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Abstract

Project-based learning (PjBL) is argued to foster a more democratic approach to education, particularly through increasing students' autonomy over their learning. This article presents the findings of research into students' views relating to autonomy over topic choice and group constitution during a series of trial interdisciplinary project-based learning activities with first year geography, earth and environmental sciences (GEES) undergraduates in a UK university. Semi-structured interviews with participating students and tutors, in addition to audio-recordings of staff-student discussion during student-led presentation sessions, formed the dataset analysed for this article. Findings suggest that while some degree of autonomy was welcomed, participants largely favoured prescription regarding research question and group membership. This has implications for the implementation of PjBL and its potential to foster democratisation within the GEES disciplines.

Key words

Project-based learning, democracy, GEES disciplines

Introduction

The socio-economic and environmental challenges facing contemporary society are increasingly recognised as complex, interrelated and transcendent of traditional disciplinary borders (Stauffacher, Walter, Lang, Wiek, & Scholz, 2006). In order to provide students with the necessary skills and aptitudes to address these “wicked problems” (Rittel & Webber, 1974) educators in a wide range of disciplines are exploring the use of project-based learning (PjBL) (see Harmer & Stokes (2014) for a thorough review). This approach claims to confer a broad range of academic benefits, including improved subject understanding and better examination results (Barak & Dori, 2004); and tailored support leading to improved results for weaker students (Frank, Lavy, & Elata, 2003). It is also argued to foster valuable transferable skills among Higher Education (HE) students (Frank & Barzilai, 2004; Mills & Treagust, 2003), such as interdisciplinary team-working, communication skills and project-management – all increasingly important in the contemporary, globalised graduate employment market (Dacre Pool & Sewell, 2007).

Additionally, however, PjBL has been argued to contribute to democratisation within educational institutions and wider society (Helle, Tynjälä, & Olkinuora, 2006). This is firstly through the extension of student choice over the subject and form of study, which is argued to have the practical outcomes of increasing student motivation and enjoyment (Blumenfeld et al., 1991; Frank et al., 2003; Kahn & O'Rourke, 2004) and helps address normative/ideological concerns around the extension of students' agency in the design and direction of their studies (Kolmos, 2009). Secondly, students are enabled to contribute to social democratic progress through their active participation in projects which address real world environmental and social problems (von Kotze & Cooper, 2000).

This article explores students' views relating to autonomy over two central aspects of study during interdisciplinary project-based learning in a UK university: choice over topic and choice over group membership. It presents the findings of research into the experiences of three separate cohorts of geography, earth and environmental sciences (hereafter referred to as GEES) undergraduates who volunteered to undertake identical interdisciplinary projects over three weeks in the autumn term of 2014. The students' experiences were investigated using surveys, semi-structured interviews and audio-taped group feedback sessions with academic staff.

Project-based learning as a student-centred pedagogical approach

Project-based learning rests broadly on the belief that people learn best through doing (Stauffer et al., 2006) and that learning is more effective when related to the exploration (and/or solution of) real world problems (Bell, 2010; de Graaff & Kolmos, 2007; Hanney & Savin-Baden, 2013; Thomas, 2000). As previously noted, such issues usually defy disciplinary boundaries and, as such, projects in PjBL are often interdisciplinary (Frank & Barzilai, 2004; Jarmon, Traphagan, & Mayrath, 2008; Nation, 2008; Stauffer et al., 2006) or work in collaboration with external organisations (Moehr, Protti, Lau, & Grimm, 2004; von Kotze & Cooper, 2000). Projects often conclude with the creation of a tangible end-product (Danford, 2006), which may incorporate a useful social function (Meehan & Thomas, 2006). The approach is practiced across a wide range of disciplines but is particularly prevalent in engineering (Harmer & Stokes, 2014), arguably because of the inherently interdisciplinary nature of the subject and its emphasis on the collaborative creation of a material end product (Otake et al., 2009).

Similarities in educational philosophy and practice, together with lack of a consistent definition and interchangeable use of terms, mean that the conceptual boundaries between PjBL and other active learning pedagogies such as problem-based learning (PBL) (Graham, 2010; Pawson et al., 2006), inquiry-based learning (IBL) (Spronken-Smith & Kingham, 2009), and enquiry-based learning (EBL) (Kahn & O'Rourke, 2005), are often unclear (Savin-Baden, 2007). In GEES disciplines approaches such as PBL (Beringer, 2007; Pawson et al., 2006) and IBL (Spronken-Smith & Kingham, 2009) are more commonly applied at undergraduate level, and as such the literature on PjBL in geography and related disciplines is relatively sparse (Nation, 2008). The few examples of PjBL within the GEES disciplines tend to focus on graduate students and/or to explore the interdisciplinary subject area of sustainability (Brundiers & Wiek, 2013; Kiliç, 2010; Meehan & Thomas, 2006; Nation, 2008). Project-based learning eludes a clear and precise definition, but for the purposes of this study is defined as “an activity in which students develop an understanding of a topic or issue through some type of involvement in an actual (or simulated) real-life problem or issue and in which they have some degree of responsibility in designing their learning activities” (Morgan, 1983, p. 66). It is the focus of PjBL on real-world issues, which are by their nature messy and complex, that makes this approach appropriate for an interdisciplinary context. However, the similarity of core attributes such as an emphasis on active and student-centred learning, together with a facilitative role for staff, with those of PBL and other enquiry-based learning approaches, means that the findings of this research project may also be of relevance to practitioners using these pedagogies.

