

1985

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J. W. McQualter  
*University of Newcastle*

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### Recommended Citation

McQualter, J. W. (1985). Teacher Knowledge Part 2: Personal Construct Theory as the Basis of a Methodology to Study Teaching. *Australian Journal of Teacher Education*, 10(2).  
<http://dx.doi.org/10.14221/ajte.1985v10n2.3>

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<https://ro.ecu.edu.au/ajte/vol10/iss2/3>

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## Teacher Knowledge Part 2: Personal Construct Theory as the Basis of a Methodology to Study Teaching

J. W. McQualter  
University of Newcastle

In the previous paper, *Teacher Knowledge Part 1: Unstopping the Dam*, the suggestion was made that a methodology based on Personal Construct Theory (PCT) could be used to explore and develop a new model of teacher professional development prepared by Fielding (1983). Two questions were asked. What is this methodology? How can it be used to explore and develop Fielding's model? The second question was dealt with in the earlier paper. The first is the subject of this paper. The intention here is threefold; firstly, to describe the theory of personal constructs, originated by Kelly (1955) and elaborated by Fransella and Bannister (1971) second to discuss the preparation and analysis of repertory grids, a procedure stemming from the theory conceived by Kelly (1955, 1961) and again elaborated by Fransella and Bannister (1977); finally to consider some of the measures used in and interpretations made of repertory grid analyses.

### Personal Construct Theory

Kelly's idea of a "personal construct system" holds that a person is an activist, constructing something. Personal constructs are personal representations of some aspect of reality. Personal knowledge and the process of personal learning involve translating an idea into action and experiencing its consequences. To Kelly reality is subject to many alternative constructions and when exploring a person's construct system we are viewing the person as "man-the-scientist" not "man-the-laboratory-subject" (Kelly, 1961). There are three basic assumptions: constructive alternativism, "man-the-scientist" and double entity choice. First, there are alternative ways of seeing reality; second, individuals derive hypotheses (expectations) from theories (personal construing) which are tested (actions); third, a construed object stands in contrast to at least one other imaginable object (Kelly, 1961). A construct discriminates between entities and is used to indicate a person's stance. A construct system can be the basis on which a person develops his or her personality, attitudes, habits, concepts or philosophy. Personal constructs are the baseline for differentiating between

objects, events, people; personal constructs give *meaning* to such elements.

Personal construct theory is presented as a fundamental postulate, eleven corollaries and a set of definitions dealing with the formal aspects of constructs and how constructs may be classified to aid in analysis and interpretation of rep grid data. While these aspects are well presented and discussed (see Kelly 1955, Fransella and Bannister, 1971) a summary is useful here.

The fundamental postulate states that "a person's processes are psychologically channelled by the ways in which he anticipates events" (Kelly, 1955, Ch.2). People construe events (construction corollary) differently (individuality corollary). This system contains dichotomous constructs (dichotomy corollary) and provides alternatives (choice corollary) within a finite range (range corollary). The system can be varied by experience (experience corollary) and limited in variation by type of construct used (modulation corollary). A person can have different construct systems (fragmentation corollary) but persons can hold common constructions of experience (commonality corollary) and social interaction (sociality corollary).

As the personal construct gives meaning - the baseline for differentiating between elements - formal aspects of these personal constructs are given.

A construct has a *range of convenience* (elements to which it is usefully applied) and a *focus of convenience* (elements on which the construct was originally formed and elements for which the construct is maximally useful). *Elements* are objects, people and events abstracted by the use of a construct and provide a *context* in which discrimination by means of constructs is done. As constructs are dichotomous they have two poles, related through *contrast*. Each construct has a *likeness end* (about which similar elements are gathered) and a *contrast end* (the opposite pole). Poles can be emergent (embracing most of the immediately perceived content) and *implicit* (again a contrast to the emergent pole and frequently lacking a symbol or name). A construct *symbol* is an element in context representing itself and the construct by which the user abstracts that construct. Constructs are *permeable* when they admit new elements to their context, *impermeable* if they do not.

