

# PURPOSEFUL TRANSFORMATION OF TEACHING PRACTICE: LEARNING TECHNOLOGIES IN COLLABORATIVE SOCIAL AND HISTORICAL CONTEXTS

**Geoffrey Lautenbach & Jacqueline Batchelor**

Dept of Sci. and Tech. Education, University of Johannesburg, South Africa

Email: geoffl@uj.ac.za; jbatchelor@uj.ac.za

## **Abstract**

This paper captures the sentiments of pre-service teachers and describes conceptions of learning in the third year of their professional degree in education. The problem we identify in this study is that many students have not changed dominant mental models of learning over the past 3 years of university life. Past exposure to poor role models is a reality which leads to the development of strong mental models which influence their conceptions of learning. We now investigate conceptions of learning through a quantitative analysis of responses to an electronic questionnaire based on the view that a sociocultural perspective on learning can be useful when a collaborative and purposeful transformation of the world is the goal. Initial findings show that student conceptions of learning are diverse and profoundly embedded in ideologies, ethics, and values rooted in their collaborative social and historical contexts. In contrast, many students are changing conceptions of learning and transforming the way they plan to teach in the future.

**Keywords:** Learning, Transformation, CHAT, Learning Technologies, Mental Models

## **1 PRE-SERVICE TEACHERS' EMERGING MENTAL MODELS: LEARNING IN THE MODERN AGE**

*“How do we think? One answer is that we rely on mental models. Perception yields models of the world that lie outside us. An understanding of discourse yields models of the world that the speaker describes to us. And thinking, which enables us to anticipate the world and to choose a course of action, relies on internal manipulations of these mental models” (Johnson-Laird, 2012).*

Notwithstanding the goal to advance education as a profession with a focus on innovative teaching we find that, in spite of our best intentions, universities are experiencing growing pressure from government to increase the competencies in the existing teacher workforce and at the same time train future teachers with the relevant knowledge and skills to affect change when deployed within the education system (National Planning Commission, 2011). Overall there is an aim to improve the professionalism, teaching skills, subject knowledge and computer literacy of teachers throughout their entire careers and to increase access amongst learners to a wide range of media, including computers, which enrich their education

(Department of Basic Education, 2011). In the light of this one would assume that senior pre-service teachers in their third year of studies have already had a number of years in which to establish their own ideas around the broad topic of teaching and learning in the modern age. In our opinion this does not seem to be the case in practice. From personal experience as facilitators of a third year module in a teacher education course we have found that there is a huge disconnect between teacher practice and teacher training especially regarding issues of technology use for teaching and learning in the first place, and secondly regarding the concept of learning itself.

In fact, it was in a recent study into the many misconceptions that plague student teachers regarding technology use for teaching and learning that we proposed that the average student teacher within the South African context does not hold suitable mental models of best practice in order to change their approach to learning in any meaningful way. The mental models we refer to in this paper can be defined as “knowledge states during the self-regulatory activity of prior knowledge activation” (Linteau, Rus, & Azevedo, 2012) which account for the deductive reasoning of these students who are largely untrained in logic (Johnson-Laird, 2012). One may argue that the lack of suitable mental models of best practice for learning may be due to the lack of good quality teacher role-models, specifically teachers who integrate technologies into their daily teaching and learning practice (Lautenbach & Batchelor, 2012). Nonetheless, this indoctrination, entrenched through poor role models, is a reality which leads to the development of strong mental models which may influence the pre-service teachers’ conception of learning, and ultimately the way in which they approach the role of teacher in the classroom.

One problem that we identify in this paper is that students are sourced from an education system that is experiencing serious challenges and that they may not have advanced their ideas over the past 3 years. To this end we propose that a more in-depth investigation into student notions of learning is appropriate and long overdue. Our aim is, therefore, to investigate senior pre-service student conceptions of learning using the heuristic of transformative learning (Stetsenko, 2008) to gain a better understanding of student’s developing mental models. In order to succeed in this task and to create such interventions, one must first understand the cultural and historical context of both the student and the education system. In other words it is essential to understand student backgrounds before planning interventions that aim to make an impact on their personal professional development as future teachers. We have also made the claim previously that in order to enable them to act as agents of change in the classroom we need to first address their inherent belief systems and dispel myths that may inhibit their contribution to the transformation of society (Lautenbach & Batchelor, 2012). These inherent beliefs also include their unique and sometimes interesting conceptions of learning.

