Chapter Four: Research Method

Research propositions

The theoretically derived method and the studies discussed in this research report informed this replication study to enable it to attempt to demonstrate that this more than 70-year-old procedure continues to have validity for contemporary cognitive psychology and psychology in education.

This research exercise aimed to be a meticulous replication of the (1928-1934) Vygotsky and Sakharov functional method of double stimulation for the study of new concept formation (Vygotsky’s Blocks) using the 22 wooden blocks and a combination of the scoring and methodological techniques of Hanfmann and Kasanin (1937; 1942), as translated and adapted by them from this earlier work of Vygotsky and Sakharov. This was conducted as a cross-sectional study from early childhood to adulthood. (However, the approach by Sakharov to provide a ‘present’ to a child who successfully manages to solve each of the word problems was not included in this research exercise. My reason for excluding this element is that I believe it introduced a type of stimulus-response element that I found rather ‘behaviourist’.)

The study intended to find out whether contemporary children and adults produced the same or similar patterns as described by Vygotsky (1986), as well as those findings of a selection of researchers who used the adapted procedure of Hanfmann and Kesanin (1937; 1942). In this way, the research aimed to contribute to a renewed understanding of how people of all ages form new concepts; to resituate the value for educationalists and others involved in cooperative enterprises of understanding the paths from preconceptual to truly conceptual thinking; and to highlight the importance for constructivist educators and key personnel to be conversant with these specific theoretical and empirical constructs of Vygotsky’s.

The participants

Sixty participants ranging in the following age-groups participated in the study. With the exception of the adult subjects, the subjects ranged in age of not more than six months per age group.

- 10 three-year-old children
- 10 five-year-old children
- 10 eight-year-old children
- 10 eleven-year-old children
- 10 fifteen-year-old adolescents
- 10 adult subjects (aged from 26 years to 76 years old)

The first five groups of participants attended either a private Nursery School or a private school for children from Grade R (Reception) through to Grade 12. The adult subjects worked for a company that provides specialised financial insurance services. These three research sites were all based in Johannesburg.

Brief outline of this replication study

The sixty subjects who participated in this study did so with a set of blocks that was ordered from Stoelting Co., Chicago, Illinois, the first company outside of the Soviet Union to manufacture these blocks in 1937. These blocks are the sizes and heights described by Hanfmann and Kasanin (1937; 1942), with the difference being that the red blocks are orange and that Stoelting Co. no longer uses a board. I took measurements from Hanfmann and Kasanin’s 1942 photograph and made a board as closely as possible to the original as can be obtained from these measurements. Sessions took place in
quiet areas in the various sites and were recorded by a statically positioned DVD camera and annotated notes on the proceedings. Two research assistants were involved in making notes on the scoring sheets for each participant. A foam board with insets cut into it was made to ensure that the placement of the blocks was identical for each participant.

The blocks (from Stoelting Co.), my foam template for the blocks and the board I made for this study

Type of information gathered

Both qualitative and quantitative data was obtained during the experimental sessions (the first three Appendices refer).

Qualitative data was obtained by observing and recording subjects’ responses to task demands (their understanding of what was to be done); the reasoning processes that the subjects talked about during the experiment; and their reactions to incorrectly place blocks as they solved the problem of why the different blocks belong in four groups (as per Hanfmann & Kasanin (1937 and 1942)).

Quantitative data was obtained by timing the experimental sessions, ie, from the commencement of the first instructions to the subject until the subject had either solved the problem of the blocks or until it became evident that their concentration spans had reached their limit. Timing scores were added to the number of both correctly and incorrectly turned over blocks (as per Hanfmann & Kasanin (1937)). Scoring also relied on Hanfmann & Kasanin’s (1942) additional scoring, and Towsley’s (2006) on transference.

There were several aspects to the 1942 scoring method of Hanfmann and Kasanin which require elucidation relevant to its applicability to a cross-sectional study. Firstly, Hanfmann and Kasanin (1942, pp. 51-52 and p. 55) raise the scoring for “Collections” above those of chains, diffuse complexes, and pseudoconcepts in a reversal of Vygotsky’s writings. Whilst it is true that Vygotsky notes that adults create collection-type complexes in everyday life (sets of cutlery and clothes, for
example (1986, p. 115), I sought to ensure that the scoring for this cross-sectional study was as close to Vygotsky's original writings as possible. (There are also several differences acknowledged by Hanfmann and Kasanin (1942, p. 32 and particularly p. 35 (last paragraph)) between their position and Vygotsky's.) I therefore found it necessary to attempt to reconcile these differences and yet maintain the integrity of the 1942 scoring method of Hanfmann and Kasanin, which appears mainly to have been developed and used for 'normal' adult subjects and psychotic patients.

Secondly, Hanfmann and Kasanin term early “primitive complexes” (ie, random groups and individual placements) as ““heaps” as the first stage in the development of concepts in childhood” and maintain that “psychologically this group does not exist as such” in terms of the bonds made between blocks “which is altogether lacking” (1942, pp. 32-33). In this respect (possibly because their studies were with adult subjects), Hanfmann and Kasanin write: “We shall, however, limit our analysis to formations in which a demonstrable bond of some kind exists between the blocks that are being placed together” (1942, p. 33). However, further into their monograph, these authors write that they do include random groups, “primitive” complexes, and individual placements (1942, pp. 51-52; p. 55) as being scored with the lowest possible score of 4. Subsequently, their scoring for “Levels of Performance” does not differentiate Syncretic Images, Associations, Collections, Chains, and Diffuse Complexes: it simply scores them as the “most primitive groups” with the lowest score of 4 out of a possible 12 (1942, p. 51). In this way, then, the 1942 scoring method of Hanfmann and Kasanin as it stands (the apparent contradiction above notwithstanding) would have affected the scores all of the three-year-old subjects, most of the five-year-old subjects, and would not have differentiated the complexes of the eight-year-old and eleven-year-old subjects. For a scoring method to be reflective of the phases in intellectual development which children pass through on their way towards abstract, logical and fully mature conceptual thinking, I addressed Hanfmann and Kasanin’s middle section, “Levels of Performance”, in several ways to allow for this reflection.

