What happens if students are asked to learn Geography content, specifically Population, through SOLE?

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Abstract *The British education system imposes intense pressure on teachers to improve levels of attainment, with constant micro-scrutiny of their performance. This raises philosophical dilemmas linked to pedagogy: is the role of a teacher in a results driven business a didactic provider of information, imparting knowledge, examples and subject techniques to students? Or is there a still greater need for the development of a new pedagogy, one in which teachers take a metaphorical back seat to facilitate self-led learning, where students take ownership through effective collaboration and enquiry? This paper describes a collaborative action research project between a researcher (Rix) and a teacher-researcher (McElwee). The project aimed to explore the potential for a Self-Organised Learning Environment (SOLE) (Mitra, 2014a) to increase engagement and learning in a low achievement cohort of students in a secondary school in England. A tentative conclusion is drawn of SOLE as an evolving pedagogy, needing leadership support for a longitudinal approach to self-organised learning in order to afford students the time needed to adapt to the SOLE ethos and thus to embrace 'learning at the edge of chaos' (Mitra, 2014b).*

Keywords   SOLE; geography; autonomous learning; alternative pedagogy; assessment; testing

Introduction

This project was conceived out of our interest in the role that self-organised learning environments (SOLEs) might have in a secondary school context. It began when Rix approached an ex-colleague, McElwee—an experienced classroom practitioner and senior leader—about conducting a collaborative action research project on the use of SOLE in his school. McElwee was enthused about the potential of SOLE yet objective enough to recognise the situated context of his own classroom and thus he was curious: would his Newcastle based students' behaviour mirror Mitra's

observations of children in India (Mitra & Rana, 2001; Mitra, 2006; Mitra & Dangwal, 2010)?

Action research seemed an appropriate approach for the project because it is a powerful tool for change at a local level and therefore well suited to a small-scale enquiry in a school. Cohen and Manion (1994, p. 186) define action research as "a small scale intervention in the functioning of the real world and a close examination of the effects of such an intervention" (Cohen et al, 2007). The relationship between Rix as researcher and McElwee as the teacher was one of mutual support and collaborative partnership, however we recognised the potential for conflict. The teacher's priority was the impact on his class in terms of teaching and learning and his perspective was necessarily framed by the existing relationship and shared experiences he had, and would continue to have, with that class. In contrast, while Rix recognised the more immediate issues that the teacher might be preoccupied with, the lens through which she viewed the project was inevitably much broader. Together we (Rix and McElwee) managed this relationship carefully through frequent conversations which enabled us to discuss our individual observations and to jointly consider the possible impact of our research. We had an excellent working relationship from our time as colleagues which enabled us both to feel confident in candidly voicing any concerns.

This article begins with a discussion about SOLE—the focus of our action research—followed by an overview of project details. It then describes the project as it happened, namely a cycle of action research followed by a planned intervention, then a second cycle of action research. As might be expected with such an approach, the phases of each cycle tended to merge together, with our observations coming to form the basis of our findings, and so they are discussed together here.

The article closes with a discussion of the conclusions we drew from the project and the way that McElwee as the teacher-researcher intends to apply these findings moving forward. We recognise the limitations of such a restricted data set and, while we are confident about what we saw with this particular class, we certainly cannot claim that the conclusions are generally representative. However we hope that this paper will be of interest to colleagues working in similar environments for whom the focus on a real, practical issue—described in its local context here but not without similarities to other settings—might be an example of what Thomas (2011, p. 31) describes as "exemplary knowledge" or that which is learnt in the context of another's experience yet is applicable to one's own, according to its resonance.

Self-Organised Learning Environments (SOLEs)
SOLEs are created when "educators encourage students to work as a community to answer their own vibrant questions using the Internet." (Mitra 2014a, p. 7). They

were developed following Mitra's "Hole-in-the-Wall" experiments which found that children could self-organise to teach themselves how to use a computer with no adult guidance or supervision at all (Mitra & Rana, 2001; Mitra, 2006). Intrigued by these findings, Mitra went on to demonstrate that children in Tamil-speaking Kalikuppam could teach themselves basic molecular biology using English language materials on a computer, and with the help of a friendly but unknowledgeable mediator they could surpass the results achieved at an under-performing local school where the subject was taught and equal those achieved at a high performing city-based private school (Mitra & Dangwal, 2010). Building on this research, Mitra developed the concept of SOLE which aims to create the optimal conditions in which children can collaborate to teach themselves within more traditional school settings (Figure 1). In conjunction with the TED organisation, from whom he received prize money, he has overseen the creation of five SOLEs in a variety of settings in India and two in schools in the north-east of England—including McElwee's school—to investigate what might happen to learning when a SOLE is provided (Scripture, 2014).
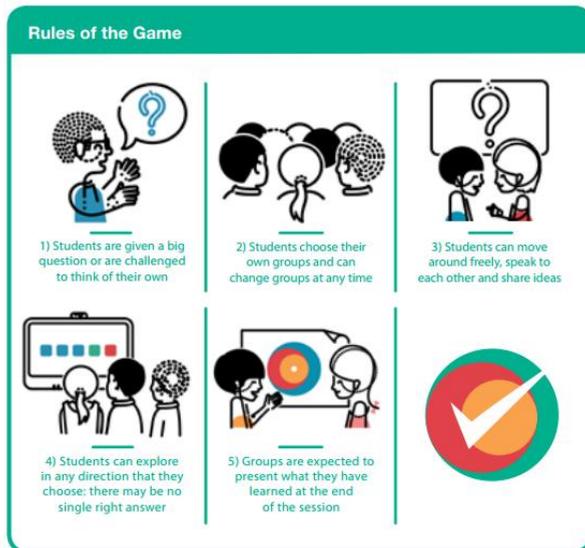

