the literature. We would agree with Ip, Morrison, and Currie (2001) and Friesen (2004) that the reference to object-oriented software design in the term 'learning object' is meaningless to educators and reveals the dominance of technologists in the propagation of the concept. More troublesome for us, the word 'object' in learning object connotes an objectivist orientation to knowledge and learning. As Parish (2004) argues, describing representations of knowledge as objects "inclines people to believe that knowledge itself is objective, rather than subjective, tacit, and dynamic" (p. 59). Of course, an objectivist understanding of knowledge is a cornerstone of the positivist paradigm that tends to dominate our students' ways of thinking (Hein, 2004). As qualitative methods instructors, this is the kind of default assumption that we are attempting to shift to make space for alternative conceptions.

We had some initial worries, too, that creating a learning object could be an exercise in packaging the complexities of coding into an overly simplified consumable experience for our students. The critics have pointed out that an excessive focus on delivering content and a tendency toward abstraction from context have made the majority of LOs reductionistic, didactic instruments that perform little more than "information shoveling" (Ip et al., 2001; Parish, 2004; D. Wiley et al., 2004). As these commentators caution, LOs are more often conceived as "content chunks or information containers" than as resources for use in active learning contexts (D. Wiley et al.).

In the end we were not deterred by the term 'learning object,' and we were reassured by the instructional technologist at our institution (whose job it was to promote LOs to faculty and to support us with his technical design expertise) that the format was amenable to the kind of contextualized, interactive learning situation we were hoping to create. Nonetheless, the unusual nature of our learning object, because of its focus on teaching analytic skills rather than conveying specific content, sometimes offered new challenges to the technological support team that built it. We insisted on a complex design, knowing that the success of our project would depend on how well the LO could approximate the best elements of classroom teaching.

Classroom-based Strategies for Teaching Qualitative Coding

Although the pedagogical literature seems to lack well-documented strategies for teaching and modeling qualitative coding, we were able to identify five articles by both graduate and undergraduate instructors who teach coding as the fundamental process in qualitative data analysis and who present clear strategies to address a range of the challenges to coding. These documented strategies are all classroom based, as distinct from digital, and they suggested to us a set of best-practices which we attempted to incorporate into the design of the LO.

Most significantly, all five articles address the challenge of demonstrating that coding may result in multiple interpretations of the data. These instructors did so mainly by leading students through an exercise of coding a common text or textual data set and then using class discussion, often in conjunction with small group work, in order to allow students to articulate and compare their interpretations. Instructors were creative in how they identified or generated these shared texts. In Roger Clark's undergraduate methods course, for example, the data set consisted of students' written commentaries about an image of Sojourner Truth (Clark & Lang, 2002). All the student commentaries were collated anonymously and distributed to the class for coding.

Instructors tended to use a combination of independent activity, small group work, and larger discussion formats so that students could compare and reflect upon their choices and brainstorm new ideas together. As a result of the group discussion in Clark's classes, for example, students became aware that "their decisions represented only a few out of an infinite variety that could have been made" (p. 352). Similarly, group work turned out to be the key experiential process in a coding workshop led by Philip Burnard because students discovered that the coding categories they had identified individually differed from those of their peers. Burnard writes, "Learning [coding] as a group reinforces the subjective nature of qualitative data analysis… There is rarely one right way to analyze textual data, unless a very mechanical form of content analysis is used in which words and phrases are counted" (p. 281). Accordingly, we aimed to design our LO so that it could support a variety of learning situations, especially group discussions where students compared their coding results.

All five of the instructors whose exercises we reviewed also sought to help students make stronger connections between theory and data. In Stalp and Grant's (2001) undergraduate course on field methods, for example, students were asked to apply a previously developed coding scheme (set of analytical categories)

to a set of personal ads that had been distributed to each student. In discussion of the exercise, students learned that they had to provide a theoretical rationale for their classification choices. Similarly, we designed our LO to model how researchers engage in a dialogue of theory and data, and to give students practice in doing the same.

