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PERSONAL HISTORIES AS A COMPONENT OF AN ETHNOGRAPHY OF EXPERT ASSESSMENT PRACTICE IN THE WORKPLACE

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A research report submitted to the Faculty of Humanities, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Masters Of Education, under the supervision of Professor Ian Moll.

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ABSTRACT

This research report describes the learning histories of computer assistants and expert assessment practice. This takes place in a workplace where computer training, specifically the fixing of hardware (CPU) occurs. It is hoped that the evidence collected might contribute towards the recognition and understanding of tacit assessment on the National Qualifications Framework, (NQF).

In uncovering these learning histories and expert assessment practices, a component of ethnography which involves case history interviews and discussions was used. The theoretical framework used was situated learning theory and the legitimate peripheral participation of the computer assistants. This framework is itself embedded in the theory of constructivism. Case histories used as a component of ethnography is part of a bigger ethnographic project developed by the South African Qualifications Authority (SAQA). This particular study will contribute along with other projects in the University of Witwatersrand research group, to make up a full ethnographic account of learning and assessment in the workplace.

Keywords: Legitimate peripheral participation, communities of practice, tacit knowledge, explicit knowledge, assessment, constructivism, novice, computer assistant, expert, learning, mediation,

DECLARATION

I hereby declare that this research report is my own unaided work. It is being submitted for the degree of Masters In Education at the University of the Witwatersrand, Johannesburg. It has not been submitted for any other degree or examination at any other university.

Sindiswa Nontembiso Msimango

Person Number: 0402490E

Date

DEDICATION

To the late Elpheus Msimango, my dear father, if only you were here to witness my achievements.

To the late Professor Ben Parker, may his soul rest in peace.

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I wish to express my sincere gratitude to the following people for their assistance in this study.

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PERSONAL HISTORIES AS A COMPONENT OF AN ETHNOGRAPHY OF EXPERT ASSESSMENT PRACTICE IN THE WORKPLACE

Chapter 1-Background to study

Introduction

This study, which explores what one particular methodology – namely individuals' accounts of their own personal learning histories – can offer to the data and analyses of a broader ethnographic research programme, how workplace knowledge is acquired and assessed. In this study, it is proposed to explore how people learnt to fix hardware, specifically the CPU and its components and the study also looks at expert assessment practices in the workplace being studied.

The particular workplace is a well known institution in Johannesburg, where computers are used on a daily basis. In each department within this organisation there are a group of people who work with computers, who are at hand to help out with minor software and hardware problems, they are referred to as computer assistants or novices, these two words will be used interchangeably throughout this thesis.

In this chapter, a background to the study will be given, a description of the research problem will follow, then the research questions and the aims and rationale for doing the research.

1.Background

It has been acknowledged that it is not only formal, explicit or theoretical knowledge that assessors use during workplace assessment but also tacit knowledge. It has also been accepted that the NQF has to be revised in order to recognize tacit knowledge in assessment. In support of this new initiative, the South African Qualifications Authority (SAQA) research directorate has developed research partnerships with three South African Universities, Rhodes University,

The researcher is involved in the University of the Witwatersand research group, which is investigating the formal and informal learning and assessment practices in the workplace and it is also investigating how novices learnt in their past and continue to learn within this workplace.

1.1. Problem Statement

The NQF was developed so that assessment and learning could be transparent. The aim of the NQF was that learners would be prepared and given the skills to be able to move between levels of learning and would be credited for the levels completed.

The following are the objectives of the NQF as stated in the NQF Act of 67 of 2008:

- To create an integrated national framework for learning achievements;
- Facilitate access to, and mobility and progression within education, training and career paths;

- Enhance the quality of education and training;
- Accelerate the redress of past unfair discrimination in education, training and employment opportunities.

It was hoped that the NQF would be able to address some of the issues in South African education and training. One of the major issues to be addressed is the recognition of tacit knowledge alongside explicit knowledge in vocational education. Therefore it is of importance that these skills present in vocational jobs can also be recognized and assessed.

The NQF underwent a review process, and it was accepted that the balance between tacit and theoretical knowledge was not sufficiently represented in the development of knowledge and skills that are part of the framework, SAQA (2009).

The NQF has therefore been probed many a time for asserting that assessment occurs "against transparent, explicitly codified criteria of human performance," (SAQA 2009, p.6). It has now been recognized that assessment in the workplace is not always done against explicit criteria but it also involves the expert using their tacit skills and experience to judge the novice, "this judgment is itself tacit", (SAQA 2009, p.6).

1.2. Research Question and sub questions

The central focus of this research is the exploration of expert assessment practices in the workplace and also the learning histories of the computer assistants. The following are sub questions from which other research questions will be formed:

- How do novices come to know what they know, how do they learn?
- How do experts assess novices in the workplace?
- What do experts in the workplace use to assess novices?

The above questions will be investigated in the context of the workplace situation which was mentioned earlier.

1.3. Aims and rationale

This research report seeks to explore one methodological approach that might help us understand how novices learn to fix hardware and how experts assess them in the workplace, namely the use of biographic accounts or personal histories in the context of a broader ethnographic project by SAQA. This study takes place in an organization that works with computers on a daily basis and specifically a department where they train their computer assistants to fix CPU's. This training and work is vocational in nature. It is hoped that the data collected from this study could contribute towards the recognition of expert tacit assessment on the NQF.

As mentioned previously, SAQA has developed a research project, which is concerned with workplace learning and is using ethnography as its methodology. This particular project will contribute to the broader research programme developed by SAQA. It is hoped that case history interviews will give insight into what happens during the learning and assessment process in the workplace. Therefore it is hoped that the findings can be put to use in coming to better understand workplace learning.

This study has potential to offer the following:

- It might provide insight into how people learnt to fix hardware, this could possibly be used in the future training of computer assistants.
- It may uncover tacit skills and this could contribute to further understanding of tacit knowledge and its importance in learning and training in the workplace.
- It is also hoped that a better understanding of expert assessment practice in the work place can be unearthed, therefore giving a better understanding of how to represent this type of assessment on the NQF.

In summary the study might potentially contribute further to the recognition and acknowledgement of tacit knowledge alongside explicit knowledge in learning and assessment on the NQF. It is hoped that the case histories from this study will be used to contribute to a larger ethnographic project of workplace learning developed by SAQA.

Chapter 2- Literature review

Introduction

In this chapter, literature important to the study will be reviewed. It is important to understand tacit and theoretical knowledge and the three learning theories, which are constructivism and legitimate peripheral participation within communities of practice. An understanding of assessment in a community of practice and how it contributes to learning is also pertinent to this study.

2. Two types of Knowledge

This research report focus on two types of knowledge – based on the distinction made by Polanyi, theoretical knowledge and tacit knowledge, theoretical being explicit knowledge and tacit being knowledge that is not recorded that is embedded in experience, Polanyi (1959, p 12). A lot of work has been done since about tacit knowledge especially in workplace learning.

The above definition of tacit knowledge is the still the most influential one in the study of tacit knowledge. For purposes of this study, in which a basic perspective on workplace knowledge as tacit knowledge was required, this distinction has been assumed as the core of the thesis theoretical position.

2.1. Tacit and Theoretical knowledge

There are two kinds of knowledge that are discussed in this thesis, tacit and theoretical knowledge, which is used during teaching and learning. The following is a quote explaining the two.

> Human knowledge is of two kinds. What is usually described as knowledge as set out in written words or maps or mathematical formulae, is only one kind of knowledge; while unformulated knowledge, such as we have of something we are in the act of doing, is another form of knowledge. If we call the first kind explicit knowledge and the second tacit knowledge, we may say that we always know tacitly that we are holding our explicit knowledge to be true.
> (Polanyi 1959, p.12)

Michael Polanyi came up with the word tacit knowledge to describe the fact that expert scientists "know more than they can tell" Polanyi, 1966 cited in, (Gorman, 2002, p.220). That these scientists could not explain everything they knew verbally, the tacit knowledge was rather demonstrated by the scientists but it was not easy for them to identify it as tacit knowledge or even explain it.

From the above we can also state in other words, that theoretical knowledge is the knowledge that we learn explicitly, we are aware of what we are learning because it is recorded in papers, it has been researched and written about. This usually takes place in a formal learning setting Polanyi (1959, 14).

Whereas tacit knowledge is usually knowledge that is not recorded in written form, it is embodied in the hands and bodies of experts or in other words, Stenmark (2000, p. 10). Connell (2003, p.141) comments that tacit or implicit knowledge are skills embedded in individuals. These experts can pass this knowledge onto the novice, but not intentionally knowing exactly what they are passing on, although they do intend on passing on some skill/s, Polanyi (1959, p.14).

Other writers also go on to make a distinction between tacit and explicit knowledge, Stenmark, (2000, p.10), claims that, they most commentators see explicit knowledge as knowledge that has been written down in manuals and is easy to explain or talk about. Tacit knowledge exists in people's bodies and can be demonstrated through action but is not easily explained or articulated, Stenmark (2000, p.10).

During the learning process the learner might make explicit connections of ideas, especially after the learner has pondered and reflected on its meaning, Gorman (2002, p.221). However, Polanyi would make us remember that reflection cannot totally describe every aspect of implicit knowledge; the expert or master will always know more than he/she can articulate, Gorman (2002, p.221).

Polanyi gives an example of how this tacit knowledge is passed on in the animal world or rather in a community of chimpanzees.

> Knowledge (as distinct from a single experience) is transmitted on a primordial level from one generation of animals to the next by an imitative process which students of animal behaviour called mimesis. There are telling

> photographs by W. Kohler of chimpanzees watching a fellow animals attempt to perform in another's efforts. Such interpersonal transmission seems at work whenever animals learn something by example which they obviously do when a trick is invented by a more intelligent chimpanzee, is immediately taken up by another, who would never have been able to think of it on his own. Kohler, giving instances of this process, convincingly asserts that it is no blind parrot-like imitation, but a genuine transmission of an intellectual performance from one animal to another: a real communication of knowledge on the inarticulate level, (Polanyi 1958, p.206).

This communication on an inarticulate level between the chimpanzees is tacit in nature, the knowledge was passed on not through manuals, speech, etc (explicit knowledge) but through action and observation and imitation (tacit knowledge).

In the following, tacit knowledge will be discussed using an example of swimming, in this case when one learns to float.

In his paper, (Gertler) gives a famous example of Polanyi's; skilled swimmers are not always aware that in order for them to swim well they usually keep their lungs filled with enough air to keep them afloat, this is something most people do, (2003, p.77). The above example demonstrates that even highly skilled individuals are not always aware of how they specifically perform a task or skill. As they are highly skilled they almost take this for granted.

In many a case as has been discussed before, the performance is hard to explain to a learner, it is not something that is easily articulated. The person (expert) performs a particular act over and over again, hoping that the learner will pick it up somehow, just not through explicit explanation, Gertler (2003, p.77).

Tacit knowledge has to somehow be acquired in the action itself: as in the example given above of when someone is learning how to float in the pool, even if you tell a novice swimmer to suck in their tummy, it is not known for sure that that person will float. Floating is a tacit skill that has to be learned in practice and cannot be put directly into words. One of the best ways for tacit knowledge to be passed on, as stated by (Polanyi, 1966; Nonanka; 1991 as cited by Gertler 2003, p. 78), is through demonstration and practice similar to a classic master-apprentice relationship in which observation, imitation, correction and repetition are all used when the apprentice is learning from the master or expert,

According to Polanyi (1959, p.13), all knowledge develops from the tacit, and that not accepting tacit knowledge would involve rejecting all forms of knowledge. Before something is made explicit, there is the tacit knowledge present that most of us have not identified. Sorri (1994.p.18) comments that explicit knowledge is not enough or even required for tacit knowing. One does not need to give details about how to ride bicycle in order to know how to ride it and being able to explain does not mean that one can in fact do it. “A highly theoretical person who can produce the mathematical analysis of bicycle riding but cannot actually ride a bicycle cannot be said to know how to ride a bike, (Sorri 1994, p.18).

