Pre-service Technology Teachers' Reflections on their Learning during Service-learning: A Promising Marriage for 'Pedagogy'

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Abstract

This article reports on a pilot project in a technology education course which enabled pre-service technology teachers'[1] (PSTTs) to interact with the communities they were assigned to during their project based assessment by engaging in service-learning. The article proposes that adopting the pedagogy of service-learning in technology education can play a critical role in promoting learning about sustainable development, critical citizenship and improving the capacity of people to address environmental and developmental issues. The purpose of this article is to explore what learning occurred when EDTE 220 pre-service technology teachers (PSTTs) engaged in service-learning while embarking on a project based assessment in the plastics section of the module. Education for sustainable development (ESD) was used as a concept to define the content of the plastics section of the EDTE 220 module. A case study design was applied in the plastics section of the module. During data collection PSTTs engaged in participatory action research (PAR) activities in their communities that contributed to communities living more sustainable lives. Pre-service technology teachers maintained a reflective journal and answered a questionnaire on service learning. Qualitative content analysis was used to analyse the data drawn from the respondents. The results indicate that PSTTs valued service learning as it allowed for the application of theory to real life problems, provided a new perspective on environmental issues, made them aware of their social

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[1] PSTTs are trainee teachers specializing to teach technology education.

responsibility to the community as teachers and agents of change, and promoted the development of social skills.

Context

Technology education involves the application of science concepts to technological systems in areas such as construction, processing, manufacturing, communications, transportation, biotechnology and power and energy. Technology education lies at the heart of the economy in every developed or emerging society and is seen as a vehicle to improve the quality of human life as it is required for the production of innovative products, modern materials, and sustainable energy supplies to meet the needs of people (Pavlova 2009). The technological choices we make have a direct bearing on the environment, natural resources, our economy and political system. As the effects of technological development on the world become more apparent, the concept of sustainability is becoming more prevalent (Gough 2013). People are trying to understand the best ways to protecting the ecological health of the world. It is with regard to the above concerns that 'education for sustainable development' (ESD) has become a buzz phrase in politics across the world and as a result education for social change has gained prominence both globally and locally. Education for sustainable development demands a new vision of education – a vision that seeks to help people better understand the world in which they live and be able to face the future with hope and confidence and to realise that they can play a role in addressing the complex problems that threaten our future such as wasteful consumption, environmental degradation, urban decay and population growth. It is, therefore, imperative for us to consider the effects of technology in our lives and its potentially destructive effects on the natural world and environment.

The preceding issues raise pertinent questions such as: how do we create a more environmentally and socially responsive technology education? Is it enough to just educate PSTTs about the challenges that communities face

without their having to do anything to help address this issue? How can technology teacher educators promote and develop social responsibility and awareness amongst PSTTs in order to empower them to promote ESD in a socially responsible manner in their classrooms and communities? How can PSTTs be assisted to understand their work as central to the future role of schooling for social responsibility, democracy and social justice?

An approach that responds to the above concerns is that of experiential learning, in particular the model located within the framework of service-learning (SL) because it facilitates community engagement, learning and social responsiveness. While planning for the lectures for the EDTE 220 module the researcher infused service-learning in a manner that responded to the desired learning outcomes related to the plastics section of the EDTE 220 module. The plastics section of the EDTE 220 module focuses on the chemistry related to the processing of plastic (the initial building block of plastic is crude oil which is a non-renewable resource), the properties of plastic and its advantages and disadvantages. An ESD lens is used to examine the disposal of plastics and its impact on the environment and human health. For their project based SL PSTTs were expected to identify a 'problem' relating to poor use of resources / waste reduction / management and recycling in the community and with the community jointly address and resolve this identified problem. The outcomes of this module related to the project were to:

1. Engage PSTTs in problem based leaning.
2. Enhance PSTTs' learning by joining theory with experience and thought with action in a community setting.
3. Enable PSTTs to help and enter into caring relationships with others and their community.
4. Increase the civic and citizenship skills of PSTTs.
5. Assist communities to benefit from engagement with PSTTs.
6. Enable PSTTs to engage in reflective practice whilst learning.
7. Increase awareness in PSTTs of the need for sustainable use of resources, waste reduction, management and recycling in communities.

The value of SL for student learning has long been the subject of investigations in the field of teacher education internationally (Anderson, Swick & Yff 2001; Furco & Root 2010). Adopting a SL approach to education engages in a language of transcendence which encourages a capacity to imagine an alternative reality and hope for education and society (Giroux 1988; Greene 1986; Kincheloe 1993). This is the backdrop against which this researcher embarked on this pilot project to employ SL as a heuristic model, in the EDTE 220 plastic section, in order to educate and engage PSTTs with respect to sustainability, social responsibility and critical citizenship. This study addresses the following research question:

What learning occurs when EDTE220 PSTTs engage in service-learning?