Another commonality among the exercises that we sought to emulate in the LO was their reinforcement that coding is a multi-stage process. In three of the courses that were reported on, students first generated a coding scheme from close examination of the data set and then in the next stage practiced applying the scheme to the data. Philip Burnard's postgraduate nursing students, for example, first worked in pairs to code a common 3 to 4 page interview transcript. Then as a class they discussed the various outcomes before agreeing upon a common coding scheme. The final stage of the exercise was to apply this coding scheme to the same text by marking up the transcript with coloured pens (Burnard, 1996). A sociology graduate course taught by Grant Blank followed a broadly similar process but required students to work independently on a more rigorous set of exercises with a larger data set (Blank, 2004).

In these exercises, as in our LO, instructors created opportunities for hands-on practice in order to teach the core lesson that "in qualitative analysis, phenomenon are not always clearly bounded and classifiable into mutually exclusive categories in the manner presumed in many quantitative approaches. Rather, phenomena can be multi-layered and have variable meanings" (Stalp & Grant, 2001, p. 211). What seems to be lacking in four of the five exercises, however, is a way to convey to students the diversity of methodological and theoretical perspectives that inform researchers' approaches to qualitative data analysis.

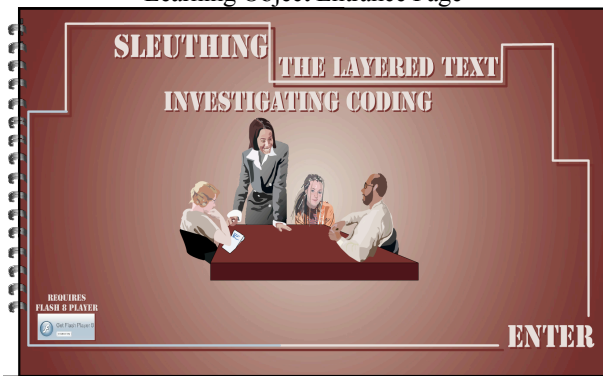
Only one course, a small, upper year undergraduate course reported on by Karen Harlos and her colleagues, provides an instructional format that fills this gap (Harlos, Mallon, Stablein, & Jones, 2003). Harlos invited a panel of three guest researchers to each model a distinct epistemological approach to the reading of a three-page transcript. The three guest researchers represented interpretive and critical perspectives, but the authors note that the panel could have been expanded to include a realist, functionalist, phenomenologist, or representative of any other intellectual tradition that employs qualitative methods. Each of the three guests already had introduced themselves to the undergraduate class in separate guest lectures about their research programs, which centered around interpretive interviewing for the first researcher, grounded theory analysis for the second, and critical discourse analysis for the third. On the day of the panel, the three researchers and the students received the three page transcript excerpt for the first time. The nearly two hour session engaged panel members and students in two successive rounds of close reading of the transcript and discussion of their initial thoughts, tentative insights, questions about the data and ideas for exploring further connections. The session succeeded in demystifying the process of qualitative analysis as the researchers talked through their feelings about the data and made explicit their reasons for reacting as they did. As Harlos et al report, the session also left students "variously excited, intrigued, irritated, and concerned about the multiple possible readings of the text" (p. 314)—a similar outcome to the other exercises. Harlos' students also practiced coding along with the panelists and had the opportunity to compare notes as they questioned the more experienced researchers.

In the next section we show how "Sleuthing the Layered Text" incorporates the main features of these documented teaching strategies, particularly the provision of a common excerpt from a transcript, the opportunity for students to practice two stages of coding on their own, and, following Harlos et al, the comparison of different approaches to coding.

A New Strategy: The Development of the Learning Object

We designed "Sleuthing the Layered Text" to achieve five learning outcomes, which were, in ascending levels of complexity: to understand coding as interpretive and subjective, to recognize multiple coding philosophies and techniques, to distinguish between open and focused types of codes, to experience coding as a multistage practice, and to perform both open and focused coding given the opportunity for hands-on practice. Built in the technical format of Flash, the LO features audio and video media and takes about 30 minutes to complete. It can be the basis for group discussion, as the instructional literature would recommend, and students can also use it independently in their own time.

