The transformation of local knowledge to qualification descriptions

James Garraway, Peninsula Technikon: Cape Town, South Africa

Introduction

Promoting and improving water and sanitation practices in rural areas without piped water is a priority of the new South African Government. One approach to doing this is to enhance the knowledge and skills of project workers through the development of appropriate qualifications. The structure for ensuring water and sanitation delivery involves government-funded projects which work in communities. Each project consists of specialised individuals who either build toilets, order and store materials, monitor health in the region, relay information to the community, keep financial records and budgets or manage the project as a whole. One role of the work of the researchers described here was to try and better organize the sector qualification and training development.

The paper examines the idea that movement of knowledge and things from one situation to another involves change. The final object, in its new situation, may be substantially different from the original object. The process of change occurs, firstly, because of the conditions and traditions of the new situation into which the knowledge is moved, and secondly because of the compromises negotiated between the different actors involved in interpreting the knowledge. The above processes of knowledge change have been described in the development of technological innovations (Callon M, Law, J & Rip A, 1986) and the transfer of technology (Law, 1997); in the development of scientific knowledge (Latour, 1999) and in the writing of scientific papers and essays (Bazerman, 1988; Callon M, Law, J & Rip A, 1986);and in the transfer of knowledge about how to manage large cities (Czarniawska, 2002).

In this paper the author attempts to extend the ideas of knowledge movement and change described by Latour (1999) in science to that of knowledge movement and change from the world of work to qualification statements.

The transformation of knowledge in science - Latour's soil example.
The Amazon, Boa Vista case study

In presenting this case study I have attempted to draw out the main nodes of knowledge transformation, with a particular focus on those transformations that seem relevant to the transformations which occur in qualification development. My presentation is thus itself a transformation of Latour's work rather than a faithful summary.

In Latour's description of the Boa Vista region of the Amazon basin a group of scientists, botanists, pedologists and geomorphologists, set out to investigate a problem, namely 'is the forest advancing or receding?' This is an important and relevant problem for these scientists and their scientific communities.

There is a particular piece of ground which interests them - the boundary between forest and Savannah. They wish to know what is happening here, and choose to do so by examining both changes in vegetation and changes in soil type around this boundary.

Sampling soils

The scientists begin by mapping out the area of soil they wish to examine at the forest/savannah interface in the Boa Vista region, and divide it up into squares on a Cartesian grid. The soils are sampled using this grid but are also sampled with a number of overlaying organizational features. The pedologists and geomorphologists are concerned with the slope of the land and thus record this with stakes and a 'clinometer'. Next, against these overlays, positions are marked off where holes are dug. A core sampler is used to take soil samples from various depths; each sample is then logged against its Cartesian co-ordinates on the grid, and its vertical co-ordinates according to depth.

Each soil sample is further classified according to its colour and texture. For colour the soil sample is matched to the most similar coloured card (Munsell code) and given a colour reference number. For texture the process is different and more subjective; whether or not the soil is sandy, sandy-clayey, clayey-sandy or clayey is decided upon by a collaborative soil rolling exercise (as with composition, the exact texture can only be decided upon in the laboratory). In both cases a physical property is replaced by an annotation.

The next stage is to represent all these soil samples in some sort of holistic form, so that we can see them all at once. This is done by use of a simple device called a pedocomparator. The pedocomparator is like a draw divided into many small boxes. Soil samples from adjacent sites and the same depths can be placed next to one another in the boxes. A pattern of change in soil type can thus easily be seen.

The final move in the transformation of the soil is to represent all that has been found out onto a single diagram in the form of a cross section of a transect of the forest/savannah interface. This is differently shaded and annotated to show changes in overall soil type, texture, colour and position. Scientific knowledge, as represented by the diagram, is highly stylized showing soil profiles and references which refer to particular soil characteristics. The diagram is the result of a number of knowledge transformations such that we cannot see this particular part of Amazon Basin forest/savannah interface when we look at it. It is possible, however, to walk back through the research process, through tables, grids, discussions blind leads etc. and recreate the original context the diagram was drawn from (it is also very portable which of course a chunk of the Amazon basin is not).

'The soil' which covers the whole area under investigation has certainly undergone some sort of transformation in its passage, via the various stages and the pedocomparator, to a cross sectional representation. It is still the same soil but it has been selected and acted upon (for example sampled and colour coded). The pedocomparator **articulates** the properties of the soil samples. That is, it brings to the fore certain properties of the soil, such as position and colour, in order to make comparison possible. And this in turn makes possible further action on the soil. For example, the changes in soil properties can be represented graphically with the sides of the pedocomparator forming the x and Y axes.

As well as this the soil has been **translated**. By this is meant that the soil has been represented selectively so as to conform to the needs of the initial problem – is the forest advancing or receding? Much information about the soil, for instance its acidity or alkalinity, has been left out.

