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Students' Conceptions—and Misconceptions—of Social Research

Abstract

How knowledge of students' conceptions of social research can influence the pedagogy of research methods is the focus of this article. This study explains how students' conceptions of social research changed over the course of a two-semester research programme. Twenty-nine graduate students participated in focus groups, interviews, and open-ended surveys to inform the instructor's pedagogical decisions in developing the course. Data were analyzed phenomenographically, and the categories that were identified defined changes in their conceptions of research related to affect and attitudes, the processes involved with conducting research, and the end products of their research projects. Pedagogical inferences were derived from the findings, and implications for future research were outlined.

Keywords

Conceptions; Phenomenography; Social research methods.

Since about the middle of the last century, there has been a shift in emphasis in education from teaching to learning. Whereas the earlier focus had been on the characteristics of a good teacher and the approaches that result in successful pedagogy, it has in recent years increasingly been on the processes that result in successful learning. In the field of higher education studies, one result of this change has been the development of a small but vigorous body of research into students' conceptions of what they learn -- the object of study – and how they learn – the processes of study. Such studies have been conducted within a range of theoretical frameworks, including, in particular, phenomenography, which was initiated in the late 1970s by Ference Marton in Sweden and developed over the intervening decades by him in collaboration with a number of scholars in that country, in Australia and to a lesser extent elsewhere (e.g., Prosser et al. 1994; Marton and Booth 1997; Marton and Pong 2005; Marton and Svennson 1979; Murtonen and Lehtinen 2003).

Phenomenography can be described as the study of ways in which human beings experience a range of phenomena (Marton and Booth 1997) and it has been

most widely applied in contexts of higher education and professional development (Ashworth and Lucas 2000). Phenomenography has made a key contribution to conception research in education by focussing attention on the notion of "conception" itself. A person's conception of an object or process can be simply defined as the way in which he/she mentally construes its characteristics, and hence goes about learning it and applying it in real life. The participants themselves are rarely conscious of these constructions – or, at least, they are rarely able to articulate them explicitly. An entire course of study can be conducted, during which neither learners nor teachers articulate to one another their potentially widely divergent conceptions or crucial elements; what the former think they are learning may be quite different from what the latter think they are teaching. Needless to say, if this happens, the course is unlikely to achieve its educational objectives to any satisfactory extent. Conceptions are thus implicit but powerful assumptions that underlie and help to determine many aspects of individuals' approaches to teaching and/or learning within an academic subject or professional field. How knowledge of these conceptions of social research, specifically, can influence pedagogy of research methods is the focus of this article.

Scholarly interest in learners' conceptions dates back at least to the 1960s. Researchers at the University of London Institute of Education and elsewhere conducted a number of studies in British schools. Their approach was eclectic, broadly learner-centred and informed in particular by construct-psychology models, such as those of George Kelly and Jerome Bruner. Marton and his colleagues pursued a similar line of research, which was gradually articulated as the systematic research framework of phenomenography. Most conception studies in the past three decades have been either strictly phenomenographic or partly informed by phenomenography, although there are a few examples of research conducted within a less methodologically explicit framework. During this same period, emphasis on the use of qualitative methods to address research problems in the social sciences has increased; however, qualitative research has yet to achieve the same prestige as quantitative research in funding, publications, and integration into the curriculum, particularly in North America (Richardson 1999).

Phenomenography investigates the "qualitatively different ways in which people understand a particular phenomenon or aspect of the world around them" (Marton and Pong 2005:335). In phenomenography, the object of study or referential aspect, is the meaning or conceptions that humans hold of a particular phenomenon (Åkerlind 2005) in which the outcomes are comprised of the various ways one might experience that phenomenon (known as categories of description). The second aspect of phenomenography, the structural aspect, involves developing a structured set of these "outcome spaces" or relationships (Åkerlind 2005; Marton and Pong 2005).

The phenomenographic approach consists of three steps. The first is to elicit, typically through interviews, respondents' conceptions that are central to the topic under investigation. The next step is to arrange these conceptions into categories. There is a theoretical presumption, consistently borne out by empirical findings, that although each individual's conception or set of conceptions is to an extent unique, there are sufficient similarities between them to allow the researcher to construct a typology of conceptions for the study sample. The final step in the process is to describe how the different conceptions vary from one another. The focus of phenomenographic research is on the collective experience of the group, rather than that of the individual.

Conception research has made a small but valuable contribution to our understanding of educational outcomes. The findings of this research have the

potential to inform the design and delivery of curricula and to improve both pedagogical approaches and the activities of learners. It must be admitted, however, that the literature is characterized more by a theoretical interest in describing the conceptions than in applying the knowledge gained to the classroom. For many conception studies, including the majority of those conducted within a phenomenographic framework, the research outcome is the categorization of conceptions and the description of their variation. Researchers may, and frequently do, make some concluding remarks about possible implications of their findings, but there are few empirical studies of their application. For example, there is little empirical evidence about the effect of various conceptions: do some give rise to more successful teaching or learning? Nor is it yet clear whether attempting explicitly to challenge and change conceptions is pedagogically effective. It does not seem, either, that much research has been undertaken into the provenance of, or influences upon, different conceptions.

