THE CONTRIBUTION OF EXPERIENTIAL LEARNING THEORIES TO THE PRACTICE OF PARTICIPATORY TECHNOLOGY DEVELOPMENT

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Abstract

This paper explores the relationship between experiential learning theories and participatory technology development (PTD). Drawing on adult education and extension literature I argue that there are many parallels between experiential learning and PTD. I identify and discuss three key elements of experiential learning: second-order experiences, reflection and dialogue, and recognise the role of each in PTD. This comparison is set within the wider constructivist context of PTD which I contrast with the positivist setting of conventional research and extension.

I then turn to one experiential learning theorist: Mezirow, and examine his theory of transformative learning to assess its relevance to the PTD process. I outline the basic components and stages of transformative learning. Following this parallels are drawn between transformative learning and what actually takes place in PTD and examples are given of the ways in which scientists and rural people may undergo transformative learning through the PTD process. I conclude that Mezirow's work can provide PTD practitioners and theorists with additional insights into how adults learn and especially how they - researchers, extensionists and rural people – can transform their ways of thinking to accommodate a shift from conventional research and extension to PTD.

Keywords: Experiential learning, Transformative learning, Participatory, Technology, Development, Constructivism

Introduction

Extension workers are essentially adult educators. Furthermore, when they are employing participatory approaches, they may well be seeking to enable rural people to analyse and reflect on their livelihoods in a way that could be said to be empowering or transformatory. Much adult education literature, in particular literature about experiential learning and critical reflection, is concerned with attaining just this emancipatory goal amongst individuals and societies (Freire, 1972; Mezirow, 1990). An examination of the literature on experiential learning and reflection provides useful insights to those involved in participatory technology development (PTD). In this paper I explore the parallels between PTD and experiential learning. I then focus on the work of one experiential learning theorist in particular: Mezirow. The theory of transformative learning developed by Mezirow and his associates over the last two decades focuses on how emancipatory learning can bring about transformations in our own constructions of reality. The relevance of this for scientists, extensionists and farmers engaged in PTD is discussed.

The practice of *PTD* involves a collaborative learning process between scientists, and/or extensionists and farmers. Rapport is built and scientists and/or extensionists learn about farmer livelihoods and development constraints, sometimes through the use of participatory

learning and action (PLA). Together they explore possible options and decide on what to try, based on the farmers' indigenous technological knowledge. A plan of action or experimentation is drawn up and on occasion scientists may train the farmers in some experimental methods and share other scientific knowledge. Farmer-to-farmer extension may start as soon as experimentation starts. Farmers and researchers reflect on the process and outcome of PTD and plan further cycles of experimentation. PTD can be equated with what Sumberg and Okali (1997) term "development-driven" farmer participatory research (as opposed to "research-driven" FPR). Examples of PTD include Farmer Field Schools, participatory extension approaches, and co-learning approaches (Hagmann et al., 1999; Hamilton, 1998; Scarborough et al., 1997). The level of participation varies greatly, with some PTD practitioners emphasising the empowering nature of the process more than others.

Experiential learning is often discussed in the overall context of adult learning. Cranton (1994) identifies the following key features of adult learning. It is participatory, collaborative and practical in nature. It involves sharing of experiences and resources as adults "bring a rich and varied set of life experiences to the learning environment" (Cranton 1994:7). It is often related to adults' level of self-esteem and to their learning styles. Adults can find learning threatening, anxiety-provoking or even painful. These characteristics of adult learning are evident both in instances of experiential learning and in PTD.
Kolb provides major insights into experiential learning which he describes as "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984:38). He proposed that experiential learning follows a cyclical process – from experience to reflection to conceptualisation to application, with this cycle being continuously repeated. Fry et al. (1999) build on this with a description of experiential learning that clearly places it within the constructivist paradigm:
"Experiential learning is based on the notion that ideas are not fixed or unchangeable elements of thought but are formed and re-formed through 'experience'. It is also a continuous process, often represented as cyclical, and being based on experience, implies that we all bring to learning situations our own ideas and beliefs at different levels of elaboration" (Fry et al., 1999:26)

