Self-Organised Learning Environments (SOLEs) in an English School: an example of transformative pedagogy?

Paul Dolan,[1] David Leat,[2] Laura Mazzoli Smith,[2] Sugata Mitra,[2] Liz Todd[2] and Kate Wall[3]

(1) Northumbria University
(2) Newcastle University
(3) Durham University

Abstract

Self-Organised Learning Environments (SOLEs) are models of learning in which students self-organise in groups and learn using a computer connected to the internet with minimal teacher support. The original 'hole in the wall' experiments in India are now applied to classrooms around the world. The idea of SOLEs is a social innovation that is inspiring educators (in schooling and also business contexts) everywhere, as demonstrated by Mitra's award of the 2013 TED prize. However, when SOLEs are located in classrooms, a number of questions arise. Are SOLEs easily adapted for the classroom context? Is the impact on learning as transformative as suggested by the original ideas? This paper considers in detail the application over two years by one teacher, using SOLEs in a Year 4 classroom in an urban North East England primary school, in partnership with university researchers Dolan, Mitra and Leat. Issues of innovation and transformation are discussed, informed by the ideas of Bernstein, Engestrom, and Giroux. The SOLE concept, although flexible, has the potential to offer a divergent, radical transformative pedagogy. This sits somewhat uncomfortably alongside more convergent approaches which position the learner as subservient to the curriculum, with the task of merely mastering subject matter prescribed by the teacher. However, what is notable from this analysis is that transformative pedagogy seems to be positioned alongside, rather than in conflict with, the dominant educational framework.

Introduction

Self-organised learning environments as used in schools are minimally supervised, internet-based learning experiences for groups of three to four children, driven by a research question (Mitra and Dangwal, 2010; Mitra, 2012). They have developed from Mitra's earlier 'hole in the wall' experiments (Mitra, 2006, carried out in India between 1999 and 2006), which

demonstrated children's facility for learning to use computers when working in small groups and their ability to learn with computers without the presence of a teacher. The SOLE's learning environment is characterised by its 'absence from adult intervention' and by 'openness and flexibility' (Mitra et al., 2005: 3). SOLE sessions have been found to provide spaces within which spontaneous creativity and unexpected learning can occur, since there may not be predefined learning objectives.

Briefly, a SOLE session in a school classroom involves a session of from between 30 and 90 minutes in which the teacher will engage the students with a question that they address. The question is chosen so as to be challenging for the students, not a question that might be regarded as 'easy'. Questions are indirectly related to the subject area and examples include: 'Who built the pyramids and why?', 'What are fractals?', 'What are they looking for with the Large Hadron Collider in CERN, in Geneva?', 'Who is Gandhi and what did he do?', "Where is Botswana and what is it famous for?', 'Was the British Raj a good idea?' Questions for primary-aged students to work on are often taken from GCSE papers. However in more divergent variants of SOLEs, students may well generate questions to pursue. For each session, the students would form their own groups of approximately four of their own choosing. Each group is allowed to use one computer with internet access. Students are allowed to change groups, talk to each other, talk to other groups and walk around looking at other's work. There are very few rules. The teacher's role at this stage is minimal, to observe the students and stay out of their way. Teachers facilitate SOLEs through setting the challenging question, but then have limited pedagogic input until the final plenary stage. However teachers vary in the degree of scaffolding they offer to students. Sometimes a student is nominated by the others to take the role of 'supervisor', to sort out any disputes and keep noise to manageable levels. It is only the 'supervisor' who can interact with any adults. About two thirds of the way through, the groups should produce and then present to the class a one-page report where they describe what they have found. The teacher can then expand on this in a later class.

Mitra's research on SOLEs typically tests students before and after different kinds of SOLE situations. The tests are usually curriculum-related but of a standard higher than the level that students are used to (Mitra, 2012). Detailed critical evidence is still to be published. However, accumulated case study and small-scale quantitative evidence from a range of contexts suggests that students tend to answer more challenging questions and retain the

information for a longer time than they would usually (Mitra and Rana, 2001; Mitra et al., 2003; Mitra and Dangwal, 2010; Mitra, 2012; Mitra and Quiroga, 2012). There is a need now for evidence about mechanisms by which SOLEs impact on student learning, for more systematic quantitative evaluation of SOLE's impact on student learning outcomes and for case studies of teachers' practical knowledge as they implement SOLEs.

Whilst there have been many blog responses from teachers using SOLEs about changes to their teaching, there has been little systematic study of the way teachers use SOLEs in schools. There are a number of questions about the use of SOLEs in the school context. How can SOLEs be embedded in classroom learning? Are SOLEs easily implemented into particular contexts (in this case, a particular English primary school)? Do SOLEs support existing curricular demands? Do impacts appear as transformative, as suggested by the original ideas? How can they be conceptualised? And, is there a basis for their conceptualisation as innovative in terms of pedagogy? This paper is a first step in considering, through data from one case study, the experiences and views of one primary school teacher using SOLEs over two years.