Literature Review
In this section the literature surveyed is arranged into 4 sub sections: definitions of SL; use of SL as pedagogy, linking SL to Experiential learning theory and; teachers' beliefs and attitudes to ESD.

Definitions of Service-Learning
A survey of existing literature reveals that SL is a particular form of experiential education that incorporates community service. According to Eyler and Giles (1999: 77), SL is a form of experiential education where learning occurs through a cycle of action and reflection. Students work with others through a process of applying what they are learning to community problems and, at the same time, reflect upon their experience as they seek to achieve real objectives for the community and deeper understanding and skills for themselves. The unique element of SL is that it has powerful learning consequences for the students as well as the community participating in the service provided by the PSTTs. A key feature of SL, according to Bringle and Hatcher (2005), is its overt association with academic course work. According to Bringle and Hatcher (2005: 27), service learning is a powerful pedagogy 'because it brings a civic dimension to teaching academic material, contributes to a civic purpose for institutions of higher education, and fosters a civic dialogue between institutions and their communities'. The

foregoing definition is frequently used in the South African context as it aligns with the framing of service-learning as having the potential to contribute to the call for higher education to place more emphasis on engaging with societal issues and thereby showing a greater social responsiveness (Singh, 2001). Bender (2005) and other scholars in the field of SL (Bender *et al.* 2006; Mitchell, Trotter & Gelmon 2005; Erasmus 2005) define SL as a type of experiential education which forms the basis for teaching and learning (pedagogy) whereby students learn and develop through active participation in thoughtfully organised service that:

- Is integrated into and enhances academic curricular learning;

- Is conducted in and meets the needs of the community (as identified by the community by means of a needs assessment);

- Is co-ordinated with an institution of higher education (and, if possible, community partners);

- Includes structured time and guidelines for students to reflect in written and oral format on the service experience and gain a deeper understanding of the module content;

- Gives a broader appreciation of the discipline; and

- Helps foster social responsibility.

This article embraces Bringle and Hatcher's (2005) definition of SL and includes Bender's (2005) notion on reflection.

From the above definitions it is clear that SL embraces a specific theory of learning, namely experiential learning, which promotes social responsibility and reflexivity. According to Witt and Silver (1994: 330-331), social responsibility is either a natural human tendency or a learnt social behaviour. They posit that if social responsibility is not a natural human tendency it can be learnt behaviour in response to social problems and issues. This means that service learning can be used to conscientise PSTTs about their social responsibility. Therefore SL is not haphazard teaching but rather a structured learning experience with explicit outcomes and assessments that

combines community service with preparation and reflection. Thus, engaging PSTTs in SL contributes to both the development of their discipline concepts as well as their understanding of social issues in the communities where they are placed. Put simply, this means that SL has the advantage of combining theory with practice, classrooms with communities and the cognitive with the affective, and seemingly breaches the disjunction of lofty academics from the lived reality of everyday life (Butin 2005). Accordingly, Gibbons (2005) posits that SL represents a paradigm shift in higher education because it heightens the role that students and communities can both assume as constructors of knowledge.

The Use of SL as Pedagogy

Much of the debate that surrounds SL focuses on its nature (what it is) – is it pedagogy, a philosophy or a form of inquiry (a methodology)? Or does it encompass all of these? The National and Community Service Trust Act of 1993 defines SL as a teaching strategy whereby students learn and develop while actively engaging in a thoughtfully organized service. Castle and Osman (2003) as well as Le Grange (2007) maintain that SL is a philosophy, a form of inquiry, a pedagogy and a methodology. The rationale for considering service learning as a pedagogy, a philosophy and a methodology in an emerging knowledge society and economy is that SL can play a role in building knowledge cultures. It can play a role in creating new knowledge spaces in which knowledge and habits can be transformed. As pedagogy, SL emphasizes *meaningful* student learning through applied, active, project-based learning that draws on multiple knowledge sources (academic, student knowledge and experience and community knowledge) and provides students with ample opportunities for ethical and critical reflection and practice (Nduna 2006; Hund 2006). In other words, 'learning' is not a simple process of knowledge transmission from teacher to students but rather a *multidimensional social practice*. Suffice it to say, engaging PSTTs in SL promotes social responsibility and can transform behaviour, attitudes and values.

Within the South African context, the Joint Education Trust (2006: 4) reinforces these points in its statement that SL is a 'thoughtfully organized and reflective service-oriented pedagogy focused on the development

priorities of communities through the interaction between and application of knowledge, skills and experience in partnership between community, academics, students, and service providers within the community for the benefit of all participants'. Therefore an argument can be made that SL represents a potentially powerful form of pedagogy because it provides a means of linking the academic with the practical. The more abstract and theoretical material of the traditional classroom takes on new meaning as the student 'tries it out', so to speak, in the 'real' world. At the same time, the student benefits from the opportunity to connect the service experience to the intellectual content of the classroom. Service-learning provides PSTTs with a 'community context' to their education, allowing them to connect their academic coursework to their roles as citizens. It is argued that SL helps PSTTs develop 'socially-responsive' intellectual skills which are essential in a 21st century context which requires adaptability, sophisticated knowledge, problem-solving capacities and life-long learning skills.