Some conception studies include the notion of "misconception", either as one of the categories of description or, in certain cases, as the primary focus. An example of the former type of study is Meyer et al. (2005), which is discussed below. A focus specifically on learners' misconceptions of what they are studying is found in a number of studies in physical science (e.g. Ebert-May, Batzli and Lim 2003; Hermann and Lewis 2003; Ray and Beardsley 2008), life sciences (e.g. Mills Shaw, van Horne, Zhang and Boughman 2008; Modell, Michael and Wenderoth 2005) and mathematics education (e.g. Green, Piel and Flowers 2008), but it is also found in other disciplines (e.g. Woody 2004). A misconception might be defined as a conception held by a learner that is significantly at variance with that of an expert and, therefore, impedes progress in learning. The pedagogical implication is that misconceptions need to be changed into, or replaced by, the "correct" conception. This deficiency view has, however, been countered by Smith III et al. (1994), who argue that naïve conceptions have an important role in developing more advanced understanding.

Research into Conceptions of Research

What contribution can conception studies make to the teaching of research methods? Unlike many other subjects, research methods has only just begun to develop a pedagogical culture (Kawulich, Garner and Wagner 2009), and the literature relating to conceptions of research is correspondingly sparse (McCormack 2004). There is a good opportunity, therefore, for those of us who are involved in teaching research methods to take stock of the potential of conception studies to enhance our teaching and our students' learning. Can conceptions of research be put into categories, and, if so, what categories? Are some more conducive than others to developing the capacity to do good research? What might be implications of this knowledge for the design and conduct of our courses?

In this section, we give a brief, critical review of major published conception studies relating to research methodology. The following section reports some preliminary findings of investigations conducted with our own students, which suggest that the essentialism inherent in existing research gives results that are only partly applicable to research methods pedagogy. In the final section of the paper, we discuss some possible directions for future research that may build on the small knowledge base we have to date and extend it into potentially more directly applied studies.

Research into conceptions of research methodology was initiated by Brew's (2001) study, in which she identified four qualitatively different ways in which

research is understood by experienced researchers. McCormack (2004) applied a similar approach to the mismatch between institutional assumptions and postgraduates' experiences, and Woody (2004) focussed specifically on misconceptions among music students. Most recently, Scandinavian Journal of Educational Research devoted a whole issue to the topic (2005), comprising several papers reporting empirical studies (e.g. Kiley and Mullins 2005; Meyer et al. 2005), an editorial survey (Murtonen and Lehtinen 2005) and a critical commentary (Vermunt 2005). A pilot study (by the authors) addressed the conceptions of research held by graduate students in the U.S. (Kawulich, Garner and Wagner 2008) and the conceptions of research of doctoral students were investigated by Halliday and Meyer (2008).

These studies, few though they are, have opened up a potentially valuable field of inquiry for us who are interested in developing a strong pedagogical culture around research methods. An obvious conclusion from Brew's (2001) study is that we should not assume that even the term "research" itself will be understood in the same way by our academic colleagues - let alone our students. Yet this assumption is rarely examined. It is a reasonable generalization to say that the meaning of "research" is assumed to be unproblematic both by those who formulate university policy statements and by those who are responsible for realizing them in practice:

> It is assumed that researchers mostly agree about what research is, at least within specific disciplines. Further, it is assumed that teachers of research courses know and agree about what research is and how to teach it (Murtonen and Lehtinen 2005: 219).

Methods textbooks typically begin with statements about what research is:

> Research is a cyclical process of steps that typically begins with identifying a research problem or issue of study. It then involves reviewing the literature, specifying a purpose for the study, collecting and analyzing data, and forming an interpretation of the information. This process culminates in a report, disseminated to audiences, that is evaluated and used in the educational community (Creswell 2002: 8).

> (Research is) a careful, systematic, patient investigation undertaken to discover or establish facts and relationships. (…) Research is called for when one is confronted with a question or problem that has no readily available answer. One must obtain information and make sense of it in order to answer the problematic question (Charles and Mertler 2002: 8).

It is impossible to disagree with statements like this but, as with any core concept in an academic subject, providing an up-front definition or description does not guarantee that students will have formed a clear and unambiguous conception for us to develop further. A subject called Research Methodology (or similar) is increasingly a compulsory and substantial part of a degree programme. It is natural that students embarking on it will have an impression that there is a definable "something" called research, for which their previous education has insufficiently equipped them, and to which they will now be initiated. Statements about what research "is" can all too easily confirm that impression without giving it substance. They inevitably leave unanswered the question of what is, and what is not, research - and whether some research is better than others. Does reading a book or consulting the Internet constitute research? Is a person asking a series of questions of someone in the street doing research? Students, even those who see little need to learn how to

do research for themselves, tend to ask such questions, if only to ensure that they will perform well enough to pass the course.

