Learner conceptual categorization of food within a developing context

By

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DECLARATION

Unless otherwise indicated in the text, this dissertation represents my own work. Opinions expressed and conclusions arrived at, are those of the author.

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Abstract

This study explored patterns of conceptual knowledge organization using a word association task among Grade 8 learners at an Ex-Model C school. The goal was to show links between conceptual knowledge development and the social and political context of learners, their individual characteristics and preferences, and the ways they individually went about their learning and thinking.This study was undertaken in the Pietermaritzburg area at a school that draws the majority of its student population from its immediate vicinity, the surrounding townships, the Eastern Cape and a small number from the surrounding communities.

A quantitative and qualitative research methodology was employed in this study using an experimental research design. Three experimental tasks were replicated from Ross and Murphy (1999) with learners across Grade 8 in a developing context. This study explored how Grade 8 learners represented, accessed, and made inferences about a real world category; food, that is complex multi-dimentional and multi-hierarchical, and cross-classificatory. The learners were selected randomly and included a good representation of the schools demographics. Different sets of learners were used in each task. The learners' groupings and rationales for the category generating, rating, and sorting experiments were recorded on data schedules.

The researcher utilized an experiment used by Bernstein (1970), Holland (1981) and Hoadley (2005) in their studies to show how working class and middle class children differently organized knowledge at the conceptual level. Other than the above research there have also been further, perhaps even more sophisticated, food classification experiments that have been completed. I focus on these latter experiments to grapple with some of the main claims provided in gthe above works.

Experimental research was used to gather data. The experimental research design included the following experimental tasks: category generating, category rating and

category sorting. Interviews were carried out to obtain a deeper understanding of why the learners made certain choices and to clarify responses offered in the experiments.

No strong conclusions were drawn from this limited sample. Nevertheless there was a notable insufficiency in the learner's usage of taxonomic categories. A small proportion of the subjects were able to categorise and organise food items by their macronutrients, suggesting a taxonomic chain.

The study also revealed that there were categories that did show groupings of foods of the same consecutive kinds. However, they pointed instead to the situation of the event, or healthiness of the food item. Food items were found to be typical members of both taxonomic and thematic categories. The default (non-directed) group results showed that its sortings were heavily influenced by script or thematic categories. Hence, the subjects in this sample displayed a weakness to organise knowledge taxonomically.

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Chapter 1: Background

1.1 Introduction

Amongst the concerns within the sociology of education is the marked achievement gap between the 'dominant middle-class' and the dominated 'working-class' children, as defined by Sikes (2003) in Hoadley (2005). It has been understood for a long time that working-class and middle-class children come to school positioned differently for success, and is supported by Coleman's (1966) assertion that schooling reproduces social class differences. Coleman's (1966) study identified the differences between the schools attended by children of racial groups as one of the factors for differential achievement outcomes giving support to reproduction arguments. Prior to 1994 schools in South Africa were stratified according to racial groups related to middle-class and working-class and the schools were controlled by different education departments. The per capita expenditure on education per child differed greatly and was based on race, colour and creed. Education in South Africa was deliberately structured to reproduce social class and racial differences.

In an attempt to address the problem of a racially defined education system, the African National Congress government initiated a transformational national curriculum to reflect the political, social and economic concerns of the country under a unified education system. The new curriculum, Curriculum 2005 (C2005), the South African form of outcomes based education, is underpinned by learner-centeredness, critical thinking (outcomes based) and integrated knowledge (group work) which envisaged that the national core curriculum would "prepare individuals for the world of work, social and political participation in the context of a rapidly changing and dynamic global economy and society" (African National Congress, 1994:69). This intended aim of C2005 was to address pedagogic practices of an "active learner in ways that suited the learner's own contextual conditions" (Hugo, 2005a) so that all learners would get a socially just education although they come from differing contexts and backgrounds. C2005 provided a blueprint for education (Harding, 2006) that would ensure "the same quality of learning opportunities for all citizens" (C2005, 1997:1) in order to promote equity as an underlying principle. The vision behind the curriculum is of a "prosperous, truly united, democratic and internationally competitive country with literate, creative and critical citizens leading productive, self-fulfilled lives in a country free of violence, discrimination and prejudice" (C2005, 1997:1) as a social justice imperative. The primary purpose of education must be "to enrich the individual and by extension, the broader society" (C2005, 2003:5). This meant that all learners would be able to learn in ways that took their contexts seriously, by allowing for learners from different backgrounds to be equal, as long as certain specified outcomes were attained.

C2005 and its philosophy of outcomes based education was severely criticized (Jansen, 1997; Jansen and Christie, 1999). After the appointment of Professor Kader Asmal as Minister of Education in 1999 the formation of a Review Committee into the C2005 was commissioned. Its report suggested that in the school curriculum "integration has overshadowed attention to conceptual coherence and progression"; that "there has been an under-specification of the requirements for conceptual coherence across all the eight learning areas"; and that there is a "relative neglect of conceptual coherence …" (Taylor, 2000: 39-40; cited in Harley and Wedekind, 2003). The review resulted in the Revised National Curriculum Statement (RNCS) and was further refined into the National Curriculum Statement (NCS).

Hoadley (2005) questioned whether the school acts as an 'interrupter' or 'amplifier' of the inequalities of society in the South African context, while Bernstein suggests that if change is taking place, it would be prudent to question "which group is responsible for the change" (Bernstein, 1996:30). Many South African's suffered social neglect in the apartheid era and were culturally and contextually bound, and linguistically restricted to the localized lore rather than being introduced to more generic concepts (exacerbated by not having English as a first language) (Davey, 2008).

Bernstein (1996) also stresses the significance of the learner's home background in the orientation to meaning when considering the reproduction of social class differences. Bernstein found that children from middle-class backgrounds were better able to understand what he referred to as a ‘school code’ or ‘elaborate code’ (and make context-independent meanings) in contrast to children who came from the working-class backgrounds, who were not as adept at using an elaborate code. The working-class children worked more comfortably within what Bernstein labelled a ‘community code’ or ‘restricted code’ (Ibid).

In a study conducted in South African primary schools in 2004, 10 years after the dawn of our democracy, Hoadley (2005) showed pedagogic variations across social school settings and how inequalities are potentially amplified through the pedagogic practices found in the classrooms, rather than its interruption. Hoadley’s research raises the concern as to how “pedagogy fails to act as an ‘interrupter’ of the community code” and that the “learners’ voice in the working-class context is found to be weakly specialized with respect to the school code or an elaborate orientation to meaning” (Hoadley, 2005:2). In her research it became apparent that the pedagogic forms that emanated from working-class primary schools seemed to represent a ‘breakdown’ in pedagogy. Drawing on the sociological theories of Basil Bernstein, Hoadley uses ‘code theory’ and ‘orientations to meaning’ to explain how the reproduction of social class differences are maintained and that schooling merely perpetuates this, instead of interrupting this phenomenon. She became interested in “how the outside becomes the inside, and how the inside reveals itself and shapes the outside (Bernstein, 1987:563)”. According to Bernstein’s theory, Hoadley considered pedagogy as either an ‘interrupter’ or ‘amplifier’ of the community code with which all learners enter the classroom. While Hoadley was aware that all learners (working-class and middle-class children) have a ‘community (or restricted) code’, she noted that middle-class learners also learn the basics of a ‘school (or elaborate) code’ in their home (Hoadley, 2005) and therefore come to school positioned differently.

The purpose of schooling is to induct all learners into the school code – to specialize their voices with respect to the particular way of organizing experience and making meaning that transcends local situations to more abstract and context independent meanings, Hoadley (2005) illustrates this phenomena in a simple experiment. Hoadley

(2005) adapted an experiment used by Bernstein, Adlam, and Holland (1981) to show how the transmission and acquisition of a more context-independent meaning (elaborate code) and context-dependent meanings (restricted codes) impact on conceptual organization.