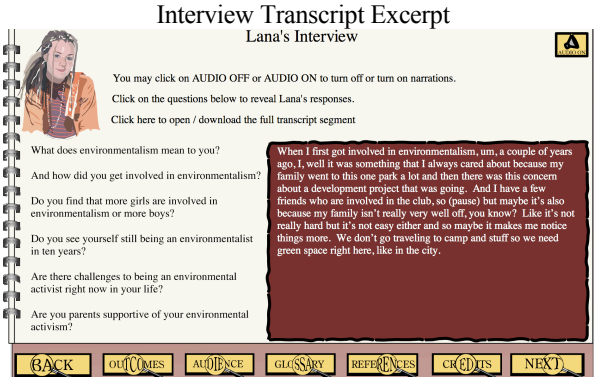
Figure 1
Learning Object Entrance Page



After a welcome message and a one-paragraph explanation of qualitative coding, it begins by introducing students to the data—a fictitious transcript of an interview

with a fifteen year old high school student who is involved in her school's environmentalism club. The transcript excerpt that is presented is said to be taken from one of thirty interviews with young environmentalists.

Figure 2
Interview Transcript Excerpt



The transcript excerpt is to be coded by three very different researcher personas, the three 'sleuths' who are introduced next. Each persona presents his or her theoretical interests, which primes students to read the transcript through different theoretical lenses and to notice how the salience of the text changes accordingly.

Figure 3
Discourse Desiree

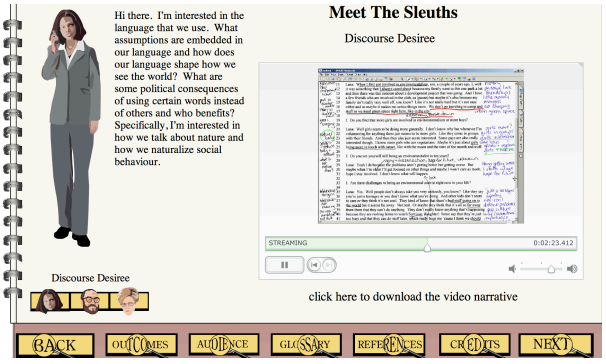


Figure 4
Social Movement Sam

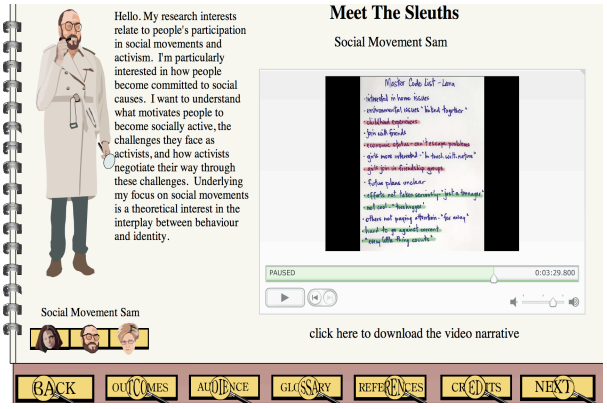
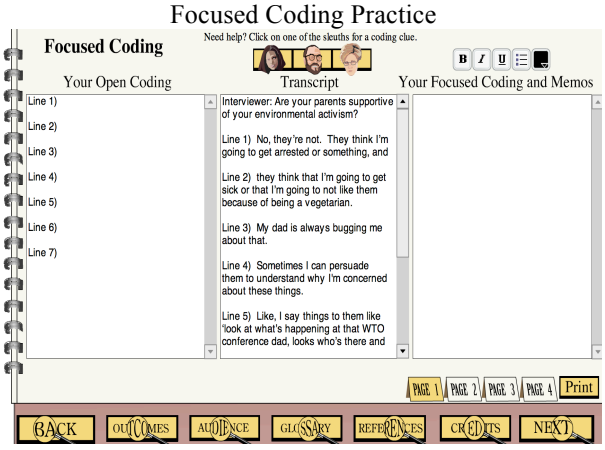


Figure 5
Political Economy Paula

Through short movies focused on the marking of text, students watch and listen as the three sleuths proceed to code the same text in order to model their different approaches. While coding the transcript excerpt in stages, the researcher-sleuths demonstrate how to focus and refine their coding categories. They explain their method of working with the data and convey how they arrive at higher levels of abstraction with each reading of the data. Each researcher is distinguished by his or her distinctive hand-written notes in the margins and by various techniques for recording or applying codes, such as the use of color highlighting, underlining, a code book, memos, or a master list of codes. In this way, the LO visually demonstrates the basic lessons that the same text can support distinct sets of interpretations, that analytical acuity develops through repeated close reading and marking of a text, and that practical techniques for coding may vary.

