Developing Self-Esteem and Empowerment through Expressive Computational Materials

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Abstract: We present a case study analysis of teacher empowerment and student learning through Constructionist engagement with computational technologies and learning about learning itself. Looking beyond how a teacher overcomes hesitations about new technologies, we consider how he redefines his own understandings of learning as he begins to use computational technologies in working alongside his students. The teacher's emerging self-reflective practice and heightened self-esteem enable him to better understand the multifaceted structure of the learning situation and his own relations to its social, cognitive, and affective aspects.

Introduction

> Above all, even beyond the love of knowledge, is this principle: If you love what you learn, you'll get to love yourself more. And this has to be the goal of education that each individual will come out with a sense of personal self-respect, empowerment, and love for oneself, because from that grows all other loves: for people, for knowledge, for the society in which you live (Papert, 1990, p.13).

Seán works in all-boys' school in a disadvantaged area on the north side of Ireland's capital city of Dublin, surrounded by high-rise public housing known locally as "The Towers." Many children at Seán's school come from households gravely stressed by poverty, long-term unemployment, drugs and alcohol abuse, absent parents, and family members imprisoned.

After 17 years in mainstream teaching, Seán decided to move into the area of special needs teaching. From the outset, he was acutely aware that the special class at his school was marginalised in terms of day-to-day activities and culture. The special class, boys aged 10 to 13 years, ostensibly had "failed" within the existing educational system. But Seán often suspected it was the other way round: that the system had failed these children. He was constantly on the lookout for ways to awaken interest in learning:

> I'm always looking for other projects that [I] think will appeal to the kids. Most of the time I'm trying to motivate them because an ordinary approach . . . or the experience the kids have had in school has turned them off learning. (Interview, July 2002).

The "dummies"

Seán believed that lack of self-esteem was the root cause of many of the problems that the children in his special class were presenting. Before Seán became involved with the Empowering Minds (EM) project (http://empoweringminds.mle.ie), his students had little experience of "the feeling of being lovable and the feeling of being capable" (Humphreys, 1993, p. 3), the two dimensions central to self-esteem. Reasoner defines self-esteem as "the degree to which people feel worthy, capable, significant, and effective (1992, p. 12).

Seán wanted to break the children's "cycle of failure" so they would feel better about themselves and more hopeful about their lives, and so they would re-engage with learning. He knew that mainstream teachers' and peers' view of his suburban, disadvantaged students was crucial to their self-esteem. Generally everyone regarded these children as

"very different" and not as capable as the mainstream children. Nobody liked to be part of the special class, as its members were classified as "dummies" by the rest of the school. No wonder, then, that every child within the unit had a very poor self-image and lacked self-esteem.

Constructionism and teacher development

Seán did not have a great deal of experience in using digital technologies, but he was open to exploring their possibilities in a learning environment. He became involved with the EM project in the summer of 2000. This project focuses on teacher development through participants' learning side-by-side with their children about robotics and computer programming, in a self-motivated, creative context that transforms classrooms into studios and involves arts, history, and culture as well as science and technology in the learning (Butler, 2004)

The approach emphasizes the importance of a supportive culture in which participants actively exchange ideas and engage in discussion of one anothers' creations and processes of producing them. These emphases on thinking and learning about learning lead to development of positive self-images, which in turn lead to participants' increasingly active community participation and better learning overall. Through combining exploration and innovative uses of expressive computational materials in a larger context that gives equal priority to discussing, writing, drawing, designing, computer programming, videomaking – and thus to arts, culture, and engineering – participants come to feel that all aspects of themselves are welcome, capable, and open to development.

Constructionism is grounded in the idea that people learn by actively *constructing* new knowledge, rather than by having information "poured" into their heads. Moreover, Constructionism asserts that people learn with particular effectiveness when they are engaged in constructing personally meaningful artefacts such as computer programs, animations, or robots that they can show and discuss with others (Papert, 1991, p.1). These artefacts are "objects to think with" and a means by which others can involve themselves in the thinking process.

Community support enables a powerful learning environment, as other people are the greatest source of alternative views needed to stimulate new learning (von Glasersfeld, 1989). Given sufficient time and using digital technologies within such a supportive learning environment "makes it increasingly possible for ...[learners]…to engage in learning practices that lead to new ways of thinking, understanding, constructing knowledge and communicating results" (Milken Exchange, 1999, p.29).