Research context

Sarah Taylor (ST) (pseudonym to preserve anonymity) used SOLEs over two consecutive years at Holy Name Church of England Primary School (also a pseudonym) in an urban area in the North of England. The school has about two hundred students and serves an area of considerable socio-economic disadvantage, with approximately half the students on free school meals (26% national average) and 4 per cent of students with special educational needs (8% national average). A 2007 Ofsted report rated the school as Outstanding.

ST contacted Mitra and invited him to her Year 4 classroom in 2009/10 when she had barely begun her first year of teaching. During the year Mitra supported ST's development of SOLEs and together they carried out a number of small-scale projects. These involved testing the children involved in the SOLEs using GCSE exam questions that were related to the SOLE questions. ST continued to use SOLEs the following academic year with a new cohort of Year 4 students. During her 3rd year teaching, ST found SOLEs inappropriate for the Reception class she had been given. However, she had developed though her use of SOLEs a collaborative manner of talking to students and took this to her Reception teaching. This was a pedagogy that assumed that students were knowledgeable and had her asking them what

they already knew in any topic. During this third year, although use of SOLEs was not widespread, it started to be used more often by other teachers at Holy Name Primary.

It should be stated that in ST's implementation of SOLEs in Holy Name, she had regular support from Mitra and other Newcastle university staff, namely Paul Dolan (PD) and David Leat (DL). Also, the school has had many visitors looking into the use of SOLEs and there has been a high level of interest from external parties.

Methodology

This paper will draw primarily on the in-depth case study of one teacher and her classes over a two-year period spanning 2009/10 and 2010/11 at Holy Name Church of England Primary School, North-East England. It reports on and discusses themes in ST's interaction with and use of SOLEs over this time. The context of this research investigating SOLEs is a particular classroom in England and generalisability to other contexts is not assumed. The questions being explored are how were SOLEs introduced and developed over time and does this constitute pedagogical innovation. The detailed nature of the data makes the examination of these questions possible. An initial dataset was collected by ST in conjunction with Mitra during the academic year 2009/2010. This included testing the children pre- and post-SOLE sessions to explore learning. During the academic year 2010-2011 with a university partner, PD, ST collected a variety of data. This included, from September 2010 to April 2011, videos of SOLE sessions with transcriptions, and diary entries on all SOLE sessions (recording both notable events and small incidents). PD both collected data of his own (for instance, through lesson observations) and, with DL, analysed some of ST's data (for instance her notebooks). We interviewed ST in October 2013 to enquire about her current views about her development of SOLEs.

Data collected on students were also analysed for this paper. The purpose of the analysis of student data was not to evaluate SOLEs so much as to provide a parallel story of student views of SOLEs to set alongside ST's narrative. Without such a story, knowing (for example) that ST was often surprised by the impact on student learning of SOLEs would beg the question on the perspectives of students regarding whether they enjoyed SOLEs and how they perceived SOLEs in relation to their other learning experiences.

Student data took the form of student questionnaires and pupil view templates (PVTs, see Wall and Higgins, 2006). PVTs were administered to students in ST's class on eight different occasions, a total of 122 PVTs. There were also some stimulated recall interviews using the PVTs. The student questionnaires used a mind-mapping exercise that asked for a comparison of SOLE lessons with other 'normal' lessons (see Figure 1). The PVT provides an image of the learning situation on which the research is focused, together with empty speech and thought bubbles. Pupils are invited to write in the bubbles. This could very simply be what they think about a specific activity, for example independent reading, or it could be more sophisticated and concern the more abstract thinking processes that they associate with or use during a specific activity. The templates are a 'pragmatic tool' (Dewey, 1931; Leont'ev, 1981) that, it is hoped, has meaning and value across both learning and research contexts. In other words, PVT use aims to be a research tool that can be empirically influential and powerful, while also having an impact upon the pedagogical processes within classrooms.

For this paper the data was analysed using a repeated process of systematic analysis to identify key themes. However, the data was also used in cycles of action research. During the course of 2010/11 the data and analyses were fed back to ST, often by PD but also by DL, and this close relationship supported her development. It is therefore a critical part of the context in which ST used SOLEs at her school, and in which interpretations of the data reported in this paper were developed.