Pretorius (2007) conducted an inquiry into attitudes and perceptions of students regarding their SL experiences at the Central University of Technology, Free State, in developing a higher-education programme management model for community service learning. This study showed how SL provides opportunity for students to develop three attitudes: 'self-efficacy', 'obligingness' and 'engagement'. Stears and James' (2011) study conducted at UKZN shows how engaging biology pre-service teachers in project based service-learning enhances the development of social/civic skills. Dos Reis (2012) used SL as a tool to mentor pre-service accounting teachers to increase their pedagogical content knowledge in accounting. The above South African based studies confirm the use of SL as pedagogy to improve content knowledge, develop social and civic skills, reflexivity and increase community engagement.

Linking SL to Experiential Learning Theory

According to Wong (2008: 8) 'powerful, experiential learning events associated with service learning can provide pre-service teachers with the opportunity to learn about diversity and challenge their preconceived ideas about various cultural issues'. Wong found that pre-service teachers involved in SL projects mature in terms of these factors: transactional relationships (impersonal), transformational relationships (curiosity about tutees'

backgrounds) and transcendent relationships (acknowledgement of significant personal growth in personal ideas and beliefs and recognition of how institutional and social structures impact on students). Diambra *et al*. (2009) observed that apart from providing an atmosphere that can be therapeutic, focus groups in SL help students clarify their roles and provide opportunities for revealing student anxieties. Much has been written regarding the merits of SL as a pedagogic strategy that contributes to cognitive development (Jones and Abes 2004; Billig and Klute 2003). Jensen (2006: 2) argues that the benefits of engaging students in a SL activity can assist students to retain the course material for longer periods of time because the students begin to see the relevance of their learning as it pertains to everyday life experiences. Studies reveal that students participating in SL courses report a greater understanding of social problems (Astin & Sax 1998), greater knowledge and acceptance of diverse cultures and races (McKenna & Rizzo 1999), a greater ability to get along with people of different backgrounds (Astin & Sax 1998; McKenna and Rizzo 1999), positive attitudes and values and a better understanding of social issues (Stears & James 2011), and increased awareness of their own biases (Eyler *et al*. 2001). While acquiring this important learning, students also provide meaningful outreach to people and organizations in need, a service generally valued by community partners (Driscoll, Holland, Gelmon & Kerrigan 1996; Gray *et al*. 2000). A number of researchers (for example Eyler & Giles 1999; Astin *et al*. 2000; and Eyler *et al*. 2001) have documented that SL improves student learning outcomes and contributes to student personal and social development. Therefore it is envisaged that by engaging PSTTs in SL they will graduate with particular values in that they will not only be technically competent but also disciplined in attitudes, values and behaviours that allow them to participate as critical citizens in our democracy. While developing their knowledge and skills pertaining to technology education, PSTTs will have been able to reflect on their roles as educators in a broader community and as agents of change in that community.

Linking Teachers' Beliefs and Attitudes to ESD

Research by Kriek and Basson (2008), Tobin, Tippins and Gallard (1994) and Pajares (1993) has shown how important teachers' beliefs and attitudes are

when it comes to reforms in education. In this respect it is worth noting Songqwaru's (2012) call for investment in pre-service teacher education programmes which groom pre-service teachers to be proficient in pedagogical content knowledge and experiential learning in order to be able to carry out effective reform of ESD. Songqwaru argues that such skills will allow pre-service teachers to actively participate in shaping today's world and society in a sustainable fashion. In support of this approach, Tuncer et al. (2009) reason that teachers will only produce students who are environmentally literate if they themselves are knowledgeable and have positive attitudes towards the environment. Therefore, a proposition is made that innovative PSTT programmes are an integral part of educating for a sustainable future as pre-service teachers will be at the coalface of community engagement when they qualify and can serve as change agents.

Methodology

As experiential learning theory (ELT) frames this project. A qualitative case study approach was adopted and applied to this pilot project in the plastics section of the EDTE 220 technology module. Written permission was obtained from the university ethics committee and relevant personnel to conduct research within the Technology Education cluster.