The roots of PjBL have been traced to the educational philosophy of John Dewey (Morgan, 1983) and to educationalist William Kilpatrick (de Graaff & Kolmos, 2007). In *Democracy and*

Education, Dewey (2009, p. 467) argues that education has a normative purpose: that of “improving the life we live in common”. Democracy, he argues, cannot thrive where education has utilitarian, or technical, rather than human ends (Dewey, 2009, p.467). Instead, the subject matter must be “relevant to the problems of living together, and where observation and information are calculated to develop social insight and interest” (Dewey, 2009, p.467-8). Crucially for Dewey, interest cannot be imposed externally but is intrinsically bound up with the student’s life and expectation and participation - it is “volitional” (2009, p.434). For Kilpatrick, “purposeful activity” should be at the heart of learning and this is achieved through respecting each student’s personality and fostering qualities supportive of democracy such as “self-direction, initiative, acting on thinking...” (Kilpatrick, 1951, pp. 248-249). Importantly, it also involves choice on behalf of the learner, or what Kilpatrick describes as “child purposing, conducted under teacher guidance” (1951, p.249). These classic formulations of student-centred pedagogy, in which learners have a degree of choice over the subject and direction of their educational exploration, are very much at the heart of the theory and development of PjBL (de Graaff & Kolmos, 2007; Morgan, 1983).

In Europe, PjBL began to gain traction in the 1960s in response to student demands for a cultural shift away from traditional teaching (transmission-based) methods to student-centred techniques which were implemented across several Western European institutions (Kolmos, 2009). One aspect of this democratisation was a commitment to working for community benefit and for socially progressive aims (von Kotze & Cooper, 2000). A second element was the democratisation of the learning experience itself through valuing and drawing upon student’s prior experiences (Von Kotze & Cooper, 2000) and utilising student choice to increase motivation (de Graaff & Kolmos, 2007). PjBL usually incorporates greater

levels of student involvement in choosing the subject, direction and development path of their study than in traditional teacher-centred pedagogies (Morgan, 1983). This is seen to have intrinsic normative value (Helle et al., 2006) and also practical application as student choice is seen to be linked to increased levels of student motivation towards their learning (de Graaff & Kolmos, 2007).

A key characteristic of PjBL is the emphasis on the *process* as well as the *product* of a learning activity (Morgan, 1983). In particular, the importance of student choice over area or topic of study is stressed in much of the literature on PjBL (Harmer & Stokes, 2014). Stauffacher et al. (2006) argue that student choice over the question to be investigated is key because a largely self-directed project, likely to take time and resources, needs to be relevant to the student's interests in order to sustain motivation: "Ownership", it is claimed, is all important "when it comes to the motivation of the students" (2006, p.265). A crucial aspect here is the choice of case study or topic. Danford (2006), for example, stresses that a student's ability to have 'some choice of topic as well as the nature and the extent of content in the project' is central to the approach (Danford, 2006: p.11). Bell also considers student choice to be a critical element, although students do not maintain complete control since "Teachers oversee each step of the process and approve each choice before the student embarks in a direction" (2010, p.39). Choice is so important because it provides "intrinsic motivation" allowing learners to pursue "their own interests" (Bell, 2010). Furthermore, the inclusion in PjBL of greater student choice and autonomy, together with opportunities to work unsupervised and assume greater responsibility for their learning than in traditional teaching approaches, facilitates student learning and mastery (Thomas, 2000). Bell (2010, p.43) suggests that by having choice over the way in which they learn,

their learning environments, and the method of final presentation of the learning outcomes, students are likely to reflect upon their choices and take more responsibility for their own learning. This is further underscored by Helle, Tynjälä and Olkinuora (2006. p.293) who argue that PjBL allows learners to find solutions to problems “in their own idiosyncratic way”, including having a say over “content, sequence and pacing”. It has also been argued that the use of facilitated group work can foster pro-democratic behaviours such as decision-making within a group context (Frank & Barzilai, 2004; Joyce, Evans, Pallan, & Hopkins, 2013), particularly where an emphasis is placed on providing sessions on group decision-making techniques such as consensus, and majority voting (Frank & Barzilai, 2004). However, group work has also been widely recognised as one of the most problematic elements of PjBL (e.g. Frank & Barzilai, 2004; Meehan & Thomas, 2006; Stauffacher et al., 2006).

PjBL thus clearly has its roots in, and the potential to provide, a vehicle for a more democratic approach to education. There are two critical elements associated with this: 1) increasing student autonomy over the topics and modes of study in order to harness and motivate through relevance to students’ own lives, experiences or interests; and 2) a commitment to progressive social change. This latter principle is of particular relevance to education within the GEES disciplines, in which there is a long history of commitment to helping students gain the knowledge, skills and critical faculties with which to help tackle complex and cross-disciplinary socio-environmental problems.

