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Teaching ethics when working with geocoded data: a novel experiential learning approach

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ABSTRACT

Research ethics are not the favourite subject of most undergraduate geography students. However, in the light of increasing mixed-methods research, as well as research using geocodes, it is necessary to train students in the field of ethics. Experiential learning is an approach to teaching that is potentially suitable for teaching ethics. The aim of this article is to discuss how the experiential learning process in a course on Ethics & GPS-tracking contributed to the ethical awareness of third-year undergraduate geography students. We conducted a qualitative study in which we held four focus group discussions with two cohorts of students (2016 and 2017). We explored the students' views on the learning environment in relation to ethics in GPS-based and mixed-methods research. Our findings show how an informal learning environment and collaborative learning in a small group contributed to deep understanding of research ethics. These aspects of the learning environment are tied to an ethical framework that consists of three dimensions: (1) the ethics of collaborative research between staff and students; (2) the ethics of privacy raised by the geo-technology adopted in this research case study; and (3) the ethics of the research process with respect to informed consent and data storage.

Introduction

To achieve ethical awareness among undergraduate geography students, training in ethics should be part of university education and has to be included in the curricula (Carr, Vallor, Freundschuh, Gannon, & Zandbergen, 2014; DiBiase, Harvey, Goranson, & Wright, 2009; Gannon, 2014; Scull, Burnett, Dolfi, Goldfarb, & Baum, 2016). Reasons for students and researchers to act ethically, aside from moral arguments that humans should always do so, can be categorized into three arguments (Hay, 2010). First, ethical behaviour ensures the protection of the rights of individuals or communities affected by the research. Second, by

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behaving ethically, researchers maintain popular public opinion and public trust, which will allow future academics to carry out new research. Third, universities can be held accountable for the actions of their students or employees, and therefore need to protect their institutions, which reinforces the emphasis on acting ethically.

There is a growing academic interest in working with geocodes, often in combination with other data, which creates new ethical implications for geographers and geographers in training (Gannon, 2014). Geocodes are geographic coordinates that can be abstracted for various spatial levels (street level, city level, province level, et cetera) through, among other means, surveys, censuses, and, more recently, global positioning system (GPS) trackers. Geocodes may provide insights into the patterns, mobility and/or behaviour of a research population (see, for example, Bell, Phoenix, Lovell, & Wheeler, 2015; Meijering & Weitkamp, 2016).

Working with geocodes has the potential to expose ethical aspects of doing geographical research, especially because of their privacy-sensitive nature (Michael, McNamee, & Michael, 2006). The likelihood that students will work with geocodes is increasing, as the range of possibilities to collect geocoded data is growing through the use of smartphones and GPS trackers, and as the market for analysing these geocodes is increasing as well (Carr et al., 2014). It is therefore of particular importance to implement ethical training on working with geocodes in university education. Thus, as argued by Carr et al. (2014), there is "a powerful need for a broad ranging program of information ethics education focusing on geocoded data" (p. 449), because individuals simultaneously wish to assure their locational privacy while being unaware of the way in which existing geocoded data, for example through smart phone use, put their privacy in jeopardy.

In geographic research, geocodes are often combined with other types of data, such as in-depth interviews and surveys without spatial references (Bell et al., 2015; Christensen, Mikkelsen, Nielsen, & Harder, 2011; Zeitler & Buys, 2015). For instance, Bell et al. (2015) combined GPS-tracking, in-depth interviews and go-along interviews to study everyday well-being in coastal landscapes. Mixed-methods approaches such as used in that study are especially useful for illuminating the ethical aspects of doing research, since they have the potential to uncover much, and at times sensitive, information about the research participants. Hence, this article discusses the ethical issues that emerge when using a mixed-methods approach, consisting of GPS tracking, travel diaries and semi-structured in-depth interviews, to study the mobility patterns of students. The use of GPS tracking within this set of mixed-methods was chosen because of the amount of data on space-time patterns that can be collected using GPS trackers, and because these new technologies create new challenges and opportunities in relation to ethics. Although there is some knowledge on how ethics can be taught in geography curricula, scientific knowledge on the subject is largely either theory based, or informed by quantitative studies (Chavan, 2011; Zhai, Gu, Liu, Liang, & Tsai, 2017). There is little evidence about how ethics can be taught through using experiential learning as a teaching method. This article discusses a novel way of teaching ethics, through experiential learning in a mixed-methods research project. The aim of this article is to discuss how the experiential learning process in the course contributed to the ethical awareness of third-year undergraduate geography students. We discuss how ethics can be taught to geography students, based on in-depth qualitative research, from the perspective of undergraduate learners. The article's main contribution lies in its presentation of an ethical framework that identifies three relevant dimensions in teaching ethics to undergraduate geography students, namely: (1) the ethics of collaborative research

between staff and students; (2) the ethics of privacy raised by the geo-technology adopted in this research case study; and (3) the ethics of the research process with respect to informed consent and data storage.