Purposive sampling was used to select the study participants. The purpose that informed the selection of participants was they had to be enrolled for the EDTE 220 module in 2014. In purposive sampling participants are selected on the basis that they are most likely to generate useful information (Kumar 2011). The sample consisted of 36 PSTTs enrolled for the EDTE220 in 2014. Participants were provided with a letter of information which explained the research protocol and the voluntary nature of their participation, and signed consent forms. Participants were informed of the project and its goals which was to identify an issue or issues related to litter and poor use of resources pertaining to plastics/sustainable development, discuss the issue identified with the community and jointly come up with a solution to address the issue, thereby building capacity in the community in terms of ESD[2]. The PSTT participants were trained to engage

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[2] Problems identified included: burning of waste, increasing the carbon footprint; illegal dumping of waste leading to infestation of pests/rodents;

in PAR to be able to embark on the project. In this project PSTTs' voices and experiences are considered as central to their learning. Such an approach acknowledges and validates PSTTs as active contributors to their own learning, and to the process of knowledge production, while rendering a service to their community. Participatory action research was selected as a data generation method as it provides opportunities for PSTTs to develop pedagogical content knowledge, examine their beliefs about teaching, and gain confidence in addressing social issues. Furthermore engaging in PAR ought to encourage them to become more socially conscious, critical, imaginative and argumentative as teacher-researchers. PSTTs were informed how to maintain a reflective diary and record their observations, emotions and thoughts during their community engagement. PSTTs were randomly placed in groups of six to facilitate team work within the groups. With the PSTTs' assistance, six communities around our university campus were identified and conveniently selected on the basis of their proximity to the campus for this project.

PSTTs also answered a questionnaire on SL. For the purpose of this paper the data from the reflective diary only was used. Content analysis was used to analyze the reflective journal narratives. According to Cohen, Manion and Morrison (2013) content analysis is defined as the process of summarizing and reporting written data. Content analysis was conducted in order to establish the problems identified in the community relating to sustainable use of resources, the plan designed to overcome the identified problem, the application of the plan, their experiences of working within the group and community, their learning that occurred and their attitude to and experiences of SL.

Findings and Discussion

This section responds to the research question and reflects on PSTTs' experiences of the learning that occurred during their engagement in service learning. Content analysis of data from the reflective journals confirms that SL does indeed promote learning. PSTTs developed first-hand experience on waste management and ESD, greater consciousness of societal issues as well

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pollution of stream leading to poor quality drinking water; non-recycling of plastics; excessive harvesting of trees for fire wood.

as a deeper understanding of what it means to be a teacher agent of change. PSTTS have three key experiences regarding the kinds of learning that SL promotes, namely:

- Service learning promotes real world context of learning ESD;

- Service learning promotes social skills; and

- Service learning promotes awareness of their role as agents of change.

In the reporting of the findings and discussion codes for the respondents are represented as R1, R2 and so on.

Service Learning Promotes Real World Context for Learning ESD

It can readily be recognised that all PSTTs developed a positive attitude regarding the infusion of service learning into the EDTE 220 module as can be seen in the excerpts below:

> *We had control over our learning in this project, unlike in a class based project, we identify the problem and arrive at the solution with the community, this project allowed for greater freedom and engagement with the issue, we should get more projects like this where we are involved as problem solvers/researchers* (R1).

> *I was involved and participated in the project directly, I enjoyed this kind of research based project, I wanted to learn and was motivated, I could see the link between the practical done and the impact of plastics on the environment, the impact of landfills on people's health* (R2).

> *Projects like this one should be a part of every course, it's hands on, it allows us to link our theory to the real world, it allows us to talk to our community and address ESD issues that affect us and them*

directly. We (my group) actually helped people recycle plastic by making products they could sell or use in their homes. I didn't expect this, I thought we are university student and we are in the know how but I learnt a lot from the community about weaving plastics (R 3).

I saw the link between the theory of plastics and its harmful impact on the environment. The visual impact of litter / pollution / lack of clean drink water and its impact on the community, their health/welfare was an eye opener – you can just learn about ESD in a classroom and not use the information to transform communities. I come from an advantaged background, I could only imagine what a child headed household was but now I have seen it and the constant struggle. This project has made me realise that I want to teach in a disadvantaged community where I can make a difference and add value (R5).

I will expose my learners to this type of project during TP, the community is the best place to see real examples of poor use of resources, fires, dumping. These contextual problems are better than using a pp or textbooks. It contextualizes learning (R22).

I got a chance to apply the chemistry of plastics, which I could only visualize taking place in a lab or classroom and not in an informal community setting, now this is leaning, in this community many people suffer from asthma and they burn their garbage (mainly plastic). We talked about the ill effects of burning and the impact of the toxic fumes on their health. What's amazing is that this community has asked my group to help them water proof their dwellings they want to know about the using paraffin (R20).

I always wanted to do something to help others in my community and now I feel glad with myself cause I feel like I gave something to my community (R7).