This article focuses on the first of these elements by exploring students’ views of autonomy over choice over topic, and group constitution, during a series of trial PjBL activities

undertaken with interdisciplinary groups of students from across the GEES disciplines. This research was carried out as part of a curriculum development project investigating the effectiveness of interdisciplinary PjBL as a student-centred pedagogy for first year undergraduates. As well as providing new insights into the application of PjBL within the GEES disciplines this research also offers deeper understandings of some of the challenges around the extension of democracy in regards to student autonomy of learning when participating in interdisciplinary PjBL at the early stages of an undergraduate degree. The study used Morgan’s (1983) conceptual model for PjBL as its theoretical framework, whereby PjBL activities are characterized with respect to two dimensions: *project intention* in which the focus varies along a continuum from purely academic topics to ‘real world’ issues with social and political components) and *control* which varies along a continuum from entirely student-centred to entirely teacher-centred). In this project the intention was to focus on a real world issue with social, economic and environmental implications, and to apply a largely student-centred pedagogic approach, albeit with some teacher control. The activities undertaken most closely represent Model II (‘project component’) in Morgan’s idealised typology (Table 1), and bear the following characteristics:

- Interdisciplinary with broad objectives
- Focus on relevant/real-world issues
- Run in parallel with conventionally taught components

Table 1. Morgan’s idealised models of project work (Morgan, 1983)

Idealised model	Key characteristics
Model I: Project exercise	<ul style="list-style-type: none"> • Students apply knowledge and techniques already acquired to an issue in a familiar subject area • Some topic choice with options likely to reflect teacher’s

Model II: Project component	<p>research area</p> <ul style="list-style-type: none"> • Methods reflect existing paradigms of discipline • Similar to final year research projects in science disciplines • Interdisciplinary projects with broad objectives to develop abilities in problem-solving and independent working • Methods less clearly defined and discipline-specific • Often run early in degree programmes alongside more conventional taught components • Greater freedom to choose topic • Projects related to ‘real world’ issues, i.e. perceived as ‘relevant’
Model III: Project orientation	<ul style="list-style-type: none"> • Reflects entire curriculum philosophy where project work central to curriculum delivery • Conventional (didactic) teaching used to supplement project requirements only • Interdisciplinary projects based on ‘real world’ issues • Pedagogic approach promotes independence and intrinsic motivation

These activities are located within a broader Model III (‘project orientation’) framework which reflects a large-scale shifting of the curriculum philosophy within the host institution from simply delivering ‘education’ towards provision of a more innovative, market-driven commodity. This includes the delivery of interdisciplinary modules during the second semester of the first undergraduate year which are designed around a PjBL framework involving small group project work. These modules, which will be delivered over a four-week period of intensive and immersive teaching and learning, are due to be introduced into the host institution in the 2015/16 academic year.

This article reports on the following aspects of the research: i) the extent to which students desired choice over their research question and topic of enquiry; ii) students’ views on the

autonomy to choose group membership; and iii) the implications of student responses to levels of autonomy in the trial for furthering democratic practice in GEES education.

Methodology

The study took place between April 2014 and November 2014. Full ethical clearance was obtained prior to the commencement of the project. The project was designed and delivered by a team of five academic staff with expertise across the GEES subjects (the 'project team'), and a key characteristic was having students and academic staff work in partnership to explore the key issues around interdisciplinary PjBL. The project was undertaken in two phases, and this paper focuses on findings emerging from the second phase of the project:

- **Phase 1:** Fourteen first year undergraduate students and six academic staff members (including two members of the project team) from across the GEES disciplines participated in a half-day workshop in April 2014 to identify the key benefits and challenges offered by interdisciplinary PjBL, and to identify ideas for potential pilot projects.
- **Phase 2:** Using the outcomes from Stage 1, the project team developed a pilot PjBL activity based around the issue of energy and climate change, which was tested with three small interdisciplinary groups of undergraduates over successive, identical trials during October to November 2014. While the number of students taking part was limited, the use of group discussions and individual interviews meant that a rich dataset was created, which provided in-depth insights into the students' experience.

Invitations to take part in the study were sent to individual students nominated by their personal tutors. Although the opportunity to participate was restricted, this targeted

sampling approach was favoured as it was important to recruit motivated individuals willing to undertake academic work voluntarily, and outside of their normal curriculum. This approach enabled the successful recruitment of fourteen first year students to phase one of the project, with an additional two recruited to phase two. The limitation of this method was that the students recruited were not necessarily representative of their year group, although they were able to reflect on how they felt other students in their wider peer group might experience this teaching technique. For the second phase (the PjBL trials) the students were placed into three cohorts, each consisting of one interdisciplinary group of five or six participants defined by the project team (Table 2). The PjBL trials were undertaken at the beginning of their second academic year, although one student withdrew partway through his respective trial so only fifteen completed. An incentive to participate was the opportunity to gain substantial credit towards a major award offered by the host institution.

Table 2. Gender and academic programme of student participants in the PjBL trials (Stage 2).

	Trial 1	Trial 2	Trial 3	Total
Male	2	2	3	7
Female	3	4	2	9
BSc / BA Geography	1	1	1	3
BSc Geology	2	2	1	5
BSc Physical Geography and Geology	0	1	1	2
BSc Environmental Science	2	2 ^a	2	6
Total	5	6	5	16

a. One student withdrew partway through the trial.