Figure 1: Guidance given to teachers on how to set up a SOLE session (Mitra 2014a, p. 7)

While early research suggests that SOLEs can have a positive impact within traditional education environments (Mitra & Crawley, 2014; Dolan et al, 2013), there is nevertheless some criticism of the approach. One element of this focuses on wider concerns regarding the role of digital technology in education and the accompanying discourse, which can seem to imply that it is a solution to all problems despite the fact that, as Selwyn (2015, p. 3) cautions "Empirical research has remained resolutely equivocal about the 'learning' that can actually be said to result from the use of digital technologies." More specifically relating to SOLE, questions have been raised regarding the extent to which learner autonomy, and the requisite cognitive skills, can develop without any support from a facilitator. Paradowski (2015, p. 43) argues that "children first need to learn *how* to learn on their own." Even where students are successful in using the Internet to find answers to Big Questions, there is debate about the relevance of this if SOLEs are not part of a more holistic approach where the right questions are asked, information prioritised and the wider learning experience structured and organised by a knowledgeable facilitator. The feedback at the end of the SOLE session, where students share their findings with a teacher, thus plays a vital role in terms of making the experience meaningful because it anchors the findings within a wider learning context. Yet there is some concern that the admiring, praising tone recommended for the debrief might negatively impact on the experience if it implies that "the quality or veracity of the answers themselves do not seem to matter." (Paradowski, 2015, p. 46). Overall these concerns did not deter McElwee from using SOLE as the basis for this research, not least because the seemingly extreme version of learner independence that it offered guaranteed a change from his usual teaching methods. He was also keen to find ways that the use of SOLE might be developed within the school more generally. An awareness of the existing critique of SOLEs—while endeavouring not to let it bias our research—meant McElwee was in a good position to consider what worked well and what might need adapting to the secondary school context, so that he could support other colleagues using it in the longer term.

Rix's research into SOLE began a few months after the SOLE Room opened at McElwee's school. Most of Mitra's early research focused on primary school children, particularly 8-12 year olds, yet two of his newly established SOLEs were placed in secondary schools which not only cater for older students (11-18 years), they also tend to be more highly structured environments. Using Bernstein's (1975) terminology we could also interpret them as environments which rely on "visible" pedagogies, incorporating strong classification, where subjects are separated within a highly-differentiated curriculum, and strong framing, where the balance of control sits with the teacher, not the students. It is evident that SOLE-type "learning at the edge of chaos" (Mitra, 2014b) might not comfortably fit within such an education system and Rix wanted to understand the implications of utilising SOLE in this context.

Initial observations had found that the practicalities of secondary education—where students move from lesson to lesson on a timetabled basis—resulted in students having haphazard access to SOLE. Different teachers use it in different ways and at different times (or indeed not at all). Thus, unlike students at primary level who have one teacher who might be committed to using SOLE on a regular basis, most students in a secondary context have irregular access and for them it remains, on each experience of the SOLE Room, a novel and exciting learning opportunity. In an effort to move beyond this feeling of novelty as a substitute for pedagogy, Rix was interested in exploring what happened when a class had regular access to the approach and thus had time to move beyond the excitement of "difference" that seemed to characterise many sessions. This was Rix's motivation for approaching McElwee about the possibility of researching together.

Overview of the project
The teacher
As an experienced classroom teacher, McElwee has strong beliefs about education which are predicated on the assumption that offering students regular opportunities for taking ownership of their learning not only helps them to develop "soft skills" they will need throughout their lives, such as the ability to communicate, but also facilitates the most effective subject learning. This approach is grounded in years of teaching experience which he believes have proven the value of activities where students are given a measure of independence such as peer-assessing, making judgements and presenting their learning. It is also supported by Bloom's Taxonomy (1956) in which such learning opportunities—which consultation via Student Voice consistently indicates students most enjoy—are identified as being those which promote the highest levels of thinking.

As a teacher, McElwee typically has few behavioural issues to deal with in his classes. He can always ensure that a class completes the work he sets to a standard that assessment data shows to be at least acceptable. Yet while his tried and tested approaches to teaching might be reasonably effective within the National Curriculum Assessment framework he had become conscious of the fact that, within Key Stage 3, they did not go far enough to reflect his deeply held beliefs about education. He was, as Barry (2012) suggests, a "living contradiction," whereby there was a disconnect between his values and his professional practice (Atkins & Wallace, 2012, p. 131). When he was given a challenging Key Stage 3 class last year this suddenly became a much more real issue, a "stone in your shoe" problem, "right there in front of you, driven by your context and your learners and intimately bound up with their needs" (Baumfield et al, 2013, pp. 38–39).

Thus at the time when Rix approached him about this collaborative action research project, McElwee had already been considering how to develop his practice and whether alternative pedagogies could support low achievement students in becoming more active and engaged learners. He decided that rather than focusing on what was happening already—what was not working—this opportunity for enquiry provided a chance to move closer to his core values by beginning from the question "What happens if?" whereby he would "instigate a change and explore the impact" (Baumfield et al, 2013, p. 39). We agreed that SOLE was an ideal example of the kind of change he was looking for.