Apart from the positive attitude concerning the involvement in SL, the foregoing excerpts provide evidence that learning is no longer construed as a simple process of knowledge transmission from teacher educator to PSTTs

but is an active process controlled by PSTTs ('*we have control over our learning*') where they take ownership of learning and discover relationships and solutions for themselves. The above excerpts reflect the paradigm shift that occurred during SL, from PSTTs being recipients of the learning process to being active participant in the learning process *('I was involved and participated directly').* SL provided learning opportunities for PSTTs to be deeply involved and meaningfully engaged in the learning process. This means that the learning was meaningful ('*I gave something to my community*; *I will expose my learners to this*'). It afforded PSTTs the opportunities to practice and utilise skills learnt in lectures *('It's hands on').* Clearly the above excerpts reveal that by involving the community, SL provided PSTTs with a real world context to apply theory on plastic to ESD problems that were identified by the community where they conducted their project. PSTTs were able to develop the capacity to see and comprehend the linkages and commonalities between the aspects studied in class with the various issues identified in the community. This means SL allowed PSTTs to participate in the production of knowledge that is aimed at addressing the challenges pertaining to ESD in the communities they were working in. Service-learning also allowed PSTTs to gain deeper insight into the ESD issues, waste management and recycling. In other words, engaging in SL ensured continuity of the learning experience ('*link theory to the real world*'), allowed for greater interaction with the community ('*talk to community ... this is learning*') and allowed for reflective activity that leads to learning and awareness of values ('*where I can make a difference and add value*'). In an inconspicuous way SL contributed to the development of social capital for both PSTTs and the community. Service-learning enlightened PSTTs about social issues in the community and enhanced their personal growth in terms of values, attitudes and social responsiveness. Therefore SL served as a vehicle to validate students' experiences and bridge the cultural divide between the university and the community. In this study, service-learning also led to the empowering of the communities the PSTTs worked in concerning ESD issues ('*burning plastics', 'recycling', 'waterproofing dwelling', 'using paraffin*') that impacted them daily and assisted them having 'safer' dwellings and using materials safely. The above excerpts also reveal the kind of learning PSTTs appreciate, namely, active learning strategies that promote community engagement and reflexive thinking.

Service-learning Promotes Social Skills

An unexpected and interesting finding is that SL promoted the development of social skills amongst PSTTs as reflected in the excerpts below:

> *It is an amazing experience, I had a chance to get to know people from my lecture room, I normally do not speak to them, I learnt to be confident when I talk to my community, I learnt how to be a team player* (R7).

> *I don't like group work, I prefer to work on my own, but in this project I realized you can achieve more if you work in a group. Problem solving becomes easier and solutions are reached faster. I actually enjoyed working in my group* (R15).

> *I have learnt to treat everyone kindly, with respect* (R31).

> *I was judgmental of my group because I never socialize with them on a day to day basis. We are only faces in the same lecture room. During our project I realized they are no different to me. They share the same emotions and fears as I do* (R 1).

> *I always try to be independent and work by myself, I learnt about team work, I depended on Yolisa to help me communicate with the community as my isiZulu is pathetic, I realise that everybody has some strengths and I learnt to admit my limitation. I have a new friend who is teaching me Zulu and I help her with EDTE 121* (R 10).

The above excerpts bring to the fore the reflective space provided during SL. It is this reflective space (*'I realise'*) that helped PSTTs to gain better understanding of themselves (*'I realized you ... achieve more'*) and others (*'They are no different to me'*) as they explored and developed ways to contribute to the communities they were working in (*'solutions are reached faster'*). The reflective space/s which SL provided promoted interpersonal development as PSTTs developed self-confidence (*'I learnt to be confident'*), team building (*'enjoyed working in my group'*), reduced anxieties related to perceived differences between cultures and backgrounds (*'They share the*

same emotions as me') and enhanced commitment to group work. In other words PSTTs' engagement in SL helped them to break down stereotypes, produced positive feelings toward group members and developed collegial relationships. In a way, the reflection processes attached to SL were liberating as they provided PSTTs with the skills needed to successfully manage life tasks such as identifying anxieties, labeling emotions, learning in groups, team work, kindness, forming relationships and overcoming biases. Service-learning allowed PSTTs to modify their preconceived notions about peers/communities through social bonding and interpersonal interactions with the communities they were working in and to develop a sense of self-worth/self-concept. Simply put this means that SL contributed to holistic learning and development of PSTTs. These finding bring to the fore the powerful and transformative nature of SL. The findings elucidate the social and behavioural dimensions of learning afforded by the reflective space SL provided these participants, an aspect that is all too often ignored or taken for granted in normal lecture room learning. In other words SL in this case was shown to have the power to shape PSTTs' attitudes positively toward members of society and contribute to the holistic development of students. The above findings coincide with the findings of Astin and Sax (1998) and McKenna and Rizzo (1999) who report that students show a greater ability to get along with people, greater self-esteem, respect, team work and responsibility as a result of SL.