It is clear that a cross-sectional diagram is not the soil at the forest/savannah interface of Boa Vista, but a representation of it derived through a chain of transformations. As Latour puts it, the cross section replaces the actual, real forest. He puts forward a further interesting point here. In the chain of transformation, the soil, in all its rich contextuality, is stripped of extraneous information and reduced to an abstract diagram. We could represent this '**reduction**' graphically like this:

Transformation as reduction
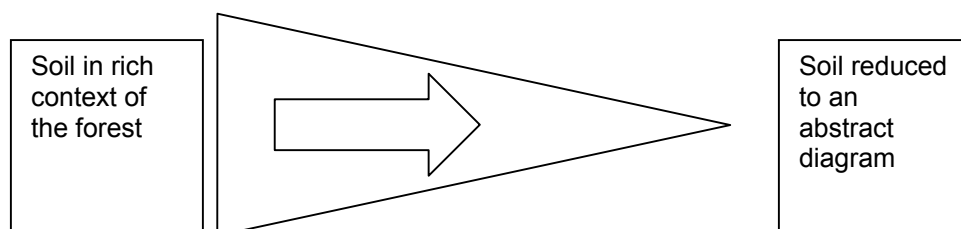
Returning to the case study, the soil is not only reduced but at the same time given properties (graininess, colour coding) that enable it to better fit in with preexisting scientific systems. In this sense certain properties of the

soil are not so much reduced and abstracted but **amplified** and concretized; the soil becomes more in the field of science than it was in the forest.

Transformation as amplification
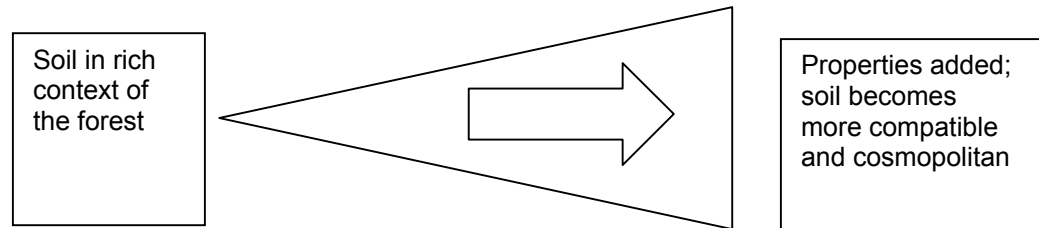
This is, perhaps, the essence of translation, that the soil becomes positioned in certain ways particular to the problem at hand, which is itself part of a larger system, that of botanical/pedological discourses, along a chain of transformations. Latour refers to the changes that the soil undergoes along the chain as **circulating reference**. By this he means that we do not discover the soil as we engage in research but that the process of transformations successively strips the soil of certain properties (reduction) and at the same time adds properties to it (amplification). But these added properties have a purpose in that they render the soil more **compatible** with larger, super-systems of scientific knowledge; the soil is now more cosmopolitan.

This selected account of Latour's analysis provides us with an interesting and stepwise account of knowledge movement and change within the world of scientific endeavor. I will now extend this selected analysis as a potential framework to explain knowledge change in a different world, that of qualification development in the field of water and sanitation

Transformation of knowledge from the workplace to a qualification
In Latour's analysis the source of knowledge was the forest floor; in dealing with qualifications the source of knowledge is the workplace. Latour analyses how knowledge at the source becomes transformed into scientific discourse; in dealing with qualifications the discourse is that of education. In extending Latour's analysis to qualification development I will start with a description of the workplace as the source of knowledge.

The water and sanitation scenario
The area we are dealing with is near the Botswana border, in the North-East of South Africa, in the Mafikeng district. Like vast tracts of rural South Africa the area is without waterborne sewage. A major part of local governments job is to ensure that waterborne diseases are prevented and controlled through encouraging hygienic practices generally, and through the appropriate construction of pit latrines. Without waterborne sewage, Ventilated Improved Pit Latrines (VIPs) provide the best solution for disease control. The work on water and sanitation and the building of VIPs is to be done through water and sanitation employees who will work with communities.

There is, though, a problem. Despite the projects such as the one described above, waterborne diseases are still rife in the area. The researchers believe that this is because on the job training of water and sanitation workers have placed too much emphasis on the workers ability to successfully run and communicate effectively within community structures, rather than to work as interactive professionals within a project. The interactive part is seen as important; builders need to know what health promoters, bookkeepers and storekeepers do and why they do it this way and not another, if the project is to run smoothly. It is this project emphasis which perhaps provides a level of **translation** of the knowledge gathered by the researchers; i.e. knowledge gathered is aligned with the different stages of the project, what everybody does, rather than on community structures and communication.

Knowledge transformations in developing a water and sanitation qualification

The researchers cannot visit all the pertinent local government areas so they take a sample by asking provincial organizations to select their best water and sanitation (W & S) projects, and to justify this selection. They then visit each sampled site and gather information from the members of the project about what they do and what they think they need to be able to do. Because work within a W & S project typically occurs within a project cycle, i.e. identifying health and sanitation needs, registration of households, the development of VIPs and quality control, the researchers used this as a tool to gather and initially organize information in a table. So, for instance, identifying a need requires the functional skills of project management and the ability to identify health problems.