There is an assumption that 21st century teachers will naturally introduce learning technologies into their teaching and in so doing change the way that they learn. We propose in this paper that the motives of student teachers change as they investigate the purpose of their engagement in the

process of learning and in this way contribute to the joint construction of new activity models in their work that may ultimately lead to transformation of their practice. The notion of “models of activity” is a concept derived from cultural historical and activity theory (CHAT) which is used in this paper simply as a conceptual framework and lens through which we will view the activity of learning. The central issue of *engagement with learning technologies in the process of learning* was a main focus in this undergraduate module and it is this engagement with the learning technologies that may also lead to further expansive learning cycles as a result of their collective activity (Stetsenko, 2005) during which students activate prior knowledge and hopefully transform it to create new mental models.

Engeström’s notion of expansive learning offers the opinion that expansive learning activities within specific contexts produces culturally new patterns of activity as well as new forms of work activity (Engestrom, 2001) and in this paper we aim to highlight some of these activities. According to Engeström (2001) “a full cycle of expansive transformation may be understood as a collaborative journey through the zone of proximal development (ZPD) of the activity.” In this process, extended cycles of expansive learning occur and workplace transformations, questioning of the ‘system’, and a move away from what has been done in the past sometimes escalates into a “deliberate collective change effort” (FitzSimons, 2003). The expansive cycle of learning (Engeström, 1987) for these students began with an analysis of the situation where they questioned their activity by jointly analyzing problematic situations that arose from the authentic learning tasks presented as part of their course work (Herrington, Reeves, Oliver, & Woo, 2004; Reeves, Herrington, & Oliver, 2002). It is at this level that they engaged with systemic and historical causes of problems related to learning, which in this specific context are profoundly embedded in ideologies, ethics, and values rooted in their collaborative social and historical contexts. For this reason we predict that every student’s individual expansive cycle of learning will be unique and form part of the complex set of contradictions that continuously drive the activity systems (Barab, Barnett, Yamagata-Lynch, Squire, & Keating, 2002).

The activity system where the student teacher carries out the activity of learning with learning technologies may be seen as the zone of proximal development (ZPD) of these students - the theoretical space that provides learning scaffolds (Bentham, 2002). Vygotsky (1986) suggests the intervention of a more able peer in this process, but we argue that the learning technology itself could fulfill this mediating role. This differs slightly from Vygotsky’s view that individuals left to their own devices to construct knowledge for themselves are unlikely to be stretching their intellectual capabilities. At the time when Vygotsky conceptualized these ideas there were no learning technologies that could, to the extent found today, replace the human mediating presence. Currently we could argue that technology may be able to provide interventions that ‘extend’ the human mediating function as proposed by Vygotsky. (Zinchenko, 1995) concurs that certain ‘technologies’ can become a “functional tool”. In other words, the lecturer is not left alone, as the technology mediates as the tool, or *functional organ* taking the place of the *other*. Furthermore, in transforming personal, organizational and professional practices, these students

are expected to “learn new forms of practices which are not there yet” (Engeström, 2001). Engeström contends that these practices are usually learned as they are created without the intervention of a more competent teacher and we concur that the learning technologies have a great mediational role in this process. We also argue that these student teachers only make meaning of learning when they start modeling new solutions and examining opportunities for the production of culturally new patterns of activity by transforming their frozen and unyielding mental models.

Activity theory adds a formalized structure to these dynamic human interactions (Engeström, 1999), such as the activity of learning in this case, and acts as a heuristic to better understand zones of proximal development within the learning process (Wertsch, 1984). Throughout the module we have observed student teachers continuously changing strategies and questioning their learning as they expanded their involvement with others in the class and engaged with the tools (learning technologies) that were introduced to them through the structured learning activities. By extending their zones of proximal development through participation and collaboration learning has become *social and cultural* rather than *individual* (Kozulin, Gindis, Ageyev, & Miller, 2003).