Constructs are then classified according to the nature of their control over elements. Constructs can be *preemptive* (elements are exclusive to its realm), *constellatory* (fixing other realm membership for elements) or *propositional* (carrying no implications of other realm membership). This last is an uncontaminated construction.

As the original use of Personal Construct Theory was in clinical psychology a number of general diagnostic terms are described.

Constructs can be *preverbal* (used with no consistent word symbol) or *submerged* at one pole (less available for application). An element can be *suspended* when it is omitted from construct context as a result of a revision of the construct system. The *level of cognitive awareness* shown in construct use can range from high to low, high levels being illustrated by the use of socially effective symbols, accessibility of alternatives within the range of convenience and not being suspended by the super-ordinate constructs in the system. A person's construct system can *dilate* (a broadening of the perceptual field in order to reorganise the system) or *constrict* (the perceptual field narrows so as to minimise apparent incompatibilities). Within the construct system constructs can be comprehensive (subsuming a wide variety of events), *superordinate* (including another construct in its content as an element) or *subordinate* (included as an element in the content of another construct). *Regnant* constructs are superordinate constructs which assign elements to a category on an all-or-none basis, and so are not abstractive. Finally there can be *core* constructions (governing a person's maintenance processes), *peripheral* constructs (these can be altered without serious modification to the core construct), *tight* constructs (leading to unvarying predictions) and *loose* constructs (providing varying predictions while retaining construct identity).

Constructs are related to transition. Such concerns as *threat*, *fear* and *guilt*, are described in terms of awareness of likely changes in a person's core construct system: *threat* (imminent comprehensive change), *fear* (imminent incidental change), *guilt* (dislodgement of self from core role structure). *Anxiety* is awareness of events confronting a person as being outside the range of convenience. *Aggressiveness* is active elaboration of the perceptual field while *hostility* is continuing to find evidence in favour of a social prediction recognised as a failure. Two cycles of construct operation are then described. The *CPC* cycle is the sequence circumspection, pre-emption and control by which a person makes a choice in a particular situation. The *creativity* cycle is the process of loosened construction becoming tightened and terminating in a validation construction.

### Personal Construct Procedures

Along with this theory Kelly developed the *repertory grid* procedures as a technique for making sense of a person's world of meaning, that, how the individual sees some part of reality. The *repertory grid* is a matrix, each cell of which represents how a particular element is discriminated by a

particular construct: "a general mathematical operation for relating events and behaviours" (Kelly, 1961, p. 113) using personal constructs as the basic units. The *repertory grid* is a form of structured interview formalising the interactions of interviewer and interviewee and assigning mathematical values to the relationships between a person's construct in the context of a certain situation containing the elements. The *repertory grid*, and the procedure of *self-characterisation* (Kelly, 1955, p. 323 - 326) are methods of self-exploration, ways an individual understands oneself. Kelly has commented that the primary purpose of psychological measurement is to survey the pathways along which an individual is free to move (Kelly, 1955, p.203).

One basic technique for *deriving* constructs asks subjects presented with groups of the three elements (role titles, people, beliefs, book titles etc.), to specify some important way in which two of them are alike (construct pole) and thereby different from the third (contrast pole). Alternatively, a set of construct might be taken from the research literature or some other justifiable source, and these *provided* to subjects who rate or rank a set of elements on each.

The resultant grid represents a sample of a person's construct system. The person can use it to anticipate events, determine behaviour or ask questions. It enable the person to examine relationships. The elements construed by the constructs must fall within the constructs' range of convenience, that is the application of constructs to the elements is useful to the person. Grids should be examined in the light of the formal content of personal construct theory described above. The means of obtaining the grid is based on this theory, in particular on the fundamental postulate and the construction, dichotomy, choice and range corollaries. The grid obtained is only as good as the use made of these corollaries in collecting it. The examination of grids seeks to find meaning in terms of these and other corollaries, and the formal descriptions of constructs and construct relations given above.