If we accept that one of the main functions of schooling is to introduce learners to various formal bodies of knowledge, and also accept that middle-class children, because of their upbringing in the home, show an ability to work more comfortably with conceptually ordered patterns than working-class learners, then one can assume that working-class learners will find the conceptually organized world of school knowledge harder to master (Hugo, 2005b). Hoadley's (2005) experiment, using a food classification task, has been used to show working-class and middle-class children tend to conceptually organize concepts differently. The investigation by Hoadley (2005), which took place in two South African primary schools, from different socio-economic settings, directed and provided the foundation for my study. She used a series of picture cards showing common food items. After making sure the children recognized the pictures she asked her sample, which consisted of eighty 10-year-olds, to classify the cards into groups of their choosing. The children were asked to group those pictures which they thought belonged together. They could use all or only some of the cards, and they could use any reason for grouping their clusters. Hoadley's conclusions suggested that working-class children predominantly used criteria drawn from their own life context to pattern the cards as a principle for categorization and classification (e.g. 'I eat these in the mornings').

For these children the reason for grouping is embedded in the local context and personal experience of the learner. The principle of classification and category sorting used by the middle-class children were organized on a conceptual basis, e.g. 'they are vegetables' or 'it comes from the dairy'. There was a very strong correlation between the under privileged working-class children using context dependent justification and middle-class children using context independent justification (Hugo, 2005b). When the children were asked to group the cards in another way, middle-class children shifted their classificatory principles and justificatory strategies (Hugo, ibid) away from the contextindependence to increased variations in context-dependent reasoning, drawing on their local context and experience; while working-class children kept to the same patterns, repeating context-dependent categorization that relied on personal (everyday) experience. Middle class children were able to use two methods of classifying food items and displayed access to two principles of classification: one formal and specialized (elaborated code or school knowledge) and the other personal and localized (restricted code or everyday knowledge).

Unlike her predecessors, Hoadley (2005) conducted a third sorting task with the learners. She presented to the learners a grouping of the food items assembled with given context-independent selections such as potatoes / cabbage / butternut / onions; and chop / boerewors / fish / chicken; and milk / butter / cheese; and rice / spaghetti / bread to determine whether learners could recognize the categories of 'vegetable', 'animal product', 'dairy', and 'cereal' respectively. According to Hugo (2005b), this was perceived as a 'guess what the teacher was thinking' game. The working-class children still responded with context-dependent everyday use reasoning, providing justifications like 'Because I eat them often' or 'You mix them and serve them on a plate', and 'I like them', even though the context demanded an attempt to guess the researcher's categorizations. The middle-class children recognized the context-independent categorizations, used by the researchers, with little difficulty.

My research was conducted at a specific site that drew on learners from suburban and outlying (township) areas of Pietermaritzburg. A peculiar characteristic of this group of learners at this school is that the African children come from a social group that has changed its class status through rural-to-urban migratory movement, while the majority White children come from a lower socio-economic suburb which is near the sample school. The White members of the staff at this school refer to this group of learners as "white trash' and 'railway whites', many of whom come from dysfunctional and single parent families. However, it is interesting to note that there is a 'new class' of learners that has emerged at this school. These Black children have White parents (or caregivers), who are adopted or educated them because they are either children of their domestic worker, or they were abandoned.

I became interested in conceptual development because ‘advantaged’ (Ex-Model C) post-apartheid South African schools are now to some extent integrated because the shackles of the group areas have been transcended. The learners in my sample have now been exposed to seven years of schooling in the outcomes based system of schooling. South Africa is now a democracy since 1994 and my study school has a large intake of learners from the peri-urban areas (surrounding Black townships – Edendale, Imbali, Sobantu, Panorama Gardens, Hammarsdale and as far as Eastern Cape), some of its learners come from the surrounding suburbs (Scottsville, Hayfields, previously ‘white’ suburbs during apartheid era) of Pietermaritzburg. This school is of particular interest to me, and in my opinion, it is a third or fourth choice school for learners wanting to attend Ex-Model C schools in Pietermaritzburg area. It would appear that when most popular schools have their quotas then my sample school becomes the next choice. During the apartheid era in South Africa, education was administered by different ministries for the different racial groups. The Group Areas Act demarcated residential areas along racial lines. This meant that white schools were located in white residential areas; Indian schools were located in Indian residential areas, and so on. White public schools were able to admit African, Coloured, and Indian learners if the parent bodies agreed in the 1990’s. These became known as ‘Model C’ schools. This category of school is now defunct, but the term ‘Ex-Model C’ school still remains common in use (see Hoadley, 2005 for a more detailed discussion).

This thesis, the outcome of these research interests, is concerned with two related issues. The first is the question; how does thematic knowledge and taxonomic organization of concepts differ in children within a post-apartheid, socially integrated but Ex-Model C School? The second issue focuses on how do learners classify food types taxonomically and thematically (by script)?

As useful as studies that use social class as a key variable in understanding conceptual development are, there are more detailed, focused and intricate studies that hone in on conceptual development in its own terms, specifically within the tradition of cognitive psychology. Food experiments by Ross and Murphy (1999) and other researchers on categorization explored both the structure of people's natural categories and their ability to acquire novel categories. People's natural categories are acquired in the course of interacting with the categories and with other members of that category. People classify novel items, make predictions about unknown properties, solve problems with categories, make explanations based on them, communicate about them, and form preferences. Models developed on the basis of people's performance on classification tasks are referred to as categorization models. These models are meant to provide insight into category representations. In essence, there are many models that have been used to explain data from classification studies, namely, prototype models, exemplar models and rule-based models. These models can explain nearly all the classification data that has been collected (Markman and Ross, 2003).

Prototype and exemplar models are similarity-based approaches. On these views, people classify each instance by virtue of its similarity to a stored category representation. In prototype models, the stored category representation is an average exemplar of the category (Markman and Ross, ibid). In exemplar models, individual exemplars are stored along with the label of the category to which they belong. New instances are compared with the stored exemplar and are categorized on the basis of their similarity to individual exemplars. According to the rule-based models, people try to find some rule that allows all (or most) of the exemplars to be placed into the correct category. If there are exceptions to the rule, then those exceptions may be stored separately. Theories of categorization that are based on classification data typically posit some kind of internal category representation (e.g. exemplars or prototypes) that captures information about features of a category and distinguishes this category from other categories being learned.

1.2 Motivation

Hoadley's (2005) experiment using a food classification task has been used to show that working-class and middle-class children tend to conceptually organize concepts differently. Other forms of food experiments by Ross and Murphy (1999) showed added complexity in terms of their experimental design, but paid less attention to class differences. My research juxtaposed the sociological and psychological traditions.

Ross and Murphy (1999) have highlighted three limitations in the works of other researchers on food experiments: namely; a single hierarchy, a single function, and isolated knowledge, which inspired them to carry out several experiments using food items. Ross and Murphy (ibid) have come to the conclusion that children have a rich domain of concepts that must be explored in their multiple functions. Using Ross and Murphy's the experimental designs a richer picture of how learners categorize knowledge and understand conceptual representations that are cross-classified and integrated was developed. My research attempted to explore the representations and by using a real-world concept, food, to overcome the limitations of previous work carried out by Hoadley (2005) and Holland (1981). Hoadley (2005) presented arguments of a social nature however she did not fully take in to account the psycho-cognitive factors affecting cognitive and conceptual development. To take these into account, the experiments used were more nuanced than the ones conducted by Hoadley. Hoadley worked with recognition rules and realization rules and how working-class children lacked them. I argue that although recognition or realization rules are important it is also important to look carefully at how children actually categorize things, especially in a taxonomic manner.

1.3 Research focus

To explore patterns of conceptual knowledge organization using a word association task among Grade 8 learners in an Ex-Model C school.

1.3.1 Rationale

A key experiment using a food classification task by Holland (1981) and Hoadley (2005) has been used to show how working-class and middle-class children tend to conceptually organize concepts differently. However, since their research, there have many been very sophisticated experiments done on 'food classification' that they did not use. By using these newer experimental situations it is hoped that more light would be shed on their claim.

Concepts are ubiquitous across different populations and ages – "it is hard to see how any (intelligent) creature could do without them" (Murphy, 2002). It used to be thought that infants and young children were lacking in true conceptual abilities, which had been onerously acquired over the preschool years. However, more recent research has found basic conceptual abilities in infants (only a few months old) and preschool children now appear to have sophisticated conceptual abilities, even if they are lacking much of the conceptual content that adults have.