Tacit knowing cannot be accessed by everybody or publicly agreed upon therefore it appears to lack objectivity, Polanyi (1959, p.43). Polanyi does admit though that the objectivity will be impaired as a result of personal involvement of the person. But impairment of objectivity does not rule out that something is knowledge.

Many empiricists have been opposed to Polanyi's tacit knowledge theory; accusing it of being subjectivist. They argue that only knowledge that is explicit, formal or theoretical can be called true knowledge. The empiricists assert that tacit knowledge allows personal biases into what they call explicit knowledge. We all have access to explicit knowledge, as opposed to tacit that we all don't have access to. They accuse Polanyi to being opposed to explicit knowledge, Poirer (1988, p.315).

Polanyi continues to argue that objective knowledge does not always share the same meaning with explicitness and subjective knowledge is not always parallel or even similar to tacitness, Poirer (1988, p.315). We need to move away from thinking of tacit knowledge as always being subjective. Even knowledge that is considered objective always has a tacit dimension to it and tacit forms of knowledge could have an objective dimension.

In getting us to understand better the relationship between tacit and explicit knowledge, Polanyi does not prefer either tacit or explicit knowledge, both are important. Tacit knowledge can exist on its own but explicit knowledge needs a tacit grounding in order to understand it and for its application. Hence, all knowledge is rooted in tacit knowledge, Perraton and Tarrant (2007, p. 355).

In terms of this study, it is important to distinguish between tacit and explicit knowledge but also that neither is more important than the other. But because of the nature of this study the main focus will be on tacit knowledge.

2.2. Learning

In order to understand how learning occurs especially in the workplace environment, it is important for one to understand some of the learning theories. It should be noted that these are not the only learning theories used in understanding workplace learning but the three that are represented here are appropriate for to this study. The three learning theories to be discussed are legitimate peripheral participation in a community of practice, behaviorism and constructivism. Legitimate peripheral participation is the main theoretical framework of the study and is embedded in constructivism.

2.2.1. Situated learning theory

The following is an explanation of situated learning theory. This theory is also important to the study as it gives insight into how the social aspect of the workplace fosters learning.

Lave and Wenger state that legitimate peripheral participation involves newcomers actively participating in a community of practice, “a person’s intention to learn are engaged and the meaning of learning is configured through the process of becoming a

full participant in a socio cultural practice, (1991, p.29). If organisational or community of practice learning is to occur it needs individuals who are willing to learn, Senge (1990 p. 140)

When a novice enters the community of practice, they enter as a legitimate peripheral participant; this involves the newcomer mastering knowledge and skills through being a participant in the community of practice, this enables the newcomer to move from being a legitimate peripheral participant to being a full member of the community of practice, Lave and Wenger (1998, p.167).

Wenger states that, within the community of practice there is a culture that is unique and specific to it, there are ways of doing things and these practices can only be learnt within this community of practice. This involves both the newcomer and the full members engaging with the tools and culture so that the newcomer can become a member, (1998, p.167).

The activities or practices within the community of practice, everything that occurs in the community of practice has meaning, all these practices are made in the community and they arise out of relationships among people in the community of practice, Lave and Wenger (1991, p.53). Therefore legitimate peripheral participation which fosters learning can only occur in a social environment, therefore through interactions with others within the community of practice.

2.2.2.Communities of practice

A community of practice is made up of three dimensions: mutual engagement, joint enterprise and a shared repertoire. This is membership in a community, being an active member and making the community of practice work. Members within the community engage with each other, Wenger (1998, p.74).

Wenger states that within a community of practice, “mutual engagement involves not only our competence but also the competence of others” (1998, p.76). Members in a community of practice go to each other for help and advice. New members look up to experienced members, who can model to them how to become a member of the community of practice.

It has to be noted that in a community of practice relationships among members are not always harmonious. “In real life, mutual relations among participants are complex mixtures of power, dependence, pleasure and pain, expertise and helplessness, success and failure” (Wenger 1998, p.77). Many problems may arise but members and novices together need to be collective in solving such. The success of the community of practice relies on its members to at least be united within the organization.

Joint enterprise comes about as a “result of a collective process of negotiation that reflects the full complexity of mutual engagement” (Wenger 1998, p.77). Joint enterprise develops and is defined by members of the community of practice. Joint enterprise does not mean that everybody agrees with everything, rather, most things are negotiated by all people, Wenger (1998, p.77). The members within the

community of practice have to reach consensus, this takes work but if the community of practice is to function well they have to engage in such a practice. In addition to this communities of practice that want to build shared ideas need to always keep encouraging fellow team members to develop their personal ideas, Senge (1990 p. 211). Without this sharing of ideas a learning organization is difficult to build and sustain, Senge (1990 p. 211).

Mutual accountability develops among those involved in the community of practice, it arises during the process of negotiation of a joint enterprise, Wenger (1998, p.76), all members are accountable within the community, everyone needs to take responsibility, and all have to work to ensure that all members are accountable and if there is a problem to rectify it as a team.

Shared repertoire develops over time, this repertoire includes words, tools, symbols, stories, ways of doing things, that have become part of the organizations practice (Wenger,1998, p.83). When novices or new members enter the community of practice, they do not automatically become a part of the organization. They need to engage with the practices of the community of practice and make meaning of the tools within the community of practice, the way members of that community of practice use them. Brown, Collins and Duguid comment that “tools share several significant features with knowledge. They can only be fully understood through use, and using them entails both changing the users view of the world and adapting the belief system of the culture in which they are used”, (1989, p.33).

The mastery of knowledge and skills for the novice involves acquiring the tacit knowledge that is embedded in the organization and its members. It is of importance that these tacit skills and knowledge be acquired so that the apprentice can become a member of the organization and also start contributing to its success.

> Apprentices or newcomers work alongside and learn from, their more experienced colleagues, the 'old timers: In Lave and Wengers' accounts of workplace learning, attention is paid to the importance of learning by doing of embedded, context-specific knowledge and of narrative as a significant means whereby knowledge is socially distributed" (Yandell and Turvey 2007, p. 535).

Therefore the newcomers learn but so do the members of the community of practice, they need to study the newcomer, learn how to adjust to having a new person in their company and also should realize that all their actions, words, gestures are being observed by newcomers and this helps them become full participants.

The following is a discussion of learning, work and tacit knowledge acquisition. In the workplace much learning occurs apart from the learning that occurs in formal training, personal interest and life experience also contribute to learning in the workplace.

There are many definitions of what learning is, learning occurs best when a person learns by participation, their eyes, muscles, thinking processes and feelings are involved, (Davis, 1972 as quoted by Boydell 1976, p.19). This is important to tacit

knowledge acquisition as the novice has to use their eyes, muscles, thinking processes and feelings when learning form an experienced colleague. The novice has to be more involved, doing things physically by imitating the experienced other.

The above is just one of the many definitions of what learning is, but what can be said is that learning is embedded in experience. This experience could involve the learners own initiative to learn or learning from others more experienced people. Peoples learning experiences are made possible by other experienced people and what individuals do in order for them to develop their learning.

Experience is important to the acquisition of tacit knowledge and skill. The novice needs to be engaged and keep experiencing in order to acquire tacit knowledge skills that are needed in order to function in a community of practice.

Many people learn a skill through being around other experienced people, they observe and are shown how to do something or through being given something and being assessed or appraised by a more experienced individual. Novices can learn through imitating their mentor, by trying to do things exactly the way they are done by their more skilled counterparts, Gertler (2003, p.77). They can ask questions, they can be explained to and in their spare time if resources allow, they can practice what they have seen and through time, patience and interest manage to improve or make progress with their new found skills.

Interest plays an important role in learning, for one cannot experience or learn new things if all their energy is being focused on something else, Wylde (1989, p.115). In

some situations it is best that the novice be left to experience things on their own, this can be done through discovery learning, where the learner has discovered things on their own, (Ausubel, 1968, p.22 as cited by Boydell 1976, p.5).

At the end of the day learning is in the hands of the learner, it is his/her responsibility, experts and other trainees can only give information, support and provide feedback, Downs (1995, p.54). Here it needs to be explained why learning is the learners' responsibility. The issue is not whether learning takes place in a formal or informal setting. If the novice does not take the initiative and responsibility for their learning, there would be no self motivation to learn. And because learning is a continuous process, one would need to stay self motivated for as long as possible.

In order to gain skills, individuals need to learn. This takes some self-motivation and commitment, nobody else can do or give these to a novice. Learners do not just enter a workplace situation and undergo training, at the same time that they are learning they also contribute to their learning, it is important to note that everyone can contribute and gain something when they are learning, Downs (1995, p.55). During and at the end of the learning process, the learner is helped by fellow learners and experts. Experts' comments and advice contribute to the learning.

2.2.3. Constructivism

An appropriate and fitting learning theory that supports legitimate peripheral participation of novices, is constructivism. Today learning is seen as an active process, the person is not controlled but rather the person is involved in their learning. In order for one to learn, they have to act on what they are supposed to work with. Learning also occurs in social environments. The two pioneers of this learning theory are Jean Piaget and Lev Vygotsky.

Piaget developed a theory called equilibration; this according to Piaget is how we learn. It consists of schemas, assimilation, accommodation, disequilibrium and equilibration. Moll. Steinberg and Broekmann (2005 p.101), state that schemas are storage compartments where there is an arrangement of different categories of knowledge. The more experiences and knowledge one gains, the more these schemas change. Assimilation occurs when new knowledge is added to our existing conceptions, when we act on the new information; sometimes we tend to change the new information so that is fits with our existing knowledge or schemas.

There comes a time in our pursuit of knowledge when there is an imbalance between our previous knowledge and new knowledge that needs to be learned, this is called disequilibrium. Moll et al (2005 p.101) add that at this point one is confused and unsure of their ideas. In order to rectify this, we need to reach a stage where both accommodation and assimilation reach a balance, this stage is called equilibration.

Sometimes we are forced to make an adjustment to our existing schemas when we have new information or experiences or are just confused. Without this adjustment it would be difficult for the new knowledge to become part of our schemas, this process is called accommodation. Moll et al (2005 p.101) state that, during accommodation, new schemas can be formed, as we are adding new information to old information. This is when one applies what they already know and using the new information, forming a new schema and make adjustments, so that new knowledge can be acquired, at this point reaching a state of equilibrium.

This theory supports tacit knowledge acquisition, as learning does not only occur outside but also inside. Tacit knowledge is innate. Constructivist theory encourages active learning and tacit knowledge acquisition requires that the novice be an active member when learning in the workplace, Connel et al (2003 p.141). They have to imitate, practice and try to do whatever it is that is required of them, in order for them to gain skills and become full participants in the organization.

Vygotskys theory involves the social nature of learning, this theory is called the theory of mediation; individuals construct their knowledge through social interactions, with people who mediate new experiences and information during learning, this is the "mediator-learner (or teacher-student) relationship", (Moll et al 2005, p.105). The zone of proximal development demonstrates how a teacher or more knowledgeable person mediates these new experiences for learners. This theory supports situated learning theory and the aspects of legitimate peripheral participation.

The zone of proximal development is the stage where the learner has information and can do something to a certain extent but becomes stuck, getting to a point where they now need help during their learning. The more knowledgeable person mediates for the learner, knowing that the potential is there but they just need to support the learner, Moll et al (2005 p 105).