We acknowledged earlier that conception studies in relation to research draw attention to the need to address these issues in teaching methodology, even if they have not yet explored the pedagogical consequences of doing so. There is, however, also a danger that such studies contribute to reifying research as a discrete kind of academic activity, rather than the basis of all academic activities. Reifying, or essentializing research, is both theoretically unjustifiable and pedagogically unhelpful. Byrne-Armstrong et al. (2004: vii) quite rightly depict research as "complex, often chaotic, sometimes messy, even conflicting, full of critical moments that disrupt the process". It is not surprising that the studies noted above have all found wide variation in how research is understood by successful researchers (Brew 2001), supervisors and teachers (Kiley and Mullins 2005).

Our own experience as methods teachers confirms the findings of conception studies: it is extremely difficult, if not impossible, to formulate a concise statement of what constitutes this thing we call research. Does this, then, negate any pedagogical value in studying students' conceptions of research? By no means is it a principle of all learning theory that we learn by building on what we already know. With good teaching, epistemologies can be extended, made more sophisticated and more comprehensive, and thus lead to the growth of further understanding of the field of study. But they do not arise from nothing, nor are they written on the blank tables of the students' minds by the teacher. It is extremely valuable, therefore, for the teacher to have some appreciation of the students' conceptions as a starting-point for the course. This will help to provide a focus and a sequence as the teaching proceeds.

There is a caveat, however. As Smith III et al. (1994) argue, conception research is too often led into a pedagogical cul de sac by seeking to identify misconceptions. This is both logically and empirically unjustified. To label a view as a misconception is logically unjustified on the grounds noted above: it relies on the false presumption of an incontestable definition of research. Significantly, in two recent studies, one focussing specifically on misconceptions (Woody 2004), and one including them as a category among other, apparently acceptable, conceptions (Meyer et al. 2005), no explicit definition of research is provided.

An objection could be raised here. It takes the following form. Let us avoid a simplistic dualism that sees conceptions as either right or wrong, and let us think of various conceptions in terms of usefulness or functionality for developing students' research skills. From this perspective, while there may inevitably be some disagreement about the degree of functionality, there are some conceptions that are so patently misguided as to justify the label of misconception. These need to be identified, challenged, and changed if those holding them are to learn from the course. This counter-argument does not stand up to close examination. In practice, students who have reached university - even those in the first undergraduate year - will have some idea, however vague or superficial, of why research is done, and what sorts of things it involves. It is not true that they have absolutely no idea at all of what the word "research" refers to, even if they claim not to. The search for misconceptions of research held by students also distorts the findings of empirical studies, particularly in relation to possible pedagogical applications.

Methodology

While there is a vigorous body of literature on students' learning and teachers' conceptions of teaching in higher education, less is known about students'

conceptions of research (Brew and Phillis n.d.). Students' voices are rarely heard in research in higher education (Cotner et al. 2000). To investigate graduate students' conceptions of research, we adopted a phenomenographic approach, focussing on a class of 29 specialist-level graduate students in one U.S. university; this school was selected, in part, to expand the use of phenomenography in North America (Richardson 1999). The research experience of the students enrolled in this two-semester (Fall 2007 and Spring 2008) graduate research course culminated in their production of reports of the research they carried out. The students' research projects included quantitative statistical studies, qualitative studies, ethnographies, case studies and action research. Students were educators employed in various teaching or administrative positions in schools where they carried out their research. The students participated in a focus group (three groups of approximately 10 students) at the end of the Fall semester, periodic individual interviews with the instructor during Spring semester, and an open-ended survey at the end of Spring semester.

Phenomenographic data analysis involves describing the variation in how humans conceive or experience a phenomenon (Åkerlind 2005) - in this case, how students conceive of research. The data collection methods were used to determine students' previous experience with and attitudes towards research, changes in their conceptions of what constitutes research, and what conceptions of research they had that they would consider to have been misconceptions of research. The data were analysed using a phenomenographic approach by first eliciting responses from students; the data were then coded thematically and grouped into categories of meaning. Last, these categories were compared for similarities and differences to provide a description of the array of conceptions these students held about research.

Findings

These students began the two-part course with varying levels of confidence and skill as researchers. As a result, there were different views of what constitutes research. Their previous research experience ranged from a few who had taken statistics courses and/or action research courses in their master's programme to several who had taken a research overview course in previous coursework to those who had no experience at all. The instructor's assumption was that students had been exposed to various approaches to research. In this course, each student selected the topic for his/her study and completed the paperwork to obtain permission to conduct research from the ethics review boards at the university and school district. Pedagogical tools included lectures with powerpoint slides, class discussions, share-pair discussions, one-on-one meetings with the instructor and various exercises to enable them to practice data analysis skills. Students were allowed to submit segments of their written work for feedback periodically throughout the two semesters.