Within the staff project team two members acted as academic tutors for the trial activity, two acted as researcher-evaluators, and the fifth undertook a facilitative role. These roles were deliberately distinct in order to separate out the academic delivery from the evaluation. The three groups of students separately, but consecutively, trialled a PjBL

activity in which they were required to research the question ‘To what extent does coal with Carbon Capture and Storage (CCS) represent a sustainable means of electricity production?’, and to present their findings on a mind-map which would then be discussed with the project team. The research question was designed to be sufficiently broad in scope to be inclusive of students from each of the participating disciplines. Each trial ran over a three-week period, and each started with a one-hour staff-led introduction and ended with a student-led session in which they informally presented the outcomes from their project. Each staff-led introduction provided only a brief twenty-minute overview of CCS, followed by an explanation of the staff research project into PjBL, and an introduction to mind-mapping techniques. As the introductory and student-led sessions for each of the three cohorts lasted for approximately one hour each, formal contact time with project staff was limited to two hours per group (see table 3)

Table 3. Pattern of activity within each trial.

Week	Student activity	Academic tutor activity	Research/evaluation activity
1	<ul style="list-style-type: none"> • Attend introductory session and project briefing • Commence project activities 	<ul style="list-style-type: none"> • Deliver introductory session and briefing 	<ul style="list-style-type: none"> • Administer survey to evaluate introductory session
2	<ul style="list-style-type: none"> • Continuation with project tasks and activities 	<ul style="list-style-type: none"> • Deliver optional staff-led support session (if requested by students) 	
3	<ul style="list-style-type: none"> • Present mind-map and discuss research findings 	<ul style="list-style-type: none"> • Lead debrief discussions 	<ul style="list-style-type: none"> • Record discussions between students and staff about the project activity
Post-trial			<ul style="list-style-type: none"> • Conduct one-to-one interviews with students and academic tutors^a

^a. Academic tutors were interviewed once all three trials had been completed.

[Insert Table 3 here].

Students were asked to spend a total of between twelve and fifteen hours on the activity including the introduction and presentation sessions. The introductory session also detailed the project aims and evaluation procedure, and sign-posted key background information relating to the research topic. The information from the introductory session was also made available as narrated PowerPoint presentations through a dedicated online learning site, together with reading and resource lists. Students were advised that they could request additional staff time if further support was needed but would otherwise be reporting back at a final session in three weeks' time. This framework allowed the students to determine how they would approach the activity and how much, if any, help they would seek from the tutors, who maintained a facilitative, rather than directional role.

The final session was deliberately informal. Students and project staff sat together around a table while the students discussed their findings and responded to questions from the academic tutors. The trial incorporated several features of a democratic approach to pedagogy embedded within the philosophy of PjBL. Firstly, students had input into the design of the trial through participation in the initial workshop – although academic staff made the final decisions on the topic and the wording of the research question. While there is no consensus in the literature on whether questions are best chosen by staff or students, Blumenfeld et al. (1991) have stressed instead the importance of non-pre-determined outcomes so that students can have genuine ownership of the process of exploration. Secondly, after the initial introduction by staff, students were able to choose how they approached the question, the group work, and production of the final product and were

encouraged to proceed without further direction from tutors unless help was needed.

Thirdly, the format of the presentation of the mind-map was not pre-determined by staff and tended to evolve as a dialogue led by the students. However, students did not have a choice over group membership or over the type of output required. This balance between teacher-centred and student-centred control of the design and implementation of the project conforms to Morgan's description of PjBL where he argues that in practice both groups will be involved in the decision-making, with the relative influence of each party varying between projects (Morgan, 1983).

Three types of evaluation data were collected over the duration of the research (Table 3): i) a survey of students following the staff-led introduction to gain feedback on the design and delivery of the session; ii) semi-structured interviews with the students and with the two academic tutors, following the end of the trials; and iii) tape recorded discussions from the student-led session. The first dataset, comprising surveys collected after the introductory session, are not discussed in this report. Fourteen students participated in semi-structured, individual face-to-face interviews with the first author in the week following the end of their trial, while the two academic tutors were interviewed at the end of the third trial.

The interviews lasted between 20 and 40 minutes and questions focused on the participants' motivations for taking part, experiences of undertaking interdisciplinary PjBL, and reflections on their personal and academic outcomes. These, together with the group discussions held during the final project meeting, comprise the dataset discussed in this paper. All interviews were audio recorded and the transcriptions analysed using Nvivo 10.

Interview transcripts were thematically analysed to identify participants' perceptions of, and responses to, key aspects of the PjBL process.

One limitation of the methodology is that the students were required to carry out the project in addition to their other timetabled modules. This meant that the time spent on the project was necessarily restricted and not comparable to the experience of carrying out a project full time for four weeks, as required in the new PjBL modules. Also, being at the beginning of their undergraduate second year, the students were at a more advanced academic stage than they would be if undertaking the new PjBL module 'for real'.

Furthermore the output (a mind-map) was less ambitious than would have been possible if the project had been full time. Nonetheless, the students were able to give in-depth feedback about their experiences and frequently reflected on how they might have found the project if they had been in their first year, and had been able to devote themselves to the project full time across four weeks. Finally, as previously noted, students were invited to participate in the trial based to some extent on their levels of academic motivation so the study sample is not necessarily representative of the wider student cohort.