Researchers in conceptual development have identified several types that children may use to classify objects (Murphy, 2002). The classical view assumed that taxonomic categories were the only, or the only "correct" form of classification possible. Markman's (1989) study found that preschool children often grouped objects using thematic and script categories and concluded that these categories share properties that are defined by external relations rather than internal properties. Other studies found that young children can form taxonomic categories while having no difficulty in learning basic-level categories such as dog, chair, tree, etc. even at early ages (Horton and Markman, 1980; Rosch et al, 1976). Further to this, children can learn and use superordinate categories under certain conditions (Markman, 1989; Waxman and Gelman, 1986). Waxman and Namy (1997) found that children are not strongly interested in thematic relations as previously believed (by the classical theorists of educational psychology). Taxonomies are so called because they are usually organized into hierarchies of increasingly abstract categories (for example, boxer-dog-mammal-animal) or on common properties or similarity or common nouns based on shared properties among the category members

(Nguyen and Murphy, 2003). A taxonomic relation links a concept to its hierarchically superordinate level concept (dog-animal) to its lower or subordinate level concept (dog-collie) and to a concept of the same hierarchical level (dog-cat) (Borghi and Caramelli , 2003). Thematic categories serve to group categories that are associated or have a complementary relationship which are often spatially and temporally contiguous. For example, cereal and a bowl are not similar and do not share many properties but are contiguous to form a thematic pair associated with breakfast. (Nguyen and Murphy, 2003). Borghi and Caramelli (2003) suggest that concepts are thematically related when different knowledge domains are linked by cross-categorical relations (dog-bone). Further, thematic relations include spatial and temporal relations and bind one concept to another by highlighting their co-occurrence in an event or situation. Nguyen and Murphy (2003) make a distinction between thematic categories and script categories. For the purposes of this study these categories will be used synonymously, the term 'script category' will be used throughout the study. Recent studies found that adults use thematic and script categories when the relations are sufficiently strong (Lin and Murphy, 2001; Murphy, (2000); Ross and Murphy, 1999). In the literature on adult concept, there is increasing recognition of the fact that items can be cross-classified into more than one category (Barsalou, 1991; Murphy, 1993; Ross and Murphy, 1999). In addition to the usual taxonomic categories that people use, such as 'dog' and 'animal', they know a variety of other kinds of categories that include the same item, such as other, more specialized taxonomic categories: e.g. carnivore, pet (Nguyen and Murphy, 2003); *ad hoc* or goal derived categories e.g. things to carry out of burning house (Barsalou, 1983, 1991), script categories. Although taxonomic categories are particularly useful, other modes of categorization are also worth examining (Nugyen and Murphy, 2003). Markman (1989) pointed out that children must learn script categories such as things that are found at a birthday party, things you bring to school, breakfast foods, and so on, as part of learning about the activities in their culture. There might be external relations involved in script categories which might make it easier for children than to identify the similarities underlying taxonomic categories. Many studies have examined real-world categories such as animals. These categories are still at the periphery of most children's daily lives and everyday thinking, especially those living in urban settings (Medin et.al.

(1997). The domain of food is one that is highly central to the children's lives and everyday thinking (Brich et. al., (1999) and is an integral part of the children's broader knowledge about health, illness (Rozin, 1990) and religious convictions (for example, a child following the Islamic faith will not eat pork). Rather than outgrowing such categories, adults may continue to use them alongside taxonomic categories (Murphy, 2001).

1.3.2 Key Questions

- How does sociological and cognitive psychological accounts of thematic knowledge and taxonomic organization of concepts help us understand how learners organize knowledge?
- How does learners classify food types taxonomically and thematically in a Grade 8 Ex-Model C School?

1.3.3 Overview

Chapter 2 presents the theoretical and conceptual framework to this study. Various theories of categorization and models of categorization, namely, the classical, prototype, and exemplar approaches, are examined. Work relating to reproduction theories in education, and Bernstein's 'code theory', and 'orientations to meanings' are also reviewed.

Chapter 3 is the literature review which provides the general insight into the readings that impacted on the study and research. Furthermore it outlines the literature relating to empirical studies in the fields of sociology and psychology. This chapter provides an in-depth review of conceptual development in children.

Chapter 4 presents the methodological framework for the study. This chapter sets out the methodology employed to carry out the research. It addresses the analytical framework and issues of research design. Chapter 5 presents a descriptive analysis of the findings of my research. Chapters 6 and 7 draw together the results and findings, and how this applies to the conceptual development of children. This chapter will conclude in a general discussion of the findings. The final chapter, Chapter 8, will provide a summary of the thesis and outline the implications and limitations of the study.

Chapter 2: Theoretical Framework and Conceptual Framework

2.1 Introduction

In this chapter the theoretical and conceptual background of the study and the theoretical assumptions underlying the analysis are presented. This chapter focuses on the reproduction of inequalities and class stratification in the social tradition as well as conceptual knowledge organization in the psychological tradition.

As a point of departure I highlight how social class differences are reproduced by considering ‘orientations to meanings’. This entails an analysis of the transmission of context-independent (elaborated code or school knowledge) and context-dependent (restricted, community code or everyday knowledge) orientations to meaning in the school. Bernstein’s (1990) ‘code theory’ and ‘orientations to meanings’ form the central reproductionist theoretical resource for this study. I will develop this showing how Bernstein offers a theoretical language to explain the manner in which social inequalities are reproduced in the family and through the schooling system. I shall define and describe relevant Bernsteinian terminology that will help the reader to understand Bernstein’s description of ‘school code’ or ‘elaborated code’ and ‘community code’ or ‘restricted code’, as forms of consciousness in the ‘orientations to meanings’.

Next, the historical development in concept organization and knowledge structures will be outlined to help us understand the extent to which knowledge structures change and develop. The theoretical notion of conceptual knowledge organization, categorization and some key issues in cognitive psychology will be discussed. The psychology of concepts has the goal of understanding the representations that allow us to identify objects and events as being in a certain category, drawing inferences about novel entities, and communicating about them in a meaningful way, either, ‘taxonomically’ or ‘thematically or by script’.

The most popular theories of concepts are based on prototype theory (Rosch, 1975; Hampton, 1979; Smith and Medin, 1981) or exemplar theories (Medin and Schaffer, 1978), which are strongly unclassical (Hull, 1920; Inhelder and Piaget, 1964; Vygotsky, 1962). These will provide the theoretical background to my study in the psychological tradition. The knowledge approach (Carey, 1985; Keil, 1989; Murphy and Medin, 1985) will be briefly outlined to show the effect of prior knowledge in the conceptual, classification, and categorization process. I shall define and describe relevant terminology that will help to inform the understanding of taxonomic and thematic development in people.

2.2 Theoretical antecedents to my study

2.2.1 Social reproduction theories

2.2.1.1 Reproduction theories and its influence

Reproduction theorists are concerned with how power is distributed in society to ensure the dominance of a particular group or class. They focus on how schools play a role in this process by making use of their material and ideological resources to reinforce the social relations of the dominant group.

Althusser (1971) was instrumental in shaping reproductionist theory. For Althusser, the reproduction of productive forces is essentially the reproduction of labour power, and the reproduction of labour power requires, not only a reproduction of its skills, but also a reproduction of its submission to the rules of the established order (Hoadley, 2005). Althusser (ibid) suggests that dominant ideology is represented at school not only in the material demonstrations of rituals and practices but also in the unconscious images that subjects hold of themselves within society. He asserts that there is a marked relationship between the psychological makeup of people and their positions within society. This binding of the sociological and the psychological, of Marx and Freud, is a key integration that this thesis actively supports in conceptual development. It should be noted, that Althusser did not delineate how the reproduction of inequality happened through the intricate ways that conceptual knowledge functions in classed ways.

Bowles and Gintis (1976) present another view of reproduction of inequalities. Their argument was that education functioned to reproduce class-stratified economic and occupational positions in society by allocating manual skills and 'obedience' to authority to working-class students in schools, and by equipping middle-class students with mental skills and opportunities for developing internalized self-discipline. As a result, learners are inculcated with the necessary attitudes and dispositions to carry out what they have learned at school, in society. In this way, social relations in school determine the social position of learners in society which determined their mode of production. Again, as influential as their work was, it did not explore the inner workings of the schooling system and how it worked with conceptual knowledge.