It is this type of relationship; mediator – learner which is very similar to the expert novice relationship in the workplace that facilitates the acquisition of tacit knowledge, where the expert passes on tacit knowledge to the novice. The expert also supports the novice knowing that in time the novice will get to a point where they are knowledgeable enough to go from novices to full participants in the community of practice.

2.3. Assessment

This research report concentrates on case histories of computer assistants and how they came to learn what they know. Many factors contribute to workplace learning, interaction with fellow colleagues, practice and assistance and comments from more experienced people in the workplace. As expert assessment plays an important role in skill acquisition and work place learning, a brief explanation of aspects of assessment will be described in the following. This will concentrate on some aspects of assessment that are relevant to this study., the constructivist approaches to assessment that facilitate learning. This type of assessment is different to the type of assessment usually used in schooling, which is to test if the learner knows something which could very well have been memorized and not understood. Usually this type of assessment

takes place at the end of the course at school and is explicit in nature. Assessment in the workplace employs the experts own experience and could therefore be said to be implicit. Assessment in the workplace should not only facilitate learning it should play a pivotal role in skills acquisition and gaining expertise.

2.3.1. Assessment in the workplace

Because learning was behaviourist and used to be guided by such principles, assessment was therefore behaviorist in orientation, the emphasis was on what has the learner achieved, input and output was the way assessment was done. With a set of the behaviours or objectives learners had to reach, if these behaviours were not displayed the way they were written down learners were said to have not achieved these behavioural objectives. All assessment was uniform despite learners being at different levels of their learning, Shepard (2000 p.6).

Assessment was used at the end of the learning process rather than during, Shepard (2000 p.8), therefore behaviorism is not concerned with how the human mind works and how learning occurs, Moll (2009 p.3). What was assessed at the end of the learning process was what the learners had been taught as opposed to how they learnt what they were taught. Therefore this type of assessment involved the assessment of explicit knowledge against explicitly developed criteria. Tacit knowledge could therefore not be easily assessed in a behaviourist learning or assessment environment because behaviourism requires that criteria be observable and be agreed upon by the public.

It was soon recognized that what was important in assessment was how the learners learnt; assessment moved away from being behaviorist and was influenced by constructivism. The constructivist approach influenced assessment in such a way that it was placed midway in the learning and teaching process rather than at the end, Shepard, (2000 p.8). Assessment placed halfway, during the learning process supports the learning of concepts from learners, whereas if it was done at the end it would not support learning in such depth.

In this type of assessment environment there is no expectation of a specific or pre-specified behavior from the learner. Learning is recognized as being unexpected and spontaneous and that learners will not only have one response but many responses might be given by learners, Moll (2009 p.7).

It is therefore this theory (constructivism) and approach to learning that makes assessment of novices more meaningful and useful in the workplace as it facilitates learning. There need not be observable pre-determined criteria for the assessment of one's performance.

The expert in the organization does not only use explicit set of criteria to assess the novice during training and learning, the expert also uses their own experience and tacit skills to assess the novice. During knowledge acquisition the expert assesses the novice throughout the learning process by way of close observation and conversation. Assessment does not only take place after the training of a novice it also takes place during training.

The behaviourist and constructivist approaches to assessment have been mentioned because it is the constructivist approach that allows a range of different methods and tools to be used in assessment, it is not necessarily pen to paper only but it could be peer or group assessment that is used, observation from the teacher (the expert), this develops a collaborative relationship between learners and teachers in terms of assessment, Shepard (2000 p.9). The constructivist approach is important to how assessment is done in a community of practice as it validates it as a relevant and legitimate form of assessment.

Assessment in the community of practice takes place through the judgments of experts in the field, these judgments are done by the expert using among other skills his/her tacit knowledge to assess a novice or apprentice.

> The crucial point is that, if the assessor is an expert in the relevant field of practice of the learning task, then she must draw or her expertise (which is at one and the same time the expertise of a community of practitioners of which she is part) to make the judgments she must in order to assess competence on the task. It does not matter whether the outcome statement is formulated using a verb specifying an observable action at the beginning or not; her judgment is necessarily about something much deeper than that, (Moll 2009, p.13).

An example of this could be when a medical student is learning to read x-rays, the student learns to identify the darkened areas as part of a general pattern by being shown many x-rays in the attendance and in discussion with an experienced specialist, Sorri, (1994 p.22). In such an interaction the experienced specialist is able to guide

and assess the medical student when learning to read an x-ray, the specialist uses their experience and gives a judgment which is among other aspects also tacit. The judgment is not done using only explicit criteria, rather it is also the implicit or tacit knowledge that the expert possesses, that is employed in the assessment of a novice in a community of practice.

In summary, learning in a workplace environment needs to take place in a community of practice setting and through legitimate peripheral participation of the novice. The environment of learning needs to be constructivist in nature, where one is given an opportunity to learn and practice with others and also on their own at times. As mentioned previously the assessment that takes place in the workplace is very different to that which is usually used in schools, which tends to be explicit in nature. Where pre-specified outcomes have been formed to assess learning. In the workplace it is the expert assessment given by experienced individuals that contributes to learning. This type of assessment is individualized and is not explicit. It can be said to be implicit or tacit .

Chapter 3- Research design

Introduction

In this chapter, the research design of this study will be described and clarified. As mentioned before the research report is part of a SAQA research agenda, which focuses on workplace leaning. Its aim is to understand how tacit forms of assessment can be represented on the NQF, in order to do this it is necessary to concentrate on tacit skills and knowledge. In this research report a particular data gathering device, used in ethnography - personal histories of workers will be examined. Although this study it is not a full ethnography, it is pertinent to give the reader some background of this particular methodology and the reader needs to understand that this is part of a bigger ethnographic project and contributes a piece to that puzzle.

The approach in which the research is located, *personal histories*, will be identified and accounted for as a component of ethnography. Then the data collection by way of interviews and discussions will be presented. The analysis method, thematic content analysis will also be discussed.

3. The Research Paradigm

This study is situated within the qualitative research paradigm. A quantitative research method was not used owing to the nature of the research question, therefore in depth interviews had to be conducted. The aim of qualitative research is to learn about how and why people behave, think and make meaning as they do Lacity and Janson (1995

p.139).. This approach will help the research in answering the questions it asks and provide deeper insight into the workplace being investigated.

3.1. The research method

The methodology that will be used to collect data is an aspect of ethnography, which are case history interviews. Instead of using participant observation or other methods, as part of a broader ethnographic project case history interviews are being used. These interviews will be used to develop the learning histories of the participants. In the following a brief explanation of ethnography will be given. Ethnography, specifically a procedure similar to that used by Wenger in his book *Communities of Practice: Learning, Meaning and Identity* (1998). In his study of insurance claims processors in their own workplace, he used ethnographic methodology in order to make sense of the community of practice he was observing.

Ethnography is a particular kind of social science methodology, suited to uncovering meaningful accounts of the activities people engage in their contexts of daily living. Ethnography involves representing the world view of the participants being investigated. Typically, the ethnographer enters a situation, a community of practice, and observes people, their actions and how they relate to each other in an ongoing social process over an extended period of time, Spradley (1980 p.18).

In other words the ethnographer becomes a new member of that culture, even if things are done differently where the ethnographer comes from, in the community of practice they are in they need to do things the way they are done in that particular

community of practice. An ethnographer also needs to learn the language or jargon that is used, “discovery depends to a great extent on learning the language used by members of the group to describe their beliefs, norms, behaviors and motivations, (Schensul, Schensul and le Compte 1999, p.4).

As an ethnographer, one observes everything that goes on within the community of practice, because every word and every action has a meaning and is important. It is not clear to the ethnographer at first what will be significant to her core research questions, and so at first, she tries, so to speak, to observe and record everything But the ethnographer’s interpretations are relevant to the ethnographic focus, so although one [she] observes and takes note of most events in an ethnographic setting, there also needs to be a focus.

Ethnography provides a richer insight into the community of practice being studied, because the reader should be able to picture the setting. This richer insight can be gained by using thick description.

Fetterman gives an example of thin and thick description. In thin description one would only talk about closing of the eyelid. A thick description gives context, why the eyelid closed either because one was winking or had something in their eye, Fetterman (1989 p. 114)

Below is an account of an ethnographers experience in gaining the trust of a community he was studying.

> Campbell conducted his research in Greece in a village of the mountain region, N.E of Jannina. However he found the populations of the villages much depleted as a result of civil war and his English background led to suspicions that he was a spy. Sarakatsan transhumant sheperds lived on the hills above the village and relations between them and the villagers were uneasy.
>
> Our own contact with them had not gone beyond formal greetings when one day in the heat of the summer a young sheperd boy returning from school had stopped at the village spring for a drink, and was there set upon by larger village boys…..At this point , the anthropologists wife entered indignantly to rescue the victim. This small adventure had its consequences. We received an invitation to visit a Sarakasan encampment and the relationship prospered. When some weeks afterwards the time arrived for the Sarakatsan to take their flocks and families down to the plains of Thesprotia for the winter, one family sent us a peremptory message. We were to accompany them and they would build us a hut (Campbell 1992, p.152 as cited in Hammersly and Atkinson 2007, p.30).

The ethnographer interacts with different people in the social setting and relationships develop with the participants. Eventually the ethnographer has to identify informants, informants that can give them information and more insights into the practices of the community of practice. Throughout the ethnographic process and data collection process the ethnographer should keep in mind that “informants are human beings with

problems, concerns and interests. The values held by any particular ethnographer do not always coincide with those held by informants", (Spradley 1980, p.20).

The ethnographer should try at all times to be objective and to refrain from putting forth their values and ideas, as this could interfere with the quality of information being collected during the research process. Instances could happen where the ethnographer does not agree or a ritual is foreign to them, even if the ethnographer does not agree with a particular practice it is best that one hold his/her tongue.

There are different types of ethnography that one can do; they can be ethnographies of a tribe/ community of people, a family, a school and even of a workplace. Ethnographies are always based in a social setting. In this study the researcher is interested in explaining what workplace ethnography entails.

An ethnographer wishing to conduct workplace ethnography has to choose a suitable workplace setting (suitable to their research in terms of what needs to be studied, time, access etc) to conduct their research or field work. The ethnographer can enter the workplace as a participant observer and actively participates depending on how much they are being allowed to do. But the ethnographer might have certain restrictions on where they can go, what they can actively do in the workplace and access to certain information.

The ethnographic method has been favoured by workplace researchers, as ethnography uncovers "the tacit skills, the decisions, rules, the complexities., the

discretion and the control in jobs that have been labeled routine, unskilled, disliked, marginal and even trivial" (Smith 2001, p.221).

It is often not easy for a researcher to gain access to a workplace environment, it took Thomas (1994) fully one year, approaching fifteen different firms "before he was finally found a workplace environment that would allow him to conduct his research. Another researcher, Morril had to wait 18 months before he could enter a workplace to conduct his research in, Smith (2001 p.226). Below is another case where a novice ethnographer was having trouble gaining access.

> We know one novice who contacted a detention home in order to set up a time to begin his observation. The supervisor with whom he spoke told him that he wouldn't be interested in visiting the home that day or the next because the boys would just be making Halloween decorations. He then suggested which times of the day would be best for the observer to 'see something going on'. The observer allowed himself to be forced to choose from a limited number of alternatives when he should have made it clear that he was interested in a variety of activities and times (Bogden and Taylor, as cited in Hammersly and Atkinsen 1975, p.51)

The example above may not be a workplace situation but it illustrates just some of the difficulties that some ethnographers experience when trying to gain access to an ethnographic setting. "Evidence suggests that organizational gatekeepers tend to deny and delay researchers because they are concerned" (Smith 2001 p.226). They could be concerned about exposure of what goes on in the company, fears that the ideas that

the company has might be shared with other companies, or that information about them could be used in suing them Smith, (2001 p.226).