Experiential learning and PTD

From the extensive literature on experiential learning the role of *second-order experiences, reflection and dialogue* in experiential learning are of particular relevance in the context of this paper. Malinen (2000) reviews the work of five major experiential learning theorists: Schön, Revans, Knowles and Mezirow as well as Kolb and concludes that experiential learning involves *first and second-order experiences*. First-order experiences are past, lived experiences. They are tacit or implicit and though they seem true to the adult they are actually incomplete, inadequate, or distorted. These experiences are not sufficient for experiential learning to occur. A connection must be made between what one has experienced and what one comes to learn through second-order experiences. Second-order experiences often involve disorientation (Mezirow), surprise (Schön), or recognition of ignorance (Revans) - elements which challenge the first-order experience and lead to reconsideration and modification of that experience or knowledge. (This reflects the threatening or anxiety-provoking nature of adult learning described above.) Second-order experiences occur when individuals reconsider their existing knowledge and experience. Referring to van Manen, Malinen explains that experiential learning therefore involves "modification of earlier constructions: re-organisation, re-construction, re-defining, re-thinking, re-shaping, re-

interpretation and re-formulation...aiming to establish renewed contact with something original" (Malinen, 2000:75).

Reflection is integral to experiential learning and is often described as a complementary process to action. It is a stage in Kolb's experiential learning cycle as described above. Several authors (King & Kitchener, 1994; Mezirow, 1991; Van Manen, 1977) consider that there are different levels of reflection. For instance Van Manen identifies four levels of reflection: thinking and acting on an everyday basis; more specific reflection on incidents or events; development of understanding through interpretation and, last, reflection on the way we reflect. Kings and Kitchener's stages of reflection range from the (non-reflective) view that what is believed is true and that knowledge is absolutely certain, to the ability to make reflective judgements through a process of rational inquiry. There are parallels between these levels of reflection, levels of cognition (Kitchener, 1983), and Bateson's single-, double- and triple- loop learning (Bateson, 1972). A common understanding concerning levels of reflection is that the higher the level of critical reflection the more likely it is that transformation, autonomy, emancipation or empowerment can occur. Empowerment through attaining higher levels of reflection is often the goal not only of experiential learning but of PTD also.

Dialogue is also a key factor in experiential learning according to Mezirow, Revans and Schön. Malinen (2000) identifies four stages in dialogue: sharing, testing, justifying and believing. She explains that for true dialogue to take place there needs to be a spirit of goodwill or friendship and that dialogue involves the temporary suspension of each person's points of view. Dialogue is a central element of PTD as will be pointed out below. Dialogue amongst and between farmers, extensionists and scientists is crucial to the process of group awareness raising and empowerment.

How far does experiential learning take place in PTD? And what experiential learning theories do those working in PTD explicitly draw on? A case can certainly be made that PTD does involve experiential learning. Only recently, however, have scientists and extensionists, in both practitioner and academic roles, sought to provide a theoretical underpinning for the PTD process (Cerf et al., 2000; Röling & Wagemakers, 1998). The European Group of the International Farming Systems Association has, for example, identified, as one of their continuing workshop themes: "Learning processes in research and extension" to which this paper is a contribution. An analysis of the recent literature focusing on learning in PTD reveals certain recurrent themes. The authors unanimously take a constructivist stance. Many (e.g. Kersten, 2000; Woodhill & Röling, 1998) draw on the work of the Brazilian neuro-biologists Maturana and Varela (1987, 1992) who provide scientific evidence for constructivism. They also draw on such constructivist theories as action research, action learning and experiential learning with reference to Revans, Friere, Kolb and Schön amongst others.

In the discussion above regarding experiential learning three aspects were considered relevant to PTD: first and second-order experiences, reflection and dialogue. I now examine each in turn in relation to the practice of PTD. The key points of this discussion are summarised in Table 1 below which also includes a general comment on process.