After viewing the demonstrations, students are then presented with another segment of the transcript for their own practice. In this part of the module, students have the opportunity to do two levels of coding, which we call open and focused, and to print their results.

Figure 6
Focused Coding Practice



During focused coding they are prompted towards greater abstraction through the help of optional hints from each sleuth that they may select if stuck. Such hints involve questions that encourage more critical and abstract engagement with specific lines in the text. At any point they can use arrow buttons to navigate backwards or forwards and they can open up a glossary of basic terms such as 'code,' 'memo,' 'qualitative research,' and so on. After the practice component, students proceed to a yes/no quiz that allows them to self-assess their comprehension of the main ideas and vocabulary that were conveyed throughout the LO.

Evaluation of "Sleuthing the Layered Text: Investigating Coding"

As mentioned, learning objects are typically housed in searchable on-line repositories so they can be available to instructors in various institutional settings and disciplines. Before our own LO was linked to its repositories, we conducted quantitative and qualitative evaluations of its effectiveness with two different groups of students. The purpose of this evaluation was not only to assess learning outcomes (Did students learn what we hoped they would learn about qualitative coding using the learning object?) but also to assess the value of the LO itself as a learning tool and as a medium for teaching about qualitative coding. For such an evaluation, comparison of results with a control group that did not use the LO would have been ideal, but because each instructor had introduced other changes to her courses and/or coding assignments, an appropriate control group did not exist. Our next best evaluation method was student self-reporting. For this we used a generic learning object evaluation tool that had been developed by a group of researchers at the Centre for Learning and Teaching through Technology at the University of Waterloo (Schoner, Buzza, Harrigan, & Strampel, 2005). The questionnaire provides quantitative data on four variables: a learning object's learning value for students, the 'value-added' it contributes to other components of the course such as lectures and readings, the usability of its design, and its technical functionality. The questionnaire also provides for qualitative evaluation through three open-ended questions:

1. What were the main strengths of the Qualitative Coding learning object?
2. What were the main weaknesses of the Qualitative Coding learning object?
3. In your estimation, is it desirable to use technology to support teaching and learning in campus-based university courses? Why or why not?

This evaluation instrument had been used already with at least nine different LOs with different instructors in at least that many courses at different universities. Vivian Schoner and colleagues selected four of these studies in order to demonstrate the questionnaire's flexibility in assessing a range of LOs across disciplinary and course contexts (immunology, human nutrition, particle physics, and introductory chemistry). In addition they compared questionnaire results with instructor interviews in order to confirm the face validity of the questionnaire as an evaluation tool.

We assessed "Sleuthing the Layered Text: Investigating Coding" in two very different courses: a high enrolment, required qualitative methods course (Year 2 Methods) in a Sociology department (n=66) and a smaller, elective, advanced, content-related seminar course (Year 4 Seminar) in a department of Child and Youth Studies (n=17). The Year 2 Methods students were given the LO to work with in a 50 minute session in a computer lab. Five groups of approximately 15 students used the LO at individual computers in the lab with the instructor or a teaching assistant present to answer questions about both the LO and how the instruction applied to their upcoming coding assignment based on data from another course project. The last screen of the LO prompted students to complete the voluntary on-line questionnaire that was appended to the module. Sixty-six students submitted their answers electronically to a questionnaire database.

In the Year 4 Seminar class, 17 students completed the questionnaire on paper in class, having used the LO outside of class as a prelude to completing a coding assignment with another data set. In this case, in order to see that students actually had used the LO, the instructor required them to turn in their LO-generated practice coding at the same time they submitted their assignment. This practice coding was not evaluated. In both courses, the instructors timed the introduction of the LO to follow their own lectures and assigned readings on qualitative coding.

Because the questionnaire was in two parts, with the open-ended qualitative questions following a series of Likert-type quantitative questions, we analyzed results for each part separately.

Results of the quantitative evaluation. The results of the quantitative section of the questionnaire are reported in Appendices A, B, and C. Appendix A presents the item by item results for the Year 2 Methods class, and Appendix B does the same for the Year 4 Seminar class. Appendix C compares the results for both classes, including the percentage of students who 'strongly agree' and 'agree' with each questionnaire item. Appendix C also includes the mean scores for each item, the grand means for the four main variables, and the results of two-way t-tests of significant differences between the mean scores of the two classes.