Case history interviews give deeper, richer and useful descriptions of the participants learning journeys histories. As previously mentioned the case studies have been used as an aspect of ethnography. Very early on in this thesis it was also mentioned that this study along with other projects in the University of the Witwatersrand research group, would be used to develop an ethnographic account of learning and assessment in the workplace.

In the case histories will be represented ethnographic descriptions of the participants learning journeys and expert assessment practice. Through usage of case history interviews it is hoped that insight can be given into how participants learnt and the expert assessment practice that was involved in this learning.

3.2. Data Collection Methods

Case history interviews are being used in this study as an aspect of a bigger ethnographic project developed by SAQA and this research will rely heavily upon them for data collection. Therefore it is vital to discuss interviews and their value in ethnographic research.

3.2.1 Interviews

Interviews, mainly ethnographic interviews are used by researchers when one seeks to gain more in depth information from the interviewee. Interviews allow the interviewer to ask more questions and get elaboration from the interview subjects about their answers. “the interview by definition, belongs to a class of methods which yield subjective data-that is, direct descriptions of the world of experience”, Hyman, Hart, Cobb, Fieldman and Stember 1954, p.15).

There are different types of interviews. The first type where is the researcher and the interviewee, in a one- on- one conversation. The second type of interview is when the interviewer conducts the interview over the phone. The third type of interview is usually recorded by way of notes or tape recorders. For purposes of this study one-on- one case history interviews will be sued with the view to specifically represent the learning histories of participants and expert assessment practice in the workplace. The interviews will be one on one conversation between participant and interviewer, with some discussion for further details. The information is to be captured in written form.

There are many advantages and disadvantages with interviews in research and only a few have been discussed here. The first of these advantages is that interviews are also useful when the research subject cannot be observed directly, Creswell (2003 p 185). This could be due to time constraints or the research participants not willing to be observed directly as in the case of telephonic interviews, Creswell (2003 p.185). the research participants can also provide historical information, which would otherwise

not be available to the researcher if one of the data collection methods was not an interview.

Another advantage of using in depth interviews which are characteristic of ethnographic research is that the questions can be descriptive therefore eliciting descriptive responses from participants, especially when they discuss a particular cultural scene in the interview, Spradley (1979 p.45). These types of responses are pertinent to the study as they will provide rich descriptions and also replace the absence of observation that the researcher wished to do but could not because of time constraints.

A disadvantage of using interviews as a data collection method is that they "provide 'indirect' information filtered through the views of interviewees, (Creswell 2003, p.186). Therefore the information that we obtain is possibly not in its purest form as participants may be telling the researcher what he/she wants to hear and trying to please the researcher, rather than answering the question truthfully.

3.2.2. Interview Sample

The aim was to find out about peoples learning histories, how skills were passed onto them and their assessment by experts in the workplace. The organization in which data will be collected works with computers on a daily basis, therefore the setting and sample was determined by the research questions.

Because the research is based in the workplace, the site had to be a work environment as indicated earlier in this thesis.

The sample consisted of experts in the community of practice and novices or apprentices. This particular sample has been chosen because the research project is interested in, how people learn, the transfer of tacit knowledge from experienced people to novices in the workplace and assessment of novices in the workplace .

3.3. Data Analysis

The data was analysed using the thematic content analysis approach, which involves organizing the data into categories based on themes, (Holsti, 1969 as cited by Smith, 1992 p.4) .The following is an account of how the data was analysed. That which is important and relevant to the research questions was selected from the raw data. The data was presented as the learning histories of the participants.

Anything else that was discussed during the interview but was not important to the research, has been classified as off the record, as was the wish of some of the participants, therefore such data was not presented.

In the analysis, the responses were analysed with the theoretical framework in mind, which consists of the main framework which is legitimate peripheral participation. The sub framework used was Vygotsky's theory of mediation and Piaget's constructivist theory of learning.

3.4. Ethical Considerations

This study has respected and followed the ethics issues that have to be observed by researchers. With research, especially that involving human subjects, organizations or sensitive information, it is important to obtain permission. Permission is obtained by academics through their ethics committee, which involves filling in a research ethics form, where one has to promise to keep the participants identities private.

A researcher is also bound by ethics not to force research participants to partake in research activities. It is also important beforehand to give the participants a thorough transparent overview of what ones research involves and what the researcher intends to do with the data that they collect. Even if they have started the research process the participant is also allowed to pull out at any time they wish without any repercussions whatsoever.

Here the researcher wishes to discuss the issue of confidentiality. Some research can contain data that is quite sensitive and therefore, participants who wish to not have their identities revealed should have this wish honoured by the researcher. It is also important to note that participants may request that a matter be off the record, the researcher is also bound at this point to keep such information confidential, even if it is important to their research.

Ethics does not only protect human subjects, it could also protect the name of the organization where the data was collected. It is possible that the participants being

interviewed or observed work for the organization. Therefore ethics can also protect the interests and reputations of the organizations.

The research that was conducted involved human subjects, therefore clearance had to obtained from The University of Witwatersrand Ethics Committee. The name of the organization where data was collected and the names of the research participants will be kept confidential. There will be no names mentioned, people's identities will be protected, pseudonyms will be used to protect the identities people that have been interviewed.

In summary quantitative research methods are relevant to this study, especially some aspects of ethnography such as case history interviews. A background of ethnography was given so that the reader would have a broader and clear view of what this study entails. The study itself was not an ethnography but could in the future lend itself to a full ethnographic study.

Chapter 4 - Data presentation and analysis

Introduction

In this chapter, data will be analysed by means discussed in chapter 3. The data analysis will involve thematic content analysis and subheadings will be developed from research questions and themes that emerge from the data.

The following involves the presentation of the relevant data; the data has been represented as case histories of the respondents. Excerpts from the case history interviews will also be analysed and discussed

4. Data presentation and analysis

The data was collected through interviews and discussion. This data was collected at a well known institution in Johannesburg. In this organisation computers are used on a daily basis. There are many different departments within this organisation and in each department there is a group of people who work with computers. They are at hand to help out with minor software and hardware problems and are called computer assistants. They work in shifts, one person does the morning shit form 08h00 till 12h00, and then the next computer assistant comes in from 12h00 till 17h00.

These minor hardware problems could include defective parts, wrong sized parts of the Peripheral Component Interconnect slots (PCI slots), graphics cards,

motherboards, processors just to name a few. More hardware problems could include the computer running slowly, which requires installing a new processor, if that's the cause and overheating of the computer happens then anew fan is required etc. When these minor hardware problems become complicated or there is just something that can't be fixed, trained technicians that are within the organisation are called in to fix them.

For the purposes of this research report the participants will be called computer assistants. The main focus of the report is how these computer assistants came to do what they do, how they learnt, their experiences and how expert assessment practice takes place. Below are represented the life and learning histories of the respondents, pseudonyms have been used to identify each respondent.

4.1. Learning histories

Because the respondents learning experiences with computers and hardware are all very different and unique, each respondent's experiences will be presented separately.

Khumo

He grew up in Johannesburg his school had computers, he had done a computer module at school, although it had nothing to do with all the hardware he fixes today. He also had a computer at home just a standard computer that was not too expensive. Khumo started out by working at a shop where computers are upgraded, sold and fixed.

I used to watch the (guys) at the shop while they fixed the hardware problems. I was first a cashier before they involved me in fixing computers. I learnt so much by actually doing something, it was more real to me

Although the shop worked with software too, he became particularly interested in hardware at the time.

He used to watch the guys at the shop while they fixed the hardware problems, they seemed to just know where parts belonged. After he had watched them over time, he moved from being at the front desk as cashier to learning by working with the hardware with his hands, he was no longer an observer he was a doer.

There were times he felt discouraged, especially when he thought he had finished something and when he tried to use it, it failed, it left him feeling inadequate and a failure sometimes. But his desire to see what he could achieve kept him going, he knew that if he gave up he would not have gained anything.

He got his current job after he had been given a few weeks training along with other trainees. The training involved opening computers and fixing them, there were many demonstrations and they would go home quite late after a long day. They still have training workshops from time to time. He really appreciates this as he feels this adds to his learning experiences.

He also feels that his background knowledge of computers, the experiences he had at the shop helped him get through his training, things were familiar to him and he also

states that it helps him in his job. His assessment involved having to fix a part of the computer, while someone watched him and took notes, when he was finished the end product was also assessed.

He also got involved in the training of new guys and their assessments, below is what happened during the assessment of one of the novices under him.

> *I remember one of the guys I was training spent 5 minutes looking for the corret screwdriver, he grabbed one, tried it but it was the wrong size, so he went through a lot of screwdrivers until he found the right size. Anyway that used to happen to me. The size of the screwdriver is the last thing I thought about during training I never knew it would become such an important factor when opening the CPU. So what I told him is that all one has to do is just take an overall look at the case, notice the size and make of the CPU, even look at the bolts, then you know which screwdriver will work.*

For him working with cables is the easiest part of hardware and the hardest part to fix he could not recall the name at the time of the interview but said that if something is too difficult to fix then the technicians are called in. He has a real love for computers, according to him anyone can learn, this is a skill that even accommodates the hearing impaired.

It took him quite a few years to learn how to fix basic hardware problems but he feels that there is still more he can learn about hardware, there is always something new that is introduced in the world of technology.

Lerato

She was born and brought up in Johannesburg. Her school had computers and they would have lessons a few times per week. Her mother worked as a helper for a family and they had a computer at their home. She became interested in computers because when she was still living at her mother's employer's home, there was an old computer that was no longer working, lying in the garage.

> *I didn't have a PC of my own, my mother was a domestic and she and I were living at her employers home in the back room. There was an old computer that was no longer working, lying in the garage so I asked my mother's employer if I could open and see what was inside. I opened the CPU case, everything looked so messy and complicated, there were wires everywhere. I put it back together but it was tough, anyway I was very excited and pleased with myself for achieving this*

She would often join her mothers employers son when he was fixing his computer or when he had a project and would ask him many questions. He was studying electrical engineering information systems, so he had extensive knowledge of computers. He was also very patient with her and would often show her how to fix some hardware problems. Eventually when he got a new computer she was given his previous computer. She also encountered some problems with her PC and would try to fix it instead of taking it to a computer repair shop; this also saved her money she did not have. In her spare time she would also read some books that were about hardware and

software of computers. Although she reckons that nothing is better than doing practical work, books have their use but when it comes to fixing hardware one needs to practice to be able to feel and identify something.

She thinks it has taken her about 10 years to get as good as she is now at fixing computers but also wants to learn more. She thinks the easiest part of hardware to fix is taking out the cover of the CPU and unscrewing it. The most challenging to fix is the motherboard, you have to be a technician or engineer in order for you to know how to fix it properly.

She certainly feels that her previous experiences with hardware helped her get the job she has now; her training was a few weeks and she was given many parts of hardware to experiment with. She is grateful for the training and it was mostly practical. During assessment it was the computer technicians that observed her.

> *The other trainees and I were being shown how to fit parts into the CPU shell. Just bt looking at the case inside, studying the overall size, i know what size cooling fan, PCi card, processor to install instead of spending time measuring or installing and taking out parts, it's a tedious exercise when you still don't know that the size and model of the CPU can indicate the size of the parts needed. One of the technicians just said to me 'picture the finished product, imagine the finished product before you even place the part inside'. None of that made sense to me at the time,*

Sometimes though she hated the assessment process, sometimes she felt that the technicians were picking on her.

I have gotten quite angry when I was criticised, especially when what I did was correct, it's just that sometimes my trainers wanted things done their was. Lerato is now aware that ant criticism she may have received in the past was to help her. It was to get her to a point that she was also able to function as a computer assistant.