Table 1: Key features of experiential learning and PTD compared

Features	Experiential learning	PTD
Process	A cyclical process of action, reflection, conceptualisation and planning/experimentation	Purposeful, creative and reflective interaction of rural people and researchers/extensionists involving joint exploration of constraints and opportunities, identification of ways forward and action. Often cyclical
First and second order experiences	New (second order) experiences challenge past (first order) experiences. This often involves disorientation, surprise or recognition of ignorance. Learning may follow	Changing circumstances for farmers may constitute second-order experiences, as may changing relations between farmers and researchers/extensionists.
Reflection	Integral component of experiential learning. Different levels of reflection (and cognition) exist. The higher the level the more likely that transformation or empowerment will occur	Reflection occurs both at the start of PTD when problems and opportunities are identified, and during and after experimentation. PTD may involve movement to different levels of cognition or double (even triple) loop learning.
Dialogue	Key component. Stages include sharing, testing, justifying and believing. Requires a "spirit of goodwill" and temporary suspension of each person's points of view	As PTD is an interactive process its basis is dialogue between all stakeholders. For this trust, rapport and time are needed

In experiential learning, a *new (second - order) experience*, often involving disorientation, surprise or uncertainty, triggers off reflection on a previous (first order) experience, leading either to defence of the earlier position, or to a new level of understanding. This is relevant to PTD in at least two ways. First, PTD developed in response to the complex, diverse and risk prone environments of some farmers. Due to rapidly changing environments, many farmers can no longer rely on their local knowledge alone in order to farm in the way they have in the past. They are thrown into a position of uncertainty or, as Vaill (1996) puts it "permanent white water". Those facilitating the PTD process work with farmers to help them step back and analyse their situations anew then together identify ways forward through experiential learning. A second instance in which second-order experiences trigger off a re-examination of previous experiences is where roles of farmers, researchers and extensionists change in participatory contexts as compared to conventional extension and research. This is discussed in more detail below in relation to transformative learning. In the broader context, Schön

(1983) casts light on the relationships between professionals and clients. His comparison, back in 1983, of the role of experts as compared to reflective practitioners closely mirrors the contrasting roles of scientists and extensionists in conventional and participatory research and extension as is illustrated in Table 2 below:

Table 2: The "expert" and "reflective practitioner" compared (Schön, 1983, p.300)

Expert	**Reflective practitioner**
I am presumed to know, and must claim to do so, regardless of my own uncertainty	I am presumed to know, but I am not the only one in the situation to have relevant and important knowledge. My uncertainties may be a source of learning for me and for them
Keep my distance from the client, and hold onto the expert's role. Give the client a sense of my expertise, but convey a feeling of warmth and sympathy as a "sweetener"	Seek out connections to the client's thoughts and feelings. Allow his respect for my knowledge to emerge from his discovery of it in the situation
Look for deference and status in the client's response to my professional persona	Look for the sense of freedom and of real connection to the client, as a consequence of no longer needing to maintain a professional façade

Reflection plays a key role in PTD. The PTD process itself involves the experiential learning cycle. Reflection on past experience leads to action (experimentation) after which conclusions and generalisations are drawn from the action which then informs planning of a further cycle. Where PLA is used at any stage in the PTD cycle, as it may be when researchers and extensionists are learning about farmers' local knowledge, practices, constraints and opportunities, then a mini experiential learning cycle takes place at this stage, leading to "cycles within cycles". Within all of these reflection is a key component. Within extension training, Australia's Rural Extension Centre uses the experiential learning cycle as a basis for courses, modules within them and perhaps most interestingly, student work-based projects (Fell, 1999). Also in Australia, King (2000) explored the qualities leading to effective learning amongst a group of farmers over a period of eighteen months. Throughout that period farmers used the experiential learning cycle to analyse the meetings, field days, workshops and study tours they were involved in. One conclusion from the work was that systemic reflection (and dialogue) enhanced farmer's learning.