Overall, the results of the questionnaire show that a majority of students in both classes had a positive experience of the LO across all indicators. Further, the evaluations of the LO by the two classes were highly congruent, which suggests that the LO can be successfully integrated into different learning environments. More specific findings related to the four main variables of the questionnaire are presented below.

Learning value. Items related to the learning value of the LO received high scores. Averaging these items indicates that approximately 92 percent of Year 2 Methods students and 84 percent of Year 4 Seminar students 'strongly agree' or 'agree' that the LO helped them learn qualitative coding. Both groups of students showed the strongest level of agreement with items that related to the LO providing them with an alternative way to learn the course material, including that the LO helped them "visualize the concept better" and learn the material "in a new way" and "at my own pace."

In comparing the scores of the Year 2 Methods and Year 4 Seminar students, no significant differences were found in the ratings for any of the questionnaire items, although the percentage of agreement and overall means for all items were higher for the Year 2 students, suggesting that the Year 2 Methods students found the LO to be more valuable to their learning than the Year 4 Seminar students. The widest differences were for the items related to understanding the concepts and integration of the LO with other course components. We can see how this difference would result. For example, the Year 2 Methods course was centrally focused on learning the techniques and concepts of qualitative methods, whereas in the Year 4 Seminar course the coding exercise was brought in as a tool to help students analyze data that they were to then use in the preparation of a comprehensive paper. Also, these students in Year 4 had already been exposed to qualitative research in a previous methods course. Given their background knowledge, they may not have had as much to learn from the LO as the Year 2 students.

Value-added. Compared to the other three variables, in both classes the scores were lowest for the variable related to how the learning object 'added value' to other forms of instruction. Among the Year 4 Seminar students, fewer than two thirds "strongly agreed" or "agreed" that the LO was a valuable supplement to other forms of instruction. The items for this variable also received the lowest mean scores. It should be noted that very few disagreed and none "strongly disagreed" that the LO added value, but a sizable minority in both classes expressed ambivalence about the advantages of the LO in comparison to lectures and assigned readings. In the questionnaire, value-added was conceptualized in terms of whether the LO was able to replace lecture or textbook learning, reduced the amount of time spent studying notes, and exposed learners to situations that could not be done in the classroom or through textbook reading. Of the three items, highest ratings of agreement were for the item related to exposure to new situations, which corresponds with the high ratings of the learning objects as an alternative way to learn the course material. However, the low ratings of agreement for both the potential of the learning object to replace in-class or textbook learning and reduce the amount of time spent grasping new material are important to note, as it suggests that for these students, the LO did not provide an easier or faster learning avenue. The qualitative results (below) help us interpret this finding.

Usability. Another variable that received high ratings and the highest mean scores for both classes was 'usability.' On average, over 90 percent of students considered the LO easy to use, with no significant differences found between the two classes on the questionnaire items related to their ability to navigate through the module, understand instructions, and follow the flow of the material. We are pleased by these results as we felt that we had developed a LO that was quite complex and ambitious, yet students reported that the content was well sequenced and intuitive. For us, it showed that it was possible to incorporate a linear and stepwise learning module into an interpretive and subjective process.

Technological functioning. That said, the variable 'technical functioning' received mixed scores from students, with the students from the Year 4 Seminar class rating two of the items significantly lower than the Year 2 Methods students. While almost all students in both classes found the technology suitable in terms of their skill levels, the Year 4 Seminar students reported experiencing technical difficulties and hardware and software problems with the program. These ratings are in part due to a problem with the printing function that arose for the Year 4 Seminar students who tried to complete the LO from their home computers and who were expected to print something and hand it in. The printing problem has since been corrected, but we are left to wonder whether the questionnaire results should be taken as anomalous or whether such 'glitches' are actually endemic to interactive instructional technologies.

Results of the qualitative evaluation. We coded and reflected upon students' open-ended comments in order to identify patterns in responses that would embellish the numerical ratings and convey in more detail the way they felt the LO helped or did not help them learn. The qualitative comments were particularly useful in conveying student attitudes towards the LO as a medium of instruction. Coding of the qualitative comments involved several passes through nine pages

of qualitative comments from the second year course and three pages from the fourth year course, affixing descriptive codes to each comment and then distinguishing between the most common codes and the 'negative cases.'