Distributed expertise

Like all the other EM teachers, Seán was used to highly structured, content-driven, in-service presentations of curricular objectives and methods, conducted by a "presenter" or "expert." So not surprisingly he — and all of his colleagues on that first day of the week-long workshop — found EM's evident lack of structure "strange." At times he admits he even felt "under threat," being in a situation where he wasn't being told what he should do and was continually asking himself, "What's going on here?" (Field notes, conversation with Seán, August 2000).

Gradually, he realised that rather than being unstructured, the workshop organizers were trying to facilitate self-structuring rather than enforcing a predetermined programme that people had to adhere to (Field notes, cluster meeting, December 2000). We adopted a "different strokes for different folks" approach (Papert, 1996, p.86), because "only if a workshop respects and supports a diversity of working styles, will participants feel comfortable enough to work on personally meaningful projects" (Resnick, 1991, p.5). The participants were setting their own learning goals as they built their own chosen projects using the computational materials. As learners, they were actively involved in the learning process, so their experiences were meaningful and their motivation levels rose accordingly (Ruopp, 1993; Thompson et al., 1992, pp.11, 68; Thornburg, 1994, pp.24-25).

Many studies have demonstrated that a supportive community encourages the sharing and dialogue necessary to promote trust and risk-taking (Zetlin et. al. 1998; Mc Laughlin and Talbert, 1993). With our encouragement Seán started to look upon the others in the group as "flexible resources" that he could use and rely on (Rogers, 1969). Hearing other people's opinions and ideas was important to Seán, as they helped answer questions or clarify doubts he may have been experiencing while also providing new ideas to think about (Von Glasersfeld, 1989). He began to realise that "other people are the greatest source of alternative views needed to stimulate new learning" (von Glasersfeld, 1989). Being able to voice his own opinions and ask questions were equally important to Seán as he tried to understand the Constructionist approach to learning and what was possible using computational materials (Harel and Papert, 1991; Kafai and Resnick, 1996). The development of this open, respectful ethos among members of the EM community was vitally important to combat the ersatz "interactional congeniality" and "surface friendliness" that can impede individuals from examining their personal beliefs or practice (Grossman and Wineburg, 2001).

Being part of a learning community

When asked for the highlights of the project, Seán ranked the value of "working with the other teachers as well as the sharing of ideas" at the top of his personal greatest hits (Interview, July 2002):

> I've learned a lot in the last two years. If I were to take it in segments of how I've change in the past 22 years' teaching, the last three years have been the most dramatic changes really in me…what I've learned and how happy I am in the job." (Interview, July 2002).

Seán attributes much of this growth to "being part of a group, being part of a community," the members of which he regards "very much as partners" (Interview, July 2002). These sentiments are consistent with the literature on teacher development that clearly demonstrates ongoing collegial support is essential to meaningful and long-lasting teacher change (Darling-Hammond, 1996; Raywid, 1993). And the community support is particularly efficacious when coupled with opportunities for reflective thinking (Darling-Hammond 1996; Hamilton & Richardson 1995). Rosenholtz (1989) maintains that teachers who felt supported in their own ongoing learning and classroom practice were more committed and effective than those who felt isolated and without support. Lindeman (1926) suggests that teachers' own personal needs and interests, coupled with their experiences in the classroom, should form the starting point around which to challenge and build new ideas and perspectives on learning. Seán believes that he has made the greatest strides in his own learning in the context of the EM learning community because it supports and responds to all the teachers' personal needs and interests:

> I feel very much *in* the group and that's the spirit that we've got in the group. . . . Everyone is being very open with their experience or lack of experience in the area . . . right from the moment, "Go!" So people are very comfortable with one another. And I think that's very, very important (Interview, July 2002).

Seán's experience bears out Mc Laughlin and Talbert's assertion that support from such professional communities not only offers "the most effective unit of intervention and powerful opportunity for reform" but that "participation in a professional community . . . supports the risk-taking and struggle entailed in transforming practice" (Mc Laughlin and Talbert,1993, pp.15, 18).