Analyses of the grid data can be conducted manually or using specially developed statistical packages. Both types of procedures are usefully summarised in Fransella and Bannister (1977). Pope and Keen list five major considerations when using the *repertory grid* (Pope and Keen, 1981, Ch. 4). First, there is the need to determine the range of convenience, how the rep grid is to be used: for reflection or to extract "deep structures". Second, decisions need to be made about constructs and elements; elicited from or provided to the person. Third, there is the matter of scaling: to grade or to rank. Fourth there is the need to decide, if the eliciting process is chosen, as to how to elicit, using the original method of Kelly or other methods

involving interview, questionnaire or interactive computer programmes. Finally there is the question of how to analyse the data, by hand or using a computer package.

In the work done with mathematics student teachers (McQualter and Warren, 1984), even though each *rep grid* was a fifteen by thirty matrix (15 elements providing columns, 30 constructs providing rows), it was found that an examination of the raw data by comparing grades across columns and down rows provided a good preliminary "picture" of each student's belief system about mathematics teaching. Then each matrix was analysed using the computer programme INGRID 72 (Salter, 1977) as its statistical analysis provided the widest range of results. Using this programme provided the means to prepare both *personal life space maps*, based on the results of principal component analysis, and clustering or focusing on construct associations, based on correlations (Pearson's  $r$ ) prepared by the programme. There are other programmes available which do provide principal component analyses or associations based on correlations. However, INGRID 72 does relate the two. Its major fault is that it does not provide a means of construct and elicitation through an interactive programme as most of the other available programmes do (for example Keen, 1982; Thomas and Harri-Augstein, 1982).

### Some Interpretations and Measures

Essentially the interpretation of the results obtained by analysing a rep grid by any of the various methods is to look for associations (similarity) and ordination (organisation of the construct system). Interpretation of grid analyses is finding meaningfulness in patterns of association of constructs and elements and relating this to the individual's construing. There is no such thing as correct or incorrect, just what relationships exist. Such relationships can exist at the individual level (individuality corollary) or for a group, showing a common realm of meaning (commonality corollary). These two corollaries are in a sense opposites and their links must be traced using construct correlations. The sociality corollary provides the rationale for linking certain elements with the constructs and warns the investigator that construing is two way. While the main purpose in examining each grid is to explore a person's construct system (organisation corollary), subsequent grids can show changes in that organization, particularly in choice, range and modulation of the system through experience. At the centre of all interpretation of grids, however, is the exploration of the construct system: how it is organised.

When *organising* constructs a person appears to have a *hierarchical* system.

Some constructs are *superordinate*, others *subordinate*, in their relationship to each other. Constructs can fall into three categories: pre-emptive, constellatory and propositional. These categories can be seen as "nothing but" (pre-emptive), "is also" (constellatory) and "as if it were" (propositional). Examining grids requires asking four questions: (1) What does this mean? (2) How is it used? (3) Why is it seem this way? (4) Does this perception need to change?

The literature on Personal Construct Theory and its applications contain many detailed discussions of measures derived from analyses of rep grids (see Fransella and Bannister, 1977; Rathod, 1981; Adams-Webber, 1979, 1981; Bell, 1983; Pope and Keen, 1981; Slater, 1977). These are concerned with determining cognitive differentiation and integration of a construct system. For example, cognitive simplicity and opposites at ends of a continuum. *Simplicity* is seen as *constrictive* and *pre-emptive*, that is minimising apparent contradiction and limiting the number of constructs being applied to an element. The opposite of constriction is *dilation*, the opposite of pre-emption is *circumspection*. The first considers a new array of elements so as to reorganise the construct system at a more comprehensive level, the second occurs when additional constructs are employed. The person's construct system is then said to be *cognitively complex*. By looking at the results of a Principal Component Analysis of a rep grid the amount of total variance accounted for by (a) the largest component, and (b) the three largest components, illustrates cognitive simplicity (large amounts) or cognitive complexity. If the components are used as axes, a spatial model (life space map) can be prepared of a person's construct system by using the loadings of each construct and element on a pair of components as co-ordinates to plot that element or construction in the space defined by the axes. Each element is retained as a point but each construct is shown as a vector, obtained by joining the origin to the construct point and then continuing the line to the space boundary. This becomes the emergent pole of the construct. Relations between constructs, between constructs and elements, and the nature of the components can be taken in quickly. A second model, using components one and three as axes, would provide another cross-section of the person's life space and show certain relations in three dimensions.