In the light of the discussion presented above a suitable framework was selected to use as a lens through which we could explore the student conceptions of learning as manifested in their existing and changing mental models of learning. To this end we decided to use an existing framework within the broad field of CHAT with a specific focus on transformation through collaborative practices. Stetsenko’s 2008 notion of transformative learning is anchored in the CHAT tradition and we used this perspective to design the questionnaire items for this study (Stetsenko, 2008). Instead of viewing student teachers as being passively bound to the world and society, a transformative activist stance acknowledges their ability to collaboratively and purposefully transform the world and themselves. To briefly describe this framework one must first start at learning through *acquisition* where information processing is seen as an individual process, obtaining knowledge and occurring in the individual mind. Figure 1 highlights the characteristics of learning through acquisition as an individualized process with no agency for social change. However, in our opinion, no learning can take place without knowledge acquisition.

Learning through *participation* is depicted in Figure 1 as a step closer to transformational learning with a focus on belonging, participating and communicating for the ultimate benefit of the community. Learning through contribution is the third column in Figure 1 and highlights contributing to collaborative practices and knowing the past in order to transform it. If one supposes that collaboration in social practices entails participation and contribution, it implies that both these processes are required for transformation (Bester, 2013). Bester also notes that according to this structure, “acquisition, participation as well as contribution are required for transformative learning to take place”.

**Figure 1:** Stetsenko’s depiction of the transformative stance perspective: implications for the notion of learning

	Acquisition	Participation	Contribution
Key definition of learning	Information processing; obtaining knowledge; individual process ‘in the head’	Participation, i.e. becoming a member of community; the permanence of having gives way to the constant flux of doing	Contributing to collaborative practices of humanity: continuing, while simultaneously transforming them
Key words	Knowledge, concepts, meaning, fact, contents; acquisition, internalization, transmission, attainment, accumulation	Apprenticeship, situatedness, contextuality, cultural embeddedness, discourse, communication, social constructivism, cooperation	Contribution, transformation, history as collaborative practices, cultural tools; vision and directionality; activism and commitment
Stress on	The individual mind and what goes into it; test and control of acquisition outcomes	The evolving bonds between the individual and others; the dialectic nature of learning interaction: The whole and the parts affect and inform each other	Dialectics of continuity and transformation, tradition and innovation; Knowledge for and as action; learning-for-change
Ideal	Individualized learning	Mutuality and community building	Contribution through self-development <i>and</i> community development
Role of teacher	Delivering, conveying, inculcating, clarifying	Facilitator, mentor; Expert participant, preserver of practice/discourse	Activist open to collaboration and dialogue; agent of a collaborative change
Nature of knowing	Having, possessing facts and skills	Belonging, participating, communicating	Collaboratively transforming the past in view of present conditions and future goals
Time line	Carrying out past experiences into the present; future is irrelevant	Focus on the presently evolving patterns of participation; the past is irrelevant and no future	Interface of the past, the present, and the future; the past and present are known through positioning vis-à-vis the future
Agency	No agency for social change	Collaborative agency	Co-evolving individual and collaborative agency
Who develops?	Individual learner	Community	Learners-through-humanity and humanity-through-learners
Where is mind	In the head	In patterns of participation	In continuous flow of transformative action
Key goals of learning	Knowledge of facts and skills	Ability to communicate in the language of community and act according to its norms	Knowing the past in order to be able to transform it; emphasis on the vision for the future from which the past can be known

Stetsenko contends that all human activities are “instantiations of contributions to collaborative transformative practices that are contingent on both the past and the vision for the future and therefore are profoundly imbued with ideology, ethics, and values” (Stetsenko, 2008, p471). This is very much in line with our thinking above where we speculate on the deeply embedded issues that influence students’ current mental models and their sometimes limited conceptions of learning.

## 2 A METHODOLOGY TO INVESTIGATE TRANSFORMATION OF EXISTING MENTAL MODELS

In this paper we investigate senior pre-service student conceptions of learning through a quantitative analysis of participants responses (n=277) to an electronic questionnaire set up using Google Forms and managed in Google Drive. The total enrolled cohort for the module was 579 students. All students were invited to participate in the online survey and a total of 277 responded positively. The remaining students who did not participate report that their limitations included lack of connectivity, overcrowded computer centres, time and work pressures and data costs. The questionnaire items in this survey were created based on the view that a sociocultural perspective on learning can be useful when a “collaborative and purposeful transformation of the world” is the goal (Stetsenko, 2008).