New learning leads to new growth

Since his involvement with the EM project Seán is more "open to new ideas" resulting in further professional development opportunities that have "opened so many other doors" for him:

> Even my own development — giving a course this year to other teachers in the summer — that's something I haven't done before. Talking to the group has given me a lot of confidence (Interview, July 2002).

He also feels that "there has to be a fun aspect to [learning] as well, which is very, very important." Because the EM learning environment was enjoyable and boosted his self-esteem, Seán stayed motivated (Tough, 1979). For him, teaching now extends "beyond the moment":

> I'm thinking about it when I'm not there as well, reflecting back why I'm doing certain things." (Interview July 2002).

Seán is continually aware of and interrogating his "meaning perspective" (Cranton, 1996). Using his classroom experiences as "an object to think with" (Papert, 1986; 1991), he has embedded his learning "in the very routines of practice" (Sugrue et al., 2001, p.8). Seán believes he has "developed a lot" because his own self-esteem has been boosted.

> [Teachers] spend a lot of talking about the kids' self-esteem but . . . to develop the kids' esteem, you have to have good esteem yourself, which is very important. . . . Mine has been given a great boost with the project (Interview, July 2002).

The "positive feedback [he] got . . . from different people [the children, the parents, the principal], the two newspaper articles" [1](Interview, July 2002) about his work, and numerous visits from other educators to his classroom all helped Seán develop the confidence to host a discussion about his work with the learning-support teachers' group in his area (January 2002) and to act as a facilitator in workshops for undergraduates using computational materials (final year preservice elective, March 2002). He also conducted workshops for primary and post-primary teachers (2003/2004), for learners within a disadvantaged urban neighbourhood (Liberties Learning Initiative Workshops, 2003/2004), and for care workers and parents (Disadvantaged Forum, July 2002).
Encouraged by this cycle of confidence-building involvements, Seán began to take increased risks, branching out in ways he never would have considered prior to EM:

> Now I'm doing the Masters course this year. . . . The assignments . . . all have contributed to me in the last couple of years. I've had an interest in video work which has developed into using digital video technology. I wouldn't have had an opportunity to do that if I wasn't in the project. Even my interest in computers – they've all come now as a result of the project (Interview July 2002)

The classroom meets atelier-style learning

When he returned to the classroom after his first EM summer workshop, Seán set up his own atelier-style workshop within his classroom, and encouraged the boys participating to share ideas about their constructions and to critique each other's work and designs (Kuhn, 2001, p. 5). He wanted to provide opportunities that would enable the boys to discusstheir thinking:

> It is the thinking about the problem that fosters learning. So does talking about the problems or showing them to someone else. (Papert, 1996, p.12).

Seán expected that this new way of working might prove to be very difficult, as these boys generally displayed behavioural problems. They were often antagonistic towards one another and found it difficult to co-operate on even the smallest of tasks.So when he introduced the computational materials, Seán was surprised to discover that collaboration developed naturally. The materials included a range of gears, sensors, and associated kit for robotic constructions. These supplies are based on the Programmable Brick research at the MIT Media Lab, now commercially available as the LEGO Mindstorms product (www.legomindstorms.com).
The boys began to look to each others' building projects for ideas, and some boys began to emerge as competent builders who were willing and able to help the others. Seán encouraged the boys to keep records of their work as they developed it. Using photographs and drawings and sometimes text, the boys kept accounts of their thinking over time, describing the problems, successes, and design changes. Working like this, Seán believed, his students would "get a sense of the way in which real designers go about their work, as part of a community of designers" (Resnick and Ocko, 1991, p.6) rather than being the receptacles in the traditional classroom scenario that "is based on the model of the pipeline through which knowledge passes from teacher to student" (Papert, 1996, p.45).
One boy, David, is a particularly radiant example of the transformations that began almost immediately. This child had experienced many years of failure in mainstream classes. He had little interest in learning, was difficult to motivate, and his self-esteem was very low. David is similar to many children whom Papert has written about: "As seen through school tests he appears as an incompetent person: virtually illiterate …— in brief, 'a failure'" (Papert, 2000, p.721).
David had announced to the principal and class teacher that he did not like himself, was "no good at anything," and that he was going to leave school. This incident coincided with the arrival of the LEGO Mindstorms materials. David was intrigued with the materials and the prospect of being able to build his own models and programme them to control what he wanted them to do.
Living in an area that is experiencing a lot of regeneration and being constantly surrounded by cranes and other building machinery, David decided to build a crane. He threw himself into finding out as much as he could about how a crane is structured and the complexities of how it works. He talked with many of the men on the local building sites and even managed to convince one of the crane drivers to take him up into the crane's cockpit and explain to him how it operated.