Teaching ethics through experiential learning

There are many challenges in teaching ethics in geography curricula. First, ethical codes vary with time, place and people (Carr et al., 2014; Hay, 2010; Valentine, 2005; Zhang, 2017). Hay (2010) states that it is impossible to have a clear set of rules for conducting ethical research when it comes to doing research involving people. People's expectations of a researcher vary across cultures, which means that there is no "correct" approach to fit all contexts. As a consequence, one should always be critical of ethical standards set by peers or educators, as their solution might not be suitable for the context one is facing. Second, by implementing ethics into the curricula, there is less time for other subjects. Scull et al. (2016) find that even though many teachers in the field of GIS consider issues of privacy and ethics to be important, it is difficult to implement this into their courses due to lack of time, overload of information and lack of specific academic textbooks on the subject. Third, Carr et al. (2014) argue that developing a curriculum to teach ethics is complicated due to rapid developments and changing expectations regarding privacy, as a result of the rise of social media and GPS-enabled smartphones. For this reason, the content of any curriculum will quickly be outdated. Fourth, formalising ethical requirements could lead to the development of "prescriptive ethics" (Zhang, 2017, p. 148). This means that students might engage with ethical issues because they have to, which may lead them to see it as yet another "box to be ticked", or hurdle to be taken, rather than something that needs to be thought through and reflected on to ensure that their research is ethically "right".

In order to overcome the challenges described above, various approaches to teaching ethics have been proposed, such as using case studies, peer review, in-class discussions, and adopting a modular and dynamic teaching method that can quickly be adapted to new developments (see Carr et al., 2014; Davis, 1999; DiBiase et al., 2009; Gannon, 2014; Hay, 2010; Huff, 2014). At a broader level, many authors advocate a need to develop moral reasoning skills and a moral framework that can be used to evaluate ethical dilemmas, rather than a focus on making students aware of ethical issues (DiBiase et al., 2009; Huff, 2014; Valentine, 2005; Zhang, 2017). By developing these skills, students will learn to identify and reflect on the ethical implications of research, realise the importance of carrying out their own research in an ethical manner, and learn to apply ethical thinking to their own future research. Such skills will not only help students to prepare for unique and challenging situations throughout their research, but will also be useful in "real life" and future professions that might not be related to the field of academic research (DiBiase et al., 2009; Huff, 2014; Valentine, 2005; Zhang, 2017).

How can students develop such moral reasoning skills? Experiential learning, or learning by doing, is a way of teaching that has the potential to teach students about the potential risks and harm of working with geocodes and emerging technologies, while stimulating the development of moral reasoning skills (Carr et al., 2014; DiBiase et al., 2009). This approach to teaching is grounded in David Kolb's experiential learning theory (Kolb, 1984; Kolb & Kolb, 2005). Kolb and Kolb (2008, p. 44) identified learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the

combination of grasping and transforming experience." In short, learning by doing creates meaning from experience (Chavan, 2011). Kolb's theory suggests that learning is cyclical, involving four stages: concrete experience, reflective observation, abstract conceptualization and active experimentation (Healey & Jenkins, 2000; Kolb, 1984; Kolb & Kolb, 2008). In the process of experiential learning, students ideally learn in small groups, where they have the freedom to make mistakes and learn from them, and where they engage in each of the four stages of learning. Experiences in realistic scenarios can help students learn and gain better understanding about otherwise abstract concepts (Chavan, 2011; DiBiase et al., 2009; Gross & Rutland, 2017). Critical reflection and thinking about the learning situation can lead to alternative solutions or possibilities, which can ultimately lead to new implications for action. As the process is cyclical, these actions can be tested again and reflected upon in new scenarios (Kolb & Kolb, 2008; Zhai et al., 2017). In experiential learning, the role of the teacher is not to transmit knowledge, but to facilitate realistic learning experiences (Gross & Rutland, 2017). This can be achieved by providing realistic case studies, creating an informal atmosphere, and by encouraging individual decision-making, free choice and the expression of contesting views (Kahane, 1997, in Gross & Rutland, 2017). Thus, the learning environment should both encourage students' independent learning and challenge their preconceptions (Golubchikov, 2015).

There are multiple advantages to experiential learning which make the approach suitable for teaching ethics. First, it may provide students with a deeper understanding of the concepts studied and it may help to create reflexive students (Carr et al., 2014; DiBiase et al., 2009; Kotval, 2003). Second, small group exercises within experiential learning promotes the potential for collaborative learning (Kolb & Kolb, 2008; Kotval, 2003). Third, through experiential learning, "transferable skills" concerning ethics or general competences can be further developed, such as independent learning, problem solving and communicating (Boyd et al., 2008; Healey & Ribchester, 2016; Kotval, 2003). Notably, reflection can also be promoted through the educational context. In particular, reflection requires time investments, from both the academic staff and from students, to gain the confidence to express themselves and to share ideas (Bovill, Cook-Sather, & Felten, 2011; Kuh, 2008).