It was pointed out above that there are different levels of reflection and that there are parallels between these and different levels of cognition and double- and triple-loop learning. This was applied in a professional extension development (PED) context by King and others in Australia (King, 2000). Based on experiential and action learning, three different practice domains were identified: extension practice, workplace practice and improving the PED domain itself. Participants kept learning logs throughout a six-month period. In effect the three levels of learning the participants worked through corresponded to single-, double- and triple-loop learning. King concluded that all three levels were necessary to bring about systemic change. Hamilton (Hamilton, 1998) developed co-learning tools with farmers using

participatory learning and action research. In the process double-loop learning was seen as critical in enhancing farmer's commitment and enabling them to make informed choices.
Situated (Lave & Wenger, 1991) and social (Korten & Klauss, 1984; Woodhill & Röling, 1998) learning theories are also drawn upon in relation to PTD. *Dialogue* is critical to both these forms of learning and to experiential learning in general. Kersten (2000) describes how a process for dialogue helped move pastoralists and researchers in New South Wales from destructive debate to constructive dialogue. She explains how the different understandings of pastoralists and researchers are through dialogue "combined to build richer pictures, a process whereby both pastoralists and researchers are knowledgeable and both are learners by sharing and valuing their understandings" (Kersten, 2000:201). King (2000) and Hamilton (1998) also discuss the importance of dialogue in relation to other Australian case studies.
To conclude this section it is clear that PTD involves a great deal of experiential learning. Reflection and dialogue are key elements in this process which is often triggered off by a need to work in new ways and find new solutions. Farming in complex, diverse and risk-prone (CDR) areas tends to be more and more unpredictable and uncertain. It could be said that scientists working with such farmers are working in a 'soft' system in which it is critical that those involved learn by relating second-order experiences to first order experiences thus constructing and transforming their reality in a constructivist paradigm. The theory of transformative learning involves just this. Therefore an analysis of transformative learning in relation to the practice of PTD may provide greater insight into the learning processes taking place in PTD which may in turn inform practice.

Transformative learning and PTD

Mezirow's theory of *transformative learning* has been growing and changing for almost three decades. It draws on sociology, philosophy, developmental and cognitive psychology and psychotherapy. Habermas's theory of communicative action provides a foundation and starting point for the development of transformative learning theory. Mezirow focuses on adult learning and in particular how the ways in which adults see things – their frames of reference, can be become more differentiated, open, inclusive and integrated and, thus, transformed. Such changes in frames of references are pertinent to PTD where both the attitudes and practice of those involved must shift from the 'hard' positivist approach of conventional research to the 'soft' constructivist PTD context. In what ways then can transformative learning theory enhance our understanding of, and practice in, PTD? To address this question I will first describe the three major elements of transformative learning theory: *meaning perspectives, learning domains, and types of reflection*. I will then draw parallels between transformative learning and PTD, using the steps involved in the PTD process and explain in what circumstances transformative learning may be sought after.
Mezirow terms our 'frames of reference' or the way we see things, i.e. our constructed realities, *'meaning perspectives'*. Although they interact, he identifies three different types of meaning perspectives. The first, *epistemic*, relates to what we know and how we know it. The second, *socio-linguistic*, relates to the social norms and culture we operate in, our socialisation and our language norms. Last, *psychological* meaning perspectives are how we see ourselves as individuals. Meaning perspectives are made up of meaning schemes i.e. our understanding or frames of reference on particular aspects of a meaning perspective.

Mezirow also identifies three different *domains of learning*. Drawing on Habermas, he identifies instrumental, communicative and emancipatory domains (as compared to Habermas's instrumental (causal explanation), practical (understanding) and emancipation

(reflection) types of knowledge). Mezirow's *instrumental knowledge* relates to empirical knowledge in the positivist paradigm whereas his *communicative knowledge* concerns constructivist aspects of how we learn as adults. This domain includes how we understand and describe intentions, our values, beliefs and feelings. The third domain, *emancipatory learning* involves critical self-reflection possibly leading to transformations of our meaning schemes or even perspectives. The instrumental and communicative domains of learning can work together and interact and the emancipatory domain can work in either as well as independently.