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[1] Class@ct, the Magazine for Teachers, Eircom Learning, Spring Issue 2001
Education Supplement, Irish Times, 9th February 2001

David spent hours working on his creation, ultimately constructing an elaborate, working crane. He displayed his model around the school with great pride. This LEGO robotic crane became the nexus for numerous learning activities and the skill developments that, up until then, David could not or did not want to work on.
The following January, David displayed his model at the National Young Scientist Exhibition held in the facilities of the Royal Dublin Society (RDS). With the boost to his self-esteem, David became more sociable and confident. Members of the learning community held him in high regard and he had achieved a new self-respect. His peers called on him regularly to assist others with LEGO construction, both in in his own class and in the mainstream class. David's reading also improved, as he wanted to learn all the programming words and the names of the LEGO parts.
When he left the primary school, David gave his teacher, Sean a thank-you card. His reference to himself as "your best LEGO maker" indicates the positive self-image that he developed and in which he continues to holds himself. David has moved on to a second-level school but he comes back to the primary school regularly to mentor other pupils as they pursue their work in their LEGO robotics. Rather than regarding David as "a dummy," teachers and children alike respect David, and he enjoys his new role as "building consultant."

Figure 1: David tests his crane construction

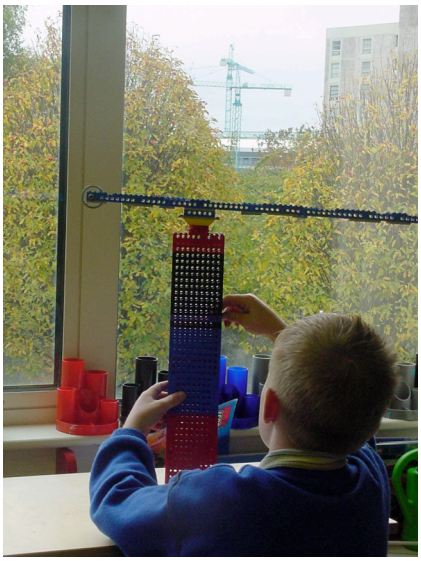
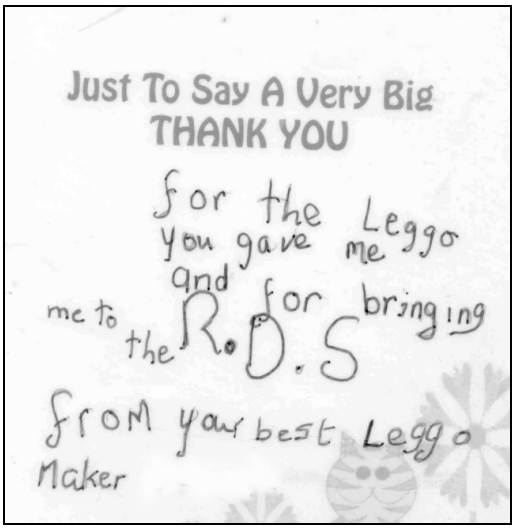


Figure 2: David's letter of thanks



Outcomes as new foundations

Now in Seán's classroom, it is common to see one child tutoring another on programming or a number of children making recommendations for improvements in each other's project designs. Working with the computational materials in this new learning environment, the special class soon stopped thinking of themselves as "dummies." Seán openly tells everyone that these positive outcomes were not usually present in his class, prior to the work with LEGO Mindstorms and EM methods. He has gone on to become an esteemed member of his own professional community, as he models confident approaches to new learning and respected mentoring of others'.
We consider Seán's and David's stories as important evidence for how working with digital technologies can promote the values we want to live by, nurture the kind of people society needs, and develop the very future we want to create.

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