The Development by ST of SOLEs in Holy Name Primary

The first SOLEs carried out with ST's Year 4 students, supported regularly by Mitra, used GCSE questions. Three months after the SOLEs, ST asked the children the same GCSE questions under examination conditions (no speaking to others, no use of internet). Surprised that the children had retained the answers assumed to be gained by SOLEs, the tests were repeated on two further occasions all with high achievement. ST was the curriculum leader in science and found SOLEs generated student interest and knowledge from science questions. She then started to use SOLEs in other areas: history, geography and English, and then mathematics. During this first year, when ST first used SOLEs without Mitra's presence, she reported feeling deeply worried at the level of noise and with low expectations of the outcomes. However, she also reported feeling greatly surprised at what the children came up with. The science curriculum topic on one occasion was 'friction', so ST chose the question,

"Why do you slip on wet surfaces?" The children were talking in their groups about friction, snow tyres, grips on football boots, different surfaces, racing cars, all in twenty minutes.

ST said that SOLEs can work in conjunction with the curriculum at different times in different ways. As information is gathered so quickly it is ST's view that SOLEs can come to the aid of teachers with little time to complete a topic. For example, at the start of a topic a SOLE is a useful way of introducing a new area, but it is equally useful at the end of a topic with only a week of teaching time remaining but much material to cover:

> *I was absolutely stunned with what they [the students] came back with. They had practically covered the whole scheme of work in one lesson. I was totally amazed because these 8/9-year -olds were coming back with such complex information.* (ST final interview)

Here, ST gives as an example a SOLE session from her second year of using SOLEs, on Vikings and religion. What impresses ST is the complex discussions that this initial question led to:

> *We taught the Vikings once and we hadn't really touched on religion and I was thinking I haven't got much time and we gave them the question 'What did the Vikings believe about God?' and they went off and came back with the most amazing information ever. Stuff that I didn't know at all and they ended up having this really big debate. They found out that the Vikings weren't necessarily fierce fighters by their nature but they had to be because they believed that if they didn't fight and didn't show that they were aggressive and manly that they wouldn't go to heaven, they wouldn't have an afterlife. So the children were starting to say things like 'well maybe people didn't really want to but they had to because they had this really strong belief that if they didn't fight for their cause to take over land that they wouldn't have an afterlife, so maybe a lot of them weren't really like that but they just had to pretend to be'. And I was thinking how on earth would I ever have been able to do a lesson to 8-year-olds about that massive issue in an hour? There is just no way! But they're the kind of jewels that they come back with and then a whole discussion started about religion – should you do everything that a religion tells you to do even if you don't believe in it yourself but your parents do. And they were talking about the school because it's a church school and so*

are there any things that they learn in school that they didn't agree with. As a teacher I would never in a million years have planned a lesson about all of that. It would never have crossed my mind! It made them look back over the whole topic as well. (ST final interview)

This extract is evidence of the influence that ST's first hand experience was having on her stance on SOLEs, as she was seeing significant potential for learning in her pupils.

Journal analysis: A year of SOLEs

We conducted an analysis of ST's 2010/11 journal to identify themes. The journal contains reflections based both on ST's presence in the room and to a lesser extent reviewing the video recordings of sessions and discussion with university colleagues or visitors. The 20 entries were divided into four time periods, each covering five entries: September-mid-October 2010, mid-October-November 2010, early December 2010-early January 2011, mid-January 2010-April 2011. Early on there was considerable emphasis on general behaviour and the functioning of the 'supervisor', with some consideration of the SOLE process and the quality of information being found and analysed. In the second period the scrutiny of behaviour lessened and there was more consideration of how students were responding. This continued into the 3rd period when the focus became student response and learning, along with reflections on planning. Reflections on learning in many cases were prompted by observations on individual students.

One of the most significant challenges was learning how to conduct plenaries during which groups present their work. ST saw this as an opportunity to deepen and broaden learning and to challenge students. Planning was both short term, on how to proceed to the next lesson, and longer term in respect of managing different aspects of SOLEs. In the fourth period, student response/learning and group interaction seemed to be dominant categories, and there was more general reflection on the year so far. Another emerging category was observations on how groups were working together, perhaps in terms of accommodating individuals. Behaviour does not disappear; there were still three references in the last five entries, but it seemed to have had less relative significance. There were two particularly interesting trends. Firstly, those aspects concerned with strictly organisation/'teaching' aspects seemed to diminish over time and, secondly, those concerned with learning increased.