Class context
We focused on a Key Stage 3 class which, according to Key Stage 2 SAT scores, was a low achievement group. The students exhibited what the teacher considered to be the characteristics of very passive and disengaged learners. Engagement is usually defined in three ways (Lawson & Lawson, 2013, p. 435; Fredricks et al, 2004): emotionally, many individuals in the class exhibited negative feelings towards learning specifically (Skinner et al. 2008) and school more generally (Finn & Zimmer, 2012); cognitively, the majority of students showed little evidence of self-managing learning tasks or implementing appropriate strategies in an effort to master the skills or content taught (Cleary & Zimmerman, 2012); and behaviourally, consideration of conduct indicators such as compliance with school rules (Finn & Zimmer, 2012) showed that students found it challenging to conform to the expectations of McElwee's classroom. In addition, relationships within the class tended to make collaborative work very challenging and many of the students lacked the range of social skills required to resolve conflict or to communicate effectively. The net effect was that there were few opportunities for students to ask questions, collaborate or learn independently because the class seemed to be most manageable and receptive within a highly structured, closely-controlled environment; as a result they were spending a lot of time individually completing what McElwee considered to be low level learning tasks. The introduction of SOLE had the potential to impact on this learning passivity in two ways: firstly, removing students from their traditional learning environment might facilitate the emergence of new norms of interaction which would encourage participation and thus greater engagement (Tseng & Seidman, 2007); secondly, giving students more responsibility for their own learning might foster student initiative or what Reeve (2012) terms "agentic engagement."

Action research
Having identified our research problem and a possible solution we found ourselves facing some big pedagogical issues, so at this stage we elected to keep our enquiry very open in an effort to avoid pre-empting what might happen. We created a project framework characterised by continuous reflection and discussion which allowed us to refine our focus over time. Our initial objectives were to construct a clear picture of what happened during the SOLEs themselves and to gain some understanding of the quantity and quality of subject content the students covered when left to self-organise. It is usual for action research projects to be represented by a spiral denoting Plan, Act, Observe, Reflect in a repeated cycle, and we were keen to adhere to this while heeding the warning that in reality research rarely conforms to such a structure and is usually far messier, so that "the process is likely to be more fluid, open and responsive" (Kemmis et al, 2014, p. 18).

Participants
McElwee was the teacher aiming to "improve action" (Baumfield et al, 2013, p. 3) in the project, while Rix led on the research process. The class we worked with (Figure 2) was chosen because McElwee wanted to try an innovative pedagogical approach in an effort to impact on their passive behaviour and yet it was also clear that, given their disengagement from the learning process, they would make an interesting test case. SOLE relies so heavily on student motivation and engagement that if this class responded positively to the experience we might posit that other, more inherently motivated groups, would do so too and thus they were in part an extreme sample (Efrat-Efron & Ravid, 2013, p. 62). Letters were sent home asking parents or guardians for written consent for their children to participate in the project and the students also gave their verbal consent to be involved (BERA, 2011). All of the students were able to participate in the project but five parents did not want their children to participate in filming or interviews and we were careful to comply with this requirement.

In addition to the students as learner-participants, over time we also found it useful to include what we have called here "mediators." These were older students (aged around 17 years of age) who came in and assisted the Year 8 students by restoring some of the structure lost when the teacher stepped back from a central role. Their position as older students in the school meant that they were not perceived as either teacher-authority figures or didactic informers by their younger peers and could act instead as facilitators of learning. They were involved in a limited number of sessions so we have not classed them as participants as such,

although we did interview them at the end of the project. Discussion of the findings from these interviews is below.

The students	Context
Year 8	The school caters for years 7-13.
12-13 yrs old	The youngest students in the school are 11 and the oldest 18.
26 in class	Class sizes are typically 25-30 students.
15 girls & 11 boys	Absence meant the number of girls was as low as 10 in some sessions and the number of boys as low as 9.
Set 4 (of 4)	Grouped by ability (according to assessment data) with highest achieving students in set 1 and lowest achieving in set 4.

Figure 2 – The Participants

Lesson by lesson plan
Our research plan was largely dictated by the school timetable: McElwee taught the class just once a week and was about to begin a unit on the topic of population which he needed to complete within a given timeframe. In order to address Rix's interest in moving beyond the novelty factor of SOLE we planned for the class to spend every lesson of this unit in the SOLE Room. This is a space specifically designed to facilitate self-organised learning, for example by having a limited number of computers to promote collaboration and large screens for ease of sharing and accountability (Figure 3).