Approach to teaching and assessment

Context and learning objectives

In this paper, we discuss the third-year undergraduate course "Ethics & GPS tracking", which is part of the joint undergraduate Honours College of the Bachelor Programmes in Human Geography & Urban and Regional Planning, and Spatial Planning and Design, at the University of Groningen, the Netherlands. The Honours College in this setting is a 3-year 45 ECTS[1] extracurricular programme that provides talented, motivated students with the opportunity to challenge themselves and to develop their talent and initiative. The course discussed here is part of the "disciplinary programme" in which students deepen their knowledge and skills in the field of geography and planning, beyond what is expected from "regular" students. Other disciplinary courses within the honours programme deal with theoretical perspectives on geography and planning, as well as analyses of spatial planning projects. The focus on ethical awareness and methodological reflectivity in the discussed course was thus a very specific topic within the honours programme.

The course was taught by one lecturer in the academic years 2015–2016 (Cohort 1) and 2016–2017 (Cohort 2), with support from a student assistant. In the first year, five students took the course, and in the second year six students participated. Both cohorts consisted of Dutch students. In the course, experiential learning was encouraged, and students had to move back and forth between the stages of concrete experience, reflective observation, abstract conceptualization and active experimentation (Kolb, 1984). An experiential learning approach was chosen since it is both suitable for teaching ethics and for the small scale of the Honours College, in which 5–10 undergraduate students per cohort participate each year. The course comprised of 5 ECTS and took place during a period of ten weeks. However, as they continued working on their undergraduate dissertation for ten additional weeks, the students could use that time to reflect on how they could apply what they had learned in the course in their own research projects. The course aimed to teach students (1) how academic research is conducted, by requiring them to conduct their own research combining various methods of data collection; and (2) to reflect on the ethical aspects of academic research when using sensitive techniques which involve geocodes, such as GPS tracking. The first part of the course focussed on applying a mixed-methods approach, using GPS trackers, travel diaries, and in-depth interviews, in a small research project on student mobility and social contacts (Year 1) or student mobility and green space (Year 2). The second part of the course focussed on discussing the ethical issues of sensitive research techniques such as GPS tracking and mixed-methods approaches.

Assignments and assessment

In the said course, nine meetings were held, which equates to a meeting almost every week (see Table 1). At the first meeting, each student received a GPS tracker, which was used to track out-of-home mobility for eight days. The device used was the QStarz Travel Recorder BT-Q1000XT, because of its accuracy, signal acquisition time, battery life, data storage and user friendliness (Schipperijn et al., 2014). The lecturer provided an instruction sheet on how to use the GPS tracker, which had to be switched on in the morning and off in the evening, and charged at night. In addition, each student was asked to keep track of his or her activities in a travel diary. In this travel diary, the students could indicate the times of departures and arrivals, destinations, activities, modes of transportation, with whom they travelled or undertook the activity, whether the activity was planned or unplanned, and optional particularities.

After eight days, the students returned the GPS tracker to the lecturer who prepared the data for visualisation. The lecturer shared the GPS data with the students, and the students exchanged their travel diaries in groups of two or three students. Within these groups, each student conducted an in-depth interview with a fellow student about his/her mobility in relation to social contacts or green space, based on the GPS data and the travel diary. The conversations were recorded with mobile phones or other recording devices. The interviews contained questions to clarify the movements of the students during the seven days and questions about the experience of carrying the GPS tracker (for further details on the methodology, see Van den Bemt, Doornbos, Meijering, Plegt & Theunissen (2017).

Students were assessed on two major assignments, complemented by two peer review assignments and participation in class. The first assignment consisted of a 1,000-word essay in which they had to elaborate on the findings from their small research project based on the

Table 1. The outline and contents of the meetings during the course.

Meeting	Contents
1	• Explanation of the aim of the course, learning outcomes • Inventory of the students' expectations and wishes • Handing out GPS trackers and diary format
2	• Practising conducting focus group discussions (FGDs) • Discussing reading materials
3	• Practising conducting FGDs • Discussing reading materials
4	• FGD about student mobility (Cohort 1); spaces of well-being (Cohort 2) • Focus on results generated by data collected through GPS tracking, travel diaries and in-depth interviews • Conducted by two students
5	• Discussing reading materials • Preparing FGD about ethics in mixed-methods research • Preparing for the seminar in the 7th week
6	• FGD about the ethical implications of doing mixed-methods research • Focus on research using GPS tracking and/or other forms of geocodes • Conducted by two students

7	• Seminar on the ethical and privacy implications of mixed-methods research
	  ○ Cohort 1: with students of Research Master in Spatial Sciences
	  ○ Cohort 2: with students of Information Law and Information Technology

8	• Extra meeting about qualitative data analysis, to support this phase in the research process, also in the context of academic writing (Cohort 1)
9	• FGD about the course (evaluation)