ST broadly recognised the pattern reflected from her journal:

> *I think you get more precise at what you're looking for. At first, you're just looking at a whole class picture of behaviour, everybody getting on with work, and then you start looking for other things: groups, individuals, the effect of the question. I think once you're satisfied that they understand the process, the structure of a SOLE, then you can start to think about the significance of things. They need time to settle in to the process. If they get stuck then you talk about how to overcome problems. In those lessons, there isn't a problem that can't be discussed and overcome, some lessons, it's harder to talk about things in structured lessons. I think meetings with Paul and David probably also prompted me to reflect on whole school issues.* (ST diary)

The SOLE method seems to have allowed Sarah opportunities to observe her class 'from a distance' during extended periods of time when the students are self-organising. The notebooks show she had reflected on how the SOLE method could be modified in order to suit the needs of her class better. This reflection led to planning and interventions. The notebooks also showed Sarah thinking about the effect of SOLEs on her class at different levels: the effect on specific students; the effect on a group of students working together; the effect on the class as a whole; and the effect on the school and staff. Sarah found SOLEs enabled her to notice changes in the social relationships in her classroom. At first, children worked on SOLEs in friendship groups, but as time went on she noticed a range of changes, including children making other kinds of choices about who to work with, such as perceived skills in different subject areas. ST spoke about how difficult it was not to intervene in SOLEs, such as when you saw a child working alone. Her observations of the different approaches taken by children to a particular SOLE might be discussed with them afterwards individually, to encourage them to reflect on their own learning.

Our data suggests that ST's approach to teaching, to her planning over the term and her delivery of individual lessons changed as a result of using SOLEs. Not only did ST find discussions on topics (such as the Viking approach to theology) that she would not have thought within the capability of her students, she found herself using vocabulary of a greater complexity as a result of students doing so in their SOLE discussions and panel presentations. In order to consolidate children's understanding she collected words from SOLE presentations into a word bank and explored these further in subsequent lessons. There

seemed to be a 'knock-on' effect into her wider thinking and practice, reinforced by the students:

> *Whatever I do now, I think, would a SOLE question be useful here or not? I don't do it for the sake of it, I think 'would it be valuable?…. The SOLE method bleeds into everything else I do. The students start to take SOLE experiences into other lessons too – they ask 'why can't we work in groups of four in this lesson?' sometimes I think, well, actually OK you can, whereas sometimes I have to explain it's just not appropriate.* (ST final interview)

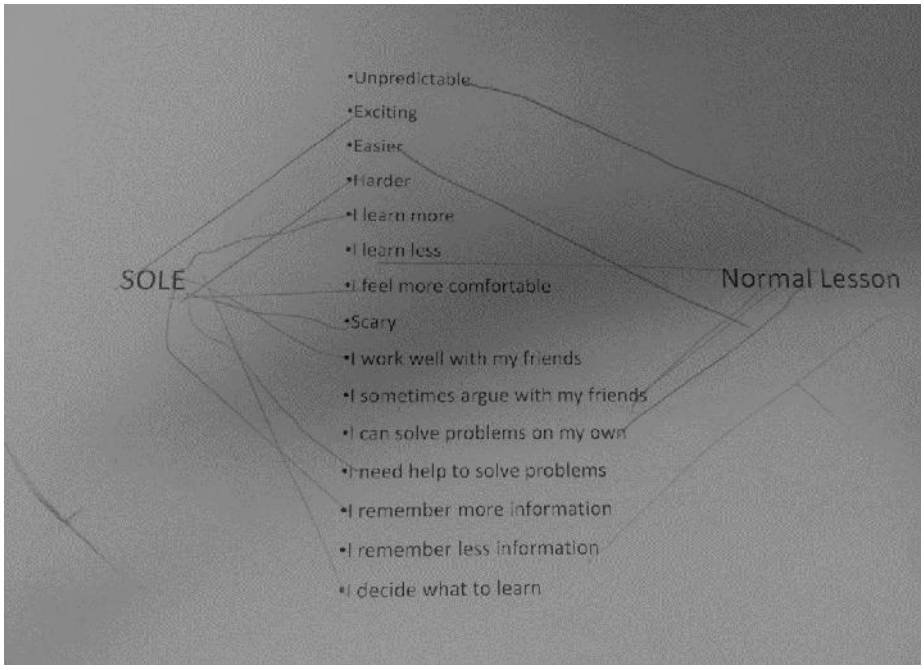
What seemed most striking from ST's data was the impact of SOLEs on her appreciation of the children:

> *A lot of the time we don't listen to the children and we don't listen to how they would like to learn and what they would like to know.* (ST Youtube video)

Y4 Pupil responses to SOLEs in Holy Name Primary

Analysis of all student data showed the children to be generally positive about SOLEs and also (in the case of one student, a response in keeping with that of many other students in the class) to see SOLEs as different to 'normal lessons' (Figure 1). A positive response may, of course, result from novelty. However, the novelty effect diminished since the SOLE approach became a regular feature of student work across the whole year. Pupils reported remembering more, working with others, having more choice and being more excited in relation to SOLES. There was also evidence of metacognitive thinking from the use of PVTs, in that students evidenced the development of sensitivity to their work habits and the accuracy of their work. In general, the students reported positively on school, so there were many positive comments about both approaches (SOLEs and normal lessons). However, they were slightly more explicit about learning processes in SOLES, which might be because it was the approach that was perceived as different. The main difference, however, was in the large number of negative comments made about 'normal' lessons against a much smaller number for SOLEs.