Melusi

He has lived in Johannesburg for most of his life, his family moved here when he was four years old from the Limpopo province. He was exposed to computers from an early age, at school and at home. His father ran a small business and therefore it required that he have a computer at home. He became interested in computers because of games and viruses, they amaze him, and he often wished he could create viruses.

He started fixing hardware when he was trying to upgrade the computer at home; he states that it was trial and error; some of his friends would also help out if they had time. He also read books about computers which he obtained from the library close to home. He was always experimenting and ended up with many hardware parts lying around at home. He had done a computer course in high school too and he thinks it has been about 8 years now that he has been working with hardware.

He states that there is no easy part of hardware to fix but he does say that often one problem leads to another. The most challenging to fix is the power supply but where

he works if the problem cannot be fixed by him, the highly skilled technicians are called in, they also work at the same organisation.

> *When the technicians are called in to fix something that I can't fix, I sometimes stay and watch them work, I ask many questions because if there is something that i do not understand I want it explained to me step by step. Sometimes I would be working with some hardware and I could remember what they said, especially if it's a similar problem. I think that I have learnt so many things by just watching these guys.*

During the few weeks training he received, the technicians would open up computers and do demonstrations, the trainees also had to work with the computer parts and try to fix any problems.

If he could not get something right he would sometimes feel very down but because others were very supportive and wanted him to be as good as them, he decided not to give up, he did not want to disappoint others or himself.

He had been shown how to install the motherboard, now he had to do it himself, the technician stayed and watched him, taking notes and making comments.

> *When installing the motherboard you have to make sure the nuts are placed correctly so that they do not touch the metal plate, I watched many guys do this, I do not remember how they placed the nuts correctly, afterwards they would bend and check or pick it up and check, I always ended up with the*

motherboard touching the metal plate. I would also bend and check or pick up and examine. The technician was watching me and would say I have placed the nuts incorrectly. This used to piss me off as I had done exactly what I had seen the guys doing. What was he talking about? Eventually I got it right over time but seriously being told what to do is easy but trying to actually do it is hard.

He feels that the practical tests he was given when he had to fix a hardware problem and his day to day experiences with computers, contributes to his ongoing learning about hardware.

George

He grew up in Johannesburg, in a township, his family had a computer at home and there were computers at school, although the computers at the school were very few and some did not work. Students had to sit two at a computer. When he was in school, he was asked by his teachers to help other students because he knew computers very well. He became interested in working with computers because he feels that without some basic knowledge of computers, one will be at a disadvantage because most places use computers these days.

It is rare to find a place that does not use computers in urban areas, hospitals, shops, schools, small businesses all use computers in one way or another.

He started out learning how to fix hardware with his friends, if one of them was experiencing problems with their computer, they would all get together and try to solve the problem. This could end up taking a whole weekend and this became a way for them to bond with each other. It kept him off the streets and away from bad things. He also helped out at his father's friends' computer repair shop and watched the more skilled technicians when they worked; he used to ask a lot of questions. Sometimes they would allow him to fix something considered 'difficult', just so that he could have the experience.

> *So I walked into the shop and just thought I would be upgrading a computer, the usual stuff. All of a sudden I was given a cloth and told to cover my eyes with it, obviously I asked my fathers' friend what's going on and he told me I had to identify hardware while blindfolded. I thought that was crazy. But he was actually serious hey, so I blindfolded myself and held the equipment in my hand. I was so confused like what was I supposed to do? He told me to fee it, weigh it in my hands. It did not weigh anything, I just remember it had grooves on it, was somewhat rough and quite small and rectangular. It could have been anything, a PCI card, a graphics card, man I was confused. It turned out to be graphics card; I had not guessed right. The guy told me that one day I would be able to identify something even if I could not see it, if I happened to be working in the dark I would know what I am holding because of its weight, shape, texture and size. I can't fix a computer blindfolded but I can identify most of the parts blindfolded.*

He has been fixing minor hardware problems for about 4 years now, but does not consider himself an expert. In his job now as a computer assistant, he owes his ability to work with computers to his previous experiences, but sometimes a problem arises that even his previous knowledge of hardware is not able to fix. He finds the easiest part of a computer to fix is the CD-Rom and the most challenging is the motherboard, he still has not mastered how to fix it, but vows that one day he shall.

He was given weeks of training before getting this job, he was given many computer parts to play with, and some he had never seen before. When he was assessed he was given a CPU that had been opened, he had to fit parts into their correct place. Once he had successfully put everything back together one of the technicians came over and said he had done a good job.

There were times that George was reluctant to ask for help,

> *I was afraid that they would laugh at me or I would look uncool or even be called a loser. Most guys know about computers, if you don't know about something it can be embarrassing. Anyway I now ask questions because there is only so much I know, someone else can give a helpful hand.*

He states that he now knows that when you are stuck you should ask for help because you can waste a lot of time just standing around trying to do what is impossible for you.

George mentioned that being able to experiment and touch the hardware further contributed to his knowledge of hardware, practical is a universal language according to him.

Thabang

He was born in Qwa Qwa, Freestate and also grew up there; he came to Johannesburg a few years ago. He did not have a computer at home and his school did not have computers. He became interested in computers when he realised many places use computers and the friends he was staying with had computers. They would also spend time trying to fix minor hardware problems they were having and he would help out often.

He was told by a friend about the job he has now as a computer assistant. This job and the training he received have given him the basic skills that enable him to fix hardware. He states that he learns something new everyday despite his previous experiences and training, some problems are just impossible for him to fix. He was being assessed by a technician when he was trying to install cables onto the motherboard.

> *I was watching busy trying to install the system cables onto the motherboard I had put the motherboard inside the CPU case already and was taking forever to attach the cables. The technicians kept shaking his head and mumbling, he eventually said that I should just install the cables with the motherboard outside. This just left me confused cause I thought he must be mistaken.*

Anyway I decided to try attaching the cables while the motherboard was outside the case, after I was done I tried to fit the motherboard inside the CPU case, it did not fit, I struggled for a while trying to figure out what I should do, eventually the motherboard, it can only fit inside when placed into the CPU case in a certain position. For a while I thought what a waste of time but actually later realised that it was easier to put the systems cables on motherboard while it was outside rather than inside the case.

For him the easiest parts to work with are the hard drives, keyboard and monitors. The most difficult so far has been his experiences with the motherboard. It is the most complicated part of hardware and he does not have confidence that he will ever be able to fix it entirely. He also reads any material about computers in books, magazines and on the internet.

There were times of disappointment that he experienced over the years especially when he had spent a long time fixing something and it did not work at the end. What he also appreciated though, through all the learning he has had is not being compared to other people, or comparing himself to others.

During his training he was exposed to hardware he had never seen before. At his current workplace, they receive further training and workshops, he thinks this contributes further to his knowledge of hardware and there is still much to learn.

Sihawu

He was born, in the North West Province in Rustenberg and moved to Johannesburg a few years ago with his parents because his father found a job there. He did have computers at school but did not have a computer at home; his family could not afford one. He became interested in computers because of games and the internet. He also states that computers have become one of the most important technologies that we have today; it is a good field to enter as there are many opportunities within it.

His brother was the first person to have a computer in his family and it was with his brother's computer that he had his first experiences with hardware. He learnt through trial and error and some of his friends who were studying electrical engineering at universities and technicons helped him when he was fixing his brothers computer.

> *This is much easier to do as the person is much more approachable if they are your friend, especially when you are going to ask lots of questions which does happen, I find if at least you know the person well they are more willing to help you, some of my friends have even gone as far as opening hardware for me even if they were not working on it. What I also liked is that they would also let me do what they had just done, try to copy them and they would stand there and say no thats not good, you almost have it. Things like that which sometimes a trainer will not have the time or patience to do.*

He eventually got his own computer and could do much more with it as it was his. He would often open up his computer and with a book try to identify which part of the

hardware he was looking at. But sometimes the book did not help as what was drawn in the book was completely different to the hardware it was referring to. He believes there is no easy part of hardware to fix but the hardest parts to deal with are the cables and the motherboard.

There were times he would end up tired because he had tried to fix something for hours and had not succeeded; this made him want to give up. When he saw that the other learners were succeeding it helped him move on, he told himself that if they could fix it then he could too. With the training he received for the current job he occupies, he also feels that he learnt a lot and learns everyday because there are hardware problems that come up that even his training did not prepare him for and in this way he has to learn all over again how to fix it.

> *When I was busy fitting fan into the CPU one of the guys that works there, he was actually a technician, came to watch me and he was writing everything I did. Afterwards I was called into a room and the same guy who was watching me and three other technicians were there. They just told me that I did eventually fit the fan into the CPU but there were a few steps I had missed. I had not plugged the fan correctly onto the motherboard and so on. I don't really remember right now what exactly they said to me anyway it was something along those lines. So they started telling me what I should have done, anyway all I can say is that I did not understand a word of what they said at the time but when i was fitting another fan in I tried to fit things and it only then that what they has said to me made sense to me, I guess because I was actually trying to do it.*

Luvo

He was born and raised in the Limpopo province; unfortunately he did not have a computer at home or at school. He became interested in computers because of what he saw in the movies,

> *Computer nerds, they look so cool on television and it is a skill that is held in high regard in society. Knowing how to fix computers and how to use them has opened up many opportunities for me.*

He also used to ask people who were already technicians what their job involved.
When he eventually acquired his own computer, which he bought second hand, he started encountering problems with it. He would often experiment and try to fix any problems by himself as it was the cheaper option. When he failed he would talk to his friends who were computer technicians to help him. He would sit and watch what they were doing and he would also try to help out, they often taught him what to do. He cannot estimate how long it has taken him to become familiar with hardware but he says that he is still learning.

His experiments with hardware, he thinks have helped him a lot in his job, although from time to time he comes across hardware problems he never knew could exist. He does not find fixing the CD-Rom very challenging what he finds challenging he could not mention offhand. He did mention that when the mouse breaks it cannot really be fixed, maybe the manufacturers can fix it but it is not easy, one just ends up buying a new one.

During his training he had someone who never was pleased by anything he did, when the technician was assessing him he did not even compliment him when he got something right, he was always negative towards Luvo. When he was called in for a sit in session for the assessment the technician pointed out everything he did wrong. Ranging from how he held the PCI card to the removal of parts.

> *This technician however could not even explain to me exactly what I was doing wrong when removing the PCI card or whatever else he gave me a hard time about. I felt really bad and walked away feeling that he had helped me with nothing I was back a square one. I just wanted to give up but one of the other trainees just told me to keep going not everyone will like you and not everything you are told will be positive.*

Although his training was only a few week, he feels that his past experiences with computers and the training he received where he works now have helped him immensely in doing his job.

John

He was born and raised in Johannesburg, his family did not have a computer at home but he did have computers at school. Eventually he acquired a computer from someone who was getting one of the newer CPU models, he did not have to pay anything for it, and so he feels that he was quite lucky. He experienced many

problems with his computer, while trying to fix it; he made many mistakes and would have to end up asking friends for help. He also had a part-time job at a computer repair shop downtown, they did not pay him very well but what he learnt there he feels was invaluable.

He thinks that it has taken him a few years to get where he is now, in terms of his knowledge of computers. He feels that his past experiences with his troublesome computer and his part- time job, have contributed to his knowledge of hardware. Every now and then he chuckles to himself because the problems he deals with now are very similar to those he experienced with his very first computer. For him assembling the computer, for example where the wires go is the easiest part of hardware to deal with. The most challenging for him is fixing the motherboard.

A low time for him during his training/learning, was when he struggled to fix his computer and he needed it for something, it was very frustrating. Even today when he is faced with a challenge he finds out how to overcome it, when he finally is able to fix something he feels very proud of himself, it's a good feeling to finally achieve something.