GPS data of their fellow student, their travel diary, and the in-depth interview. All students were asked to write a peer review on the essay of one fellow student. As a second assignment, the students wrote popular academic articles in pairs, in which they reflected on the ethical considerations concerning GPS tracking and/or mixed methods. Again, all students peer reviewed an article of their fellow students. During the course, students had to organise and moderate two FGDs, one on the topic around student mobility that we were working on and one on the ethical implications of mixed-methods research and GPS tracking. At the end of the course, the students organised a seminar for fellow students from other programmes, on a topic related to ethics in geography and planning. In year one, the students organised a seminar on Ethics and GPS tracking for students of the Research Master in Spatial Sciences; and in year two, the students organised a so-called Privacy Impact Assessment (Hansen, Jensen, & Rost, 2015) with undergraduate students in Information Law and Information Technology. Each student was involved in organising and moderating one of the meetings. The assignments, peer reviews and participation in class (including organisation of the FGDs and seminars) were evaluated using an evaluation form, and resulted in grades on a scale of 1 to 10, with 10 indicating the highest possible grade.[2]

Methodology

Qualitative research methods were used to study the learning experiences of the students in relation to the aim of this article, to assess how the experiential learning process contributed to the ethical awareness of undergraduate geography students. Data were collected through FGDs and written reflections on the course. The written reflections were submitted by the students at the end of the course. We use two FGDs that were held with each cohort, one on the ethical implications of doing mixed-methods research, and one in which the course was evaluated. Each FGD was moderated by two students. One student took the lead in asking the questions, while the other took notes and contributed to the discussion by probing or sometimes asking additional questions. The FGDs took place in regular class rooms, but the moderators created an informal setting, by the provision of drinks and snacks, for example.

The main aim of the FGDs on ethical implications was to gain insight into the experiences of the students both from a participant's and a researcher's point of view. The discussion focussed on handling ethical issues. The opinions of the students about the use of GPS tracking in research, specifically in combination with other research methods, took a central place. In the evaluative FGDs, we discussed the characteristics of the course which contributed to the learning experiences of the students and what could be improved. The learning environment and the acquisition of transferable skills especially were topics of conversation. The evaluative FGD with the first cohort was informal in nature; with the second cohort, a more structured evaluation meeting was organised, to facilitate comparison of the experiences of the second cohort with those of the first cohort.

The FGDs were recorded and transcribed verbatim by the students. The transcripts were anonymised and the data were analysed according to the principles of thematic analysis (Joffe & Yardley, 2003). In the first stage of data analysis, a codebook was developed by a primary coder (one of the students), in collaboration with two secondary coders, one of whom was the lecturer, the other one the teaching assistant. In this phase coding was double-blind. The lecturer did attempt to make the student think critically about the data, for instance in linking reflections on ethics in other research projects to their current research.

At this point in time, the student was still working on her final paper for the course, so power relations may have played a role there. Coding and analysis were conducted with use of Atlas.ti, a software package for qualitative data analysis. At this stage, coding and analysis centred around the students' experiences as participants and researchers. In the second stage, the data were analysed in more depth, with the addition of experiential learning as an analytical layer. Here, the lecturer was not involved in the process of coding. That was necessary since the students who participated at this stage were asked to evaluate the course and the lecturer and we wanted them to be able to speak freely. This second stage of the analysis was carried out on paper, by three of the students. They used a codebook they had jointly developed. Throughout the process, the data and emerging findings were discussed in the team of authors, including the lecturer. The lecturer did ask questions about the general codebook and the links between codes in these discussions, but power relations between the students and the lecturer did not play a role here. In the process of analysis, we compared the findings from both cohorts, and found that the experiences from both cohorts confirmed and reinforced each other. We did not find any major discrepancies in findings between both cohorts.

This article is the result of a collaboration between students and lecturer. The lecturer had expressed her interest in a joint writing project during the course in 2016. Three students from the first cohort, the teaching assistant and the lecturer wrote an article for a Dutch professional journal together, upon completing the course (van den Bemt et al., 2017). That article was written for geography teachers in secondary and tertiary education in the Netherlands, and focused on the students' experiences as both researchers and participants during the course. Upon running the course successfully for a second time, we decided to write the current article with the same team, focusing on the benefits of experiential learning. The collaborative nature of these papers has been valuable for all writers involved. For the students, it was interesting to engage in (academic) writing together with a former teacher, and for the lecturer, it was an opportunity to work with and invest in promising young researchers outside a traditional "research" environment. Additionally, the – sometimes contrasting – views of lecturers and students enhanced the quality of this article, as it forced the writers to look beyond their own experiences.

Ethical issues

There are several ethical issues pertaining to both the teaching of the course, and the research that was conducted, which are connected with the issue of doing collaborative research with lecturers and students. Because of the focus on experiential learning, the lecturer refrained from giving a lot of information about the ethical aspects involved in doing mixed-methods research herself – although working on ethical aspects was discussed in the Course Outline and in the course literature that was distributed before the course commenced. At the end of the first meeting, she asked the students whether they would be willing to carry a GPS tracker for a week. However, in the classroom context, which is a hierarchical situation as the lecturer grades the students' work, students may not have felt free to decline this request. In the studied cohorts, all students agreed, without asking any questions. After the students had agreed to participate, the lecturer handed the trackers to them, without discussing the ethical implications of their use. The rationale behind this was that she wanted the students to discover these ethical implications "by doing".