Figure 1. The response of one student to a comparison of SOLE lessons to 'normal' lessons



Placing student data alongside the data from ST, it seemed as if it was not only ST's thinking and behaviour that developed, but also that of the students. As ST suggested:

> *The increase in notebook observations of student dialogue and learning-centred talk might be to do with an increase in student confidence – later in the year they tended to tell me more about what they're doing – they were more likely to talk about learning rather than behaviour issues.* (ST diary)

The process of reviewing student data with ST seemed to have been valuable for her in both reinforcing perceptions and adding justification:

> *The formal data showed me what the children actually thought about it. It's their point of view. It confirmed/ dispelled ideas that I was having throughout the process. Sometimes it's really surprising to see what they write. I was amazed at how brutally honest they are – as soon as you say 'it's not a test, you can write what you want' they really do! It confirms what you think you're seeing, what you think you're changing, is real, because the children see the benefits of working in this way as well. It's quite important with this kind of thing, that you know the children are enjoying it and benefiting from it. [The data] made me more aware of their views on all the aspects of*

*the SOLE process. You don't really realise how many decisions are going on in their heads at the different stages of an enquiry***.** (ST, video)

Discussion

One of the most obvious of all the many possible questions arising from our focus on SOLEs in the English primary school is the extent to which this particular practice of SOLEs can be regarded as transformative and innovative. We suggest that some of the other questions that are asked of SOLEs, such as whether the teacher involvement really can be conceptualised as minimal, can be considered within a critical analysis of SOLEs as innovation.

Transformative pedagogy?

SOLEs have garnered international acclaim in part because they are perceived to be so innovative and also because of exciting early results (Mitra, 2006; Mitra and Dangwal, 2010). There is compelling evidence that Mitra's ideas about SOLEs, and the implications of these ideas for pedagogy, have inspired educators across five continents including India, UK, Argentina, USA, Australia, China, Finland and Qatar. Mitra's ideas have also inspired the film, *Slumdog Millionaire*. Mitra has been awarded the 2013 annual TED prize ($1 million) for his wish to build the school in the cloud, an invitation to everyone to create their own miniature child-driven learning environments and share their discoveries. Mitra's TED prize-winning talk (Mitra, 2013a) on SOLEs has been viewed over 1,750,000 times on TED.com and TED's YouTube channel and over sixty major press articles have been written about the work (including *New York Times, TIME,* the BBC and *Times of India*). The 'SOLE Toolkit' (Mitra, 2013b) on the TED website, based on work in classrooms carried out with colleagues Dolan and Leat), has been downloaded over 16,000 times and many blogs posted by teachers inspired to make classroom changes. The TED website lists five ways in which the public can become involved in the prize-winner's wish and the first of these is to: 'Try out a Self-Organized Learning Environment (SOLE) in your home, school or community', with links to the TED SOLE Toolkit (Mitra, 2013b). There is therefore enormous momentum behind SOLEs, both within and also beyond educational spheres. This kind of attention creates a powerful discourse around SOLEs and is therefore part of the context in which draws teachers to them.

Innovation, however, is a thorny topic in educational policy, as the school system seems remarkably resistant to change (Sarason, 1990). According to Tyack and Cuban (1995), there is a 'grammar of schooling', reflecting patterns of teaching, which is hard to shift. So despite a continued barrage of educational reform in many advanced economies, which are often structural in nature or related to assessment regimes, change can be an illusion. Using Bernstein's (1990) terms, many systems are characterised by strong classification (subjects taught in isolation from each one another) and strong framing in which students have little control over the selection, sequencing or pacing of subject matter. Framing reflects power structures in education and strong framing has many associations with convergent pedagogy and assessment. In such settings there are unwritten, but usually well understood, rules which influence the shaping of social conduct and roles in the classroom. SOLEs have the potential, particularly when pupils have some responsibility for generating and refining questions, to reframe the relationship between learner and teacher, and learner and curriculum.

Neither are SOLEs without their critics. Clark's (2013) blogged critique rests on claims of the lack of permanence of the previous Hole in the Wall computers in India and other countries, and his view that many of the particular requirements of classroom SOLEs lack novelty. For example, he suggests there is nothing new in the organisation of a lesson to involve groups of students exploring answers to challenging questions set by teachers. We suggest that in order to consider whether or not SOLEs represent a form of innovation requires a consideration of SOLEs in their entirety rather than of particular elements. And finally, we propose the discussion of SOLEs in relation to various understandings of innovative.