Service-learning Creates Awareness of their Role as Agents of Change

It is worth noting that SL also promoted PSTTs' awareness of their civic/social responsibility in society other that being mere transmitters/facilitators of knowledge as can be gleaned from the excerpts below:

> *Dr S-P always mentions we are agents of change in her lectures, I never quite understood what she meant, to me teaching is just a job. I'm not trained to bring about change, no module/course on campus does this. Doing this project opened my eyes, I now know what she means. I can make a difference in my community, I can bring about*

change. I together with others in my group used our knowledge of plastic properties and showed the ladies in the community how to make jewelry boxes, handbags, mats, Christmas trees, table decorations, door stoppers from recycled plastics that they could sell and earn an income. They are now collecting plastics to make these items and then sell the products. They told me they use the money to buy food and household items, So I am an agent of change (R12*).*

If it was not for this projects I would have ignored the impact of people's actions on the environment and sustainable use of resources, to me this was something you learn about, teach it and forget about it, bringing change is not my job, my job will be just to teach, now I feel differently, I have changed it's not just about learners in school it's also about my learners in their homes, I have changed because of this project, my thinking about me as a teacher and my role in the community has changed, I can use my teacher voice to change people's lives, improve our society, this is my responsibility, I now care about my community (R 25).

During the project, I really didn't care about the community at all. I felt really just as long as I took care of myself that was it. But just doing the project made me feel that the community is a part of our extended family and we have to take care of our family (R 34).

This project has showed me what an important role I have as a teacher in my community, I can make a difference even if it a small change, it's the difference I make that is important, not how big the change is. As a result of this class and my experiences, I will not be able to turn a blind eye to issues as easily as before (R30).

I know now that change can be little steps we take to improve the quality of life for others in our community, it doesn't have to be grand and fancy. Working on this project let me see that I can contribute to change. Even though this project was on plastics and ESD, I found I could not ignore the lack of clean drinking water, asthma, and took it upon myself to tell the mother the importance of sterilizing the water before drinking. I even demonstrated how to do

> this using bleach. I felt inspired and would want to do this type of
> project again. I will engage my learners in this type of project when I
> start teaching, this is real contextualized learning, you don't need
> fancy resources for this (R16).

This data indicates that SL provided opportunities for PSTTs to be agents of
change in the communities they worked in; they became aware of their civic
responsibility towards the community which allowed them to forge ties with
them and bring about change. From the preceding point it is evident that SL
promoted inner reflection amongst PSTTs during their community
engagement projects. The transformational power of SL comes to the fore as
it altered PSTTs' views in terms of transition from ignorance of the social
responsibilities attached to teaching (*'it not my job*)' to a greater sense of
awareness of the need to bring about change, transformation and social
justice in the communities they are working in ('*this is my responsibility; I
can make a difference'*). It is evident that engaging in SL made PSTTs more
aware of their responsibility to address social issues in their placement
communities and of the social capital ('*teacher voice'*) that they could
contribute to make a difference there. It is the change in consciousness and
awareness that PSTTs encountered when engaging in SL ('*that they can make
a difference'*), that was significant. The shift in PSTTs' awareness of social
issues and their acknowledgement of their awareness made it difficult for
them to ignore social issues. The reflective space that SL allows increased
PSTTs' awareness of their social/civic growth. This particular finding
resonates with Stears and James' study (2011) which highlights that engaging
pre-service teachers in SL enhances their civic/social responsibilities. This
means that SL can be used as leverage to foster in PSTTs the ability to
understand social problems, identify solutions to community issues, reduce
their apprehension levels for community engagement and increase their
confidence in their ability to make a difference in their placement
community. In other words, the experience of SL is able to provide the basic
knowledge, skills and positive attitudes needed to be responsible citizens and
contributing members of society. The above findings concur with the findings
of Astin *et al*. (2000) which reveal that students who engage in SL display a
greater understanding of social problems as well as a greater ability to get
along with people of different backgrounds. Exposure to service-learning

allows PSTTs to have a clear vision of their civic responsibility as teachers of technology at schools and in the communities they are located in.

Conclusion

The object of the study was to explore the learning processes that occur when PSTTs engaged in project based SL. The findings show that when PSTTs were immersed in an ESD project based SL they had the ability to take ownership of their learning – learning was no longer a passive process. SL forced students to become involved in the application of this knowledge. This means that as pedagogy, SL allowed PSTTs to apply academic, social and personal skills to improve the community; make decisions that have real, not hypothetical results; grow as individuals, gain respect for peers, and increase civic participation; experience success no matter what their ability level; gain a deeper understanding of themselves, their community, and society; and develop as leaders who take initiative, solve problems, work as a team, and demonstrate their abilities while and through helping others. Hence, as a result of SL, the PSTTs developed a deeper understanding of the ESD content, have modified their thoughts about their social responsibility as teachers, acknowledge their responsibility to address social issues / challenges in the communities they teach in and engage in critical reflection. They realise the power they have to bring about change in their communities. PSTTs see the community as an extension of the classroom where learning and change must occur. The value of SL as a pedagogy is related to a shifting understanding about the nature of learning as a social and dialogical process by PSTTs.