The lecturer explicitly introduced ethics in mixed-methods research as the main topic of the course. However, as part of the experiential learning philosophy, she did not mention all the ethical aspects that could become relevant for the students in the course at the start, but responded to issues whenever these were raised by the students, and introduced important issues in the FGDs. For instance, when the students asked how their data would be used in publications, the lecturer explained that her priorities lay in teaching the course, and that she would not publish about the course if any of the students objected to it. All students from both cohorts gave their written consent for participating in the FGDs, and for the use of the data for publication. It was emphasized before each FGD that anything that would be discussed would not affect the grading of the students.

Findings

Our findings illuminate the importance of three characteristics of learning by doing in teaching ethics in geography: an informal learning environment, collaborative learning in small groups, and the development of deep understanding.

An informal learning environment

During the evaluative FGDs after the course, the students discussed the learning environment in which the course was taught. First, the students agreed that the setting and teaching atmosphere of the course were crucial to achieving the learning objectives. One of the students explained that the lecturer gave them the freedom to choose what they wanted to focus on:

> We could give our own input for the course. (…) Do you want to practise with focus group discussions, do you want to practise something else? (…) This freedom was not just stated on paper in the course outline [as with other courses], it really worked like this in practice.

Having the opportunity to direct their own learning experiences created an open and almost casual atmosphere where students felt free to share their opinions. Such an atmosphere is one of the elements necessary to facilitating the experiential learning process, and can be related to Kahane's (1997, in Gross & Rutland, 2017) code of behaviour which basically explains that teachers should facilitate learning experiences by encouraging individual decision-making and the expression of contesting views, rather than telling students what to do.

Second, the relationship between the students and the lecturer during the course was quite informal and the students experienced little distance from the lecturer. This was established during the first lecture when the lecturer sat with the students instead of standing in front of the blackboard:

> [I experienced] less of a hierarchy. In the beginning a bit [of a hierarchy] of course, but this changed fast. 'I will just sit with you', she said. She did not stand in front of the blackboard, she immediately sat down. Small things like that. Or, 'guys, we have to move the tables closer, otherwise we're sitting so far away from one another'. And when you sit in a circle it's different from sitting behind one another.

As a result of the relative lack of hierarchy, the students felt free to voice their opinions, and felt that the lecturer would not judge their behaviour. This was especially important as the data acquired from the GPS tracker showed many personal details about the students' lives, as they studied their own mobility patterns and experiences, in relation to social

contacts (Cohort 1), and green space (Cohort 2). The students stated that they would not have spoken freely about the collected GPS data if the ambience had not been this open. The students' preference for an informal learning environment in this context illuminates the ethical implications related to privacy when working with geocodes. The importance of lack of hierarchy in the learning environment was confirmed by Kahane (1997, in Gross & Rutland, 2017) who argued that a symmetrical, balanced relationships without hierarchy contributes to the informal setting in which experiential learning should ideally take place.

Third, the scale of the course (five to six students) was appreciated. It meant that the students were less hesitant to participate and share their personal data, since they knew the other students quite well:

> No one changed their behaviour [while carrying the tracking device and keeping the diary]. (…) During the interviews everyone seemed open and honest as well. [During the focus group discussion] we discussed this and we thought it was mainly because of the small and familiar group. It might have been different if we had been talking to strangers.

Additionally, another student thought about the possibility of a similar learning experience in a larger group and argued:

> [In bigger groups] you have to take into account more people. Also in a focus group discussion or an in-depth interview it would be less personal [if there were more students participating, or students who you knew less well].

However, Kuh (2008) argues that active learning practices could also be achieved in larger groups, even though it may be labour intensive and costly. For instance, learning communities and writing-intensive courses could increase students' engagement. Kuh also highlights the importance of the composition of the instructional team and possibility of exploring a common topic across courses. Additionally, frequent feedback from and proximity to academic staff members, mentors or other students is pivotal to gaining "high-impact" results. Hence, the instructional team should promote ongoing sets of conversations. However, this will require time and continuous efforts of both staff and students (Bovill et al., 2011; Kuh, 2008).

Another benefit identified in the current research was that the small scale of the course allowed for the flexible schedules and contents of the classes. This made it easier to shift quickly between topics, and to spend more time on the topics that the students considered interesting. This is in line with Carr et al. (2014) who found that in order to keep up with rapid technical developments and the corresponding changing perceptions of privacy and ethics, a modular and dynamic teaching method is crucial. However, there was also a downside to the flexibility that prevailed in the course, as that was perceived as a bit chaotic by some of the students. Therefore, the key is to create a balance between being flexible and sticking to the original course outline. A potential solution could be to allow students to choose between two alternatives, such as interviews and FGDs. This way, a high level of flexibility could be maintained while at the same time creating more structure by offering just two options.