SOLEs can be seen from at least two perspectives as an educational innovation. Firstly, it is a technological innovation that potentially disturbs classroom ecology as the teacher shifts from being centre stage and, secondly, it is an enquiry-based approach where greater student autonomy is anticipated. From the first perspective, a major challenge is orchestration (Dillenbourg and Jermann, 2010), which represents how classroom teachers accommodate technology into their practice. From the second perspective, classification and framing are both thrown open to being re-cast. SOLEs can be conceptualised as non-dominant activity (and therefore innovative), being weakly framed and having unpredictable learning outcomes in comparison with the dominant model of highly directive learning outcomes (Sannino, 2008). Enquiry approaches are divergent, in which a number of important learning parameters may change; for example assessment is less concerned with testing the mastery of

a set body of knowledge and more geared to evaluating what exactly has been learned, and teachers assume a greater role in mediating learning rather than instructing. Such changes can be extremely challenging for some teachers (Leat, 1999; Williamson and Morgan, 2009).

The notion of challenging our expectations of student's outcomes, evident in ST's experience of SOLEs, is consistent both with dominant and non-dominant educational activities. However, it is possible that SOLEs are a challenge to the essentialist and individualist notions of ability and learning implicit in the pedagogical models that follow from strong classification and framing. This seems to happen in two aspects of SOLEs. Firstly, learning is both distributed and democratised rather than individualised. This frustrates the evaluation of children in terms of more or less 'ability' (Mazzoli Smith and Campbell, 2012), since the children's movement between groups, taking knowledge with them, 'stealing' knowledge through sharing or building from one group to another, leads to a more uniform learning across the class. This concurs with notions of distributed and collective cognition (Littleton and Mercer, 2013). Secondly, student agency seems to be greater in SOLEs than in the more usual teacher-directed lessons (Todd, 2007). Children have been observed choosing a more difficult question for a SOLE when it was explained to them there would be no competition, whereas initially an easy question was chosen due to fear of failure (Mitra, 2012). SOLEs are associated with a curriculum which relates more strongly to students' interests, questions and experiences (Payton and Williamson, 2009). One of the main themes of ST's experience was the insight into the benefits of student agency, and also learning to give greater opportunities for student agency in her teaching. Indeed, there is evidence that ST was at the centre of her own learning and became an active agent in the production of pedagogic discourse (Edwards and Brunton, 1995).

At least superficially, it appears that there is a considerable conflict between the dominant English model of teacher-led education, with highly specified learning outcomes, and the SOLE method. This is supported by a body of scholarship that recognises the limiting impact of policy discourses on teacher thinking and reflection (for instance Edwards and Thomas, 2010; Priestly and Biesta et al., 2013) The issue is whether teachers presuppose that SOLEs come pre-packaged with an inherent educational philosophy. Seen this way, this case study suggests that SOLEs may be less likely to be sustained in mainstream schools. We can speculate that this orientation comes from a wider climate where dominant theories of cultural reproduction in education, such as those of Bernstein (1990) and Bourdieu and

Passeron (1990), promote narratives of the impossibility of spaces for resistance and contestation in educational practice and a uni-directional flow of power. Giroux (2003) argues that this has in part fostered a pervasive cynicism amongst educators about forms of radical pedagogy and transformation.

However, it is also possible to conceptualise SOLEs as *both* innovative / transformative - and at the same time supporting current strong classification and framing. The way in which SOLEs are presented in the TED training manual (Mitra, 2013b) accommodates both a human capital model of education within the neo-liberal paradigm and a progressive child-centred model focusing on the importance of creativity and transformation within a more liberal tradition:

> *To prepare for the realities of the future workplace and the rapidly changing technological landscape, it is critical for educators to invite kids to get good at asking big questions that lead them on intellectual journeys to pursue answers, rather than only memorizing facts.* (Mitra, 2013b, *SOLE Toolkit,* p. 2*)*

> *The SOLE mindset is transformative. Children have the ability to think critically and can learn astonishingly quickly. (*(Mitra, 2013b, *SOLE Toolkit,* p. 6)

ST's own perspective is that SOLEs are indeed both transformative of current pedagogical understandings and supportive of current curricular demands, enabling the established curriculum to be 'covered'. Much of the history of the implementation of SOLEs, and indeed the origin of ST's work, has been higher than expected student performance in terms of the prescribed learning outcomes of the English curriculum (i.e., using GCSE questions), rather than a focus on other kinds of creative learning outcomes. Similarly, whilst SOLEs challenge teacher control and enable student agency, in the plenary ST spoke of taking back control and being able to challenge students to reflect on their discoveries, hoping to deepen their learning, drawing on her observations of students during a particular SOLE. Is it possible that SOLEs help ST to establish and maintain what we call a Normal Desirable State (NDS) of pupil activity in the classroom (Brown and McIntyre, 1993)? Different teachers have different NDSs at different times and, from this case study, we can see how ST incorporated SOLEs into one of her NDSs in the classroom.