Reasons for doing research

In defining research, students also explained their reasons for doing research. Their responses addressed research as a means for answering a question, for supporting or generating theory and for bringing about change.

Answering a question

Five of the students defined research as answering a question. For example:

- ⇨ The act of finding out about something that is unknown.
- ⇨ Investigating problems of interest.

Supporting/generating theory

Another student viewed research as a means to support or generate theory:

> ...searching for material or support to a theory or argument; or creating such material through a study to support a theory or argument.

Vehicle for change

One student viewed research as a vehicle for change:

> I defined research to be a process to bring change to a problem or situation.

Another student mentioned these reasons for doing research:

> I have learned that you must do research to find the underlying factors to improve your problem or situation. You cannot make assumptions. You could be right, but you could also be wrong. When we are dealing with students, we cannot afford to be wrong. Plus, the research process helps you think through various scenarios that will eventually bring about change.

The categories generated from the data analysis addressed affect, process and product. Each category illustrates changes that students experienced in their conceptions of research.

Affect

Several affective/attitudinal aspects of the research process were identified that illustrated students' feelings about conducting research. Many comments from the students related to their prerequisite knowledge for the course, stemming from their varying levels of experience with conducting research. Fourteen students bemoaned their lack of knowledge of research practices at the onset of the course. A typical response was:

- ⇨ I thought instructors would teach everything we needed to know about research; it is not fair to expect students to know something taught in a different course unless there is a prerequisite course that teaches those concepts I need to know before entering this class.
- ⇨ (I thought) it would be a step-by-step process. For example, one week we would complete or work through chapter 1.

Five students' comments made it clear that they initially had feelings of insecurity about their level of expertise and prior knowledge of research methods and

shared concerns about their knowledge base compared with that of their peers. For example, one student said:

> (I got the feeling) that everyone else knows what they are doing.

In addition to the above responses, nine students made general comments about their initial understanding of research, such as having believed that doing research "is hard", "is just boring math" or "is very time consuming". Specific comments that illustrated their beginning attitudes were:

- ⇨ It is a huge waste of time that will have almost zero effect on my daily life as an assistant principal.
- ⇨ (Research is a) bunch of garbage – somebody doesn't have anything else to do, so they make up something.

One student stated that, at the beginning of the semester, he/she believed that:

> Research was a long drawn out process that was drudgery. It would go into a research journal that no one would read.

Students' attitudes towards research and towards viewing themselves as researchers changed throughout the two-semester course. Three students found that taking a research course affected their self-efficacy, particularly when working with others. For example, one student said:

> I have learned that I can do serious research and develop a quality paper by working hard and utilizing the expertise of my professor. My ability to locate resources has grown considerably.

Students also broadened their knowledge base related to the processes of research. Students gained an appreciation of the research process and broadened their initial understanding of research processes. At the beginning of the course, several students expressed their concerns about having to do mathematical computations in statistics. By the end of the course, three of these students focused their comments about what constitutes research more expansively to include more than statistics:

- ⇨ It's more than just statistical equivalence or causal relationships.
- ⇨ (I) was not aware that research was actually dual focused – qualitative or quantitative.

Other students' comments from the end of the course indicated that they had expanded their conceptions of research to include more positive views of the value of research and of their ability to conduct a study.

- ⇨ It's much bigger than I thought, and one should be much more careful than I anticipated. The little details in a write-up can send the reader in directions other than intended. As to "bigger", I think sometimes small "findings" or "results" can have profound insights and relevance as to meaning or implication.
- ⇨ I think I've been able to "see the big picture" a little more when it comes to the importance of research. The conversations we've had, both in and out of class, have given me a good bit to think about. I'm not so quick to blow

off reading an article now. Now it's more of "ooh, what's this?" where it used to be "I am NOT reading that…I don't have time".

⇨ (I learned that) most research is valuable.

Process

Students' experience with conducting research also changed their initial conceptions of the processes involved in conducting research. Their views of the variety of approaches to doing research were expanded, along with their views of specific aspects of the research process, such as topic selection, theoretical framework, sample selection, data collection, data coding/analysis and ethics.

Approach to research

Thirteen students specifically stated that they had initially equated doing research with conducting the review of the literature or re-examining existing knowledge. Typical student responses reflecting this idea included these:

⇨ I thought research was reading and reporting (I know now that that is just the literature review).

⇨ Reading articles or books and writing a paper using them as sources.

⇨ The process of reading, writing, questioning, and deciphering information that helps to conclude answers to a question or a problem.

⇨ I really thought of research as reading a lot of articles and presenting a paper on what I learned.

⇨ I thought that research was a long process of locating information, sorting through it, conducting a survey, developing data, and writing a detailed summary of the information, including a bibliography.

Another student shared his/her initial belief that doing research meant "overquoting" others' work from the related literature.