McElwee then designed two Mitra styled Big Questions that the class would work on throughout these lessons (Mitra 2014a, pp. 16–19). The questions were based on the premise that the increasing global population is a metaphorical time bomb: "Can we stop the population time bomb?" and "Should we stop the population time bomb?" We agreed that during the last session in the SOLE Room each group would give a presentation on what they had learned throughout the project—the presentation part of SOLE as described in Figure 1—which would give us an opportunity to gauge the depth of subject knowledge gained, whilst leaving us free to focus on learning behaviours during the sessions themselves.
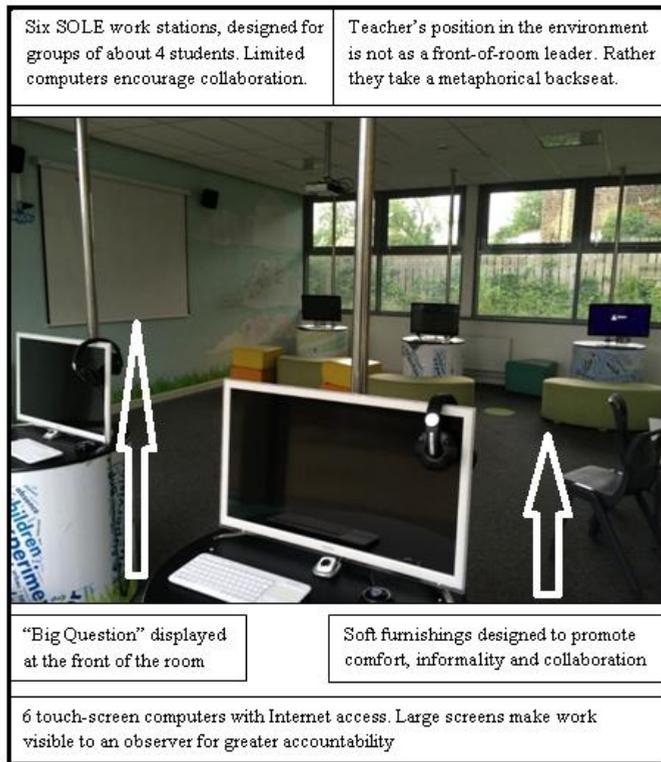
Figure 3 – Physical layout of SOLE Room

Data collection

In an effort to gain a variety of perspectives on the ways the class responded to SOLE we agreed upon a range of qualitative data collection techniques. During the SOLEs themselves Rix took field notes. After each session we would make time to have a reflective conversation ranging from a few minutes to almost an hour, depending on McElwee's commitments, so that our initial thoughts and impressions were captured and any disparities between our accounts could be discussed while the session was still current in our minds. This ethnographic approach helped us construct a picture of what students were doing during the sessions and to highlight any changes in learning behaviour over time. We also filmed the student presentations in the final session which provided an indication of what they actually learned during the project in terms of geographical subject knowledge, specifically

population. These presentations effectively supplanted the traditional end of unit assessment that students would have completed, therefore in order to try and mirror the usual professional judgement marking process we transcribed the video of the presentations. McElwee annotated these transcriptions for evidence of learning using Bloom's Taxonomy (1956), which he then converted into approximate National Curriculum levels. This data gave us a clear indication both of what happened during the SOLEs themselves and of the subject content covered.

Data Type	Data Collection
Field notes	Taken by Rix, who attended every session: one session introducing the SOLE concept to the class, eight SOLE sessions, one presentation session at the end of the project. Conversations between researcher and teacher both during and following the sessions were recorded in these field notes.
Interviews (students)	Conducted by Rix at the end of the project, a sample of students was interviewed in pairs.
Interviews (mediators)	Conducted by Rix at the end of the project, 3 of the 5 mediators were interviewed together.
Video recording of student presentations	All presentations were filmed by McElwee who later evaluated them using Bloom's Taxonomy (1956), which he converted into approximate National Curriculum levels.

Figure 4—The data

At the end of the project we were keen to understand students' own perceptions of SOLE and its impact; this seemed particularly worthwhile given that it was their apparent apathy which had initially prompted the enquiry. We agreed that Rix would conduct the interviews in order to avoid a situation where students felt under pressure to give particular answers to McElwee, who is an authority figure both as a teacher and a Senior Leader. While Rix had previously worked at the school she left one term after this class entered Year 7 and had not taught them, thus they did not know her as a teacher. Although it is debatable whether Rix's status as an outsider was equally intimidating, after weeks of observing the SOLEs students seemed at ease with her and we both felt that McElwee's continued role as their teacher would

result in greater bias. In order to make the interviews as non-threatening as possible they were voluntary and completed in pairs. It was made clear at the beginning of each interview that there were no "right answers" and that students could choose to withdraw at any time. Interviews were conducted using a semi-structured format to encourage students to talk freely about the process.

The findings presented in this paper are based on analysis of the field notes, student and mediator interviews and student presentations.

First action research cycle
Observations
During the first cycle of our action research the students undoubtedly gained some Geography knowledge. In the very first session the Big Question was posed by the teacher in a manner to stimulate curiosity and to enthuse students:

> Session 1: McElwee had a population clock on the board from the start of the lesson. As soon as he told students what it did they were audibly interested ('ah wow!') (Field notes).

The spontaneous interest generated by the question drove each group's initial enquiries and it was immediately clear that the order in which students would encounter information would differ greatly from the traditional Scheme of Work. For example in the very first session, as the questions were introduced, one student asked about China's One Child policy (Session 1, field notes). This policy is something they would have been taught, according to the usual Scheme of Work, but not until lesson nine and yet it proved fascinating to many students in this first session, prompting further questions such as 'What happens if you have twins?' (Session 1, field notes). The open nature of the SOLE enquiry enabled them to find answers to such questions instantly, rather than being asked to wait until they had reached that point in the Scheme of Work. Similarly the range and scope of knowledge that students accessed was different because although they covered most of the topic areas that they would usually have been taught—albeit to varying degrees—they also spent considerable time on topics tangentially relevant yet particularly interesting to them, such as current news stories regarding Ebola. This led them to consider the impact of disease and epidemics on the population.