Results

Choice of project topic

A key strand of the literature on PjBL stresses the importance of student choice over their topic of investigation (Danford, 2006; Bell, 2010). However, the student participants in this study demonstrated considerable ambivalence over their desire for choice of subject, as opposed to academic staff determination of the topic. Some students were very much in favour of the question being selected by the academic tutors, arguing that choice can be

problematic. One student explained that creating ones' own question is "quite difficult to do". They referenced the experience of peers in first year tutorials who had been asked to devise their own questions and "didn't even know where to start" and felt that this might be possible for high-achieving students but that "those who are sort of middle to not as good would probably struggle to come up their own question at that point in the year" (Student interview, group 3). The difficulty of choosing, albeit from a range of pre-allocated questions, was also highlighted by another student, along with the potential for disagreement within the group. For example, one student explained:

Personally, I'm like awful at picking, at choosing. So I'm so indecisive. I'm quite happy that there was just one question because I think some people, like I was in a group a while back and we got to pick and somebody was just like: "Well that's not a question I wanted to do, so I'm just going to sit in the corner and cry and I don't want to do that". I think it may just make life so much more difficult and I think like being given the question, this is what you are doing, none of us even questioned it really, we were like: 'Yeah, it's a good question. It's interesting. I like this part of it. I like that part of it'. And we just sort of got on with it (student, final session group 1).

The student does suggest, however, that the topic's grounding in real world problems maintained their interest, and that the scope of the question and the autonomy over how the project was approached, allowed students the agency and freedom to pursue aspects of the topic which piqued their curiosity.

The need for direction, however, was highlighted by another student as rationale for lack of choice over the question or topic:

Student: I think good to have a bit of certainty that this is the question you are doing, because sometimes you don't know where you want to go actually, need a bit of direction. And sometimes actually you get more from it if you go into an area that you maybe don't initially think you would do that.

Interviewer: So are you really saying no choice; just be told what to do?

Student: Yeah, maybe. Maybe sort of three different topics. Actually, no – maybe no choice is probably best (Student interview, group 3).

Despite some initial hesitancy, the student suggests that a restriction of choice is helpful and this is linked to a lack of prior knowledge about which topics might be fruitful for exploration.

A further reason for students favouring a restriction of choice is a commitment to interdisciplinarity. The students reported that they valued working with students from other GEES disciplines and some were concerned that providing choice over topics would dilute the interdisciplinary nature of the project. One explained:

I think, with a choice of question, there's almost a danger that the geographers are going to want to do one, the geologists are going to want

to do another and the environmental scientists another. So I think it probably would be easier if you were assigned a question but as long as it kind of covered enough so that people didn't feel like they were being left out....(Student interview, group 2).

The academic literature suggests that group tensions are a common challenge in PjBL (Meehan & Thomas, 2006; Stauffacher et al., 2006) and research by Frank, Lavy and Elata (2003) also suggested staff carefully consider and are involved in forming group composition. The issue of group dynamics is linked to choice over questions as it is seen by some students as having the potential for discord. Thus one student, while arguing that “it would be nice to pick and choose” partly because “everyone has things they prefer and their opinions”, also foresaw difficulty in group consensus on a topic “because the group would have to decide on and some people would want to do one and some people would want to do other.... So choice may not necessarily be a good thing [laughing]” (Student interview group 2).

The students interviewed were not unanimous, however, regarding a lack of choice over the question. The inclusion of group discussion as well as individual interviews as a source of evidence on this theme and the nature of qualitative data, which does not demand an either or response, means it is difficult to express statistically the number of students who expressed a preference for choice over restriction of choice. A simple categorisation of all responses into: ‘wanted choice’ over the question; ‘wanted no choice’, and those who were not sure or ambiguous, suggests that seven responses favoured no choice, five favoured some element of choice (but this included the provision of a set list of questions) and a further three responses were undecided or ambiguous. Several students commented that

they would like to be able to develop their own question “with guidance” from the academic staff. One student also noted that question development, if properly supported by lecturers, could be a useful skill for future assignments, suggesting the importance of this autonomy for later stages of study. Others felt that a choice from a staff-formulated list might also allow for students to pursue a topic which appealed to them; or that students could be directed to explore different aspects of the same topic to avoid duplication.

Choice of group

One notable finding within the PjBL trial was that students were supportive of working in pre-allocated groups and having choice over group constitution removed from them.

Although several questions about group work were asked, the original interview schedule did not contain a specific question regarding whether the students favoured choice or staff allocation of group membership. This question was asked at the second student-led session and then emerged strongly during an interview with a student in the second cohort from an answer to a general question about the project. It was then asked directly to six of the students and at the final focus group. Of the nine responses on this issue, all favoured being put into groups by the academic staff, although five of these added a caveat that having one ‘buddy’ in the group from their own discipline would be preferable. Several students felt that ‘free-riding’ by group members might be limited where people were not from existing friendship groups and that it was easier to voice concerns about levels of contribution with strangers than with friends. As one student explained:

Personally, I think its better just to get put into groups because at the moment I have loads of different group works, three or four going on at the

moment. Most of them are with people I don't know and it is quite good because I've got to meet people and talk to people you don't normally talk to and you sort of make new friends. But in the group that I am actually with my friends, which is one of them, all we do is argue about what we are going to decide on; every sort of point that we make, someone has something to say about it. I think it's is because we are so relaxed as well with each other, we are happy to put our opinion across and all we do is argue, we don't get any work done and we are so behind on the work because all we do is bicker (Student interview, group 2).

Another student commented:

I think you [academic staff] should pick because I really don't want to be with my friends for group work because it will cause so many arguments. And my friends are going to be like: Oh, I'll be with you. And I'll be like: yeah... [laughter]. You can't say to your friends: I don't want to work with you because they will be like: why not? (final session, group 2).