In line with this view, questionnaire items related to learning as acquisition, learning as contribution, and learning as participation were created based on Stetsenko’s transformative

stance perspective. Items included the key definition of learning, the key goal of learning, what learning should stress, what it is about, the best way to learn, the role of the teacher, the nature of knowing, and where learning takes place. Three questions for each of these six items were linked to the constructs acquisition, learning, and participation. A total of 18 question items made up this survey. These question items were all based on an existing framework that went through a face validity exercise with module lecturers. In order to fully understand students ideas about learning they were then asked to arrange the items in each group from least (1) to most (3) important. The questionnaire items were uploaded onto Google Drive in the form of a Google Form and students followed a hyperlink to the online form. A single question item from the live form is presented as an example in Figure 2 below.

**Figure 2: Extract from a survey tool to investigate student conceptions of learning**

**Your ideas on learning**

In order for us to fully understand your ideas on learning, and to identify possible research areas, please rank each of the items in each group from least (1) to most (3) important.

Each row on each statement must be ranked either (1) least important (2) important or (3) most important.

Although all three may be important to you, you MUST have a 1, 2 or 3 in each row without repeating any of the numbers.

E.g. if you have used 1 already then you may not use it again for that question.

Key definition of learning is *	1	2	3
information processing individually 'in the head"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
participation as member of community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
contributing to collaborative practices and changing them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

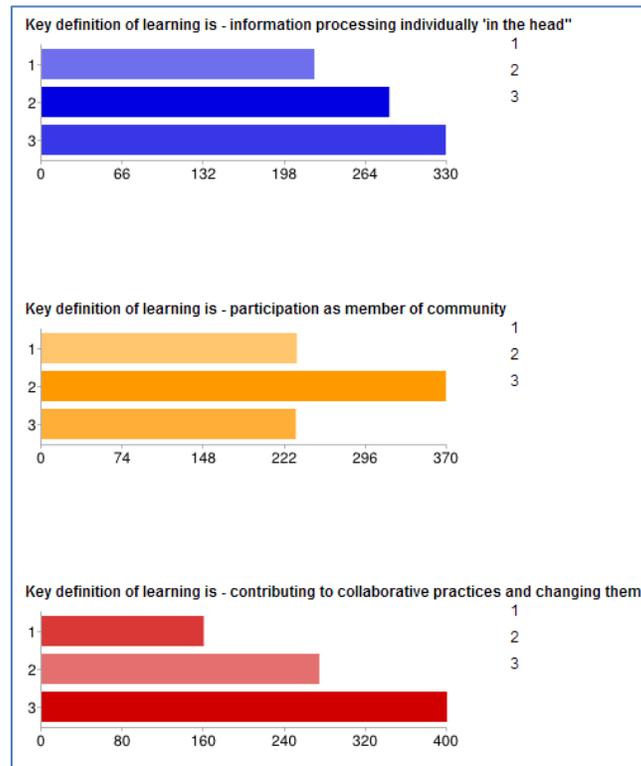
Data were then analyzed to illustrate student’s conceptions of learning at the third year level. In this paper we will only report on trends that emerged from the compilation of data within the Google Form environment and provide our personal qualitative views on these trends. A more rigorous quantitative analysis of the data will be presented at a later date and may already be finalized before the presentation of this paper in which case we will share the findings.

**3 INITIAL FINDINGS**

67% of participants in this survey were female and 33% male. The 3 choices for each item are numbered 1, 2, and 3 and symbolize least important (1) to most important (3). Each of the 3 choices for each question on the questionnaire have been taken into consideration in the compilation of this preliminary discussion of findings.

When considering the *key definition of learning* students were divided in their opinions. This is evident in Figure 3 where data are represented in a visual format. It should be noted that each

student had to select their ranking for each of the statements resulting in a potential total of 831 votes per item.



**Figure 3: An example of the raw data from one survey item in visual format**

Many students recognize that *information processing individually in the head* is the least important factor when it comes to learning. In line with this, many see *participation as a member of a community* as the key definition of learning with the greatest number opting to indicate that learning as *contributing to collaborative practices and changing them* is the most important factor. This data is very much in line with Bester’s (2013) claim that “acquisition, participation as well as contribution are required for transformative learning to take place”. Students seem to recognize this and their divided responses on this item are noted.

When asked *what learning is about*, more students felt that is about *contribution, transformation and cultural tools* than those who chose *apprenticeship, communication, social constructivism and cooperation*. But despite the high percentage of students leaning towards a more transformational approach to learning, still the highest proportion of students opted to venture that learning is mainly about *knowledge, concepts, meaning, facts and contents* which lies on the level of acquisition according to Stetsenko’s framework.