At some point he was also one of the demonstrators and assessors for the novices in the organisation, he had to show them how to remove the CPU case,

> *When I was done showing them how to remove the case I asked some of them to try, they kept struggling to push the cover off and they kept pushing in ports on the motherboard. I could not figure out what was wrong with them, why*

> *couldn't they get it? Anyway I showed them again and again. I realised that actually you can tell and show a person exactly how to remove the cover, which involves pulling up and towards the case without pushing in the ports but they won't necessarily get the procedure right the first or even the fifth time, it takes practice. So what I do is just tell the guys over and over anyway eventually they get it right but it just takes time for them.*

He appreciates the few weeks of training he received; he says it helped him a lot. He states that it is through trying to fix difficult things that he learns the most. He appreciates a challenge for the learning curve it becomes.

Talifane

He grew up in Limpopo and did not have a computer at home or at school. His school principal would say that *computers are rich peoples things.* When he finished matric, he did a computer literacy course at a small centre in Johannesburg. He started becoming interested in computers especially hardware, because he was curious

> *This is the age of technology after all, if you know nothing about technology you risk being left behind. Anyway computers are easy to find and get hold of, just like cellphones.*

He can't really say how long it has taken him to become familiar with hardware but thinks there is much more for him to learn. He says that technology is always changing and there are always new things a lot of the time.

He would spend weekends with friends when they were trying to fix their computer problems. By attempting to fix their own computers they saved a lot of money not going to a repair shop. Sometimes they would end up being forced to but that's only after trying by all means to fix their problem.

He has also faced some challenges from time to time and they made him want to give up, the only reason why he did not is because he is not a quitter, because it would be better to be fired than to just give up. Opening the CPU is quite easy and anyway I'm not here to fix difficult things it's the technicians job to do that.

Before he got his current job, he had to undergo a few weeks intensive training at the organisation he works for. The training involved being given computer parts that they had to fix; there are also demonstrations from time to time and workshops.

> *I had to try not to touch the pins on the chip as I could damage them. I was told only to hold it on the sides. I also watched this other guy working he held the chips so carefully when inserting or removing them. With the PCI cards, graphics card he told me that I have to angle it a certain way so that it can fit into the slot. I was not told that when you remove the PCI card you need to rock it a bit so that it releases the connector and therefore the card comes out, it took me ages to figure this out, you grasp the edges and you pull but the damn thing does not budge until you start fighting with it. That's how I figured out how to pull the PCI out of the slot. It was by mistake. It looks so easy when*

someone else is doing it but when you first try, the first few attempts really suck.

Learning is not a once off he says, it is a continuous process, especially where computer hardware is concerned.

4.2. Analysis of data

The main themes and findings from the interviews are discussed below. Before they are discussed an overview of the theoretical framework is also given. The interviews were analysed with the view of identifying different learning experiences and expert assessment practice in terms of legitimate peripheral participation and tacit knowledge. There are some points that emerge from the analysis and they have been placed under various themes which were also informed by the research questions and interviewees responses:

- Interest and motivation to learn
- Early experiences with hardware
- How procedures were conveyed
- Practices mediated by experts
- Assessment process

Each of these themes mentioned above played an important role in the computer assistants learning and assisted them in becoming members of this community of practice.

These themes mentioned above are appropriate and match with the situated learning theory of legitimate peripheral participation. In terms of interest and motivation to learn and how procedures were conveyed, the participants had to have an interest to learn so that they could move from being on the periphery of the community of practice.

One is often not willing to learn if motivation and interest are not inherent. In terms of how procedures were conveyed, in the community of practice, the novices were exposed to the everyday work environment of computer assistants and technicians. The setting was realistic as the hardware problems they were being trained to fix were problems that arose within the organisation, none of the training were simulations. Therefore the novices could from their exposure to the natural environment engage with the practices of the organisation and it was easier for the practices to be conveyed to them.

With the early experiences with hardware, the mediation of practices by practices by experts and also the assessment process itself occurred in the natural environment, all these were grounded in tacit knowledge. The computer assistant's earlier experiences with hardware are tacit as tacit knowledge is embedded in experience, Gertler (2003 p,77). One can only acquire it through experience and practice. The experts would observe and give advice to the novices as they worked on the hardware, they could also give advice because of their experience.

Even the assessment the technicians carried out of the novices was from the experts own tacit knowledge and experience. This type of relationship between the expert and

novice is supported by Vygotsky's theory of mediation, as it is the expert who trains the novice and guides them in the right direction so that they may gain the skills necessary in order to function in this community of practice, Moll et al (2005 p.105). Piaget's account of how learning occurs accommodation, assimilation, equilibration, Moll et al (2005 p.101), is also relevant here as most of the learning occurred through the participants being actively involved in their learning and environment.

All the above mentioned themes will be discussed in more detail in the following;

4.2.1. Interest and Motivation to learn

When asked what got them interested in fixing hardware, one of the participants reported that watching movies that had computer computer technician motivated him to learn how to fix computers, (see case history Luvo), *they look so cool and it is a skill that is held in high regard in society* – Luvo. Another of the respondents stated, (see case history Lerato), *there was an old computer that was no longer working, lying in the garage so I asked my mother's employer if I could open it and see what was inside. I opened the CPU case and put it back together but it was tough, anyway I was very excited and pleased with myself for achieving this.*

Two participants stated that this is the age of technology, if one does not know anything about computers they risk getting left behind, *knowing computers has opened many opportunities for me* (see case history Luvo), one of the two participants added that it's really important to become familiar with this type of technology as it is more accessible and affordable to people apart from cell phones.

Two more participants cited games and viruses as a motivator for their interest in computers, usually when the computer had a virus the respondent had to fix their computer and the other respondent even added that he actually likes viruses and finds it amazing just how software can mess up a computer's hardware and software systems.

From the interview data it also emerged that most of the participants also became interested in hardware and computers in general, because they is technology that is used in many places for important functions, *it is rare to find a place that does not use computers in urban areas, hospitals, shops, schools, small businesses all use computers in one way or another* (see case history George), therefore it is advantageous to become computer literate or at least have basic computer skills.

From the above responses it is evident that the participants all had different things that got them interested in computers, from this interest in computers was sparked a need to learn and know more about this technology.

4.2.2. Early experiences with hardware

The interviewees were asked to give a recount of their early encounters with computers and particularly early experiences with hardware, before they got this current job that they hold. The following were their responses to the question.

Out of the nine interviewees only six had had exposure to computers at school, one mentioned that he had been appointed a computer prefect at his school and had been asked on a number of occasions to help out in the schools computer room. Another of the participants indicated that although they had computers at school they sometimes had to sit two learners at a computer, but this did not in any way retract from their learning of basic computer skills.

The other three interviewees indicated that they did not have computers at school, the school had many other problems and any money given had to go to attending to these problems so buying computers for the schools was not an option. One of the interviewees mentioned that his school had been given computers but they were stolen from the school in less than two months.

Only four of the interviewees had computers at home while growing up, usually the computer was a family computer that everyone used in the household. One of the respondents mentioned that his father had a small business and needed a computer so that he could manage his business affairs.

The other five participants did not have computers at home, mainly because their families could not afford one.

The majority of participants, seven of them had their earliest experiences with fixing hardware, when their own computers gave them a problem and also out of curiosity. All the of the participants had spent time experimenting with hardware in the presence of their peers or someone who knew more about computers, if a friend’s computer

had a problem they would all get together and solve the problem. It also served their purpose to rather try fixing their own computers as cited by one of the participants as a computer shop can be costly.

Three of the participants had worked in a computer repair shop, this is where they were exposed to a wide variety of hardware and software problems. One of the respondents mentioned, *I used to watch the guys at the shop while they fixed the hardware problems, I was first a cashier before they involved me in fixing computers, I learnt so much by actually doing something, it was more real to me* (see case histories Khumo).

For the reasons stated above it is evident that all the participants early experiences with computers occurred around other people, in social interactions with others. These social interactions include when they were friends, or in a computer repair shop and even at the organisation itself. All these social circles are communities of practice and within them is a shared repertoire which includes words, tools, symbols and ways of doing things that are unique to the community of practice, which have been developed within the orginisation through the interaction of its members with each other, Wenger, (1998 p.15). the theory of constructivism also supports these early experiences that the computer assistants had as it was through being actively involved and trying to figure things out on their own that some skills were acquired. It was through observing those who were more knowledgeable that these novices learnt. Although some of them did not have exposure to computers while growing up, this did not discourage their interest to learn nor did it become a barrier to learning later in their lives.

4.2.3. How procedures were conveyed

This question was answered poorly but were there some participants that gave quality responses therefore those have been represented here. Generally all the participants had a chance to experiment with hardware, although only five of the participants mentioned this explicitly. What was also common for all participants is that they learnt to fix hardware through trial and error, usually when their own computer was giving problems or when they were helping to fix someone else's.

Many of the procedures were conveyed to all the respondents through demonstrations, as one of the respondents mentioned, *when the technicians are called in to fix something that I can't fix, I sometimes stay and watch them work, I think that I have learnt so many things* (see case study Melusi).

Interviewees also mentioned that they ask questions, especially if someone is more knowledgeable than them, this helps clarify points that they do not understand. They ask questions of their friends also especially those that are technicians or engineers, and they tend to get much more as the person is their friend and therefore more accomodating, *this is much easier to do as the person is much more approachable if they are your friend* (see case study Sihawu). It also helps if the person teaching is patient with the novice as the case was with Lerato when she was learning the ins and outs of hardware. But for George it was not so easy to ask questions, *I was afraid that they would laugh at me or I would just look uncool or even be called a loser, most guys know about computers, if you don't know about something it can be very*

embarrassing. Anyway I now ask questions because there is only so much I know, someone else can give a helpful answer.

Only three of the participants, Lerato, Melusi and Thabang mentioned in the interview that they read books to keep up to date with the newest on hardware and also when they were learning. Lerato mentioned though, that is much easier to learn when you do something physically than to learn from a book, but she thinks that books play an important role too.

It is clear that acquiring computer skills necessary for the computer assistants to do their job, both tacit and explicit knowledge played a role. Although the participants were most of the time engaged with hardware physically, they could also read books to further their knowledge. Even if participants were shown how to fix something they had to practice it, merely observing was not enough. This involves legitimate peripheral participation of the computer assistants, they had to engage in the practices of the community of practice, Lave and Wenger (1991 p.29). This could include even the language (jargon) used or the steps necessary to execute a function. The participants also had to ask questions from the members of the community of practice, as the members could also help them acquire skills.

4.2.4. Practices mediated by experts

Only five interviewees responses have been selected as they are the only five who actually 'answered' the question, their responses are relevant to the research question.

One of the participants recounted an issue he had noticed when he was training a new computer assistant, (see case history Khumo), s*o what I told him is a that all one has to do is just take an overall look at the case, notice the size and make of the CPU even the bolts, then you know which screwdriver will work.* The participant gave the trainee advice on how to work with a screwdriver one of the most important tools when working with CPU's. This advice was given from his own experiences with fixing CPU's and screwdriver usage.

In one of the interviews, a participant recounted an experience he had with someone who was training him, (case history George), *the technician told me that one day I would be able to identify something even if I could not see it, if I happened to be working in the dark I would know what I'm holding just by prodding it, feeling its weight. I didn't believe him, I just thought he was fooling around. It turned out to be true; I now know what I am holding because of its weight, its shape, texture and size. I can't fix a computer blindfolded but I can identify most of the parts blindfolded.* The respondent had encountered training of the unconventional kind, but this assisted in facilitating his learning and knowing hardware.