Bourdieu and Passeron (1977) were concerned with the way in which class relations, power and privilege, are reproduced through the 'apparently neutral' attitude of a school. Bourdieu (1973) used the term 'habitus' to describe systems of dispositions or schemes of thought that are lasting and lead to actions that reproduce structures. In this context the function of the education system is to reproduce the culture of the dominant classes, thus helping to ensure their continued dominance. By this I understand that success in the education system is largely dictated by the extent to which individuals absorb the dominant culture, or how much cultural capital they have on entering this domain. Bourdieu (1973) argues that those in power control the form of that culture and are thus able to sustain their position in society. Here again, one can note that this reproductionist argument does not open out the actual functioning of how knowledge is worked with by learners within schools. It is with the work of Basil Bernstein that we get to look inside the 'black box' of schools reproducing inequality and begin to understand the actual specific mechanisms by which this happens.

2.2.2 Bernstein and reproduction theory

Bernstein is concerned with production, reproduction and change in society and how the process of reproduction worked, through connecting power and class relationships to the educational processes of the school, rather than *what* was produced

(Hoadley, 2005). This is accomplished in a way similar to Bourdieu – through the introduction of a mediating concept. For Bourdieu it is centrally 'dispositions/habitus': for Bernstein it is 'code'. It is essentially in the 'code' that the potential for change resides which introduces the potential for agency and change within the reproduction matrix. While 'habitus' refers to agents, 'code' refers to pedagogy. 'Codes' provide the grammar, through classification and framing, for an analysis of the variation (Hoadley, 2005). Code theory opens up the possibility for talking about reproduction and its interruption. Bernstein differs from Bourdieu by his emphasis on symbolic structures rather than agents – on how systems of meaning are reproduced, rather than what forms of capital. Bernstein's concerns were much broader than social and cultural reproduction. His code theory, examines the relationships between social class, family, schooling processes, the reproduction of meaning systems and its interruption.

2.2.2.1 Bernsteinian research into codes

Taylor et al. (2003) poses a question 'More social capital means more goods. But how does such goods translate into cognitive advantage?' (Taylor et al., 2003p. 55), and suggests that the answer may lie in Bernstein's theory. Bernstein offers a theory as to how 'the outside becomes the inside' (Bernstein, 1987:563). Bernstein specifies the *rules* whereby differential transmission and acquisition is effected (Bernstein, 1990:183). We recall that Althusser (1971) began this argument as to how the relay functions by drawing attention, not only to what is reproduced (i.e. skills and competences), but also to an attitude to the rules of the established order. This is taken up by Bernstein, in his theorizing of pedagogic discourses as the relay, consisting of an instructional discourse embedded in a regulative discourse, and he extends this in relation to forms of knowledge and their transmission, with the concepts of classification and framing. Classification and framing, tell us about the power and control relations in the transmission process, and how they translate into particular 'codes' of organizing experience and making meaning. 'Code' refers to the principles that regulate meaning systems; and 'code theory' is concerned with the transmission of meaning, in the family and school, and how this relates to social class reproduction.

In what follows I outline Bernstein's code theory, which developed alongside and through the empirical studies of various sociologists of education.

2.2.2.2 Elaborated and restricted codes: research

The initial work on codes examined the relation between social class, maternal modes of control and communicative outcomes. Thus mother-child and mother-other adult communication was the basis for the investigation (Henderson, 1970; Bernstein and Henderson, 1969; Bernstein and Brandis, 1970). Through this work Bernstein sought to investigate how different forms of socialization acted differently upon the speech forms of different social classes (Hoadley, 2005). These different kinds of language were hypothesized to have implications for the education of children of different social classes. Based on this and other work, Bernstein developed his initial definitions of codes: '*elaborated* and *restricted*'. In their original form they were 'sociolinguistic codes'; restricted codes being associated with particular grammatical and syntactical forms (generally simple, incomplete, and every day), as well as more implicit meanings, and elaborated codes with the accurate grammatical and syntactical regulation of what is said, and explicit meanings (Lee, 1973).

Further experiments consolidated the concepts. Hawkins (1969), for example, used a series of four pictures of boys playing with a ball, kicking the ball through a window and being scolded by an adult. He asked middle-class and working-class children to describe the pictures. He found that, for the middle-class children, verbal communication was explicit and could be understood without heavily depending on the context. For the working-class children, on the other hand, meaning was implicit and context-dependent, and relied largely on the listeners' prior knowledge of the narrative content. Similarly, Lineker (1977) found that, in an another experiment that asked children to describe the rules of hide-and-go-seek, middle-class children were more likely than working-class children to explain how to play the game in terms of rules, rather than with reference to particular events in their own experience.

The concept of code, however, underwent change and refinement. Elaborated codes referred to the prioritizing and deployment (or recognition and realization) of context-independent meanings, and restricted codes referred to context-dependent meanings. Language was a *linguistic realization* of the codes, rather than the codes themselves. One of the main studies exemplifying this shift was an experiment designed by Bernstein and Adlam, and analysed by Holland (1981).

In Holland's (1981) experiment, many aspects of which have been replicated by Hoadley (2005), seven-year-old children from working-class and middle-class homes were shown pictures of different foodstuffs and were asked to group them in any way they wanted. They were asked the reasons for their groupings. They were then asked to group the food a second time, and provide criteria for the grouping again. The experiment showed that working-class children generally used context-dependent principles for their sorting in that their groupings referred to personal and particularistic meanings (e.g. 'I like those things.'; 'That is what mother cooks for breakfast.') which generally referred to everyday use. They did not change their principles for sorting the second time, demonstrating a single coding orientation (restricted) which informed both groupings. Middle-class children more often responded to the context (task) firstly by referring to general principles (e.g. a food category), non-context-dependent meanings, and, in a second grouping, to more personalized, local meanings. They thus demonstrated two coding orientations, elaborated and restricted, and context-independent meanings were privileged for the school context. In this way, and through other experiments (for example, Adlam *et al,* 1977), different coding orientations were attributed to different social class groupings. It was argued that the focus of the child's selections is not a function of the child's IQ or cognitive power, but rather a difference in the recognition and realization rules used by the children to read the particular context (the school), make selections (around what is appropriate given the context), and realize a particular text (their groupings of the food).

Bernstein argued that these codes, or coding orientations, were class-related in that they were related to the social division of labour, which privileged either context-independent meanings or context-dependent meanings. Stated succinctly:

> The simpler the social division of labour and the more specific and local the relation between an agent and its material base, the more direct the relation between meanings and the specific material base, and the greater the probability of a restricted coding orientation. The more complex the social division of labour, the less specific and local the relation between an agent and its material base, the more indirect the relation between meanings and a specific material base, and the greater the probability of an elaborated coding orientation. (Bernstein, 1990:20)

Bernstein (1990) provides an example which clarifies the meaning of the relation between orientations to meaning and the social division of labour. A peasant working on a sugar plantation would view himself as part of a simple division of labour. His social interactions would have, as their centre of gravity, interactions which refer to practices relating to a local, specific material base, such as the cutting of cane. The patron, on the other hand, would see himself as part of a complex division of labour, which includes the plantation, the local market and the circulation of capital.

> The patron's centre of gravity would lie within a complex division of labour-regulating practices with respect to a generalized material base. (Bernstein, 1990:20)

Note that these locations of peasant and patron are physical (i.e. material) locations with different relations to the material base, which give rise to different interactional practices and so to different coding orientations.

In general, these experiments found restricted codes to be prevalent in the homes and communication patterns of working-class children, whilst middle-class children were socialized into, and utilized, both restricted and elaborated coding orientations, and privileged the latter in the school context. The main criticism of Bernstein's code theory is that, it is a 'deficit theory', where the working-class is presented as deficient in their orientation to restricted codes. Bernstein's work was criticized for presenting a deficit theory, for arguing that working-class language was deficient. Bernstein (1996) rejected this interpretation, explaining that 'codes arise out of different modes of social solidarity, oppositionally positioned in the process of production, and differentially acquired in the process of formal education' (p. 182). Restricted codes are necessary in the context of production, but in the context of reproduction the school requires an elaborated code for success, and this means that working-class children are disadvantaged by the requirements of the dominant code of schooling. As previously stated, Bernstein's intention was to show that elaborated and restricted code orientations are part of everyone's social interaction in different spheres. The school, however, is predicated on and privileges an elaborated code, and working-class learners are disadvantaged in terms of the requirements of the school. That is not to say that working-class language or meaning-making is deficient, simply that it is not congruent with the requirements of the school, to which middle-class children are more aligned, given their socialization in homes where parents are productive within a more complex division of labour.