The student also felt that first years in particular would find it challenging to approach and join those they did not know from other disciplines and that therefore it was a “more democratic process” for academic staff to pre-select groups from across the disciplines. The use of pre-allocated groups was also seen by some to ensure that project work was truly interdisciplinary. One student, for example, commented that: “...the pairing up worked really well: two geologists; two geographers; two environmental scientists. We all kind of covered our own area and the economic [aspect of the issue] kind of got overlapped” (final

session, group 2). There was, however, some support among the participants for using a “buddy system” where you could choose one person to work with from your own discipline in order to have “that safety net of someone that you know” (student interview, group 2) with the rest of the group drawn from other disciplines. Another benefit from tutor-allocated groups, identified by several students, was the chance to work with new people and make friends outside a chosen degree course. One student explained that social groups tended to form fairly early on in the first year and that after this, opportunities for meeting new people can be limited.

For instance, one student commented:

I think the social aspect of it, especially for first years is probably on par with the learning aspect of it. So I do think....there are just four other people you would never otherwise have spoken to that you would speak to for a first year (Student interview, group 1).

The results outlined above suggest that students in the trial favoured the pre-determination of project groups by staff for three main reasons: self-selection into groups was seen to potentially jeopardise the benefits of working as an interdisciplinary team; students welcomed the social opportunities afforded by meeting peers on other programmes; and participants liked working with relative strangers as they were able to interact on a more professional basis, unimpeded by friendship ties.

Discussion and implications for practice

The findings from this study suggest that students, at this stage in their degrees, were ambivalent about the levels of autonomy they favoured when carrying out PjBL. This may be partly explained by post hoc rationalisation in that the students were not given choice over topics before the trial started. When asked about the project in post-activity interviews, they had generally enjoyed the overall project experience and this may have influenced their positivity about the lack of choice of question. For instance, one student linked their satisfaction with lack of question choice to their support of being steered to do a new topic in a different discipline. The question on CCS and sustainability had deliberately been chosen to provide for students from across the GEES disciplines, combining aspects of social science and the natural sciences. Interview responses suggested that the students generally found the topic interesting and had enjoyed the novelty of working on a cross-disciplinary issue, with the breadth to allow exploration of multiple aspects and the opportunity to meet, work with and discuss real world issues with peers on other programmes. However, it may also be explained by the setting of a question with enough scope to allow significant student autonomy over aspects of the question explored and the mode of carrying out the research.

A further explanation may be connected to the increased costs of HE in the UK and the competitiveness of the graduate labour market which may lead to students favouring high grades and the acquisition of transferable skills over autonomy of learning. This is supported in the literature by de Graaff and Kolmos (2007) who argue that that the democratic principles of PjBL may have been overshadowed by an emphasis on the development of professional skills. Alternatively students might be happy simply to let

lecturers choose because they feel that the question will be better crafted and that they will therefore have more chance of success in their degree result. In a similar vein, where there are group marks awarded, students may want to work in groups which are effective and which they believe will help them achieve high marks. The interviews with students suggest that at this stage in their study they feel this is best achieved through working with relative strangers, or with unknown students from other disciplines and a 'buddy' from their own discipline.

The issue of group membership is perhaps less fundamental to the principles of democracy and student autonomy than that of choice over the topic or subject of study, which is argued to be so important for student motivation (Bell, 2010). It may be that during a student's first undergraduate year the balance needs to be more firmly in favour of scaffolding (defined by Thomas (2000: 7) as "learning aids, models, training strategies") over independence as students may find it too difficult to either formulate their own question, or to negotiate with other group members to choose one title. Joyce, Evans and Pallan (2013. p.77) have previously highlighted the "delicate tension between student's wish for autonomy and freedom and their wish for support" in respect of mechanical engineering students, particularly those in the earlier stages of their degrees. The results of the trials outlined in this article suggest that, particularly in interdisciplinary PjBL, it may be appropriate to help students at an early stage of their undergraduate studies by providing them with ready-made research questions and group membership, providing these are broad enough to allow individual autonomy over which aspect of the question to pursue, freedom to choose working methods, and are sufficiently grounded in real world problems to hold students' interest. Students had some input into the trial via the generation of

ideas about the shape and subject of the activity through their participation in the original workshop sessions. Furthermore, the trial allowed students a significant degree of freedom regarding how they conducted their study. During the final sessions, the students reflected on the way they had successfully negotiated within their groups to organise and divide up the tasks, which usually allowed individuals to choose and research areas in which they either had a prior interest or a curiosity to learn more in an unfamiliar discipline or topic area. This allowed students some choice over area of research within the framework of the prescribed question. They had also self-organised their group study sessions, planning and liaising meeting times without teacher input and had not availed themselves of further optional tutor support offered – signifying a degree of autonomy over the process and mode of their learning and choice over their area of research (Morgan, 1983). As noted above, the students were not representative of their cohort and were trialling a project aimed at first year students. Indeed two of the students suggested that the successful group dynamics experienced in the trial may have been related to the fact that they were self-selected volunteers and therefore motivated to participate. One of these students also stated that as second years “we all knew just to get on with it” (Student interview, group 1). Three students indicated they had not requested extra contact time with the tutor as they were able to do the research unassisted and another student specified this was because they felt the staff input and online resources were adequate without further contact time. However, eleven students in the individual interviews and further group discussion in each of the student-led sessions suggested that although they hadn’t requested extra staff contact time they thought that further provision of timetabled meetings with the academic staff would be beneficial and several felt this would be particularly important for first year

students. For instance, one student highlighted how she had observed that some of her peers can feel nervous about contacting academic staff. She explained:

There's kind of still this hold-over of: sir's really scary or miss is really scary ...So, I think, yes scheduled time where people are able to come along and, as it were, make use of the staff availability would probably be useful for both the staff and for the students, especially for those who aren't necessarily going to have the confidence or the wherewithal to drop someone an email when they need extra support" (student interview, group 2)

Furthermore, several were very supportive of the idea of providing initial group work training/ team-building sessions and felt this would be particularly useful for first years or individuals who were less experienced at group work. This suggests that in terms of future implementation, the projects would benefit from additional timetabled meetings between the groups and the academic staff, and the inclusion, at an early stage in the project, of group work training sessions. The exact design of the project, including factors such as the research question or topic, the type of assessment, and the balance of scaffolding versus teacher contact time, is likely to vary in relation to the specific disciplinary and institutional context, and stage of study. In this trial, student feedback suggested that staff direction over group composition and question choice were largely successful, therefore this approach will be adopted in future PjBL modules.

These features of partial student autonomy fall within the spectrum of student/teacher control outlined in the PjBL literature (Morgan, 1983). While this limited student autonomy may be appropriate at early stages of study, at later stages the crucial skills of question formulation and clarification, negotiation with peers and tutors over question choice, and

managing the dynamic of both forming and working in groups become increasingly important both in terms of the development of transferable skills and in order to empower students to make choices over the content and form of their own learning. As Morgan argues, “the key feature of project-based learning is that students develop autonomy and responsibility for their learning. The *process* of learning as well as the *products* become important aspects of the educational activity” (original emphasis Morgan, 1983, p.67).

Conclusions

This article presents findings from an investigation into the application of PjBL to small, interdisciplinary groups involving students and academic staff from geography, earth and environmental science (GEES). The findings suggest that despite PjBL’s philosophical roots in a commitment to greater democratisation in education, first year students taking part in trial projects were often happier for key decisions relating to the projects to be taken by instructors, providing the question was broad enough to allow scope for individuals to have some autonomy over how the question was approached. These findings contribute to our understanding of the student experience of PjBL in geography and related disciplines in HE, and have implications for the application of interdisciplinary PjBL across the GEES disciplines. The findings suggest that academic staff designing interdisciplinary, project-based learning with students at an early stage of study may need to consider providing greater direction over the topic of study and the constitution of interdisciplinary groups, even if this means partially limiting student autonomy – a key philosophical element of the approach. The provision of structure in this way may provide a positive experience of interdisciplinary group project work. The findings also raise challenges for the use of PjBL as democratisation

of education in practice, particularly in an era when the acquisition of professional skills may be privileged over democratic ideals (Helle et al., 2006), and suggest that the principles and practice of democratisation in education may need to be better explained, promoted and integrated into HE curricula in order to reassert its value among current generations of students.

References

- Barak, M., & Dori, Y. J. (2004). Enhancing undergraduate students' chemistry understanding through project-based learning in an IT environment. *Science Education*, 89(1), 117-139. doi: 10.1002/sce.20027
- Bell, S. (2010). Project-Based Learning for the 21st Century: Skills for the Future. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 83(2), 39-43. doi: 10.1080/00098650903505415
- Beringer, J. (2007). Application of Problem Based Learning through Research Investigation. *Journal of Geography in Higher Education*, 31(3), 445-457. doi: 10.1080/03098260701514033
- Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational psychologist*, 26(3-4), 369-398.
- Brundiers, K., & Wiek, A. (2013). Do We Teach What We Preach? An International Comparison of Problem- and Project-Based Learning Courses in Sustainability. *Sustainability*, 5(4), 1725-1746.
- Dacre, P., & Sewell, P. (2007). The Key to Employability: Developing a Practical Model of Graduate Employability. *Education & Training*, 49(4), 277-289.
- Danford, G. L. (2006). Project-based Learning and International Business Education. *Journal of Teaching in International Business*, 18(1), 7-25. doi: 10.1300/J066v18n01_02
- de Graaff, E., & Kolmos, A. (2007). History of problem-based and project-based learning. In E. de Graaff & A. Kolmos (Eds.), *Management of change: Implementation of problem-based and project-based learning in engineering* (pp. 1-8): Sense.
- Dewey, J. (2009). Democracy and Education. In S. Cahn, M. (Ed.), *Philosophy in Education: The Essential Texts*. New York and London: Routledge.
- Frank, M., & Barzilai, A. (2004). Integrating alternative assessment in a project-based learning course for pre-service science and technology teachers. *Assessment & Evaluation in Higher Education*, 29(1), 41-61. doi: 10.1080/0260293042000160401