The findings support the argument that adopting the pedagogy of SL in technology education plays a critical role in promoting learning on sustainable development, critical citizenship and improving the capacity of the people to address environmental and developmental issues. Our democracy depends on citizens who are civically/socially informed to respond to the needs of their community locally and nationally. Project based SL can be used as a vehicle to steer PSTTs into greater social/civic responsiveness and to ultimately address the social and developmental needs of their community.

Recommendations

As an evolving pedagogy, project-based service-learning interventions afford PSTTs the opportunity to apply their learning in a real world context. It allows them to discover talents and gain meaningful personal insight about who they are, what they are capable of and who they want to become. More importantly it develops leadership skills in students as they learn to work collaboratively with particular community in order to tackle the social and development needs of that community. Based on the above findings of this pilot project it can be reasoned that SL is indeed a promising partner with pedagogy. Hence, a recommendation is made for SL to be integrated into technology modules to allow for community engagement and the development of academic and social responsibility skills in PSTTs.

References

Anderson, J.K., K.J. Swick & J. Yff (eds.) 2001. *Service-learning in Teacher Education: Enhancing the Growth of New Teachers, their Students and Communities*. Washington, DC: AACTE Publications.

Astin, A., L. Vogelgesang, E. Ikeda & J. Yee 2000. *How Service Learning Affects Students.* Los Angeles: University of California, Higher Education Research Institute.

Astin, A. & L. Sax 1998. How Undergraduates are Affected by Service Participation. *Journal of College Student Development* 39,3:251-263.

Bender, G. 2005. Service-learning as Socially Responsive Knowledge Production in South African Higher Education Institutions. Paper presented at Joint Conference of The South African Association for Research and Development in Higher Education and the Productive Learning Cultures Project, 31 Aug–2 Sept, Scandic Hotel, Bergen, Norway.

Bender, G., P. Daniels, J. Lazarus, L. Naude & K. Sattar 2006. *Service-learning in the Curriculum: A Resource for Higher Education Institutions.* Pretoria: Council on Higher Education.

Billig, S. & M. Klute 2003. *The Impact of Service-learning on MEAP: A Large-scale Study of Michigan Learn and Serve Grantees*. Presentation at National Service-Learning Conference. Minneapolis, MN.

Bringle, R. & J. Hatcher 2005. Advancing Civic Engagement through Service Learning. In Langseth, M. & W.M. Plater (eds.): *Public Work and the Academy: An Academic Administrator's Guide to Civic Engagement and Service-learning*. Boston, MA: Anker Press.

Butin, D. 2005. Of What Use is it? Multiple Conceptualizations of Service-learning in Education. *Teachers College Record* 105,9: 1674-1692.

Castle, J. & R. Osman 2003. Service Learning in Teacher Education: An Institutional Model for an Emerging Practice. *South African Journal for Higher Education* 17,1:105-111.

Cohen, L., L. Manion, & K. Morrison 2013. *Research Methods in Education.* 7th Edition. New York: Routledge.

Diambra, J.F., T. McClam, A. Fuss, B. Burton & D.L. Fudge 2009. Using a Focus Group to Analyse Students' Perceptions of a Service-learning Project. *College Student Journal* 43,1:114-122.

Driscoll, A., B. Holland, S. Gelmon & S. Kerrigan 1996. An Assessment Model for Service-learning: Comprehensive Case Studies of Impact on Faculty, Students, Community, and Institution. *Michigan Journal of Community Service Learning* 3: 66-71.

Dos Reis, K. 2012. *Challenges Pre-service Teachers Face while Learning to Teach. Accounting in the Context of Mentoring.* Unpublished DEd thesis. Cape Town: Cape Peninsula University of Technology.

Eyler, J. & D. Giles 1999. *Where's the Learning in Service-learning?* San Francisco: Jossey-Bass Publishers.

Eyler, J., D. Giles, C. Stenson & C. Gray 2001. *At a Glance: What we Know about the Effects of Service-learning on College Students, Faculty, Institutions and Communities, 1993-2000*. 3rd Edition. Nashille, TN: Vanderbilt University.

Erasmus, M. 2005. Community Service Learning and the South African Research Agenda. *Acta Academica. Supplementum* 3:1-23.

Furco, A. & S. Root 2010. Research Demonstrates the Value of Service Learning. *Phi Delta Kappan* 91,5:16-20.

Gibbons, M. 2005. Engagement with the Community: The Emergence of a New Social Contract between Society and Science. Paper presented at the Griffith University Community Engagement workshop, South Bank campus Queensland, Australia, 4 March.

Giroux, H. 1988. *Teachers as Intellectuals: Toward a Critical Pedagogy of Learning.* Westport, CT: Bergin & Garvey.

Gough, N.R. 2013. Mind Games. *Science Signalaling* 6,267: ec65.