2.2.2.3 Bernstein's recognition and realization rules

For Bernstein, education specializes consciousness. Code theory was developed to describe how this happens, and the realizations of the elaborated code in institutionalized form were further conceptualized (Christie, 1999:3). According to Hoadley (2005) the specializing of consciousness (and this generally will entail the acquisition of context-independent means of organizing experience and making meaning) happens through two key mechanisms which are at the heart of Bernstein's theory: classification and framing, which refer, respectively, to power and control. Bernstein (1996:19) defines classification as "the defining attributes of relations between categories". Classification functions both internally and externally. Framing has to do with how time and pace are controlled. Framing has the power to reproduce social relations and change them.

Classification and framing are related to recognition and realization rules respectively. Recognition rules create the means of distinguishing between and so *recognizing* the speciality that constitutes a context and realization rules regulate the creation and production of specialized relationships internal to that context (Hoadley, 2005). At the level of the subject, differences in code entail differences in recognition and realization rules (Bernstein, 1990:15). It is classification which orients the speaker to what is expected and what is legitimate given the context, that is, the recognition rule. Framing regulates the realization rule – how legitimate meanings may be put together and made public. According to Harding (2006), this means that if the students (irrespective of class) are able to demonstrate control of the recognition rule and are able to produce meaningful text which would suggest that they have accessed the elaborated code.

The recognition rule enables the student to identify the specificity or similarity of contexts (Bernstein, 1996). Therefore, the middle-class child, who is most likely to come to school in possession of an elaborated code, is more likely to recognize the specific requirements of the school (Harding, 2006). This ability to apply the recognition rule of what has been learnt is not enough because students are also required to construct meaning, in the form of text and conceptualization, from what they have learned. If they are able to produce legitimate, meaningful text specific to that context of learning, then they have mastered the realization rule. The recognition rule operates between contexts and the realization rule operates within a context.

2.2.3 School knowledge and everyday knowledge

The fundamental distinction between the formal knowledge of schooling and everyday knowledge is well illustrated by the research (explained above) undertaken by Bernstein (1996) and more recently Hoadley (2005). Bernstein describes the relationship between everyday (community) knowledge and school (educational) knowledge in terms of 'framing' by considering the variations in the strength of frames. These researchers found that middle-class children tended to access two principles of classification: one formal and specialized (school knowledge or elaborated knowledge) and the other personal and localized (everyday knowledge or restricted knowledge and community knowledge), whereas, the working-class child tended to access classification principles based on their personal experiences (everyday knowledge). The movement from the particular to the general, or from context-dependent meanings to context-independent ones, is essentially a move from everyday meanings or knowledge to more vertical, codified and abstract knowledge, such as that found in the school curriculum (Hoadley, 2005). The initial distinction between these different types of knowledge was made by Durkheim (1933), who distinguished between 'sacred' (the realm of the extraordinary and the transcendent) and 'profane' (the realm of everyday activities) knowledge (Hoadley, 2005).

Dowling (1995) uses related terms of public domain knowledge and esoteric domain knowledge, the former relating to everyday knowledge and the latter to the knowledge, principles and practices of disciplinary knowledge. According to Hoadley (2005) Dowling's distinction arises out of an analysis of school mathematics textbooks, where he found an uneven distribution of types of knowledge, such that higher ability students were exposed to texts that allowed access to the esoteric domain. Generalizable principles were foregrounded – whereas lower ability students were subjected to texts where the mathematics knowledge was obscured by public domain exemplars and procedural activities. Dowling insists, however, that the public domain is crucial, for it is the 'domain through which apprentices must enter the activity' (Dowling, 1995:136). In other words, the everyday is a 'key portal to school knowledge' (Hoadley, 2005).

What follows is an outline of the concepts and theoretical representation of conceptual knowledge organization, categorization and some key issues in cognitive psychology that will inform my study.

2.2.4 Theories of conceptual development

2.2.4.1 The classical view

The classical view uses a definitional approach which implies that category membership can be determined by identifying 'necessary' and 'sufficient' characteristics (features) of a concept. As far back as Aristotle (Apostle, 1980), philosophers have assumed that definitions are the appropriate way to characterize word meaning and category membership. Nevertheless, attempting to construct definitions to specify abstract objects proved to be very difficult for the classical theorists of educational psychology, because this means that if something does not fit the proposed definition, it must be rejected.

Fisher's (1916) experimental work on concepts has become one of the most common designs in the psychology of concepts. Fisher sets out to study how people abstract and consciously grasp a concept. He postulates, firstly, that a concept of a given class is an experienced disposition to act in a given way when one encounters the members of this class (that is; a motor phenomenon or tendency, with or without a conscious… feeling). Secondly, that a concept of given class is a conscious representation (be it an image or an imageless mental representation) of the class in 'ideational' terms. According to Machery (2007), Fisher's, experimental design required that the subjects examine the category members to be able to provide a definition for the category name, that is, to determine which part is 'necessary' and 'sufficient' for being a member of the category. Hull (1920), whose experimental study on concept learning relied on behavioural data, asserted that it is a 'common response' (necessity) or 'reaction' (sufficiency) that makes things to be in the same category, distances himself from Fisher's work on concept abstraction. Hull believed that the process of acquiring the conscious knowledge that constitutes a concept is mostly unconscious. Hull describes a child who hears the word *'dog'* used in a number of different situations, and after a while, the time will arrive when the child has a 'meaning' for the word *'dog'*. Further examination showed that this 'meaning' is actually a characteristic more or less common to all dogs, and not common to cats and teddy bears. Hull concludes that to the child, the process of arriving at this meaning or concept has been largely unconscious. Smoke (1932), who criticized the definitional aspect of Hull's concepts, felt that the essential components of a concept are a complex of features that are connected by a specified relationship, rather than being a single common element. Although Smoke raises this objection, he in fact, accepts Hull's view by clarifying that definitions are more complex.

Inhelder and Piaget (1964) also promoted the use of definitions in the study of concepts in cognitive development. They viewed thought as the acquisition of logical abilities, and therefore viewed concepts as being logical entities that could be clearly defined. Such a logical approach required that every set have a definition. Inhelder and Piaget's theory relied on constructs such as: "the 'intension' of a class is the set of properties common to the members of that class, together with the set of differences, which distinguished them from another class – that is, a definition" (p.7). In order to demonstrate that children know concepts, Inhelder and Piaget argued that children should be able to give an adequate definition of the concept and furthermore show skill in answering logical questions about it. Inhelder and Piaget felt that children did not have true concepts and were not able to fully form categories until they were well into their school age.

Wittgenstein (1953) questioned the assumption that concepts could be defined, based on sufficient and necessary conditions and provided an argument against classical definitions approach to conceptual development. Using the concept of 'a game', he provided counter-examples to a variety of possible classical definitions, and concluded more generally that these definitions do not exist. He argued that it is very difficult to specify the *necessary* and *sufficient* features of most real world categories. This means that the classical view had considerable trouble explaining what the defining features of a concept are, and to try to specify the things in common. Wittgenstein urged his readers to try to specify the things in common.

The classical theory of concept representation has many drawbacks in that it is extremely difficult to find definitions for most natural categories, and even harder to find definitions that are plausible psychological representations that people of all ages are likely to use. Secondly, the phenomena of typicality (explained later in this chapter) and unclear (borderline) membership are both unpredicted by the classical view. These have to be augmented with other assumptions – which are exactly the assumptions of non-classical theories. Third, the existence of intransitive (explained below) category decisions (Hampton, 1982) is very difficult to explain on the classical view. Finally, the classical view has not predicted many other phenomenon of considerable interest in the field, such as exemplar effects, base rate neglect, the existence of a basic level of categorization, category construction, and the order in which children acquire words.

An advantage that has been proposed for the classical view is that it has a very natural way of explaining how categories can be hierarchically ordered (Murphy, 2002). This means that categories can form a nested set in which each category includes the ones 'below' (a subordinate category). The classical view points out that if all *X* are *Y*, then the definition of *Y* must be included in the definition of *X* (for example, all red triangles are triangles which must be closed, three-sided figures, because this is the definition of a triangle). This rule ensures that category membership is transitive. This nesting of definitions provides a way of explaining how categories form hierarchies.