The scoring approach I adopted was to maintain the range of scores from 4, 6, 8, 10, and 12 in the 1942 model. I worked on the theoretical assumption that if half of the subjects in a given age group scored in the top range and half of them in the bottom range, a figure would be arrived at which would provide a yardstick for measurement for each of the six groups in this cross-sectional study. The percentage difference between my scoring in this way, and the original scoring method of Hanfmann and Kasanin (1942) yielded +1.67% for the three- and five-year-old subjects; -5.83% for the eight-year-olds; -2.5% for the eleven-year-olds; and +1.67% for the adolescent and adult subjects (based on 10 subjects per group). My attempts here did not, I believe, result in percentage differences that deviated too greatly from the standard Hanfmann and Kasanin method, and yet provided the additional – and sought-after – benefit of providing differentiated scores indicative of the types of intellectual modes which Vygotsky (1986) writes of.

It is very important to note that the approaches I made here in relation to the scoring for this study were made in the full awareness of two main theoretical standpoints.

The first is Kozulin’s assertion regarding Vygotsky’s work:

The study [the method of double stimulation] revealed three major types of preconceptual representations: syncretic grouping, “complexes” and potential concepts. These types should not be mistaken for natural ‘stages’ in a child’s cognitive development; rather, they are the methodological devices for distinguishing what seems to be the most pronounced form of concept formation at any given age [emphasis added]. (1990, p. 213)

The second theoretical standpoint, by Vygotsky himself, regarding the complexity of the
transition in cognitive development, stresses the coexistence of different intellectual formations likened to that of geology in layers within the crust of the earth (1986, p. 140). However, in his discussion of the different phases in cognitive development, Vygotsky (1986) does write of them in sequential terms (I have cited a number of these below):

...the ascent to concept formation is made in three basic phases, each divided in turn into several stages. In this and in the following six sections, we shall describe these phases and their subdivisions as they appear when studied by the method of "double stimulation".

The young child takes the first step toward concept formation when he puts together a number of objects in an unorganized congeries, or "heap," in order to solve a problem that we adults would normally solve by forming a new concept. (p. 110)

The second major phase on the way to concept formation comprises many variations... thinking in complexes... (p.112)

The difference between this second phase and the third one, which concludes the ontogenesis of concept formation, lies in the peculiarity of complex thinking. (p.112)

After the collection stage of thinking in complexes, we must place the chain complex... (p.115)

...the chain complex... leads to the fourth type of complex... the diffuse complex... (p.117)

To complete the picture of complex thinking, we must describe one more type of complex – the bridge, as it were, between complexes and the final, highest stage in the development of concept formation. (pp.118-119)

Further, Vygotsky’s coverage of the potential concept is in like fashion (1986, pp. 135-140), as is his discussion of the adolescent (pp. 140-145), where he concludes his chapter as follows:

From our point of view, the processes leading to concept formation develop along two main lines. The first is complex formation: The child unites diverse objects in groups under a common “family name”; this process passes through various stages. The second line of development is the formation of “potential concepts,” based on singling out certain common attributes. In both, the use of the word is an integral part of the developing processes, and the word maintains its guiding function in the formation of genuine concepts, to which these processes lead. (1986, pp.144-145)

(Please refer to Appendix Two – Notes for Scoring – for an outline of my scoring and that of Hanfmann and Kasanin in tabulated form.)

In moving on to the next aspect of this study, it also included an element of transference to establish whether the subjects in this replication study were able to transfer the concepts exemplified in the words  cer,  bik,  mnr, and  lag to objects other than the blocks. This element was included in the study as I believe it is in line with Vygotsky’s presentation of what the functional method of double stimulation in the formation of new concepts established (Vygotsky, 1962; 1986). As has been seen in the literature in the theoretical framework, this element of transference is not included in the original Hanfmann and Kasanin work of 1937 and 1942, and has been seen in the literature survey, Vygotsky provided few details on how this transference was to be conducted. As such, I included a transference element of the study as an additional inclusion (Towsey, 2006), which was scored separately to Hanfmann and Kasanin’s (1942) scoring.

Whereas the quantitative scoring of Hanfmann and Kasanin totals 36 points, and the
supplementary scoring ranges from 1 (1 minute, no corrections) and the maximum 165 (if the procedure is not permitted to last longer than 60 minutes), the total for the transference scoring was 16 points (8 points to describe what the groups of blocks have in common; 4 points for correct transference to four glasses; and 4 points for correct transference to four candles).

In this transference exercise, the subjects were first asked to describe what they thought the blocks in each of the four groups had in common and a note of their responses was made and appropriately scored.

The set of four glasses used in this study

The next aspect of the transference study was to ask the subjects to talk about and describe a set of four glasses using the words cev, bik, mur, and lag. They were then asked to do the same with a set of four candles. The subjects were invited to ‘think aloud’ or to describe what was helping them in this part of the transference exercise: in this way, the types of mnemonics, if any, that were being used to aid subjects in this part of the transference exercise were noted and recorded.

The set of four candles used in this study