Another outcome evident during the first research cycle was the improved learning characteristics exhibited by students. Even the initial enthusiasm for the Big Questions showed a move away from the passivity and apathy that had partially provoked this enquiry. During the sessions the teacher reflected on the improved ethos of the class as a whole:

> Session 2: More focused than McElwee would usually expect them to be in his classroom at this time and he expressed surprise that "controlled" teaching would apparently result in more, rather than fewer, behaviour issues.

> Session 3: Students continued to be calm and quiet in this lesson. McElwee noted that he doesn't "feel the need to be so on top of them all the time." (Field notes)

Interestingly these positive observations were echoed by the other Geography teacher who taught the same class; she mentioned to McElwee that their behaviour in her lessons had improved since the project began (Session 3, field notes).

The SOLE also appeared to engender greater collaboration between students as they began to question their default position of keeping work to themselves. They started to establish a culture of "knowledge sharing" as opposed to "knowledge hoarding" (Ford & Staples, 2010):

> Session 2: A student in the group said that no-one else can look at their information. When asked why, two members of the group responded that they want to be the ones to "find the answer." The third group member said no, they should all be working together as a class. (Field notes)

Students also began to refine their Internet search skills, recognising that merely typing the question into Google wouldn't achieve anything because, as one student commented, *"That won't work. Sir just made the question up."* (Session 2, field notes). This dawning understanding resulted in discussions of key words which served to deepen their consideration of the topic.

Despite these positive outcomes, by the third SOLE session we observed that the learning seemed to have plateaued. The skills they possessed appeared to be limiting how much they could progress alone:

> Session 3: This lesson it seemed as though students weren't sure where else to go with their searching, they didn't read enough to get more in-depth and weren't necessarily able to recognise relevant information in a lot of text. It seemed as though students hit a ceiling. They didn't move around very much to share with each other. (Field notes)

While the students were still going through the motions of learning using the SOLE format it seemed that they had exhausted their repertoire for finding information and constructing answers to the questions. They found it difficult to identify

appropriate key words and by the third SOLE session they still tended to type the same phrases, such as "time bomb," into the search engine and then navigated to the same few websites (Session 3, field notes). It was difficult to identify the criteria they used when deciding which websites to go to from Google:

> Session 3: A search for world population growth resulted in a list of hits on Google which (to me) looked excellent for what they needed to know, e.g., nine strategies for controlling population. They navigated away from this page without looking at any sites, moving instead to the Wikipedia page on China. (Field notes)

This might partly be explained by low levels of literacy which perhaps resulted in a reluctance to engage with lengthy text, instead students would cut and paste information they thought was relevant. This did not seem to reflect a lack of interest, rather they appeared worried about missing out vital information from such an overwhelming amount of material. Students were also increasingly moving away from explicitly answering the key questions, instead providing a general response on the issue of population.

As students became increasingly frustrated, so too they were less interested in engaging with—or in sharing—the content they encountered. Drifting through content in this way seemed to become counter-productive and when we engaged in reflection on Session 3, we agreed that it was time to intervene.

Second action research cycle
Planned intervention

We had begun the project with a very broad focus and it was important to refine that as we considered how we could support students in continuing to progress their learning, without intervening in a way which would negate the SOLE philosophy. Typically in such situations a teacher might intervene by scaffolding the learning (Wood et al, 1976). However the prospect of "the usual type of tutoring situation in which one member 'knows the answer' and the other does not," (Wood et al, 1976, p. 89) did not feel at all appropriate in the SOLE context, not least because a "Big Question" has no predetermined answer, so the outcome is open to interpretation and discussion. Yet the alternative prospect of leaving the group "to struggle alone with too much complexity" (Wood & Wood, 1996, p. 5) was no more palatable.

Ideally we wanted some scaffolding of the learning process from a source other than the teacher and we took inspiration from the Hole-in-the-Wall experiments which had seemed to succeed in part because children were learning in mixed-age groups (Mitra, 2006). Our class was not only made up of students of the same age, it also comprised a very narrow representation of ability and we felt that this might be limiting progression. One premise for scaffolding as an effective way

to support learning is Vygotsky's Zone of Proximal Development (ZPD), defined as the "distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (1978, p. 86).

Clearly a class of low achieving students is likely to have limited access to the "potential development" possible within the ZPD, thus we chose to intervene by inviting some Sixth Form students to attend the sessions as "more capable peers." This expanded the age range of students involved in the SOLE and created a form of interactive scaffolding. Although we wanted the younger students to benefit from the experience of their older peers, we didn't want the mediators to lead the process or to provide answers. We therefore adhered to the principles of "dynamic" scaffolding which anticipates the need for modification "to suit the circumstances of implementation" and which identifies three key characteristics of the process: collaboration, acting within the learner's ZPD and "fading" the scaffold as learners develop to the point where they can act alone (Yelland & Masters, 2007, p. 364). This scaffolding model appeared sufficiently adaptable to fit within the wider ethos of SOLE. To further promote an approach of facilitating rather than leading learning we endeavoured to find students who were *not* studying A Level Geography and thus were not subject specialists. We also spent time explaining the philosophy behind Mitra's "granny" idea so that students could adopt this encouraging, supportive approach rather than that of an authoritative expert (Mitra & Dangwal, 2010, p. 680).