In conclusion, the classical theory of concepts has been rejected on empirical grounds. The most important of these is probably the existence of typicality effects, as demonstrated by the work of Rosch (1975; Rosch, et al., 1976). In the definitional view, it can be seen, that membership in a category is based on a small set of necessary and sufficient features, suggesting that those items that have these features belong to these categories and those that do not belong are not members of the category. The prototype view is based on the ideal of 'family resemblance' similar to Wittgenstein (1953). A brief exposition of the prototype view follows. Nevertheless, the only hope for true classical concepts is within small, closed systems that simply do not permit exceptions and variations of the sort that is found in the natural world (Murphy, 2002).

2.2.4.2 The prototype view

Eleanor Rosch, like Wittgenstein, played a crucial role in the rejection of 'the classical view of concepts'. Rosch significantly contributed to the formulation of the prototype approach to concepts. A prototype is the best example of a category, it is the original. Hence, this would be one way of understanding the existence of typicality. Very typical items would be those that are similar to this prototype; borderline (unclear membership) items would be only somewhat similar to this prototype and somewhat similar to other prototypes as well (see dot-pattern experiments of Posner and Keele, 1968, for an experimental demonstration; 1970).

Hampton (1979) proposed a critical component for the prototype view, namely, that it is a *summary representation*. This implies that the entire category is represented by a unified representation rather than separate representations for each member or for different classes of members. The representation itself could be described in terms of Wittgenstein's (1953) 'family resemblance' view, and later by Rosch and Mervis (1975). Wittgenstein introduces 'family resemblances' to help us understand how some concepts actually work, how they function in language. Wittgenstein coined this term to highlight the complex pattern of overlapping resemblances between games to explain visual resemblances between genetically related members of a family. He uses 'family resemblance' to explain the 'meaning' of 'game' about the shared nature of language, something common to a language/linguistic community. He emphasized that there were no common defining feature to all games, but that they are connected by a network of overlapping and criss-crossing similarities. Family resemblance also serves to exhibit the lack of boundaries and the distance from exactness that characterize different uses of the same concept. Rosch and Mervis (ibid) argued that items are typical when they have high 'family resemblance' with members of the category. The concept is represented as features that are usually found in the category members, but some features are more important than others.

If this feature list is the concept representation, then how does one categorize new items? Essentially, one calculates the similarity of the item to the feature list. For every common feature with the representation, it gets a 'credit' for the features weight, and when the feature is lacking or absent, it loses credit for that feature (Smith and Osherson, 1984; Tversky, 1977; Murphy, 2002). After going through the objects features, weights are attached to the features present. Weights are added less the weights of its features that are not part of the category. If that number is above some critical value, *the categorization criterion* (used in experiment 2), then the item is judged to be in the category; if not, it is not in the category. Thus, it is important to have the highest weighted features of a category in order to be categorized. So, the more highly weighted features an item has, the more likely it is to be identified as a good category member. Hampton (1982) demonstrated that some category membership judgments could be intransitive. Tversky (1977) uses the example of a 'clock' to explain the concept of intransitivity. He asserts that concept *A* (for example, Big Ben is a clock by virtue of telling time) can be similar to concept *B* (a clock), concept *B* is similar to concept *C* (furniture, because clocks are used in the homes as decorative pieces), yet *A* (Big Ben) may not be very similar to *C* (furniture). This can happen when the features that *A* and *B* share are not the same as the features that *B* and *C* share (see Murphy, 2002 for a detailed discussion).Hampton has shown that people do not always follow rules of transitivity that are found in a strict hierarchy. On the prototype view, this comes about because the basis of similarity changes from one judgment to the other, however on the classical view, this kind of intransitivity is not possible, because any category would have to include all of its superset's definition (for hierarchical classification).

The next section presents the exemplar view in the theory of conceptual development.

2.2.4.3 The exemplar view

According to Nosofsky (1988) an '*exemplar'* is not the actual thing but rather the encounter with a thing. In the exemplar view, the idea that people have a summary representation that somehow encompasses an entire concept is rejected. One's concept of 'dog, is not a definition that includes all dogs, nor is it a list of features that are found to a greater or lesser degree in dogs, instead a person's concept of dogs is the set of dogs that the person remembers which might be a set of few hundred dog memories that one has. Some memories might be more salient than others, and some might be incomplete and fuzzy due to forgetting. Nevertheless, these memories are what one consults when one has to make decisions about dogs in general. Now, suppose you see a new animal walking around your yard. How would you decide that it is a dog? According to this view, this animal bears a certain similarity to other things one has seen in the past. It might be quite similar to one or two objects that a person knows about; fairly similar to a few dozen things, and mildly similar to a hundred things. Basically, what one does is (very quickly) consult one's memory to see which things it is most similar to. So, if most of the things that are similar are for dogs, then one will conclude that it is a dog. Medin and Schaffer (1978) argued that you should weight items in your memory by how similar they are to the exemplar. When one adds up the similarities there will be considerably more evidence for the object to be categorized. So it is not simply the number of exemplars that an item reminds you often of that determine how one can categorize it; just as important is how similar the object is to each memory. The more varied one's experience of exemplars the more complex and adaptable ones understanding and use of a concept. Similarly and in relation to the food experiments in this study, everyone has a rich experience of food, however, varied experiences results in complex modes of production. If one has fewer experiences with food then their mode of production would be simple and contextual.

2.2.4.4 The knowledge approach

The knowledge approach argues that concepts are part of our general knowledge about the world. We do not learn concepts in isolation from everything else; rather, we learn concepts as part of our overall understanding of the world around us. When one learns concepts, this information is integrated into our general knowledge. Concepts are influenced by what we already know, but a new concept can also effect a change in our general knowledge. The knowledge approach emphasizes that concepts are part and parcel of one's general knowledge of the world, and there is pressure for concepts to be consistent with whatever else one knows (Keil, 1989; Murphy and Medin 1985). In order to maintain such consistency, part of categorization and other conceptual processes may be a reasoning process that infers properties or constructs explanations from general knowledge. This approach says that people use their prior knowledge to reason about an example in order to decide what category it is, or in order to learn a new category.

Barsalou (1985) explained the significance of how one would use prior knowledge to categorize food items. Barsalou found that *ideals* are important to determining typicality. Barsalou also found that items that were closer to the ideal were more typical than items that were farther away, and this was true even when family resemblance was factored into the typicality judgment. Thus, the influence of ideals cannot, then, reflect just pure observation of the category, as a prototype or exemplar approach may claim.

These ideals for categories come from our knowledge of how each category fits in with other parts of our lives – its place in our greater understanding of the world. The importance of such knowledge can be illustrated by a kind of category that Barsalou (ibid) called *goal-derived categories*. This concept is crucial to my empirical work, and I will develop it here.

Goal-derived categories are categories, which are defined solely in terms of how their members fulfil some desired goal or plan, e.g. ‘things to eat on a diet’. For goal-derived categories, very little of the category structure is explained by family resemblance. (For example, things to eat on diet might include celery, sugar-free jelly, diet soda, baked potatoes, baked fish, and skim milk. These items differ in many respects. They are less similar to one another than normal food categories such as dairy products or meat, yet, they are all within the same category by being things that people eat while on diet. Here the ‘ideal’ is something like ‘have the smallest number of calories’). Barsalou found that the most typical examples of goal-derived categories were ones that were closest to the ideal. Family resemblance did not explain a significant portion of the variance for goal-derived categories. The knowledge approach does not attempt to explain all of concept acquisition by reference to general knowledge; it must also assume a learning mechanism that is based on experience as a mode of production.

2.2.4.5 Typicality as a phenomenon

Rips (1975) found that people were more likely to make inferences when typical items are involved than when atypical items are involved in categorization. Typical items are more useful for inferences about category members. Typical category items are good examples of what one normally thinks of when one thinks of the category; thus, atypical objects are ones that are known to be members of a category but are unusual in some way. Rosch (1975) discovered that the reliability of typicality ratings was extremely high though later studies by Barsalou (1987) suggested this to be an overestimation. When people learn artificial categories, they tend to learn the typical items before the atypical ones (Rosch, Simpson, and Miller, 1976). Furthermore, learning is faster if subjects are taught on mostly typical items than if they are taught on atypical items (Mervis and Pani, 1980; Posner and Keele, 1968). Thus, typicality is not just a feeling that people have about some items, it is important to the initial learning of the category in a number of respects (Murphy, 2002). Since a prototype is the best example of a category, one can think of category members, then, arrange in order of 'goodness', in which the things that are very similar to the prototype are thought of as being very typical or good members, and things that are not very similar as being less typical or less good members. Like adults, children learn better if they are taught with typical items. Posner and Keele (1968, 1970) illustrated this concept concretely by generating a dot-patterned study.