Parallels can be drawn between Mezirow's instrumental and communicative learning domains and the 'hard' and 'soft' systems involved in conventional and participatory research and extension respectively. The move from conventional to participatory research and extension has been analysed in terms of a transition of emphasis from 'hard' scientific, instrumental, positivist systems to 'soft' unpredictable, complex, constructivist systems. 'Soft' 'human activity' characteristics of PTD include the emphasis on partnerships, collaboration, dialogue, co-learning and social learning. Recognition of different stakeholders, building rapport, recognising diversity within communities, team working, reaching consensus and conflict management are all 'soft' activities critical to the PTD process. These fit within Mezirow's communicative learning domain. The 'hard' (agro-ecological) system in a farming community is seen as a sub-system of the soft system represented by the community itself (Röling & Wagemakers, 1998). 'Hard' systems emerge as a number of technical options, thus they are theoretically subsumed within the 'soft' system (Röling & Jiggins, 1998). 'Hard' systems fit within Mezirow's instrumental learning domain. In practice the two systems interact or work together, as indicated by Mezirow. Some researchers elaborate on this by drawing on Maturana and Varela's concepts of structural plasticity. 'Soft' (human) systems have greater plasticity, 'hard' scientific systems have less and the two systems are 'structurally coupled' (Woodhill & Röling, 1998).

Type of reflection constitutes the third element of transformative learning theory. Mezirow identifies three types of reflection: content, process and premise. Content concerns what we know, process concerns how we know it and premise concerns why we need to know it. These categories are closely aligned with Kitchener's cognition, metacognition and epistemic cognition and also with Schön's single- and double- loop learning and Bateson's triple-loop learning. Content, process and premise reflection takes place in all three meaning perspectives (epistemic, socio-linguistic and psychological) and all three learning domains (instrumental, communicative and emancipatory).

How then does this rather complex theory apply to PTD? A comparison of the steps involved in transformative learning and in PTD does indicate that in many ways aspects of transformative learning do take place in PTD (Table 3).

In transformative learning a *disorienting dilemma* provokes *self-examination* which in turn leads to *critical assessment* of internal assumptions i.e. meaning schemes or, on occasion, meaning perspectives. At this stage the learner may feel alienated and in questioning assumptions may *relate to other people's experiences*, commonly through dialogue. The next stage involves the learner in *exploring options* for new behaviours and *building competence*. A *plan of action* is then developed and the learner *acquires knowledge and skills* for implementing the plan. The learner makes *provisional efforts* to try out the new roles and obtain feedback. The last stage involves *reintegration into society* from a new meaning scheme and/or perspective (or frame or reference).

Table 3: Steps involved in transformative learning and in PTD

Transformative learning	**PTD**
Step 1: Experiencing a disorienting dilemma	*Step 1:* Getting started *Step 2:* Understanding problems and opportunities
Step 2: Undergoing self-examination	*Step 2:* Understanding problems and opportunities *Step 3:* Looking for things to try
Step 3: Conducting a critical assessment of internalised role assumptions accompanied by a sense of alienation from usual social context	
Step 4: Relating to other people's experiences, commonly through dialogue	*Step 3:* Looking for things to try
Step 5: Exploring options for new behaviours	
Step 6: Building competence and self-confidence in new roles	*Step 4:* Experimentation
Step 7: Developing a plan of action	
Step 8: Acquisition of knowledge and skills for implementing the plan	
Step 9: Provisional efforts to try out new roles and gain feedback	*Step 5:* Sharing the results
Step 10: Reintegration into society	*Step 5:* Sharing the results *Step 6:* Sustaining the process

Sources: (Cranton, 1994; Van Velduizen et al., 1997)

These stages may not always follow each other sequentially, some may be omitted and some take longer than others (Cranton, 1994).