The only significant change that we made to our data collection in light of this intervention was the addition of interviews with the Sixth Form mediators at the end of the project. We were keen to understand their perspective on how the process had worked and any impact they might have had. These interviews were conducted under similar conditions to those of the younger students and with the same justifications. However one key difference is that they were led by McElwee, largely for practical reasons concerning time; we were not unduly worried about the impact that his professional status would have on these students as they knew him well from their time throughout school and were comfortable with him. They also grasped the implications of the research project and were aware that there were no "right" answers so they could be honest in their reflections without fear of consequence.

Second action research cycle
Observations
The Sixth Form mediators were quickly aware of the barriers to progress that we had already identified in the SOLE sessions and they recognised a need to support the learning process in a variety of ways. Wood and Wood's (1996, p. 5) task-

focused approach to scaffolding identifies its key functions as: engaging a student's interest, focusing them on "task-relevant goals," helping them to identify the "critical features" of the task that they might overlook, demonstrating how to achieve elements of the task and supporting them in persevering. This support is intended for individual learners and is largely a form of "cognitive scaffolding" or "activities which pertain to the development of conceptual and procedural understandings which involve either techniques or devices to assist the learner" (Yelland & Masters, 2007, p. 367).

The point at which we intervened was when it had become clear to us that students had exhausted the cognitive resources available to them and the mediators soon recognised this, recalling during their interview that at the beginning the groups "lacked organisation" (Mediator 1) and "were not focusing on a question as a whole, they tended to pinpoint one thing like the One Child Policy" (Mediator 2). Mediator 3 commented, "They could give ideas but they're not sure what to do with them. They get an idea and they just stick to it" (Mediator Interviews). Thus the mediators modelled the cognitive processes required to use the seemingly infinite resources of the Internet to construct answers to such big, open questions. The approach they took was to provide frameworks that students could use to organise the information they encountered, which effectively transferred the thinking back to the younger students. For example one mediator introduced a strategy that she had learned in A Level Sociology "Class, Age, Gender, Ethnicity (CAGE)," to ensure that she considered a topic from all perspectives.

> I used this to help them think differently. I tried to get them thinking about population in relation to class, education and so on. I thought this would allow them to see links, for example when we discussed contraception, we linked it to decision-making based on education. (Mediator 3, mediator interviews)

This was evident in the presentation that her group gave in the final session where they considered population from a range of perspectives and were able to make links between them. Prior to the intervention it seemed as though students were looking for one clear answer to each question, rather than putting together evidence to help them construct arguments and enable them to see a big picture from which they might draw reasonable conclusions of their own. Thus the real strength of this cognitive scaffolding was that it stimulated what Davidson and Sternberg (1985) have termed metastrategic processes, which are "characteristic of the deployment of higher-order thinking skills" (Yelland & Masters, 2007, p. 368). For example we observed the younger students beginning to interpret and understand the task requirements better than they had from the original teacher explanation. They also became more effective in questioning one another and asking for information from

other groups and began to hold more fluid conversations which stimulated improvements in analysis of content (Yelland & Masters 2007, pp. 373–374). This type of interaction with the mediators empowered students to resolve their difficulties by providing them with strategies to organise information and to formulate a coherent argument in answer to the questions asked. The impact was evident in the student presentations during the final session.

As well as the task itself, the students had an extra dimension to contend with due to the collaborative nature of SOLE, requiring an alternative type of scaffolding. The influence of students during collaborative activity is described by Molenaar et al (2010, p. 1728) as "spiral like" in that they contribute knowledge or skills, which elicits contributions from other group members. This in turn allows different activities to be practiced, leading to the development of skills and a change in future participation. This ideal model of the collaborative process requires students to offer feedback to each other and "Naturally a prerequisite for this mechanism to be effective is that learners must pay attention to the feedback and perceive it as relevant" (Molenaar et al, 2010, p. 1728).

Prior to our intervention, effective task-based collaboration had largely broken down as students disengaged from the SOLE process, but the mediators immediately helped to restore this mechanism by providing a new source of feedback which was valued because it originated from an older peer. This is a form of affective scaffolding, which focuses on emotional aspects of learning such as perseverance, risk-taking and the emotional intelligence needed to resolve collaborative issues (Yelland & Masters 2007, p. 367). The mediators were keen to adhere to the spirit of SOLE by supporting the students without leading the process so they tended to employ open questions. These encouraged the younger students to reflect on the information found, as well as to interpret it and make tentative judgements about its value, all in a relatively "safe" environment where their fellow group members and mediator were the only people to challenge or support their claims.

As they were asked to refrain from imparting any geographical knowledge, the mediators tended to dedicate their time to modelling and developing habits of learning instead; another effective utilisation of affective scaffolding. Educationalists such as Guy Claxton emphasise the need to explicitly cultivate desirable learning habits in order to enhance the independence of students and enable them to become, "confident, capable, creative, lifelong learners" (Gornall et al. 2005, p. 1). It is inevitable that these characteristics will not come naturally to all students and there are additional emotional challenges associated with learning "at the edge of chaos" (Mitra 2014b) where expectations are so different to a normal classroom.