For natural categories, each category might have a most typical item – not necessarily one that was learned, but perhaps an average or ideal example that people extract from seeing real examples. As the similarity gets lower, there is no clear answer as to whether the item is or isn't in the category and as the item becomes more similar to other categories, the chance increases that it will be seen as an atypical member of that other category. Typicality is a graded phenomenon, in which items can be extremely typical (close to the prototype), moderately typical (fairly close), atypical (not close), and borderline category members (things that are equally distant from two different prototypes). Typicality differences are probably the strongest and most reliable effects in the categorization literature. The simplest way to demonstrate this phenomenon is simply ask people to rate items on how typical they think each item is of a category, as I have carried out in Experiment 2 of my research.

2.3 Conclusion

Eleanor Rosch's writings on concepts greatly emphasized that conceptual structure is based on the structure of the environment. She argued that objects in the world do not have random collections of properties but are instead structured: "The world is structured because real-world attributes do not occur independently of each other… combinations of attributes of real objects do not occur uniformly" (Murphy, 2002: 118). This means that categories contain clusters of correlated attributes that are fairly distinct from other clusters. Whether the environment truly possesses such clusters is difficult to say and is something that cannot be answered by psychology experiments, which can only measure people's perceptions of the environment. While the sociological tradition speaks to the reproduction of inequalities in respect to the variation of orientations to meanings in social class, the psychological tradition looks to prototypes and exemplars. We can see from this that the psychological tradition helps us focus on how concepts are internally structured and used while the sociological tradition helps us understand how concepts operate in a broader social field.

Chapter 3: Literature Review

3.1 Introduction

This chapter presents a critical review of the literature. I frame my research interest in relation to the relevant literature in the field of sociology of pedagogy, hierarchical organization of conceptual knowledge, and conceptual development. My research interest was defined in Chapter 1 as an investigation into whether children are able to simultaneously categorize foods using thematic and taxonomic categories and, if not, to find out which one is dominant in that process of conceptual development. The theoretical and conceptual framework informing my study was set up in the pervuois chapter. This was done to assist the reader to understand the concepts used in the literature review, presented in this chapter. The literature review presents the argument that children generally (irrespective of class) are able to use multiple forms of conceptual skills to classify and categorize "food" items into clusters, 'thematically' or 'taxonomically' or both. The literature review will reveal that children from a very young age can 'cross classify' and know that concepts have 'multiple function' by using 'integrated knowledge'.

The chapter begins with a review of some of the literature on social and cultural reproduction through schooling followed by literature on conceptual development. The evolution of Bernstein's code theory has been outlined in the previous chapter, in this chapter I will focus on empirical studies which will provide the sociological background to my study. The literature will further show as my central interest and in relation to the learners' tasks (using food experiments) whether learners invoke more context-independent (taxonomic or elaborated) ways of organizing knowledge, or whether more concrete, context-dependent (thematic or restricted) meanings are privileged by learners. My literature review will focus on both, tasks that directly reflect concept use, namely, categorization and category based induction, and indirect measures of categories, such as word association or memory. Further, the literature reviews research that children, in general, use multiple forms of conceptual organization and can classify a single food item into taxonomic and thematic (script) categories that are independent of environmental and social factors. Hoadley (2005), in her research, explored the way in which children from different social class backgrounds classify and categorize food items, using Bernstein's recognition (how learners recognize a context) and realization (what kinds of meanings they realize, or produce) rules. My research will explore ways of combining this sociological research with more detailed cognitive psychology studies. This will attempt to open out the complexities of categorization in children, of how they are flexible in the types of categories they form and use (i.e. taxonomic, script, or both taxonomic and script). By drawing from cognitive theories I review the literature to outline conceptual representations in the real world, using food experiments by Ross and Murphy (1999) and other researchers in this field, to show children use multiple forms of conceptual organization and that working-class children work in complex ways with conceptual organization.

At the same time it must be noted that most of the research carried out by the psychologists were in middle-class communities that did not take into account the effects of poverty and social discrimination on conceptual organization. To some extent, this thesis is caught between these two discourses. The sociological studies pay close attention to issues of class but do not have the same nuanced range of experiments that the cognitive psychologists do. Equally however, the cognitive psychologists, for their entire experimental nuance, do not pay careful attention to how broad discriminatory categories such as race and class play a role in how conceptual organization develops.

3.2 Background

A central goal of cognitive psychology is to understand how categories are learned and used (Markman and Ross, 2003) in conceptual development. A central function of categories is their ability to tell us properties of novel entities. Researchers in conceptual development have identified several category types, namely, thematic category, script category and taxonomic category, which children may use to classify things. The literature will be reviewed along with more recent claims, that children do form abstract concepts (Nguyen and Murphy, 2003).

It is against this background I frame my research interest and review literature. With these interests in the fore, I wish to locate and position my research with Grade 8 learners, at an Ex-Model C school in the Pietermaritzburg constituency. The next section sets up the intricate debates surrounding conceptual development from a cognitive psychology perspective. This is done to show how the sociological studies on classification tasks (like Bernstein, Holland or Hoadley) need a more nuanced discussion of what is actually involved in these tasks.

3.3 Conceptual Development

Much of the research on conceptual development has been phrased in terms of word learning. Studies in this tradition show that children and adults differ in terms of the *content* of their concepts because children simply don't have the knowledge and experience that adults do. Cognitive development involves the transition from a contextual or thematic knowledge, based on the acquisition of recurrent properties of objects and events directly experienced, to a more abstract knowledge based on taxonomic relations responsible for the way objects and events are grouped into categories (Lucariello and Nelson, 1985; Lucariello, Kyratzis and Nelson, 1992). A taxonomic relation links a concept to its hierarchically superordinate level concept (dog-animal), to its lower or subordinate level concept (dog-collie), and to a concept of the same hierarchical level (dog-cat). This hierarchical structure allows us to store information about concepts in an economic way. When concepts are linked by cross-categorical relations, they are said to be thematically related as this kind of relation links different knowledge domains (dog-to-bone and lion-to-cage) (Borghi and Caramelli, 2003). Thematic relations bind one concept to another by highlighting their co-occurrence in an event or situation, that is, in a common 'theme'. In this regard some studies have shown that 20-month-old children can group together objects that are included in the same routine (Fivush, 1987) and that pre-school children use more thematic than taxonomic relations in sorting tasks (similar to Hoadley) (Gelman and Bairgellon, 1983; Markman and Callanan, 1984). This preference is accounted for by the way children deal with their environment as they build up concepts from everyday actions and events (that is, from situations or themes) (Mandler, 1992, 1998b; Nelson, 1986). This means that the early use of thematic relations helps children's later acquisition of more abstract, hierarchical relations such as those that required taxonomic conceptual organization. Thus, many researchers in this field have suggested that, once children are able to organize their knowledge in a hierarchical structure, they undergo a thematic-to-taxonomic shift which is responsible for their relying on the taxonomic organization of conceptual knowledge in their dealings with the environment.

In a study by Borghi and Caramelli (2001), many models of conceptual organization, from the classical theory, to the prototype models, excluding the exemplar models, rest on the assumption that the 'cognitive economic principle' underlies both the storing and the retrieval of conceptual information. This means that the collection of properties are stored in an efficient way and one does not have to store individual facts about an object/item because their hierarchies (or taxonomies) provide for the *transitive* inheritance of properties. They contend that it is the hierarchical organization of taxonomic relations which binds concepts together. This allows people to infer the shared properties and attributes which make the conceptual network coherent. In this perspective, Borghi and Caramelli (2001) believe that cognitive development is a progression towards the attainment of a taxonomic and hierarchical organized knowledge structure.