How then do the steps involved in PTD relate to those taking place in transformative learning? The first step in PTD is getting started which includes relationship and rapport building between researchers, extensionists and farmers. This and the second stage, understanding problems and opportunities, allow for the *disorientating dilemma/s* that trigger learning to appear. These can occur at several levels. First, the CDR environment of uncertainty may itself act as a disorienting, anxiety-causing, trigger especially for the farmers concerned. Secondly, the collaborative approach required of researchers, extensionists and farmers may be new to them and incongruent with their existing meaning perspectives. Third, farmers may have difficulties in understanding scientists' points of view and priorities and vice versa. This second stage too may involve the use of PLA to reveal development

constraints in the community. If so then a cycle/cycles of experiential learning can take place within the stage. The ensuing action, critical reflection and dialogue may foster transformation of meaning schemes.

During both the understanding problems and opportunities stage and the third stage: looking for things to try, there may be a degree of *self-examination* and *critical assessment of internal assumptions* going on at the same time as the group examines problems and explores opportunities. If the work relates solely to agricultural development then those involved may be examining their own epistemic and socio-linguistic meaning perspectives. If it focused on gender concerns in agricultural development then participants psychological meaning perspectives may also be examined in relation to self-esteem, gender roles and gender needs. Mezirow's *relating to other people's experiences* and *exploring options* would also be encompassed in the third PTD step of looking for things to try. The fourth PTD step is experimentation which would include Mezirow's *building competence, plan of action, acquiring knowledge* and *skills and provisional efforts*. The fifth PTD step is sharing the results and this could equate with both *provisional efforts* and Mezirow's *reintegration* as those involved must be confident enough in the outcome of the PTD process to share them with others. The last PTD step is sustaining the process which may involve ensuring that a continuing cycle of experiential learning takes place with further transformations of meaning schemes and perspectives were necessary.

Different kinds of transformative learning can take place depending on the level of reflection being employed, the learning domain it is being employed in and the meaning perspective being examined. Meaning schemes may be transformed through content and process reflection, but premise reflection is necessary to enable transformation of meaning perspectives.

One example would be of an agricultural researcher whose meaning schemes are challenged through working with a group of farmers in the PTD, rather than conventional research, mode for the first time. He may for instance be challenged with regard to his scientific knowledge base (instrumental learning domain) and his ability to build trust and communicate with the group (communicative learning domain). He may reflect on each of these through content, process and premise reflection, or he may stop at content or process reflection. As explained earlier, the instrumental learning domain is most related to the epistemic meaning perspective whereas the communicative learning domain is most related to socio-linguistic and psychological meaning perspectives. If the scientist reflects on his knowledge base he may transform his epistemic meaning scheme (frame of reference) concerning, for instance, crop production through seeking the knowledge he needs to work with farmers in the PTD process. If he also reflects on his difficulties in communicating with the group as a stakeholder/partner rather than in a traditional 'expert' role, he may change the way he sees himself and them, thus bringing about transformations in his psychological and socio-linguistic meaning schemes respectively. If he has employed premise reflection, and, possibly, critical self-reflection (emancipatory learning) he is likely to apply what he has learned in this instance to other contexts in which case it could be said that not only has he transformed his meaning schemes concerning agricultural production (knowledge), how he views himself and how he works with farmers (values) in the PTD context, but he has changed his overall meaning perspectives concerning knowledge and relationships.

Another example would be a woman in a rural community in which gender-sensitive PTD is being conducted. The experience may prompt her to question the basis of her understanding regarding farming (process reflection on her epistemic meaning perspective in her instrumental learning domain). It may also prompt her to question her gender roles (process reflection on her socio-linguistic and psychological meaning perspectives on her

communicative learning domain). It may further prompt her to question her position in society as a woman (premise reflection on her socio-linguistic and psychological meaning perspectives in her emancipatory learning domain). As a result she may change various meaning schemes or she may go so far as to change her meaning perspectives.