Providing emotional support and encouragement was therefore vital and this seemed to be intuitively understood by the mediators who reassured, encouraged

and gently challenged their younger peers. The impact of such a "gentle, appreciative approach" which created an "atmosphere of approval" and "encouragement" should not be under-estimated (Wood et al. 1976, pp. 92–93), yet it is incredibly difficult to measure the improved learning behaviours we saw as a consequence. It is worth noting that both McElwee and the other Geography teacher for this class commented on an improvement in the class' approach to, and engagement with, learning. This was noticed both whilst the project was ongoing and beyond its duration. We can take little credit for any success resulting from such affective scaffolding as we were fortunate to recruit Sixth Form mediators who exhibited high levels of emotional intelligence well suited to this process.

While much of the mediation focused on the cognitive and affective scaffolding described above, some of it was characterised by more direct intervention, particularly when aimed at supporting students' "conditional skills" (Raes et al. 2012, p. 83) such as reading comprehension and literacy. While development of these was not the stated objective of the task, their absence caused numerous issues that led to misunderstanding and increased student frustration. For example all mediators mentioned that the premise of the question—the time bomb metaphor—was a significant barrier for students, so clarifying the definition was an important starting point. Despite such literacy challenges, in the presentations students gave at the end McElwee identified six areas of the Key Stage 3 Curriculum that he would normally have taught. Interestingly he also found that they accessed information on population that would not usually be covered until a more advanced stage, such as an examination of population policy which would more usually be found at Key Stage 4 and technological application to food production which would be taught at Key Stage 5. This coverage of content years ahead of their age group links to Mitra's assertion that

> ...when children search the Internet for information, most of what they encounter was written with adults in mind. This means that, if they are to apply effective search and analysis skills, children need to be able to read at adult comprehension levels. (Mitra, 2014b, p. 553)

The literacy levels of these students were a clear barrier to their progress in the SOLE sessions prior to mediation, thus it is our contention that students could most effectively process information above the expected level for their age group when supported by mediators. This was not because the mediators provided answers for them to regurgitate but because their clear explanations and probing questions enabled their younger peers to more fully engage with, and thus more fully understand, the content accessed.

Perspectıve of Sixth Form mediators
Despite our positive evaluation of the role of the mediators, they themselves were surprisingly negative about any impact they might have had on the process:

> I don't think I had much impact really. I found it really difficult to get them to move on. I tried to ask them questions to move on but they struggled to do this. (Mediator 2, mediator interviews)

They were also unsure about the extent to which they were successful in supporting student learning of geographical content. When asked, "Did the process develop the students' understanding of Geography?" the replies were sceptical:

> Not really. I felt they understood aspects of population policy but not the whole understanding of the question. (Mediator 1, mediator interviews)

They also commented on difficulties with interpreting information, an inability to apply the information they found to the Big Question and social issues between group members which occasionally made effective collaboration challenging.
 This sceptical view is particularly interesting because these older students view education through the lens of their own experience within a visible pedagogy, where strong framing dictates that the power and authority in a classroom rests with the teacher (Bernstein 1975). SOLE is a very unfamiliar concept for them. Their understanding of "good" learning and appropriate classroom behaviour has presumably evolved from their own experience and what they saw in the SOLE— unstructured behaviours and thus a level of relative chaos by secondary school standards—clearly did not correlate with that. Therefore it seems that the mediators found it difficult to look beyond aspects of student behaviour to analyse their own positive impacts; it is this transfer of ownership and a move away from the order and routine of the traditional classroom, which can be particularly daunting for many when first trying SOLE.

Perspectıve of Key Stage 3 students
In contrast, the Key Stage 3 students themselves viewed both the SOLE experience and the Sixth Form mediators incredibly positively. They clearly appreciated the freedom they were given but also the responsibility that came with it:

> We had this certain amount of trust to do stuff and so we wouldn't be off watching like YouTube and we could actually get our work done. (Student 4, student interviews)

Although students also talked about enjoying both the opportunity to work with friends and the more relaxed atmosphere of the SOLE Room, there was little evidence that they considered this to be free time or that there was less focus on learning than in a normal classroom. Indeed they referenced the presentation they had to give at the end as a significant motivator:

> In class there's a question that you have to answer but most people don't do it because the books are put away, but in SOLE we had to do a presentation so everyone kinda had to do it otherwise they would look stupid in front of the whole class. (Student 2, student interviews)

Students were also able to articulate the specific aspects of SOLE which appealed to them, ranging from the collaborative aspect to the amount of time they had to learn just one topic. In stark contrast to the critical view of the mediators, some students even noted an improvement in their own learning behaviours during the project:

> You're trying to find out all the information yourselves and not relying on the teacher to tell you everything. It's like you get more independent over the time that you use it. (Student 1, student interviews)

Clearly the regular use of SOLE over time was significant to the students as it was referenced in a variety of ways, with one student admitting that they had found the process very challenging at the start as they were "panicking to try and find the answer," but once they came to understand SOLE their opinion completely changed to "interesting and fun and I really like it" (Student 2, student interviews).

Of particular note is the positive way in which most of the younger students discussed the involvement of the mediators. They felt that they could trace improvements in their presentations to the input of their older peers and they gave specific examples of how they had been encouraged, such as through literacy support. One student eloquently described their perspective on the value of mixed age learning:

> I find it more interesting asking a Sixth Former because they're kind of learning the same thing, like Sir's a Geography teacher so he knows all the answers but—well maybe not all of them!—but the Sixth Formers don't know many answers so they're kind of learning as well and it's fun learning together. (Student 2, student interviews)

Clearly the value of SOLE, viewed through the eyes of students who perhaps find the traditional school system challenging and restricting, was the freedom that it

afforded and the level of responsibility it gave them which, even during this relatively short project, encouraged them to reconsider their identity as learners.