Two students originally defined research in relation to quantitative approaches; for example:

⇨ (Research is) exploration of a topic using quantitative methods to prove or disprove a hypothesis.

⇨ (Research is) Information (data, prior research, observations) gathered by people that supports a particular topic or hypothesis.

Broadened conceptions of research

Students were asked, How has your definition of research changed as a result of what you have learned in this class? Several students indicated that their definitions had changed very little or not at all. Ten students indicated a broadened definition of what constitutes research. Their comments were similar to this one:

I have become familiar with the different types of research – qualitative, quantitative and action research and the instances where each would be

appropriate. My definition is much clearer as to the steps involved with research.

Six gave responses that illustrated a new understanding that research is not just quantitative. For example:

> I now realize that research is not only data and statistics, but also opinions and reactions.

Over the span of the course, six students indicated a new appreciation for qualitative research. Typical comments included:

- ⇨ As a mathematician I have always focused on the statistical side of research, but I realize that qualitative research is the only way to measure some information.

- ⇨ I have a different perspective on quantitative research and no longer see it as the most difficult type of research.

One student's comment indicated his/her having gained a more accessible view of research:

> (I thought research was) Unattainable – (yet) once you understand the process (broken down into parts), it can be done.

Ten students indicated their changing views of the process of doing research as being the most important thing they learned. For example:

- ⇨ I am so much more familiar with what research entails - the process of conducting a study, the phases of the study and the final product. It is so much more that just finding articles on a particular topic.

- ⇨ I now think of research as a process, beginning with a question or something you want to know and developing a way to go about finding out the answer based on the process of investigation.

Students mentioned various aspects of the research process that had been clarified since the course began, including the difference between the rationale and the significance of a research topic, understanding the processes of data collection and analysis (how to do research) or products of the process (what the paper should look like) of conducting a research project. Specific comments addressed changing conceptions of research regarding topic selection, theoretical framework, sample selection, data collection, data coding/analysis and ethics.

Topic selection

Two of the students found the class discussions of selecting a research topic to be helpful in helping them understand the research process.

- ⇨ I learned a lot. I learned that people spend years researching one topic and that the focus of a paper changes according to the results of your research. The most important thing I learned was that, if I decide to get my doctorate degree, I will be sure to choose a topic that truly has meaning to me, so I don't get bored with it and want to throw it out after a couple of months, like I did this one!!

- ⇨ (I learned) how to correctly research and gather information that is important to the subject matter. To narrow your subject to be able to fully understand the topic. Too broad of a topic makes it hard to narrow down all the data to form a conclusion.

Two students mentioned their discovery of the importance of the wording of the research questions:

- ⇨ The wrong wording can create a monstrous situation. If issues or statements are not initiated in the primary opening, then these things cannot be brought up later as a result. The research and support system must be threaded throughout the writing.

- ⇨ It is difficult to design a study so that you get clear results with data to support it. Your questions must be carefully chosen and your assessments must directly correlate with the questions.

Theoretical framework

Three students indicated surprise over the use of theory in research. A typical response was this one:

- ⇨ The theoretical frameworks supporting research was a new discovery for me.

- ⇨ My theoretical lens can influence my research.

- ⇨ I now feel that research must be supported or addressed through a theoretical lens.

Sample selection

Two students mentioned changes in their initial conceptions of the sampling process:

- ⇨ (I was under the impression that) sample selection does not include (a specific) number of participants/subjects or criteria for selection.

- ⇨ (I thought that I would be) using random selection of participants for qualitative studies.

Data collection

The discussion of various data collection methods available to researchers also broadened students' conceptions of research. Regarding survey methodology, one student indicated that he/she:

> Thought the response scale had to be the same for each question. I realized that the response scale/descriptions could be different for each question or set of questions within the same survey.

Two students discovered new methods for collecting data; one of them said:

> I never thought of interviewing as a research method.

Data coding and analysis

Three students mentioned the data coding and analysis process as being confusing previously.

> (I thought that) analysis and disaggregating data is hard. ([I found that] it's not hard, it's time consuming).

Ethics

Dealing with human subjects was an area that was clarified for two students.

> (I) was surprised to learn I needed permission forms when I didn't plan to use names.

One student was surprised at having to complete the Institutional Review Board (ethics committee) process:

> (I) had no idea I would actually need permission to observe and document observations about my students for use in my research (I mean, it's all anonymous anyway, right?). Left to my own devices, I never would have thought to do that.

Product

Writing up the research served as a growth experience for many of the students, as they had not been exposed to the various topics that researchers must address in sharing research findings in reports. Three students focused their responses on their expanded view of the write up of the project; for example:

> I now understand what a research paper actually is… complete with hypothesis, research questions, theoretical framework etc. and it is a LOT more work than I thought!!

Two students' responses illustrated their amazement at the various topics/sections that were included in the outline for the final write up; one of them said:

> I was not previously aware of all of the stages and/or components that must be completed and I now have a better understanding of what is involved. I am surprised at how much I enjoyed the assignment. I have learned much more than I anticipated.