Gray, M., E. Ondaatje, R. Fricker & S. Geschwind 2000. Assessing Service-learning: The Benefits of Service-learning for Students. *Change* 3e2,2:30-41.

Greene, M. 1986. In Search of Critical Pedagogy. *Harvard Educational Review* 56,4:427-441.

Hund, C. 2006. *Is Service Learning Effective. A Look at Current Research, Colorado.* In: Shalini, S. (ed.): *Service Learning: Perspectives and Applications.* Punjagutta, India: ICFIA University Press.

Jensen, S.V. 2006. Participation and Learning Relationships: A Service-Learning Case Study. *Journal of Industrial Teacher Education* 43,3:6-28.

Joint Education Trust 2006. *Annual Report 2006.* Braamfontein, South Africa: JET Educational Trust.

Jones, S.R. & E.S. Abes 2004. Enduring Influences on Service Learning on College Students' Identity Development. *Journal of College Student Development* 45,2:149-166.

Kriek, J. & I. Basson 2008. Implementation of the New FET Physical Sciences Curriculum: Teachers' Perspectives. *African Journal of Research in SMT Education* 12:63-76.

Kincheloe, J. 1993. *Toward a Critical Politics of Teacher Training: Mapping the Postmodern.* Westport, CT: Bergin & Garvey.

Kumar, R. 2011. *Research Methodology: A Step-by-step Guide for Beginners.* 3rd Edition. London: Sage.

Le Grange, L. 2007. The 'Theoretical Foundations' of Community Service-learning: From Taproots to Rhizomes. *Education as Change* Special Issue: Community Service Learning 11,3:3-13.

McKenna, M. & E. Rizzo 1999. Student Perceptions of the Benefits of Service Learning. *Journal of Prevention and Intervention in the Community* 18,1-2:111-123.

Mitchell, C., K. Trotter & S. Gelmon 2005. A Case Study of a Higher Education Institutional Assessment on Service-Learning. *Acta Academica Supplementum* 3:151-177.

Nduna, N. 2006. Locating and Managing Service Learning. A Complex Issue in Higher Education. *South African Journal of Higher Education* 20,4:488-502.

Pajares, F. 1993. Preservice Teachers' Beliefs: A Focus for Teacher Education. *Action in Teacher Education* 15:45-45.

Pavlova, M. 2009. Conceptualisation of Technology Education within the Paradigm of Sustainable Development. *International Journal of Design Education* 19,2:109-132.

Pretorius, J.P.H. 2007. *Houdings en Persepsies van Studente Teenoor Samelewingsdiensleer: Implikasies vir Implementering en Bestuur deur Programhoofde.* Ongepubliseerde D.Tech: Besigheidsadministrasie-proefskrif. Sentrale Universiteit vir Tegnologie, Vrystaat.

Republic of South Africa 1993. *National and Community Service Trust Act of 1993. Public Law 101-610, as Amended.* Pretoria: Government Printer.

Singh, M. 2001. Re-inserting the 'public good' into Higher Education Transformation. *Kagisano Higher Education Discussion Series*. Pretoria: Council on Higher Education

Songqwaru, Z. 2012. *Supporting Environment and Sustainability Knowledge in the Grade 10 Life Sciences Curriculum and Assessment Policy Context: A Case Study of the Fundisa for Change Teacher Education and Development Programme Pilot Project.* M.Ed Thesis. Grahamstown: Rhodes University.

Stears, M. & A. James 2011. Towards Socially Responsible Biology: Two Cases in a Teacher Education Programme. *African Journal of Research in Mathematics, Science and Technology Education* 3,15:122-136.

Tobin, K., D. Tippins & A. Gallard1994. Research on Instructional Strategies for Teaching Science. In Gabel, D.L. (ed.): *Handbook of Research on Science Teaching and Learning*. New York: MacMillan.

Tuncer, G., C. Tekkaya, S. Sungur, J. Cakiroglu, H. Ertepinar & M. Kaplowitz 2009. Assessing Pre-service Teachers' Environmental Literacy in Turkey as a Means to Develop Teacher Education Programs. *International Journal of Educational Development 29*:426-436.

University of Pretoria. 2004. School of Engineering Study Manual. Service Learning ESL 420. 1st draft. <http://eerc.up.ac.za/~subjects/files /ESL420/esl420.pdf> 2000-2004.

School of Architecture and Planning. Undergraduate course descriptions. http://www.wits.ac.za/planning/ undergraduate2.htm#year4

Witt, L.A. & C. Silver 1994. The Effects of Social Responsibility and Satisfaction on Extrarole Behaviours. *Basic and Applied Social Psychology* 75,3: 329-338.

Wong, P. 2008. Transactions, Transformations and Transcendence: Multicultural Service-learning Experience of Pre-service Teachers.

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Multicultural Education 16,2:31-36.

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