*Integration of Self with Others* is the perception a person has of being similar to others. One measure used to show this is the mean of the computed distances of the element "self" from all the other elements, excluding the element "ideal". The distances can be obtained from the "map" or from the table of distances between elements provided by INGRID 72. *Self-Esteem* is usually shown by the distance between elements "self" and "ideal" on

the largest component. These are some interpretations of the INGRID 72 analysis, the most important being that the analysis of the rep grid data provides the means for preparing the life space map: an individual's realm of meaning. Such spatial models have been endorsed as being more meaningful than cluster analysis of the correlations between constructs (Rathod, 1980; Bell, 1983).

This latter technique, called focussing, studies the organisation of a person's construct system by identifying clusters of "significant" construct intercorrelations. The construct system is classified as being *monolithic* or *segmented* (Ashworth et. al., 1982) depending on the size and number of construct clusters. Monolithic is related to *cognitive simplicity*. Monolithic systems usually contain one primary cluster and two secondary clusters. Primary clusters contain six or more constructs all related, secondary clusters contain constructs relating to some but not all of those in the primary cluster. Segmented structures contain four or more clusters each containing no more than four interrelated constructs. An *implication string* is a table of construct relations prepared by listing each construct and the construct with which it has the largest positive or negative correlation. This enables the interpreter to locate possible sources of construct clusters. Of interest here are those constructs which have a correlation of zero. These are seen as independent of each other and advance understanding of spatial models, as constructs which are orthogonal indicate the nature of the major components, themselves independent. The analysis of a mathematics student teacher's beliefs about mathematics teaching (McQualter and Warren, 1984) lists some construct implication strings. From these were prepared, by hand, thirty by thirty matrices of construct intercorrelations showing construct clusters where the correlation magnitude was larger than 0.5. The interpretation of these is still being explored. The main problem facing those using the various means used to analyse the rep grid is that much of the interpretation and many of the measures derive from rep grid analysis done by clinical psychologists.

### Conclusion

Rep grid preparation and analysis, developed from the theory of Personal Constructs, shows promise as a methodology for the study of teaching and teachers, in particular as a means of investigating the nature, development and application of *Teacher Professional Knowledge*. While there are problems in its application, some of which have been alluded to above and in the earlier paper *Teacher Knowledge: Unstopping the Dam*, many of these problems could be overcome as more work is done in applying it in

educational research. The building up of a body of literature on PCT research on educational problems is important here.

There are several surveys of work being done (see for example Pope and Keen, 1981; Rix, 1983). Studies of teacher change have been conducted since 1976 (Adams-Wibber and Mirc, 1976; Henry, 1981; Diamond, 1982, 1983, 1985; McQualter and Warren, 1984; McQualter, 1985). Work on self-organised (adult) learning, which seems to be particularly relevant to teacher education, is being done (see Thomas and Harri-Augstein, 1977, 1982; Thomas, 1985). Another area of interest to teachers, evaluation of curriculum materials, has also been suggested as being able to benefit from the use of rep grids (Steadman, 1976). The concept of the teacher/researcher, as proposed by Stenhouse (1977, Ch.10) and Pring (1978), could be explored using rep grids, especially if allied to that of Action Research (Grundy and Kemmis, 1981) and case studies of curriculum (Stenhouse, 1978).

The development of the use of PCT procedures as a research methodology to examine educational problems is part of the paradigm shift noted by Cavanagh (1983). As Pope and Keen have it:

“Repertory grid techniques are proposed as an alternative methodology which allow both research/teacher and participant/learner a means of monitoring and reflecting on idiosyncratic frames of reference which the learner evolved”.

(Pope and Keen, 1981, p.2).

Research is concerned with explanation but as Magoon (1977) once pointed out,

“Predictions about precise individual behaviour are one facet of explanation, but pattern explanations are equally legitimate and useful and may be a better scientific goal approximation for many purposes”.

(Magoon, 1977, p.688)

What better way is there to study the idiosyncratic frame of reference so as to obtain pattern explanations of the world of teaching than using the already tried and tested rep grid technique?

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