- Frank, M., Lavy, I., & Elata, D. (2003). Implementing the Project-Based Learning Approach in an Academic Engineering Course. *International Journal of Technology and Design Education*, 13(3), 273-288. doi: 10.1023/a:1026192113732
- Graham, R. (2010). UK approaches to engineering project-based learning. *White Paper sponsored by the Bernard M. Gordon/MIT Engineering Leadership Program*. <http://web.mit.edu/gordonelp/ukpjblwhitepaper2010.pdf>. Retrieved from <http://web.mit.edu/gordonelp/ukpjblwhitepaper2010.pdf>
- Hanney, R., & Savin-Baden, M. (2013). The problem of projects: understanding the theoretical underpinnings of project-led PBL. *London Review of Education*, 11(1), 7-19. doi: 10.1080/14748460.2012.761816
- Harmer, N., & Stokes, A. (2014). The benefits and challenges of project-based learning: A review of the literature. *Pedagogic Research Institute and Observatory (PedRIO) Plymouth University PedRIO Paper 6*. <https://www.plymouth.ac.uk/research/institutes/pedagogic/pedrio-occasional-papers>
- Helle, L., Tynjälä, P., & Olkinuora, E. (2006). Project-based learning in post-secondary education—theory, practice and rubber sling shots. *Higher Education*, 51(2), 287-314.
- Jarmon, L., Traphagan, T., & Mayrath, M. (2008). Understanding project based learning in Second Life with a pedagogy, training, and assessment trio. *Educational Media International*, 45(3), 157-176. doi: 10.1080/09523980802283889
- Joyce, T., Evans, I., Pallan, W., & Hopkins, C. (2013). A Hands-on Project-based Mechanical Engineering Design Module Focusing on Sustainability. *Engineering Education*, 8(1).
- Kahn, P., & O'Rourke, K. (2004). Guide to Curriculum Design: Enquiry-based learning. Retrieved from http://www.ceebl.manchester.ac.uk/resources/guides/kahn_2004.pdf
- Kahn, P., & O'Rourke, K. (2005). Understanding Enquiry-based Learning (EBL). In T. Barrett, I. Mac Labhrainn & H. Fallon (Eds.), *Handbook of Enquiry and Problem-based Learning: Irish Case Studies and International Perspectives* Galway: Aishe and CELT NUI Galway.
- Kiliñç, A. (2010). Can project-based learning close the gap? Turkish student teachers and proenvironmental behaviours. *International Journal of Environmental and Science Education*, 5(4), 495-509.
- Kilpatrick, W. (1951). *Philosophy of Education*. New York and London: The Macmillan Company.
- Kolmos, A. (2009). Problem-Based and Project-Based Learning. In O. Skovsmose, P. Valero & O. Christensen (Eds.), *University Science and Mathematics Education in Transition* (pp. 261-280): Springer US.
- Meehan, B., & Thomas, I. (2006). A Project-Based Model for Professional Environmental Experience. *Applied Environmental Education & Communication*, 5(2), 127-135. doi: 10.1080/15330150600700852
- Mills, J. E., & Treagust, D. F. (2003). Engineering education—Is problem-based or project-based learning the answer? *Australasian Journal of Engineering Education*, 3, 2-16.
- Moehr, J. R., Protti, D. J., Lau, F. Y., & Grimm, N. A. (2004). Project based experiential distance education: an oxymoron? *International Journal of Medical Informatics*, 73(2), 157-163. doi: <http://dx.doi.org/10.1016/j.ijmedinf.2003.11.017>
- Morgan, A. (1983). Theoretical Aspects of Project-Based Learning in Higher Education. *British Journal of Educational Technology*, 14(1), 66-78. doi: 10.1111/j.1467-8535.1983.tb00450.x
- Nation, M. L. (2008). Project-Based Learning for Sustainable Development. *Journal of Geography*, 107(3), 102-111. doi: 10.1080/00221340802470685
- Otake, M., Fukano, R., Sako, S., Sugi, M., Kotani, K., Hayashi, J., . . . Sato, T. (2009). Autonomous collaborative environment for project-based learning. *Robotics and Autonomous Systems*, 57(2), 134-138. doi: <http://dx.doi.org/10.1016/j.robot.2007.06.003>
- Pawson, E., Fournier, E., Haigh, M., Muniz, O., Trafford, J., & Vajoczki, S. (2006). Problem-based Learning in Geography: Towards a Critical Assessment of its Purposes,

- Benefits and Risks. *Journal of Geography in Higher Education*, 30(1), 103-116. doi: 10.1080/03098260500499709
- Rittel, H., & Webber, M. (1974). Wicked problems. *Man-made Futures*, 26(1), 272-280.
- Savin-Baden, M. (2007). Challenging models and perspectives of problem-based learning. In E. de Graaff & A. Kolmos (Eds.), *Management of change: Implementation of problem-based and project-based learning in engineering* (pp. 1-8): Sense.
- Spronken-Smith, R., & Kingham, S. (2009). Strengthening Teaching and Research Links: The Case of a Pollution Exposure Inquiry Project. *Journal of Geography in Higher Education*, 33(2), 241-253. doi: 10.1080/03098260802276813
- Stauffacher, M., Walter, A., Lang, D. J., Wiek, A., & Scholz, R. W. (2006). Learning to research environmental problems from a functional socio-cultural constructivism perspective: the transdisciplinary case study approach. *International Journal of Sustainability in Higher Education*, 7(3), 252-275.
- Thomas, J. W. (2000). A review of research on project-based learning. Retrieved from http://w.newtechnetwork.org/sites/default/files/news/pbl_research2.pdf
- von Kotze, A., & Cooper, L. (2000). Exploring the transformative potential of project-based learning in university adult education. *Studies in the Education of Adults*, 32(2), 212-228.