Collaborative learning in small groups

Collaborative learning emerged as an important theme in the process of learning about both the ethics of doing research, and the ethics of publishing what one teaches on ethics.

In the context of the ethics of doing research, small group size and peer review were discussed. With regard to the ethics of publishing about teaching and learning, the interaction between students and teacher was relevant. Group size in this context refers to active and joint participation in discussions by the students. The students argued that within a course on a larger scale, individual participation would decrease, especially because the learning environment would be less confidential:

> Because we were such a small group and because of the atmosphere, we felt comfortable to speak our minds. This would have been different during [large-scale] lectures; you would not feel [at ease] to do so.

Besides the fact that they experienced the small scale of the course as safe, the students admitted that a larger group would probably have made them lazier. Having more students in a group would decrease the need to participate actively, as there would always be "someone else" who would talk and answer questions. An important effect of small groups is that students get to know each other and the lecturer. As a result, an atmosphere in which there is mutual trust develops more easily. Since the students sensed they could express themselves freely, they were able to discuss with and learn from fellow students. For instance, several students presented very personal details of their participants in their first assignments, including names (not pseudonyms), maps and pictures of home and other locations. In class, we discussed how the students whose information was represented in such a way experienced this. Through such discussions, all students gained first-hand experience of the implications of behaving (un)ethically in doing research. They began to reflect on general ethical implications when doing research, such as data storage and informed consent. These findings confirm research by Kotval (2003) who found that collaborative learning typically occurs in small-group settings. Kotval suggests that a group size of four to six students is ideal for useful discussions, good teamwork and monitoring each other's contributions simultaneously. It should be highlighted that often only very few students are able to experience the benefits of working with academic staff members, which typically occurs in one-to-one settings. However, engaging in such "high-impact activities" is potentially valuable for all students (Kuh, 2008). With its group size of five to six students, the current research group may be seen as a relatively large mentored group who shared the benefits of working with an academic. Peer review was an important element in the course. The students reviewed each other's assignments, and gave each other feedback on how they approached the research project. In the FGDs this emerged as an important aspect of collaborative learning. How this worked is illustrated by this excerpt from the evaluative focus group discussion, when one student asked a fellow student:

> Do you feel, now that we are discussing the topic, that I did not do this [ask for consent] with you [fellow student]? For instance, I did not ask you if I was allowed to use your maps. Also, I used your name in my assignment without asking. Only after [my peer reviewer] told me that this was not usual, I started to think about it. I was wondering: how did you experience this as [a] participant?

Through talking about these ethical issues and reading each other's essays, the students got more familiar with ethical dilemmas and how to handle these within a research process. This included general issues around data storage and informed consent, as well as more specific privacy concerns in relation to the use of geocodes. Learning about the participant's point of view was experienced as especially helpful, for instance:

> I did not feel like [fellow student] asked me too much. I found it reasonable and pleasant that these [privacy] issues were discussed with me.

Again, this confirms the literature on collaborative learning, where peer review is suggested as an important element (Kotval, 2003).

Lastly, the informal interaction between students and teachers is seen as an important element of collaborative learning (Kotval, 2003). In this particular course, the informal setting that was created at the start of the course, discussed in the previous section, enabled the students to become more critical as the course progressed. This pertained to, for instance, the ethics of publishing about teaching and learning experiences as well as the ethics of doing collaborative research with lecturers and students. In both cohorts the students became more critical about what their data would be used for. They started to pose questions to the lecturer about her plans to publish an article based on the course. The following excerpt shows the interaction between a student and the lecturer on this topic:

> Student: What will the article be about? What will you publish? The maps as well? (…)

> Lecturer: I think your privacy is more important than a publication. In the beginning of the course we discussed that this was an experiment, but is that ethical? I think it is good that we are discussing this and that we should think carefully about the possible impacts of publication and what it would mean to you.

This quote summarises some of the ethical implications that are involved in adopting an experiential learning approach to teaching ethics. The lecturer explained how her strategy had not been to present the ethical dilemmas to the students, but rather to let them encounter these dilemmas themselves through experiential learning. The rationale behind this was that this would create a more lasting learning experience. In the discussions between students and lecturer, the ethical implications to this approach to teaching were discussed. In this manner, understanding from different perspectives was enhanced and deep understanding of ethics was generated. This topic will be explored further in the next section.

Deep understanding

During the course, mixed-methods were applied in which the students experienced the research process both from a participant's and a researcher's perspective. This "concrete experience" (see Kolb & Kolb, 2008) encouraged students to critically reflect on the potential impacts, risks or harm of the methods and technology they employed. For instance, one student said:

> Only afterwards I figured out how much data is actually collected during such research. Especially due to the combination of interviews, diaries and GPS data.