In the item “*learning should stress*” - the equal spread of responses on all levels between *the individual mind* and the *bonds between individuals* shows that some students are clearly divided

on this matter. In an item above only a few said that *information processing takes place individually in the head* but in this item many more students opted for *the individual mind*. Fortunately a large majority of students recognised that learning should stress *collective learning for change*. In a subsequent item related to this one, the best way to learn according to the students is *contribution through self-development to community development*. Some also see benefit in learning through *community building*. Once again in total contrast to the large numbers of students who indicated earlier that learning takes place in the individual mind, many students now opted to rate *individualised learning* as the least important way to learn, further highlighting the large body of students who still have not quite grasped the notion of transformational learning.

When asked about the role of the teacher in the learning process, most of the students agree that *delivering, conveying and clarifying* is the least important role of the teacher. They also note that the teacher should be in a *facilitating, mentoring and expert participation role* as well as an *activist role, open to collaboration and dialogue, and agent of collaborative change*. These views are encouraging and refreshing and we hope that the views of these students will eventually rub off on some of the others who are still struggling to shake off their well-entrenched, traditional views of learning. This is especially true when considering that many respondents agreed that teaching is about *planning for the future taking past and present conditions into consideration*.

There is still some confusion in the minds of students who cannot decide about whether learning is *about the mind, about transformative actions or about patterns of communication*. Once again it was refreshing to see that most students did not see learning as taking place in the individual mind but the last item once again contradicted all of this when a large number of students agreed that the key goal of learning is *knowledge of facts and skills*. It is as if their frozen mental models are slowly thawing but they still hang on to remnants of what they were exposed to when they were learning at school. This “thawing” of the mental models is evident when they once again recognize that a key goal of learning is *to know the past in order to transform it to place emphasis on the vision for the future*.

#### **4 DISCUSSION**

Unfortunately, although the University is recognized as one of the top examples of transformation and social cohesion in South Africa and has the potential to contribute to the transformation of education and affect change within society, initial findings from this study still show that some student’s activities are still profoundly embedded in ideologies, ethics, and values rooted in their collaborative social and historical contexts. On a positive note, and despite obvious contradictions which have been exposed in this simple analysis, large proportions of these students are already changing their conceptions of learning and in doing so are transforming their own learning as well as the way they plan to teach in the future.

By initially questioning existing standards of practice, in CHAT terms, students begin the cycle of expansive learning and some even progress to analyse the inherent contradictions in the activity system. Unfortunately some students in this inquiry were doing so as novices and did not get to develop drastically new forms of activity. Few have progressed to a level where they actively model a vision for teaching and learning with learning technologies or examine and implement the new model in practice. A problem may be that these students are constantly attempting to learn about something that is non-static added to the issue of embedded in ideologies, ethics, and values that they carry with them. Furthermore, learning technologies are constantly advancing and students still focus too much on the technology itself (the tool) and lose sight of the object of the activity (which in this case was learning with technologies). For this reason perhaps, many did not fundamentally change the way they learn using the available technologies. Contrary to this, others showed remarkable transformation of both thinking and practice. This is exactly what the aim of the learning activities in this module was – to model good practice using learning technologies and to drive transformation of student’s rigid mental models regarding learning.

In conclusion it can be noted that individual activity systems within the university may be seen as knowledge construction sites or the zones of proximal development for these students. However, it is also evident that students may be prevented from learning new things and progressing on the expansive cycle due to the inhibitory nature of the larger activity system of the institution. Activity systems at a university are driven by communal motives that are difficult to articulate for individual students. Disturbances and commonplace innovations such as the “top down” forced integration of learning technologies may offer possibilities for what (Engeström, 2000) calls “expansive developmental transformations” but, these transformations do not develop very far. The main factor that ultimately stimulates further transformations in the expansive cycle is the presence of a strong and extended community in which students can share, think and grow. In fact, modelling and reflection, which are advanced stages of the expansive learning cycle, only become evident when collaboration within a healthy academic setting is promoted.

In conclusion, only meaningful, practical and purposeful activities can lead to transformation in humans and their world. If learning activities do not adhere to these standards, learning can never become elevated to the level of contributions through participation and no transformation can be possible. In getting students to participate and to make meaningful contributions we contend that we have gone a long way towards transforming unyielding mental models of learning.

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