This is a first level of knowledge transformation. The 'things' which people do in their day-to-day work have been transformed into descriptors of functional skills (project management, for example). There is a contraction or an abstraction here in that what is expressed as a functional skill is a generalizable term for a number of activities. This is information recorded on site. Once in the form of a table, the information can be moved to their offices approximately 1 500 Km away in Cape Town.

In Cape Town a major tranformative move occurs. The functional skills that were previously linked to the stages in the project cycle where they occur become de-linked. Instead, they become a pool of disconnected descriptors which can then be put together all in one place. The researchers use an organizational trick here; they write out each separate skill on a small sheet of paper and affix each of these skills temporarily and randomly to a larger, sticky sheet of paper. They can then see all the functional skills at once and begin the process of organizing them into groups. This is an iterative process; as one group emerges so it changes the composition of another, pre-existing group.

This process of categorization is the second major transformative move. The pool of disparate elements (functional skills) are clustered under headings. For example the functional skills of monitoring the health of a group of households, conducting health visits, identifying health problems, doing groundwater risk assessments and monitoring peoples behavior can all be grouped under the heading of 'Observe, investigate and monitor people and things' .

The sheet of paper and the skills randomly stuck onto to it, is a device which enables **articulation**; that is, it is something which brings out commonalities and differences such that we can categorize and compare the skills.

In a sense the clustering 'emerges' on the sheet of paper as the device enables the researchers to match like elements. But there is continuity here too. The elements we began with, the roles people perform and the part of the project cycle they are in, emerge again, in a different form, having lost some properties and gained others.

The next transformation in qualification standard development is one of **reduction**; only the category headings, and not the detail, move onto the next stage. But this reduction is an enabling device, one which renders the headings as proto-qualification standard titles to prepare them for comparison to the full field of pre-existing qualification standards. It is a process of preparation for **compatibility** to a larger world out there. In some cases the researchers will say 'this pre-existing qualification standard provides a necessary introduction to ours' or 'such –and-such qualification standard should be done with our qualification standard' or even 'this pre-existing qualification standard can replace ours'. Thus from this comparison new combinations may emerge; our proto-qualification standard titles may be enriched or replaced. In the sense described previously, the standards become **amplified**.

There is a final phase of transformation to do with career pathing. In the lower level qualifications workers are trained mostly in their selected pathway (as a builder, bookkeeper or health monitor) and a bit in other functions. As they go into more advanced training so the amount of cross-disciplinarity increases; the health monitor learns enough about building and bookkeeping to be able to engage in these practices and the same applies to the other specializations. Through learning about other specializations, people are being trained as managers.

Discussion

The paper describes how local knowledge in science and education becomes packaged into forms more compatible with global discourses. The Boa Vista context enriches the field of science in that it explains a hitherto inexplicable problem – does soil change precede vegetation change or vice-versa? And it further provides linkages between other scientific disciplines (for example botany and pedology) and a platform for further scientific endeavor. In fact, the endpoint of this research points to earthworms being a major factor in soil change, a topic which can become the next focus of investigation at the local level. Thus the packaged, global discourses have enabled some form of re-insertion of knowledge at the local level; the global acts on and feeds the local and vice-versa.

In the field of educational qualifications we would also like to know about the reinsertion of the qualifications at the local level. Do the qualifications represent and extend the on-the-ground experiences of those doing health and sanitation work? And in so doing do they act to improve health practices in the community? If they do not do this then they do not serve much purpose. Unfortunately, at the time of writing, the qualification statements had not reached the ground in the form of programmes of learning, and it seems that this development is still a long way off.

But the qualifications were acting, and acting in powerful ways, not on the ground but more at the decision making and policy levels. This was because they came from the 'real world' of the projects, were part of a developmental ladder and were hybrids of previous qualification statements.

According to the researchers the qualification statements done in this study were acting as both a 'bridge and container for everybody else's work'. They were used by the researchers to provide a sense-making device for government, labour, funding and program provider organizations, something which could hold together the disparate approaches to curriculum. They were also used by the researchers to influence the future directions of qualifications, and prevent powerful water bodies from forcing through their versions of qualifications.

The transformation of local knowledge into qualification statements made the local knowledge more compatible with the existing qualification work; the transformed local knowledge could now be matched and compared to other qualifications statements. In a sense local knowledge was transformed into 'qualification discourse' and was able to act far away from its origin. It was a far more powerful discourse than, for instance, a description of local practices in water and sanitation alone.

From this qualification report it seems clear that by transforming the local into global knowledge it has been able to act with some force. The question we are left with is how effectively it can be reinserted locally. The researchers believe there is no problem here; such locally developed statements substantially change both the content and the methodology of training programs on the-the-ground; for instance training will become increasingly cross-disciplinary at more senior levels. The truth of this, however, remains to be seen.

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