Another student was concerned with the privacy of his friends while visiting them. He stated:

> I thought to myself: well, now they can track my friends and see where they live, based on my GPS data and diary. I did not mind [for myself] as I gave permission for it, but I was unsure about [my friends'] opinions as they did not have the opportunity to give permission and learn about the project.

As both quotes demonstrate, their concrete experiences gave the students more insight into why ethics plays a pivotal role in research – they were able to relate to formerly abstract aspects research ethics, such as informed consent, data storage and privacy. After these

concrete experiences, the students were encouraged to reflect on their experiences ("reflective observation", see Kolb & Kolb, 2008). In the focus group discussions, the students critically discussed their roles as both participants and researchers and evaluated the behavioural research projects in which they had previously been involved. For instance, one of the students from the second cohort applied the ethical thinking she had learned to her own research:

> I know now how important it [ethics in research] is. (…) Informed consent, I gained more knowledge about that. I can inform participants for my Bachelor thesis better now, as I know what is important to know as a participant. You use your own experiences, as I experienced the process myself.

This example demonstrates how the student actually transferred the knowledge and skills she had learned in the course, to another research context. In her story, she emphasized how she drew on her own experiences. The discussions about gaining deep understanding through experience are related to the idea that transferable skills can be developed through experiential learning. Transferable skills are skills that can be used in a variety of settings, and thus are not discipline or subject specific (Kotval, 2003). Some examples are independent learning, problem solving, communicating, presenting material, self-motivation and effectively working with others. These skills are not only useful within research activities, but also in other future professions. Furthermore, these skills are ideally developed by experience. In our study, we did find some evidence of students applying skills in a different context. However, as the evaluation meetings took place only shortly after the course had finished, the students had not had much time to actually transfer their skills to other contexts.

Besides deep understanding of general ethical issues in research, the students also learned to consider ethical discussions related to geocodes in more detail. This was done at the personal level, through reflection on their own use of social media, for instance, as illustrated by one of the students:

> I checked my Facebook account again, to see what I share with others.

As this quote shows, the use of personal data was discussed as an important ethical issue. Not only through social media, but also in more general terms, such as how sensitive research data are to be stored and exchanged in a collaborative project such as the one that students worked on in this course. Who has the right to access data? Where can data be stored most securely?

The students also engaged in larger debates around the use of geocodes, such as the ethics of tracking children or older adults with a GPS device. With the latter, the students discussed the balance between safety and privacy. They considered the level of self-determination and the ability to make a conscious decision as crucial in this case. Furthermore, the students also reflected on their own research with geocodes. They identified the knowledgeability of participants as one of the fundamentals in conducting ethically sound research. From their own experiences as participants in the course, they realised how they had consented to track their outdoor mobility without really thinking about it. Only in hindsight, and through the course, did they become aware how much data were collected. Thus they felt they had not been able to make an informed decision about their participation in the research at first. Their own experiences made the students extra aware of the importance of informing research participants properly. In this context, the question "How informed can a participant be?" was posed. One of the students answered:

> I think it is up to the researcher to translate the research into comprehensible language, in order to let the participant understand what they are committing to.

Another student argued:

> You should be transparent in all stages of research, even if it would scare off the participant.

In the case of geocodes, the students suggested showing examples of data and outcomes to the participants.

The learning experiences of the students, represented in the quotes above, demonstrate that they developed stronger moral reasoning skills (DiBiase et al., 2009). Furthermore, we found that through experiential learning, the students developed a framework that can be used to reflect on a variety of ethical dilemmas (DiBiase et al., 2009; Huff, 2014; Valentine, 2005; Zhang, 2017). In line with DiBiase et al. (2009), the students tested their ethical framework on other cases and, in doing so, were able to bridge the gap between theory and practice. In reflecting on the different aspects of ethics in relation to geocodes, the students actually identified alternative solutions and possibilities, which can be linked to the third stage of Kolb's learning cycle: abstract conceptualization (Kolb & Kolb, 2008). A concrete example of a classroom discussion about this topic was about a research project that part of the group had conducted together the year before. They had been doing in-depth interviews with older adults. One of the students explained how, in hindsight, she doubted whether one of the participants they had interviewed, had actually been able to give informed consent, in the sense that he understood what the study was about and how the data would be used. This resulted in a discussion in the group, leading to the conclusion that with their current knowledge, they would probably have decided not to do the interview with that participant, or at least not to use the data that he had provided.

Concerning the content of the course, the mixed-methods approach in which students were both participants and researchers was highly valued and repeatedly pointed out as a useful method for learning about and actually experiencing the relevance of carrying out research ethically. This relates to the use of case studies in teaching ethics. Several authors have pointed out that case studies are an effective way of teaching ethics (see Carr et al., 2014; Davis, 1999; DiBiase et al., 2009; Gannon, 2014; Hay, 2010; Huff, 2014). In this course, the students were not only provided with case studies, they were the case studies. The students indicated that this was a very effective learning method, and one of them stated:

> I was dealing with people I actually knew and got a chance to look into their lives. (…) This is one of the reasons it felt much more important to take into account their privacy. I usually do this, of course, but because I have to. Now it was because I wanted to.