Another respondent said that the guy who was teaching him would show him how to hold a processor chip, (see case history Talifane), *you grasp the edges and you pull but the damn thing does not budge until you start fighting with it then it comes out. It was by mistake. It looks so easy when someone else is doing it but when you first try, the first few attempts really suck.* This particular participant had been only told part of the procedure and had also observed the technicians doing this procedure, but it

required him to practice on his own, this observation and being told had only assisted him to get further in the task of inserting the PCI card.

One of the respondents mentioned how he was given advice on how to fit the right sized parts, (see case history Lerato), *just by looking at the case inside looking at the overall size I know which size cooling fan, PCI card, processor to install instead of spending time measuring or installing and taking out, it's a tedious exercise when you still don't know that the size and model of the CPU can indicate the size of the parts needed. One the of the technicians just said to me 'picture the finished product, imagine it in your mind before you even place the part inside'*. Just by observing the trainee the expert could pick up straight away what the problem was and could offer advice from their own experiences.

It is clear from the above that there were many ways that procedures could be conveyed either through observation or advice but without practice, doing the actual procedure, one would have a tough time grasping anything. Even for the trainers they knew that the best way for the procedures to be passed on was to do the demonstrations for the novices but that they would also have to do it themselves.

Because these procedures could only really be conveyed through demonstration and practice, it is clear that the procedures themselves are grounded in tacit skills and knowing. These tacit skills being from how to insert the PCI card to lifting off the cover of the CPU, knowing from just holding the hardware which one it is, because of the weight or its texture and shape. The computer assistants over time learnt these

tacit skills that are so important for them in order to do their job but it had to be from observation and imitation and lots of practice.

The novices had to be engaged in this community of practice and the culture of it in order to gain skills within the community of practice, Lave and Wenger (1991, p.290). These tacit skills that are present are unique to this work environment, they are the skills that make a computer technician a computer technician. Without these more experienced technicians around them and without the natural work environment that they were immersed in, gaining any skills and going from being on the periphery to being a member would be much more difficult. Vygotsky's theory of mediation is also evident here. Even though the computer assistants also brought in some knowledge, from their experiences with hardware, the members within the organisation had to help the computer assistants when they needed an extra push just by commenting or even showing them, Moll et al (2005 p.105).

4.2.5. Assessment process

When asked about how they were assessed after training all nine participants said that one or two technicians would come around and check what they had done and watch them while they worked, they always had a note book with them, which they would write in and would make comments along the lines of how they had done and what they should do.

From the comments written down by the technician each computer assistant was then called into a meeting separately to discuss the technicians' observations and what the

assistant was struggling with. Placing the plugs from the fan in the correct port on the motherboard was cited by one of the interviewees as a problem they struggled with. Usually after they try to talk about how they can improve the particular thing that the assistant was struggling with, which usually involved more exposure to it, more practice.

One of the participants also mentioned a time when he was he was training new assistants, in this case he had to show them how to remove the CPU case, (see case history John), *I realised that actually you can tell a person exactly how to remove the cover, which involves pulling up and towards the case without pushing in the ports but they won't necessarily get the procedure right the first or even the fifth time, it takes practice. So what I do is just tell the guys over and over, and show them over and over anyway eventually they get it right but it just takes time for them*. This particular response shows that sometimes it is hard to assess the novices as this participant who had trained people experienced. It was difficult for him to judge exactly what the participants were doing wrong that they could not get the procedure right.

Another of the of the participants recounted a scenario when she had to work with the motherboard, (see case history Melusi), *One of the technicians was watching me and would say I have placed the nuts incorrectly. This used to piss me off as I had done exactly what I had seen the guys doing. Eventually I got it right over time but seriously watching someone do it is easy but trying to do it yourself is hard*. This particular response makes it clear that the expert can assess the novice without pre-

determined criteria, he only has to watch and from his experience in the field can make a judgment of the novice.

During his training one of the computer assistants (see case history Sihawu) had been assessed by one of the experts, *So they started telling me what I should have done, anyway all I can say is that I did not understand a word of what they said at the time but when i was fitting another fan in I tried to fit things and it only then that what they has said to me made sense to me, I guess because I was actually trying to do it.*

While trying to fit parts into the CPU one of the respondents recounted something that the technicians has said to her, (see case history Lerato), *One the of the technicians just said to me 'picture the finished product, imagine it in your mind before you even place the part inside'*. The technician was assessing her while she was working from his own experience he gave her some valuable advice. Although at the time it did not make sense to Lerato, it was through experience that she finally was able to understand what he had told her.

One of the participants discussed how he had to attach cables to the motherboard, the technician assessing him, *kept shaking his head and mumbling, he eventually said that I should just install the cables with the motherboard outside. This just left me confused cause I thought he must be mistaken.* (see case history Thabang) When the participant tried to follow the technicians advice, he thought that his suspicions were confirmed but in actual fact the technician had been correct. The respondent had to do this no one else could have done it for him, he had to be engaged with the tool physically, use his hands and body.

The participant was required to fit a PCI card and was being assessed, (see case study Luvo), *is technician however could not even explain to me exactly what I was doing wrong when removing the PCI card or whatever else he gave me a hard time about.* The technician seemed to be giving this participant a hard time because he probably did not know how to explain to the participant exactly how to do particular procedures.

What is common with most of the participants assessment experiences is that the expert finds it difficult to explain what they know as this knowledge is tacit, as they 'know more than they can tell' (Polanyi, 1966 as cited by Gorman 2002 p.220). a lot of the interviewees mentioned how confused they were after assessment or how they just did not understand the technician. But most of the time later, when they had practiced further that was when some of their assessments made sense to them. Not only did it make sense to them it also helped them during their learning. They would take what the technician had said and try use it while working on the hardware.

Most of the respondents agreed that it was not only experts that helped them with problems they were experiencing or when judging something that they had done it was also fellow peers, friends and other trainees who would also make comments about their progress or also do a demonstration for them. The interview data showed that fellow trainees also played a pivotal role in facilitating learning.

I have gotten quite angry when I was criticised, especially when what I did was correct, it's just that sometimes my trainers wanted things done their way (see case history Lerato).. She felt this way especially when she thought that she had done a good job of fixing something, this shows that sometimes the experts judgment was not always correct but since they were using their own experience and knowledge to them this was the correct and appropriate judgment.

An issue that emerged from the interview was when one of the participants had quite a difficult assessor. During one of the computer assistants training he had someone who never was pleased by anything he did, he did not even compliment him when he got something right, he was always negative towards him. He felt really bad and wanted to give up and was even scared that he might lose a chance to get the job because of this particular technician but one of his fellow trainees just told him to keep going (see case history Luvo), *not everyone will like you and not everything you are told will be positive but that should not stop you from achieving something*

In summary, the data gave some insights into the learning process of computer assistants and expert assessment practice. These accounts are indicative of an environment where legitimate peripheral participation of the computer assistants was encouraged. In no other way would the computer assistants have gained skills if they ha not been practically engaged in the workplace.

The novices had to be involved in real life hardware crisis not simulations. They had to be actively involved in their learning. Experts used their tacit knowledge to assess novices informally; this also helped in the acquisition of tacit skills that novices

needed in order to function in the community of practice. It should be noted that it was not only experts that made judgments, it was also their fellow peers who assessed them from time to time, in the training environment.

In chapter 5 that follows, the findings were discussed further, and based on the findings a number of recommendations have been made.

Chapter 5- Discussion and Recommendations

In this chapter the research objectives and findings were summarised and discussed and based on these findings, recommendations were made for potentially improving research on learning and the expert assessment practices in this particular workplace.

5. Discussion

As explained in chapter 1 this study set out to explore the following questions concerning peoples learning histories and how and what experts used to assess them in the workplace:

- How do novices come to know what they know, how do they learn?
- How do experts assess novices in the workplace?
- What do experts in the workplace use to assess novices?

The research presented the participants learning histories. The learning histories gave insight into how novices learnt to fix hardware and the assessment practices in the workplace. The case histories were used as a component of a bigger ethnographic enterprise, which this study hopes to contribute to. The data and information from this study could be used to better understand workplace learning and specifically in the case of this study, learning and assessment. All this took place through legitimate peripheral participation of participants within the community of practice.

5.1. Participants learning histories

The interview provided the following evidence about how people learnt outside of the workplace (their learning histories) and how they learnt in the workplace.

The interviewees all started somewhere in their learning journey, some of the respondents started out by fixing CPU's using their own computers, either because they had a malfunction, needed to upgrade or just out of curiousity. Others were fortunate enough to have further experience in computer upgrading shops. They were exposed to a variety of hardware problems.

Some of the participants had computers at school, but some schools did not have enough computers for all students, so they had to share computers. Other respondents were from schools where they were well resourced with computers and they were even put in charge of the computers, as computer prefects given responsibility and helped their peers who were struggling.

Other respondents did not have computers at school; there was in some cases a lack of interest from the schools principal because they thought that *computers are rich people's things,* -Talifane or because there was a lack of resources. Some of the respondents did have computers at home, usually a family computer that everyone had to share, some did not have computers but at a later stage in their lives they finally bought or were given their own starting PC.

In terms of their interest in computers some novices said that they became interested in computers because they wanted to keep up with times, they did not want to get left behind, this was a real need to become more informed, even if they had never owned a PC, they knew the value of computers. They know that they would be at a disadvantage not knowing anything about computers, *'computers are a symbol of the technological age'*, Khumo.

Others cited that knowing how to fix computers is a skill, it is in demand, and one cannot do anything without computers because they are everywhere, almost every shop, workplace, hospital has a computer or computers.

Other respondents became interested in computers because of games and viruses. They had played a very good computer game and wanted to know how the mechanisms work in a computer when a game was played. Others had experienced problems with viruses and became interested in how a virus affects a computer and how the antivirus works, it was not only an interest in hardware there was also interest in software. What also emerged is that interest in computers was sparked by curiosity and liking a challenge.

In general the interview data shows that interest plays an important role in learning, for one cannot experience or learn new things if all their energy is being focused on something else, (Wylde 1989 p.115). All of the participants have a passion for computers, not only hardware of the computer, many other things as mentioned such as software in the form of games, viruses etc as things they are interested in.

The participants also have many different reasons for pursuing their interest in hardware and this has kept them motivated to continue to improve their skills, especially in this particular workplace.

Learning also relies on independence and self-sufficiency from the novice, Candy (1991 p.23). Many of the respondents took the initiative to learn, to educate themselves about computers and also spent a lot of time on their doing this. Just by experimenting with their own computers or working in a computer repair shop or even helping friends, their learning became their responsibility. They knew that equipping themselves with such a skill could open many doors especially in this day where technology is relied upon so much.

Within this community of practice, had the respondents also not taken it upon themselves to learn, engaging in legitimate peripheral participation could have been difficult. Therefore the computer assistants could not only rely on the other members of the organization to help them during learning it was up to them too.

From the interview data it is clear that the respondents learnt by experimenting with hardware, either because they were experiencing difficulties and were trying to fix the problem or because they were curious or it was part of their part-time job. Ian et al, (2005 p.101) state that when one experiences a misconception or confusion during learning, one tends to have to adjust their previous understanding so that they may be able to incorporate their new knowledge with their existing knowledge, this is through the process of accommodation. Some of the respondents had preconceived ideas about how to do particular procedures. It was through making mistakes and frustration that

they learnt more about hardware. It did not happen just the first time they dealt with hardware; it was after countless number of times.

It is also clear from the that all participants learnt to fix hardware specifically the CPU through interaction with others, they learnt in social environments, even before they received their training, experiences they had fixing their own PC's were usually in the presence of friends or more knowledgeable people.

All these factors that were encountered by the computer assistants during their earlier experiences with hardware have all a hand in helping them on the acquisition of skills that they use in their workplace today.

All these factors that were encountered by the novices during their earlier experiences with hardware have all leant a hand in helping them in the acquisition of skills that they use in their workplace today.