Much of what we learn is not transformative, neither does it need to be. Cranton (1994) distinguishes between subject-based learning, consumer-led learning and emancipatory learning all of which have their place. The first applies more to learning within conventional research and extension, but PTD involves consumer-led learning as much as emancipatory learning. However, the uncertain, disorientating conditions in which farming communities find themselves, and the change from positivist conventional research and extension to PTD do suggest that in order to learn, change, and develop, transformative learning may sometimes be called for. Transformative learning enables people to reflect on and analyse their lives. New meaning schemes or perspectives open new doors, empowering people and allowing them to recognise new options.

The enabling environment for transformative learning is much the same as for other forms of experiential learning and for PTD. It is one of trust, empathy, sharing, collaboration, openness and receptivity (Cranton, 1994; Malinen, 2000; Van Velduizen et al., 1997). Both transformative learning and PTD can be stimulated by critical questioning and consciousness raising (Cranton, 1994; Freire, 1972). Guidelines for the reflective practitioner (Schön, 1983) and for the supporter of transformative learning (Cranton, 1994) similarly correspond to those for the scientists and change agents involved in PTD. Schön (1983) points out that it is essential for the reflective practitioner to recognise the client's knowledge, respect the client, engage in reflective dialogue with the client, give up his/her claim to unquestioned authority and engage in a process of shared inquiry – all familiar to scientists and extensionists engaged in PTD. Meanwhile, regarding transformative learning, Cranton (1994:192) draws on the work of Mezirow, Brookfield and others and states: "If the educator is authentic, fosters healthy group interaction, is skilled in handling conflict, encourages learner networks, gives personal advice when appropriate, and supports learner action, critical self-reflection and transformative learning will be supported". Once again PTD practitioners will be able to relate closely to this. The transformative educator and the change agent in PTD alike have to be facilitators or, sometimes, provocateurs, co-learners, mentors and resource persons (Chambers, 1997; Cranton, 1994).

Conclusion

In this paper I have explored the relevance of experiential learning in general, and transformative learning in particular, to PTD. I have attempted to see how transformative learning theory, which was developed with a white, western, middle-class and primarily individual focus, could apply in development contexts in the south and in a social rather than individual setting. I have observed that the factors that enable transformative learning parallel those that enable both experiential learning as a whole and PTD. Transformative learning theory can help us understand in more detail the learning processes and changes in meaning perspectives that must take place if the shift from conventional research and extension to PTD is to be successful. It can provide insights into how extensionists, as adult educators, can facilitate this critical shift and under which circumstances this is appropriate. This has implications for the training of extensionists and indeed scientists who may be involved in participatory research directly with farmers in the absence of extension workers.

Continued study of experiential, and within this, transformative learning, will inform and benefit both the theory and practice of PTD. However, there are some processes that occur

during PTD which perhaps go beyond the transformations described by Mezirow and associates. PTD always involves a group process leading to action. The process often causes a shift in the groups' consciousness, i.e. the collective understanding of the situation on which the group is reflecting and acting on. Transformative learning theorists may wish therefore to study the practice of PTD to investigate further how this transformation of meaning schemes and perspectives is occurring at this collective level.

Finally, Sutherland (1997) and Malinen (2000) are just two amongst several authors who identify the "high degree of concordance" (Sutherland, 1997:90) between experiential learning and constructivism. Further study of this concordance may be of relevance to PTD. Another area of fruitful study would be the language of discourse regarding experiential learning. Michelson (1996) points out that an epistemological hierarchy based on positivism remains embedded in the language used to discuss experiential learning. It would be interesting to explore how far this is true for PTD. As we recognise the constructivist basis of PTD perhaps each of us needs to examine our meaning schemes regarding our own theory of, and practice in, PTD.

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