Mitra has identified current assessment practices as being a possible or perceived barrier to the implementation of SOLEs, internationally as well as nationally, referring to the rigidity of a system that does not prioritise creativity in children. However, this case study has shown that ST does not perceive these as being in conflict in her teaching practice. Of course, this might not be the case in secondary school classrooms. In the context of ST's classroom, SOLEs do not inherently resist or contest dominant pedagogies. Mitra's reference to SOLEs as learning 'tools' rather than teacher pedagogies is a deliberate way of highlighting their neutrality and protean quality. Like computers, SOLEs are tools to be used in a multitude of ways and to service a host of different agendas (Marshall, 2004). The blurring, confusion or reversal of tool and object (Engestrom, 1987: 101-103; Virkkunen et al., 2010: 18), highlighted by Engestrom's cultural historical activity theory, is useful here. Thus SOLEs become a means for better maintaining the status quo (i.e. enhanced exam results), rather than an object of pedagogical transformation.

What counts for innovation is likely to be susceptible to current discourses of teaching, to normalised understandings of what counts as a 'good' teacher, student, or lesson. It is maybe not surprising that the implication of the success of SOLEs, from much of the media attention, is that students no longer need teachers. The role of the teacher has become one that is contested rather than the respected role of a previous age. However, we suggest what is innovative about SOLEs is that they have us revise the role of the teacher, and indeed other aspects of teaching. In other words, what can be understood to be innovative about SOLEs may be the questions they have us asking about education as a whole, rather than the innovative nature of SOLEs themselves:

> *We don't need to improve schools. We need to reinvent them for our times, our requirements and our future. We don't need efficient clerks to fuel an administrative machine that is no longer needed. Machines will do that for us. We need people who can think divergently, across outdated "disciplines", connecting ideas across the entire mass of humanity. We need people who can think like children. (Mitra, 2013c)*

SOLEs therefore are not *necessarily* a form of radical pedagogy (Giroux, 2003), although in transforming education there is evidence that SOLEs can be used in this way. Giroux identifies radical pedagogy as overtly political, bringing to the fore the experiences and interests of pupils and social transformation. It is not usually seen as reproducing the

desirable skills and knowledge base of education. Giroux identifies 'curricular justice' (2003: 10) as more inclusive and equitable forms of teaching that serve to lessen the individualistic principles on which much learning is founded, and that a radical form of pedagogy problematises the mechanisms of transmission and teacher authority, as arguably SOLEs do. In this sense, the SOLE method can be *used* as a form of radical transformative pedagogy, working in antagonism to the dominant framework of largely individualised learning, fostering curricular justice without a need for teachers to position themselves as contesting the curriculum – arguably one of the main barriers to transformative education. A radical pedagogy has to have relevance for educators as a mode of viable praxis (Giroux, 1981) and, in ST's case, it has this precisely because it does not necessarily place the teacher in an arena of conflict.

If the SOLE method can indeed be adapted and adopted by teachers for a multitude of different ends, transformative and yet not necessarily in conflict with other demands, it requires a subtle understanding of the way in which power circulates and transformation is effected in educational practice. For instance, a Foucauldian understanding of discourse sees power not as uni-directional or hegemonic, but, as Giroux has argued, 'riddled with contradictions and tensions that open up the possibility for counter-hegemonic struggle' (1981:17). What is particularly interesting about this case study is that the transformative impact of SOLEs appears to open up spaces for counter-hegemonic practice without this necessarily being experienced by teachers or students as in conflict with the dominant educational framework.

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References

Bernstein, B. (1990) *The structuring of pedagogic discourse.* London: Routledge.

Bourdieu, P. and Passeron, J (1990) *Reproduction in Education, Society and Culture.* Vol. 4. Sage.

Brown, S. and McIntyre, D. (1993) *Making sense of teaching.* Buckingham: Open University Press.

Clark, D. (2013) *More holes in Mitra's 'Hole in the Wall' Project.* Blog: Donald Clark Plan B. Accessed on 20th Oct from:
http://donaldclarkplanb.blogspot.co.uk/2013/06/more-holes-in-sugata-mitras-hole-in.html

Dewey, J. (1931) *The way out of educational confusion.* Cambridge, MA: Harvard University Press.

Dillenbourg, P. and Jermann, P. (2010) Technology for classroom orchestration, in: M. S. Khine (eds), *New science of learning: cognition, computers and collaboration in education,* pp. 525-552. Dordrecht: Springer.

Edwards, A. and Brunton, D. (1995) Supporting reflection in teachers' learning', in: J. Calderhead and P. Gates (eds) *Conceptualizing reflection in teacher development.* London: Falmer.

Edwards, G. and Thomas, G. (2010) Can Reflective Practice be Taught?. Educational Studies, **36**(4), 403-414.