The interview data suggests that some of the respondents learnt to fix hardware through watching others, technicians who had more knowledge or friends they knew who were training as electrical engineers of the information system stream. Many of the respondents "use peers, experts and fellow learners as their chief sources of information and their skill models" (Brookfield 1985 p.9). It is important to note that experts and other trainees can only give information, support and provide feedback, Downs (1995 p.55). Learning is mostly up to the learner, responsibility for learning lies with the learner. Most of the respondents made their business to take their learning seriously and be held responsible.

The respondents also felt that during demonstrations, the technicians were better at 'doing' rather than explaining. Expert scientists "know more than they can tell" (Polanyi, 1966 cited in Gorman 2002, p.220). They know their skill very well but explaining to another person is very difficult for them. It seems from the interview data, that the best way to pass tacit knowledge on then is for the novice to watch the expert and to practice what they have seen.

The decision can therefore be reached that one of the best ways for tacit knowledge to be passed on is through demonstration and practice such as in the classic master-apprentice relationship in which observation, imitation, correction and repetition are all used when the apprentice is learning from the master or expert, (Polanyi, 1966 and Nonaka, 1991 as cited in Gertler, 2003 p77). The master-apprentice between computer assistant and technician was evident in this study. The computer assistants learnt computer skills through observation, imitation and repetition.

The data showed that when the novices did something with their hands, a practical task, they could remember it better. Through practice and trying to hone the skill they could acquire it in this way. Merely reading a book could not equip them with the skills they needed, but reading theory on hardware gave the basic information, for at least naming and identifying different parts. The theory could also have contained procedures that could be easily translated in to practice but also some that could not, they really had to be observed and practiced.

The data strongly supports the situated learning theory of legitimate peripheral participation theory. What also emerged from the interviews is that the training took place in an environment that was real, authentic, none of the problems with the hardware were simulations, they were problems that already existed and the type that the trainees would encounter in this particular workplace. This could have made it easier for the experts to mediate learning experiences and this was more realistic for the novices at the time.

As new comers they had to adjust to the organisations or community of practice culture. In order for them to acquire skills they had to be exposed to the real life situations that they would come across later in their careers.

They had to engage in the practices of the community of practice, engage with the tools. They also required the support of the more experienced members of the organisation so that they could go from being on the periphery to being members of this community of practice. When practices were mediated for the novices by experts they were usually given advice on how to do something, especially if the novice was struggling. They gave this advice from their own experience as the responses above suggest. These were probably things that they had come across one time or another, unfortunately these are not practices that they can do for the novices, the novices have to engage in these practices so that they may acquire the skill. This ties in with Lave and Wengers' theory about communities of practice and mediation and also is a constructivist view of learning, where one learns by doing.

As in all communities of practice this process was not very smooth, novices experienced problems with members of the community of practice who did not like them or disagreed with them. All these dynamics including conflict play a role in contributing to the organisations culture and also in the culture of learning within the organisation.

5.2. How and what experts used to assess novices

Assessment for respondents involved the following; their progress was monitored by experts in their workplace, during practical sessions the expert would stay and observe the novice, to see if the novice was following protocol and doing the right thing. The assessment was informal in nature in that there were no pre-specified assessment criteria. Rather the expert assessor used their own experience and knowledge of the job to assess the novices. There probably also were no pre-specified assessment criteria because all the procedures are different, inserting a PCI card, removing a cooling fan etc.

The problem with assessment where there are no pre-specified criteria is how is one to know whether the experts judgment is objective? This is the major debate about tacit knowledge, but tacit knowledge playing a role in assessment cannot be denied either. One does not always write a formal test when assessed and some procedures cannot be easily assessed formally anyway.

From the interview data it emerged that the respondents had their progress monitored by experts in their workplace. These experts used their expertise to make judgments

about the learners and what they were doing. If they were not placing the hardware back in their correct place, they were left on their own but told that they had not gotten the task quite right. Informal assessment was used to assess them and it contributed to their learning, Moran (1997 p.22). Usually a discussion followed the observations that the expert had been noting down, from the discussions a way forward could be planned, in this way the assessment facilitated learning too.

It was not only experts in some of the respondents cases who assessed them it was also fellow peers, friends and other trainees who would also make comments about their progress or also do a demonstration for them. All this took place during rather than at the end of the training process which is in keeping with the constructivist approach to assessment where it is placed midway in the learning and teaching process rather than at the end, Shepard (2000, p.8).

The participants were asked to describe what the expert was doing when they were training them and also during the assessment process. The experts being able to mediate experiences for the novices did so from their own experience in the field of computers. As discussed in the analysis most of these procedures had to be done by the novices, the expert could only but watch. With some of the procedures it was obvious what the novices were doing wrong and therefore the expert could give advice. But with some procedures the expert would advice but the novice just could not grasp it from just being told or having read, the novice had to practice these procedures.

It was also difficult for one of the respondents who had been involved in training novices to understand why the novices just could not get a procedure. The expert had shown them what to do. Had even answered questions but the novices still could not get the procedure it was only after many times even months later after much practice that the procedure was acquired. Then one can say that being that the procedure was not easy to explain the skill was tacit in nature.

It also emerged from the interviews that the novices had not taken any written tests, that was not part of their assessment. Their assessment was informal in the sense that there were no pre-specified criteria written down, the expert just observed the novice as they worked. What did they use? It could only have been their experience, their tacit knowledge that they equipped during the assessment. Their tacit knowledge had to be trusted when judgements were made about the novices progress.

This type of assessment of course is not objective as one cannot see how it is done, but it has been trusted by many, workplaces, professions rely on tacit knowledge as a form of assessment and even in training. It is just not identified explicitly sometimes. It can also be concluded that in cases where explicit criteria is not used to judge the novice that the expert is using their tacit knowledge to assess the novice.

The novices could during their learning process, self-assess from time to time, if the learners were not getting something correct, for example it did not work after all the work done on it, they could make a judgment about their own progress. Therefore assessment done by experts, peers, friends and their own self-assessment, added to their learning. The mediation like relationship as in Vygotskies zone of proximal

development Ian et al (2005), between the experts and the learners was important because it was through the regular judgments of the learners work that they were given guidance.

It also emerged from interviews that some respondents had disliked judgment because they felt criticised or attacked, they felt it was not welcome but Roth (2003)argues that, “mistakes can illuminate”,(p.402), they can give direction and one can learn from them and strive to do better.

What also emerged from the interviews is that during the assessment process one of the respondents had unpleasant experiences with their assessor. It has to be noted that in a community of practice relationships among members are not always harmonious. Wenger (1998), mutual relationships between people in the workplace can be very complicated, both good and bad are present in these relationships.

5.3. Limitations of the Study

- Observation of the computer assistants training could not be done; therefore the study had to rely on participants responses.
- Observation would have made it easier to identify the tacit skills present in the workplace, at present only a few of the tacit skills could be discussed in this thesis. Observation would have given richer information about tacit skills and knowledge.

- Some questions were not answered as in depth as desired, owing to some respondents not being able to remember everything from the training they underwent or in some cases the training they gave.

5.4. Recommendations

From nine interviews, the findings cannot be generalised to a wider population and further research could reveal different and richer results. The study recommends that further research be conducted, involving both qualitative and quantitative methods and qualitative and quantitative presentation of results.

In terms of the study itself, the case histories gave some insight into the learning and assessment practices within the community of practice. The case histories alone though are not sufficient for gathering ethnographic evidence, the participants could not remember everything in as much detail as needed. Observation of the computer assistants along with case histories should be used in further research.

5.5. Conclusions

One of the objectives of the NQF is to improve education and training in South Africa. SAQA has been legislated to help the NQF reach its objectives; SAQA has many projects in the pipeline so that it can work towards reaching these objectives. These projects have been delegated to three South African tertiary institutions, Rhodes University, University of the Western Cape and University of the

Witwatersrand. The projects in question might work towards improving our understanding of learning in the workplace.

Using case history interviews has been the method of gathering evidence for this study. Although the participants were able to give some accounts of their early experiences and how they were assessed, it was unfortunate that in some cases some of this could not be remembered in detail. Nonetheless, the case histories have contributed to uncovering aspects that give a further understanding of how learning took place and how expert assessment took place in the community of practice.

It is not only explicit theoretical knowledge that is present in learning situations, tacit knowledge is also important. Tacit knowledge has been the underdog in education for many years. It has been acknowledged that not everyone has the opportunity to access further education at tertiary institutions. Some people further their education in the workplace and through everyday experiences. The above findings suggest that we should further research the area of informal learning in the workplace.

Learning involves many factors, psychological (Piaget and Vygotsky) and social Lave and (Wenger). Motivation, interest, encouragement, observation, imitation and application also play an important role in learning and acquisition of tacit skills. Assessment also plays a role in learning, especially formative assessment, which supports learning rather than just being judgmental and not assisting the learner. Experts tacit judgment is also important in assessment, it involves an experts experience too, which is equally if not more important. This type of assessment also supports a learning environment in the workplace.

This research is important and adds value to this particular workplace setting that was studied, as insight is given into how training of computer assistants can be improved, this could give people more access to this workplace and training that the organization gives could be improved. The study could possibly be used as direction on how to proceed in terms of the NQF. It cannot be denied that expert assessment needs to be recognized on the NQF. Assessment does not only occur against pre-specified conditions. Not only should informal assessment of this nature be recognized but it does add value and facilitate the learning process.

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SUBJECT INFORMATION SHEET

My name is Sindiswa Msimango, I am a Masters in Education student at the University of The Witwatersrand. As part of my degree I am conducting a research study on how experts in the workplace use their experience and tacit knowledge/skills to assess novices.

For the needs of the project, interviews and discussions will be conducted.

At any time, you can decide to not participate in the interviews or discussions. In addition be assured that efforts will be made to retain your confidentiality in the study. No names or personal information will be divulged. All data will be kept confidential and is the property of SAQA research directorate.

This information sheet aims to give you a general idea of the nature of the research. Please do not hesitate to ask for more details by communicating directly with me.

Your signature attests that you have understood the above information concerning your participation in the research project and indicates that you agree to participate, knowing that you can revoke your consent at any time. Please do not hesitate to ask for clarifications or new information during the research process.

With thanks, Sindiswa Msimango

_____ _____

Name of participant Signature

_____

Date

INFORMED CONSENT FORM FOR INTERVIEWEES

I understand the aims of the study and the procedures involved. I understand that my participation in the study is voluntary and I can withdraw anytime I want to.

I understand that my name will not appear on the interview schedule and it will not be used in the final report.

Any information I reveal to the researcher will be treated with confidentiality.

I agree to take part in the study, by answering questions during the interview

_____ _____

Signature of participant Date

I (Sindiswa Msimango), have explained the procedures and the aims of the study to the best of my ability. I have assured the participant that participation is voluntary and that he/she can withdraw anytime he/she wants to.

I have also guaranteed the participant that all information revealed to me will be treated with confidentiality and that his/her name will not appear on the interview schedule and will not be used in the final report.

_____

Signature

INFORMAL INTERVIEW SCHEDULE FOR KEY INFORMANTS

- How long have you been in this field?
- Have you ever been asked to help newcomers/novices?
- What do you think is the most difficult thing for newcomers to grasp?
- What for you was difficult to grasp and how did you overcome it?
- Did you learn more from formal training or from being ‘on the job’?
- How does one know when a person is ready to be an active member of the team in any workplace?
- How do you think tacit skills are passed onto novices?
- Who assesses when someone is competent enough to enter the field?
- Who assessed you? How did they do it?
- Have you assessed a novice? What did you use to help you make a judgement?
- What do you think are the most effective assessment methods to use when assessing a novice?