Four students indicated no surprises, but one elaborated:

> (I realized) that I remembered nothing from the research methods classes I took as a part of my masters program and that "coding" is easier than it sounds! I never knew buttons could be so educational…

Five students illustrated their broadened view of what constitutes research in these comments. Typical comments were:

> I now have an understanding of the sequence, stages and requirements. I understand how to conduct research and compile data. This experience has taken the fear out of writing a lengthy paper. I have found that when I

take the steps one at a time and do my work carefully, the paper comes together.

Students were asked what misconceptions they had about research or research methods before taking this course. Thirteen students indicated having no misconceptions about research, though one of them stated: “Much of what I experienced was not expected and my thoughts about study/research project work were very embryonic”, while another said, “I’m not sure if I had strong misconceptions, because I never had a thorough definition”. These students extended their knowledge base about what constitutes research through their coursework and participation in conducting a research study.

Discussion

How knowledge of these conceptions of research, specifically, can influence pedagogy of social research methods was the focus of this paper. In this two-semester course, students illustrated conceptions of research that changed from the onset of the course to its end.

Affective aspects

In the affective aspects of their conceptions of research, they exhibited more positive attitudes about what research is and about themselves as researchers. Students brought a wide range of research experience to this course, from having taken no research courses or having only taken a research overview course to having taken several research courses in which they had the opportunity to actually conduct research. Many of these students began the research course series with feelings of anxiety about the research process and some had negative attitudes about the value of research and about their ability to conduct good research. Their self-efficacy as researchers changed in positive ways, as was evidenced by their comments at the end of the second semester. Following from Onwuegbuzie (2000), it seems that, overall, as many of the students became more proficient at conducting research, their levels of anxiety decreased and their self-efficacy as researchers improved. Several students who had no previous exposure to quantitative research methods at the beginning of the course did not necessarily exhibit the same comfort level with conducting research as did other students with prior experience. Sizemore and Lewandowski (2009) indicate that students’ misconceptions of research may underlie the lack of change in their perceptions about the value of and attitudes toward research. Hamza and Wickman (2008) reported on several studies in which misconceptions served as impediments to future learning. It is possible that these students’ anxiety about quantitative research and their initial view of ‘research means doing statistics’ stemmed from misconceptions; it seems more plausible, however, that their initial conceptions/misconceptions served as a foundation for their continued learning and that those conceptions were expanded to include a broader definition of research and its associated processes and products. The findings of this study do indicate changes in all of the students’ conceptions of research and it is believed that their participation in conducting their own research was instrumental in changing views that they perceived as misconceptions.

Process

Students' conceptions of research were broadened in terms of the range of processes that are available to conduct research. They chose their own topics for study and discussed with others in class potential research questions to pursue. Through lectures, class discussions, outside readings and instructor feedback, students formulated their individual research plans. As many of them had no prior experience in conducting research, their encounters with the processes of selecting a theoretical framework, determining sample criteria, choosing appropriate data collection methods, deciding how data should be analyzed within the chosen framework and learning about what constitutes ethical research provided an enhancement of their existing conceptions of research. The primary focus of many students' comments centred on what they learned about research methods in general.

Product

Many comments from students addressed what they learned about writing up the research. This process of description of their project from beginning to end posed a challenge for some students whose writing skills were not as strong as other students' skills; however, even the weakest writers expressed satisfaction with their end product and noted their surprise at the depth of description with which researchers must share the process of conducting research. For example, students were surprised at the need to explain in detail their actions to address issues like trustworthiness, validity and reliability. Those conducting qualitative research had to be prompted to include a section on instrumentation. Those doing quantitative studies needed encouragement in their interpretation of the results. All students, however, indicated that their research product was something of which they were proud and that it illustrated how their conceptions of research had changed over the course.

Relationship to existing literature

Previous studies of conceptions of research have generated various categories to illustrate the range of meanings associated with understanding what constitutes research. The categories identified in this study – affect, process and product – relate well to two of Brew's (2001) categories of senior academics' conceptions: domino (a series of tasks) and journey (a voyage of discovery) conceptions and, to a lesser extent, to a third category, trading (a social exchange for money or publication). Students' comments focused greatly on the process or steps involved in conducting research. Their perception of the process was viewed as the pursuit of discovery, a venture full of surprises; one student indicated that the process of learning how to do research had been, for her, a life-changing experience, similar to Brew's journey conception. The category of trading was exemplified by one student who, at the beginning of the course, indicated that he wanted to create a paper worthy of publication that would enhance his chances of being admitted to the doctoral program.

The student's conceptions of research may also relate to Kiley and Mullins' (2005) categories of "technical", "integrating complexity" and "new ways of seeing" in their study of supervisors' conceptions of research. The "technical" and "integrating

complexity" were exemplified in students' comments about the process of doing research, while the "new ways of seeing" category was illustrated in the students' changed conceptions of research at the end of the course.