Discussion
From this piece of action research we felt able to draw some tentative conclusions about SOLE as an evolving pedagogy in the context of an English secondary school. From these we developed strategies aimed at improving McElwee's practice for the future.

Regular use of SOLE
Although teachers might be apprehensive about how much students will learn when left to self-organise, we found students were able to develop their Geography knowledge when SOLE was the only strategy available to them, even prior to the intervention of the Sixth Form mediators. With that intervention their understanding tended to go beyond what might be expected according to age appropriate average National Curriculum levels. When categorised by McElwee using Bloom's Taxonomy (1956), all student presentations showed evidence of reaching at least the analysis level. Some went beyond that to the highest order of thinking, evaluation. We also found students covered much of the content that would traditionally be taught as well as accessing areas of the topic which would usually be considered beyond their capabilities until a higher stage of schooling.

While it might be fair to say that the highest levels of learning occurred once the mediators began to scaffold the process, it is worth noting that we continued our SOLE over a much longer period of time than is usual. Most SOLE sessions last for just one lesson which clearly reduces the time students have to explore a Big Question and will inevitably impact on the range and sophistication of answers given. We found that students were engaged and enthusiastic about the SOLE experience during the first few sessions and were able to access and process more information than they would have been likely to encounter in a traditional lesson. Although the teacher had assumed that the perceived learning apathy of his Key Stage 3 class restricted the kinds of tasks he could set them, it is now evident that he, like others, created his own barriers regarding what the class might be capable of. Transferring some level of responsibility for learning to students—a prospect which seemed particularly risky with this group—was in fact exceedingly motivating, especially when combined with the freedom to explore elements of a topic of particular interest to them. Thus McElwee will consider regularly using SOLE to introduce new aspects of the curriculum. This should serve to actively engage students in their learning of the topic and also allow McElwee, as teacher, to

gauge both what students already know and which sub-sections of the topic they might be most enthusiastic about exploring further.

Transferring aspects of the SOLE philosophy into other classroom situations
Although the SOLE Room provided the context for this study it is clear that elements of the underpinning philosophy can be transferred out of that particular environment and into a more traditional classroom. While the technology may not always be available, we concluded that the concept of self-organising, for example by giving a class complete responsibility for collaborating, is one which could work just as effectively for many other classroom-based tasks.

During this project we observed that the use of SOLE over time promoted deeper engagement and enabled students to adjust their expectations as they came to understand that they genuinely had the freedom to organise themselves. It is at this point that the development of learning habits can become meaningful as students lose any expectation that the teacher will step in to give them answers or to take back control. Thus McElwee recognises the importance of providing a variety of opportunities in which students can practice these skills; limiting their use to one particular environment might devalue them in the eyes of students.

Providing cognitive and affective scaffolding
The sustainability of long term exposure to SOLE highlights the tensions associated with implementing a pedagogy which encourages "learning at the edge of chaos" (Mitra 2014b) in an environment where chaos is generally considered to be indicative of failure. Schools which conform to Bernstein's (1975) visible pedagogy, with its strong framing and classification, can be very hostile environments for SOLE: SOLE is about freedom and independence and big questions which explore many topics. Secondary schools rely on routines, conformity, timetables and separation of subjects with corresponding division of accountability. This does not mean that SOLE cannot work in such a context—we offer this project as evidence that it can—rather that the implementation is very challenging for all concerned; the school, the teacher and the students themselves. In particular we found that students needed time to adapt to the SOLE ethos. Some form of scaffolding, which adheres to all three features of dynamic scaffolding as described by Yelland and Masters (2007) but particularly to the concept of fading, could be significant in empowering younger students to develop the appropriate learning characteristics needed to be successful in a SOLE.

The practicalities of manipulating a school timetable to enable older students to work with their younger peers makes the use of peer mediators difficult to sustain

in the long term. Thus McElwee intends to develop some of the cognitive and affective forms of scaffolding which proved so significant here, for use by the teacher. This should create a period of transition between traditional lessons and effective use of SOLE, with student-led SOLE the desirable outcome.

Creating opportunities for engaging with research

Both our use of SOLE as a means of resolving McElwee's inner contradiction and the intervention involving the Sixth Form mediators were decisions based partly on intuitive feelings about what might work and partly on matters of practicality and convenience. However once these decisions had been taken we reviewed relevant literature on the subjects and this had a significant impact not so much on what we did, but on how we understood what we were doing. Thus the literature on scaffolding was vital in helping us to conceptualise the interventions of the Sixth Form students. It moved our understanding of the mediator role away from an empirical focus on what they did to a much richer foundation for recognising how and why those interventions were effective. This made our discussions about how to move forward more meaningful and we were enabled to develop McElwee's practice in a sustainable way, based on a wealth of evidence beyond his own experience.

The school already has an established programme of offering practitioners the opportunity to research their own practice. Following this project McElwee intends to formalise that process to encompass at least one action research cycle, as well as the time and opportunity for teachers to access relevant literature. It is our belief that such a practitioner research programme benefits both teachers and the schools in which they work.

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