This quote demonstrates how a student's perspective on behaving ethically had changed from something that he had to do, to something that he wanted to do; thus, his motivation to engage in ethical behaviour had become intrinsic to his way of doing research. This example demonstrates that teaching ethics through experiential learning has the potential to change attitudes towards ethics from "a box that you have to tick" (Zhang, 2017) to a topic that is worthwhile to address.

Overall, our findings confirm the importance of deep understanding in ethics education. Through discussions and group interactions, students' understanding is enhanced, and reflection is encouraged. This has also been found by other authors (Gannon, 2014; Kotval, 2003). Hence, we argue, with Gannon (2014), that ethics education should not be simply about telling students how to behave; rather, they need to see ethical outcomes for

themselves. Only then will they be able to integrate ethical issues around, for instance, informed consent, data storage and privacy into their own research practice.

Limitations

Before reaching our conclusions, we wish to briefly address the limitations of this study. It should be borne in mind that this course was taught to students participating in the Honours programme, an extracurricular programme for motivated, talented and enthusiastic students. It is unclear if students in a similarly challenging course in the regular Bachelor's programme would achieve the same results and would be equally enthusiastic about it.

The cultural context in which this course was taught plays a role, and it should be noted that a similar course might result in different outcomes in a different learning environment. Valentine and Speece (2002), for instance, describe that learning is not necessarily the same in all countries and that acceptable ways to communicate and interact may differ. In countries where power distances are typically larger, it might be harder to put experiential learning in practice. Roberts and Tuleja (2008) describe the differences between a more collectivist classroom, with larger power distances, where students show respect to the lecturer by actively listening and not giving feedback, and a more individualistic classroom, where students are encouraged to participate in discussions and give feedback. These cultural differences might make it more challenging to teach a course on ethics with the use of experiential learning in more collectivist cultures, in particular because the learning environment for experiential learning should encourage students' independent learning and challenge their preconceptions (Golubchikov, 2015). However, Valentine and Speece (2002) argue that these issues can be tackled by tailoring the teaching technique to the specific context one finds oneself in, using an example of teaching in Singapore, with a more collectivist classroom. Minor adaptations such as group-based instead of individual discussion, using questions rather than statements and avoiding direct contradictions that may lead to conflict ensured that experiential learning was a suitable and successful teaching technique in this environment

The final limitation related to the course is that the teaching approach was intensive in terms of time investment of both staff and students. However, we argue that in this context this is the best teaching approach possible. The benefits in terms of deep understanding of ethics in mixed-methods research outweigh the time that has to be invested.

Conclusions

Our findings indicate that the experiential learning process in the course Ethics & GPS tracking contributed to the ethical awareness among third-year undergraduate geography students on three different dimensions: the ethics of collaborative research; the ethics of privacy, in relation to geocodes; and the ethics of informed consent and data storage. These dimensions are relevant for other teachers engaged in teaching ethics to undergraduate geography students. Ethical awareness was achieved in three different ways: (1) through maintaining an informal learning environment; (2) through encouraging collaborative learning; and (3) through working on generating deep understanding. We separated these three aspects of experiential learning in the findings, for analytical purposes. However, in everyday teaching practices they are intertwined, and so we discuss them in relation to one another in our conclusion.

In teaching ethics to undergraduate geography students, it is important to acknowledge and act upon input from the students. When they are taken seriously in this respect, students' sense of control over their learning experience increases, and with that their motivation and willingness to participate also grows. In relation to this, it is important to maintain a small-scale and open and non-judgemental environment where students feel free to participate. In the context of this particular course, letting students act both as participants and researchers contributed to their learning experience, as it taught them to observe and experience things from different perspectives. Looking at a problem from different angles contributed to the depth of understanding that the students achieved. At first sight, "ethics" did not seem self-evident nor applicable in their research projects. However, our findings demonstrated how, upon further thought and experience, ethics did become relevant for the students, in the research project conducted in the course as well as in other research projects and situations. The ability to step back from the project, through the FGDs and written reflections, allowed the students to actually realise the amount of data that was collected by combining different research methods, and what this meant for their previous, current and future research projects, as well as for other researchers and organisations who collect data through mixed and new technological methods. Based on the students' own accounts, we can conclude that the students could reflect better on the ethical aspects of their research, both in their undergraduate dissertations, as well as in smaller research projects they had conducted previously.

Notes

1. ECTS stands for European Credit Transfer and Accumulation System, a common unit of measure between European higher education institutes that allows for interchangeable national grading systems. During a regular full time year at university in the Netherlands, students gather 60 ECTS. 1 ECTS equals 28 h of study.
2. Information about the course, such as the course outline, format of the assignments, PowerPoints, and evaluation form are available on request.

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No potential conflict of interest was reported by the authors.

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