The most closely related categories of conceptions of research to those found in this study were the categories summarized by Meyer, Shanahan and Laugksch (2005) and Meyer and Halliday (2007). Students identified their conceptions/misconceptions about research and illustrated how those conceptions had been broadened through their experience. Students' initial definitions of research demonstrated such conceptions of research as: re-searching existing information; a process to gain insight into various topics of interest; a way to solve problems; a means for discovering truth; information gathering and a scientific process. Their subsequent definitions contained more depth of understanding of research and illustrated that having participated in the research process had exposed them to additional conceptions of research. Rather than viewing research as finding literature about a topic and writing an essay, their conceptions of research now encompassed research with human subjects or other data sources. They began to view research as an insightful process that enables the researcher to learn something new or to solve problems or discover truth.

Following Cotner, et al. (2000) in their study of doctoral students' preparation for conducting research, students in our study came into the course with varying levels of preparation, research skills and diverse attitudes about research; some of our students initially viewed only quantitative approaches as being ways of conducting "good" research, while others initially viewed several students described research as re-searching existing literature. Students in both studies also held a variety of opinions about the value of certain research paradigms. For example, in our study, several students who had previously only experienced quantitative research paradigms found themselves to be uncomfortable with what they perceived as the "subjectivity" of qualitative methods and others who had previously conducted qualitative research found a new appreciation for the structure of quantitative methods. Similar to the Cotner et al. findings, student support from peers, instructor and other faculty researchers was considered to be a beneficial influence in their learning experience. Prior preparation, systematic course sequencing, content-specific instruction, student support groups and a positive relationship with a faculty mentor/instructor were found in both studies to be useful in preparing students to conduct research.

Problems with students' understanding of statistics and probability were found in this study and this is not a new phenomenon (Garfield and Ahlgren 1988). Several students in the sample expressed dread and anxiety about mathematical aspects of research. At one point in the first semester, after a lecture with power points of various statistical procedures and a brief overview of their corresponding equations, two students spoke with the instructor after class to confirm that "we aren't going to have to do this, are we?" While both of these students ultimately conducted qualitative studies, they were required to sit through our discussions of both qualitative and quantitative methods to ensure that they were at least exposed to a variety of approaches. As Garfield and Ahlgren suggest, developing concepts and understanding how statistics are used in various situations is more important than carrying out calculations.

Further pedagogical considerations from the teaching/learning nexus were described by Knewstubb and Bond (2009). As they note, early phenomenographic studies suggested that students learn more effectively when they focus on conceptual learning than when they memorize information. Their study questions whether students' understandings of course concepts are the same as those of an

instructor who holds sophisticated conceptions and a structured view of knowledge that he/she brings to students. As they suggest, we need to know whether our students understand research concepts as we understand those concepts. We agree that further investigation of these communicative alignments is required.

Wisker, Robinson, Trafford, Creighton and Warnes (2003) in their study of postgraduate students' dissonance, advocated that instructors avoid adopting a particular research paradigm and work with students to select a paradigm appropriate to their research question. In our study, students conducted quantitative studies using a variety of statistical methods, qualitative studies, including ethnography and case studies, action research studies and mixed methods studies. Their students also found success through constant interaction with the instructor and through peer support groups. Reflection and discussion with others facilitate opportunities for students to clarify their own work and learn from others' concerns.

Pedagogical Inferences

Knowing students' conceptions of research can inform pedagogical decisions instructors make. According to Scott, Asoko and Driver (1991) in their study of students learning physics concepts, instructors should attend to the learning environment, teaching strategies and the learning tasks used to teach the concepts. Alleviating the anxiety students feel about learning research involves establishing a learning environment that encourages questions and discussions to enhance conceptual development. The teaching strategies include determining appropriate sequencing of concepts to be presented and effective ways to teach those tasks. Scott et al. suggest that instructors promote conflicting concepts and their resolution to encourage students to reorganize their knowledge or build on existing knowledge, thereby providing scaffolding to new ways of thinking. Their presentation of discrepant events draws from the Piagetian model of presenting some exposure to new concepts, making students aware of their own and other students' conceptions, explaining the discrepancy, and encouraging cognitive accommodation to the new model of conception (Scott et al. 1991). They further suggest that discussion, consideration of others' views and application of concepts to real life assist students in broadening their conceptual knowledge. As they note, understanding students' conceptual knowledge has the potential to assist instructors in selection of a starting point for teaching and in the sequence and design of curricula. In our study, by determining students' initial conceptions of research, the instructor was able to make decisions about specific course content and structure and to choose effective ways to teach that content.