Supporting the quantitative data, students identified a number of strengths in the LO, with a majority of student comments falling into one of five codes. Year 2 students, in descending order of frequency, suggested that the LO was easy to use (15), visually engaging (10), an opportunity to practice coding (5), successful at providing different perspectives (4), and interactive (2). Year 4 students similarly felt that the LO was easy to use (6), visually engaging (3), successful at providing different perspectives (3), an opportunity to practice coding (2), and interactive (1). As we have discussed, it is particularly difficult to teach coding without providing students with a singular template which they all then follow. Therefore one of our main goals in producing the LO was to provide an avenue for communicating the multiple approaches to coding that can be taken. While this was not identified as frequently as the more practical elements of the LO, seven students noted this advantage in comments such as:

> We got to see what three researchers' coding looked like. We could see how they underlined, or highlighted and we got to see how they go about the process of coding. It was also very interactive and I like the fact that we could work at our own pace. (Year 2 Methods)

> Easy to navigate, provided a number of perspectives/techniques for qualitative coding. (Year 4 Seminar)

> Interactive, gave good visual examples of coding, showed different perspectives and how they affect coding. (Year 2 Methods)

> I thought it was very helpful because it was a visual way of learning the coding process, and it took you through it step by step. I also think it was useful that three different perspectives to coding were shown. (Year 2 Methods)

Many other students commented more generally on how the LO provided a helpful opportunity to practice coding, particularly as they found the technology to be familiar, flexible and, for the most part, easy to use.

> The program was separated into very logical, very in-depth steps that were really easy to follow and understand. Also, the "sleuths" were very efficient in bringing forth relevant information, tips and pointers. (Year 2 Methods)

The second year students were particularly pleased that the LO provided them with a visual representation of coding:

> I enjoyed "watching" as the researchers coded the transcript. Watching the coding as well as listening to their thoughts was very helpful (Year 2 Methods).

Overall, a majority of second year students commented either on the ease of use of the LO or the appeal of the LO's visual dimension.

Students also noted various weaknesses to the LO. Eight of the Year 2 students felt that the room they were coding in was too noisy because they were in a lab with many other students who were listening to the LO at the same time. This was their most significant complaint, although another five also encountered technical problems despite the common response that the technology was easy to use. Others found the LO boring/repetitious/long (6), even though it only took half an hour to complete.

> [A main weakness was] when the 'sleuths' … seemed to ramble on about the same things over and over. (Year 2 Methods)

> …is very tedious work. (Year 2 Methods)

The Year 4 students' noted weaknesses were almost entirely related to technical problems—they provided twelve comments to this effect. Not only were the fourth year respondents frustrated that the print function did not work properly, but others found that they lost their work when they hit 'back space' or found the font too small during several of the coding presentations.

Finally, in terms of weaknesses, six students from the second year course remained confused about focused coding, despite the assistance of the LO, highlighting the on-going challenge of teaching coding and the importance of supplementing any technology with in-class teaching.

> I found it somewhat confusing because I did not entirely understand the focused coding aspect (Year 2 Methods)

> It perhaps didn't focus enough on explaining the differences between open and focused coding. Maybe a little more insight into these is necessary (Year 2 Methods).

These comments suggest to us that a LO is best supplemented by in-class teaching and more personal guidance.

Finally, when asked about the overall value of using technology such as learning objects as part of campus-based courses, Year 2 students again cited the value of hands on/practice (9), how it fits well with the role of technology in their lives (8), that it is a new approach (6), the visual nature of the LO (3), and that it works best as a supplement to classroom teaching (2). Year 4 students also appreciated how the LO fit with the role of technology in their lives (6) but were more likely to stress that it should be a supplement to classroom teaching (4). They also suggested it provides good practice (3), although one said that it offered nothing new (1). Overall, most students were positive, citing their ease and familiarity with technology and valuing the option of hands-on practice.