Engestrom, Y. (1987) *Learning by expanding: An activity-theoretical approach to developmental research.* Helsinki: Orienta-konsultit.

Giroux, H.A. (1981) Hegemony, Resistance, and the Paradox of Educational Reform. *Interchange,* Vol. 12 (2-3), pp. 3-26.

Giroux, H.A. (2003) Public Pedagogy and the Politics of Resistance: Notes on a critical theory of educational struggle. *Educational Philosophy and Theory,* Vol. 35 (1), pp. 5-16.

Leat, D. (1999) Rolling the stone uphill: Teacher development and the implementation of Thinking Skills programmes, *Oxford Review of Education*, 25 (3), 387-403.

Leont'ev, A. N. (1981). The problem of activity in psychology. In J.V. Wertsch (ed.), *The concept of activity in Soviet psychology*, pp. 37-71. Armonk, NY: Sharpe.

Littleton, K. and Mercer, N. (2013) Interthinking: Putting talk to work. Abingdon: Routledge.

Marshall, T. (2004) ICT: don't believe the hype. In D. Hayes (ed.), *The RoutledgeFalmer Guide to Key Debates in Education,* pp. 113-116. London: RoutledgeFalmer.

Mazzoli Smith, L. and Campbell, J. (2012) *Families, Education and Giftedness*. Rotterdam: Sense Publishers.

Mitra S. (2006) *The hole in the wall: Self-organising systems in education.* New Delhi and New York: Tata-McGraw-Hill.

Mitra, S. (2012) *Beyond the hole in the wall: Discover the power of self-organized learning.* TED Books.

Mitra, S. (2013a) TED talk: Sugata Mitra, Build a school in the cloud. Accessed 12 October 2013: http://www.ted.com/talks/sugata_mitra_ build_a_school_in_the_cloud.html

Mitra, S. (2013b) SOLE: How to bring Self-Organised Learning Environments to your community. TED, Accessed 12 October 2013: http://www.ted.com/pages/sole_toolkit

Mitra, S. (2013c) Google means we must rethink our approach to education, *The Observer*, 15th June 2013.

Mitra, S. and Dangwal, R. (2010) Limits to self-organised learning: The Kalikuppam experiment, *British Journal of Educational Technology,* 41(5), 672-688.

Mitra, S., Dangwal, R., Chatterjee, S., Jha, S., Bisht R.S. and Kapur, P. (2005) Acquisition of computing literacy on shared public computers: Children and the 'hole in the wall', *Australasian Journal of Educational Technology,* 21(3), 407-426.

Mitra, S. and Rana, V. (2001) Children and the Internet: Experiments with minimally invasive education in India, *British Journal of Educational Technology*, 32(2), 221-232.

Mitra, S, Tooley, J. N., Inamdar, P. and Dixon, P. (2003) Improving English pronunciation: An automated instructional approach, *Information Technologies and International Development,* 1(1), 75-84.

Mitra, S. and Quiroga, M. (2012) Children and the Internet – A preliminary study in Uruguay, *International Journal of Humanities and Social Science,* 2(15), 123-129.

Payton, S. and Williamson, B. (2009) *Enquiring minds – Innovative approaches to curriculum reform.* Bristol: Futurelab.

Priestly, M., Biesta, G. and Robinson, S. (2013) Teachers as agents of change: Teacher Agency and emerging models of curriculum, in: M. Priestly and G Biesta (eds), *Reinventing the curriculum: New trends in curriculum policy and practice.* London: Bloomsbury.

Sannino, A. (2008) Sustaining a non-dominant activity in school: Only a Utopia?, *Journal of Educational Change,* 9: 329-338.

Sarason, S. B. (1990) *The predictable failure of educational reform: Can we change course before it's too late?* San Francisco: Jossey-Bass.

Todd L. (2007) Partnerships for Inclusive Education: A critical approach to collaborative working. London: Routledge.

Tyack, D. and Cuban, L. (1995). *Tinkering toward utopia: A century of public school reform.* Cambridge, MA: Harvard University Press.

Virkkunen, J., Makinen, E. and Lintula, L. (2010) From diagnosis to clients. Constructing the object of collaborative development between physiotherapy educators and workplaces, in: H. Daniels, A. Edwards, Y. Engestrom, T. Gallagher and S. R. Ludvigsen, S.R. (eds), *Activity Theory in Practice. Promoting learning across boundaries and agencies*. London: Routledge.

Wall, K. and Higgins, S. (2006) Facilitating metacognitive talk: A research and learning tool, *International Journal of Research and Methods in Education,* 29(1): 39-53.

Williamson, B. and Morgan, J. (2009). Educational reform, enquiry-based learning and the re-professionalisation of teachers, *Curriculum Journal,* 20(3), 287-304.