Reflection on the pedagogical approaches used in this course illuminates our knowledge about what worked and what did not. Classroom discussions of research problems focused on issues that are relevant to educators and illustrated the utility of relating examples of applied research in education. To ensure that students recognized the need to produce a research report based on research, rather than opinion, the instructor continually encouraged students to explain their decisions and defend them. Similarly, Broskoske (2007) suggests that students defend their research in writing as a lawyer would present a court case, including framing the case (defining the topic), searching for evidence (searching for sources), presenting the evidence (as students write their report), and making a closing argument (drawing a conclusion). Britt (1995) also uses a courtroom format in having students defend a published research article before a jury of their peers. Innovative

techniques, such as these, encourage student involvement and interest in the subject and present creative approaches for their conceptual learning.

A short lecture on ethical research practices incorporated opportunities for students to respond to discussion questions about potential areas of concern in conducting ethical research. The importance of good record keeping and issues related to use of human subjects (confidentiality, full disclosure, anonymity, voluntary participation) were discussed.

To heighten awareness of various theoretical frameworks, the graduate students were asked to make presentations in small groups on a specific theory and how it might frame a research question on a particular topic. Problem development was addressed in whole class discussions, giving students the opportunity to benefit from other students' attempts to come up with a viable research question. Exploration of sample parameters and data collection methods followed in subsequent class sessions.

As students chose research topics that warranted the use of quantitative, qualitative and action research approaches to research, a series of powerpoint slides was developed. These addressed various statistical procedures, such as correlation, chi square, confidence intervals and analysis of variance, among others. Each set of slides was discussed with examples to illustrate the applicability to educational research. Articles using quantitative methods were assigned as outside reading and were discussed in conjunction with the presentation of various statistical procedures. Though not used in this course, one recent article explored teaching research methods through use of clips of the Mythbusters television programme, providing a creative way to teach research methods concepts (Burkley and Burkley 2009). Survey methodology was also a topic for discussion, particularly developing instruments that adequately reflect the concepts to be addressed; related topics were question wording, scaling, order and sequence of questions.

To assist students with qualitative data collection, students developed an interview guide in response to a research question and interviewed each other, transcribed the interviews for coding/analysis. Each student shared his/her transcribed interview with the other group members (typically, groups of three students) and they were instructed to use a thematic approach to coding and analysis and develop a short paper on the results of their three interviews. The students were assigned a series of observations to enable them to practice their skills in observing, taking field notes and memoing. Several exercises were used to teach qualitative coding and analysis procedures, involving organizing and making sense of various data provided to them; one of these exercises included pairs of students organizing "buttons" in various ways and deriving a story to share with the rest of the class about those "data". Throughout the course, examples of "good" research articles and dissertations were shared to illustrate various ways that one might develop the end product.

Throughout this process, the instructor met with students in small groups or individually outside of class to give feedback on their written work, to discuss their progress and to answer questions or redirect their thinking. While this aspect of teaching is most time consuming, the feedback from each iteration of their writing served to ease students' anxiety about conducting research and ensured that course requirements were met.

Implications for teaching

Several implications are identified from our experience:

1. Students should be encouraged to participate in their own research projects to gain a clearer perspective of every aspect of research.
2. Students who feel anxious about learning/doing research need support from peers and instructors to begin to view themselves as researchers. When students are presented new information in a variety of ways that engage their thinking, they tend to enjoy learning and their nervousness about conducting research subsides. Make learning fun!
3. Research should be presented to students in ways that are interesting and relevant to their experience. Building new cognitive conceptions involves expanding prior knowledge. When students see that research "is doable, when broken down into steps", they are more apt to focus on learning new concepts and applying them to existing conceptual knowledge. Systematic presentation of the aspects of good research is required.
4. Many students want a recipe book that lists step-by-step processes for doing good research, which is not necessarily the reality of what research is like. Instead, assist them to become more comfortable with allowing their theoretical philosophy guide the question development and subsequent processes. When they understand that various questions generate different protocols for research design, they may find that flexibility and subjectivity are part of the process of research in human subjects research (particularly in qualitative designs).
5. While it may not be ideal to provide detailed step-by-step outlines for writing up research projects, students may find it helpful to have a loosely structured framework that includes specific topics that should be discussed. Those who have never done academic writing may also need guidance on certain writing guidelines such as tense, person, level of detail required.

We hope that this venture into students' conceptions of research will stimulate some discussion from readers to address such questions in their future research as:

1. What pedagogical approaches are most effective at introducing new forms of research to novice researchers?
2. What pedagogical approaches work best to redirect or build on students' conceptual knowledge?
3. How can the study of conceptions of research further inform the pedagogy of research methods?

The aim of this article was to contribute to conception research, particularly students' conceptions of social research, in the tradition of phenomenography. The findings showed that students hold various conceptions of research and that certain conceptions changed over the course of a graduate research class. Asking participants to explicitly articulate their constructions aided in making their conceptions conscious and bringing teacher and student understandings closer together and informed the instructor's approach to teaching the class. This article has demonstrated how conceptions of research studies are valuable in improving research methods teaching practice.

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