> We run and depend on technology now so it is very desirable, if we can sit in our own room and learn I'll take it. (Year 4 seminar)
>
> …the multimedia is more captivating than just a textbook. (Year 4 seminar)
>
> I think it is desirable because every student knows how to use a computer and you made it easy enough to use this learning object so I think everyone learned something for this assignment. (Year 2 Methods)
>
> …it is a different way of learning, and more hands-on, which allows for better understanding. (Year 2 Methods)

The more critical responses to this question help explain the slippage in scores on the questionnaire items about 'value added.' Five of the Year 4 Seminar students registered concerns that the LO, while a "great complement" to classroom teaching, "should not take the place of in-class learning" (Year 4 Seminar). The slightly higher quantitative scores by the Year 2 Methods students may be explained by the fact that an instructor was present when they used the LO. Indeed, two of the Year 2 Methods students wrote that a limitation of the LO is that it cannot answer their questions in the way that an instructor can. One summed up this position by stating, "I think it is desirable to use technology as a supplemental teaching tool. Lecture and teaching assistant help holds its value as well because you can ask questions and get insight" (Year 2 Methods).

Discussion and Conclusions

On the whole, both groups of students showed enthusiasm for the qualitative coding LO, but as Kay and Knaack (2007) observe, many evaluation studies similarly report that LOs are well received. The important question is, did the LO help students learn what we wanted them to learn? Based on the strongly positive student self-reports of learning value, we think it did. Moreover, because practice with the LO was closely linked to the completion of coding assignments which were evaluated, students were in an excellent position to comment on whether the LO benefited their learning. This is especially true of the Year 4 Seminar students who completed the questionnaire after they had received feedback on their coding assignment.

Another question that arises is why the questionnaire items to do with 'value added'—how well the LO augmented other forms of instruction—received lower scores. Gauging from the written responses, this section of the questionnaire taps into some students' concern that the introduction of instructional technology in general may be advancing administrative cost-cutting agendas in the context of diminishing resources for undergraduate education. Although a majority of students did agree that the LO helped them in ways that traditional formats did not, the large number of tentative responses suggests that where a LO is not supported by and integrated within other forms of classroom instruction, students will respond more negatively to it.

The question that remains is whether the LO was a useful medium for teaching students about coding considering the challenges we identified at the outset. It turned out that introducing such a complex process as qualitative data analysis was a lot to ask of a LO, and we were aware of the compromises to both content and process that had to be made. For example, our three sleuths demonstrate coding using only a single page excerpt of a single transcript. Students are told that the transcript is one of thirty, but they are not given a demonstration of the fact that most qualitative researchers work intensively with much more data. It is difficult to conceive how a LO could demonstrate (and allow students to practice) common qualitative data analysis techniques such as the Glaser and Strauss' (1967) method of 'constant comparison' whereby researchers confirm the soundness of their coding categories by looking for similarities and differences across instances.

Another area of qualitative data analysis that is not addressed by our learning object is how to do narrative analysis. As distinctive as our sleuths are, their approaches are all loosely based on grounded theory and qualitative content analysis. Narrative analysis is a much different approach which works with the whole transcript and avoids fragmenting the data by breaking it into categories. Narrative analysis gives primacy to

identifying how the research subject works to construct a narrative with certain properties and implications for the self. In contrast, our sleuths tend to give primacy to the substantive content of the interview. Finally, the LO does not demonstrate how to analyze the relationship of the interviewer and respondent, including the power dynamics between them. Our sleuths do not give much attention to the researcher's questions or the research context, whereas many qualitative researchers examine both the role of the question and the questioner in the kind of data that get produced.

Despite these omissions, the LO did succeed in modeling multiple styles and layers of qualitative analysis, and it provided students with an opportunity to grasp the interpretive nature of the process and to practice their own coding techniques and style in a risk-free context. Only after publishing the LO in two large learning object repositories did we realize just how unusual our project was in this respect. We have identified only one other institution at which learning objects were created for qualitative research instruction (Chenail et al., 2006). Moreover, a search of the 20,292 online teaching and learning materials indexed in MERLOT (Multimedia Educational Resource for Learning and Online Teaching) at the time of writing revealed that "Sleuthing the Layered Text: Investigating Coding" is only one of two resources available on the topic of qualitative methods; the other is an on-line textbook.

So, the learning object did prove to be a sufficiently flexible medium to meet our pedagogical objectives. It was flexible also in the way it served students and instructors in different types of courses. As a value-added tool to their in-class learning, students reported it as having merit. However, students were also clear that they wanted the LO to be a supplement to, and not a replacement of, their current instructional formats of lectures, seminars, and labs, which is a concern we also share.

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