The classical theorists in educational psychology (Piaget and Inhelder, 1964;Vygotsky, 1965) claim, that during development, children undergo a thematic-to-taxonomic shift that is responsible for their mastering of concepts in dealing with the environment. Their claim is based on the assumption that there are '*necessary*' and '*sufficient*' properties in each concept and in order to demonstrate that children know concepts, they argued that children should be able to give an adequate definition of the concept, by showing skill in answering logical questions about it, using quantifiers such as '*all*' and '*some*'. Piaget and Inhelder (1964) didn't think that children could fully form categories until they were older. Hoadley (2005) shows that class has a serious impact on this. Piaget and Inhelder (1964) used an object sorting task (which is similar to Ross and

Murphy, 1999; Bernstein, 1971 and Holland, 1981; Hoadley, 2005, and my experimental design) to better understand children's concepts. Inhelder and Piaget (1964) assumed that if children had adequate (classical) concepts, the children would sort objects/items into groups that could each be defined by its critical features. They discovered that children often do not make such 'nice', *taxonomic categories* based on shared properties; instead they concluded that children gave two kinds of responses. The first, a *'complex'* response, implied that young children sometimes built structures or made images out of the items such as pictures or a sequence of items that did not fit any definition or with little or no coherence. A second kind of response revealed that children put items together according to *'thematic relations'* based on their involvement in the same event or setting. For example, children put a woman and a car together saying that the woman would drive the car; and they might group a dog and a bowl, saying that the dog would eat out of the bowl. It became apparent that consistently sorting a whole range of objects became rather difficult for children, so later experiments in conceptual development have often used a *triad* task, in which one object is given (e.g., a dog), and then the child is asked which of the two other objects it is like.

Other studies in this school of thought have shown that the organization of concepts develops thematically before taxonomically (Osborne and Calhoun, 1998). In a well-known study, Smiley and Brown (1979) found that children most often chose the thematic response before any other. They concluded that if children really believe that dogs and bowls are the same kind of thing, then their concepts will be radically different from those of adults. Fodor (1972) explained that children who formed a category corresponding to dog-and-leash (a contiguous relationship) because the leash is used only with the dog. Hence, the dog and leash are *thematically* related. Fodor (1972) concluded that if the dog and leash formed a category, they would be treated as roughly equivalent in the child's thought and language. Fodor (1972) pointed out that we would have little idea of what children are talking about if they actually formed categories like this, since our own (adults) words like 'dog' would refer to taxonomic categories that are qualitatively different from thematic categories. Therefore, he concluded that sorting tasks do not seem to give a valid picture of children's categories. This study conducted more varied tasks that were more sophisticated than the one carried out by Hoadley (2005) and others. In another study, Huttenlocher and Smiley (1987) who did a careful examination of how children use their first words concluded that these words were thematically related; Waxman and Namy (1997) showed that 3-year-olds in a triad task were fairly likely to respond thematically; Markman and Hutchinson (1984) – and many others since – showed that giving the target object a name greatly encouraged children to make thematic responses. Luria (1976), a student of Vygotsky, tested adults of Uzbekistan in an area far from urbanization and found that they often grouped items thematically, e.g. an axe is grouped with wood; Sharp et al. (1979) found that uneducated Mayan adults tended to make more thematic groupings than did Mayan children in the sixth grade or secondary school; Lin and Murphy (2001) found that adult college students often made thematic choices in triad tasks. I want to show here that Hoadley and others findings of restricted codes is similar to that of thematic groupings because they are localized to one's experience of the environment that is similar to the working-class practice of the community code

Borghi and Carameli (2001), contend that the thematic-to-taxonomic shift is possible because of a well-structured knowledge organization that rests on the hierarchal array of taxonomic relations. This progression from thematic-to-taxonomic relations has been challenged in other studies (see Borghi and Carameli, 2003; Lin and Murphy, 2001; Osborne and Calhoun, 1998). Recent evidence has challenged the primacy of thematic relations in younger children showing that pre-school children are able to distinguish the kind of relation required in a specific context. For instance, there is no preference for thematic relations when very young children learn new words. Young children seem aware that new words refer to single objects rather to objects plus their thematic associates (for example, they use the word 'dog' to refer to a 'dog', and not to a 'dog with a bone in its mouth') (Markman and Hutchinson, 1984; Waxman and Kosowski, 1990). Furthermore, in matching-to-sample tasks, children's choices between thematic or taxonomic relations can be determined by instructions: The "Can you find another one?" instruction yields taxonomic choices, while the "Which one goes with it?" instruction yields thematic choices (Waxman and Namy, 1997). Therefore there should be no reason, as suggested earlier, to suppose that children undergo a thematic-to-taxonomic shift i.e. that, with age, the taxonomic organization of conceptual knowledge replaces thematic knowledge (Osborne and Calhoun, 1998; Borghi and Caramelli, 2003). Markman (1989) makes the important point that thematic relations are a necessary thing for children (and adults) to know. They need to know about what things go together, how objects are used in various events, what items can be expected in different situations, and so on. A child learns that presents, cakes, candles, and guests are all likely to be found in birthday party, as this is part of learning about parties in our culture and also it is of great interest to most children. Thematic information is thus one form of general knowledge that children must learn about; it is not an irrelevant or unimportant response. The unusual aspect of children's responding, then, is not that they know about and use thematic relations, but that they sometimes use them in preference to taxonomic responses when asked to choose things that are of the same type.

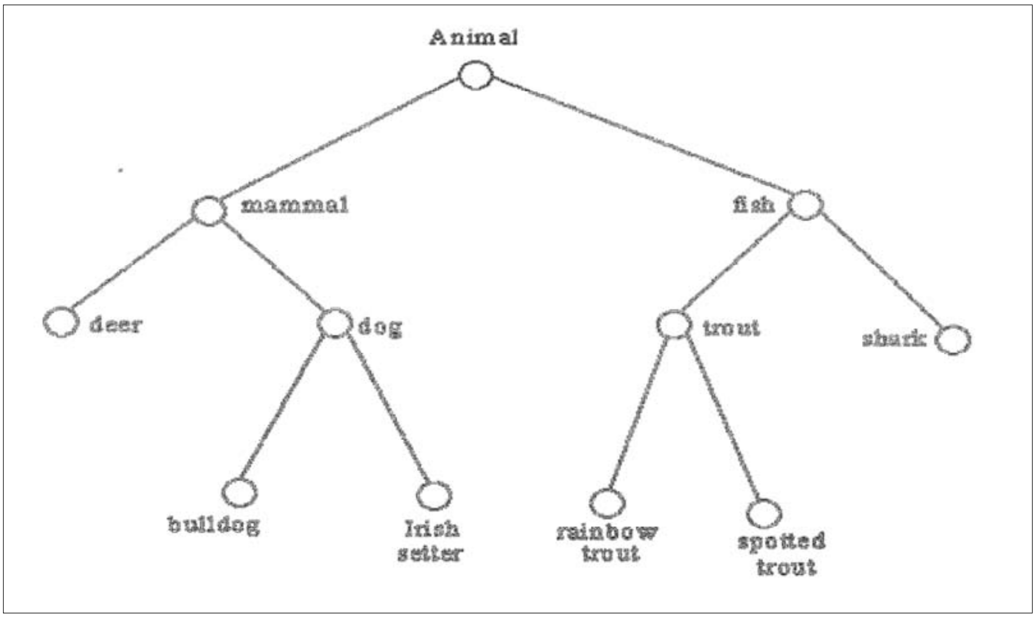
From the above discussion it can now be generally agreed that children and adults know about both taxonomic and thematic relations.

3.4 Taxonomic Organization and the Basic Level of Concepts

Murphy (2002) makes an important observation that at different times, a 'dog' might be considered a pet, friend, guard dog, or even a weapon. Most things are not solely in a single category and can be placed into a large number of different categories. The people, objects, and events that we encounter everyday do not each fit into a single category (for example, 'Wilber' might simultaneously be a bulldog, a dog, a mammal, and an animal) (Murphy, 2002).

My focus here is on one particular kind of category organization: the *hierarchical* structure of categories. In the above example, the categories bulldog, dog, mammal, and animal form a hierarchy or taxonomy (showing a vertical modality). These form a sequence of progressively larger categories in which each category includes all the previous ones. Therefore, the category animals include all mammals, the category mammals include all dogs, and the category dogs include all bulldogs. The hierarchical organization shown above suggests a particularly important way of organizing concepts. When people are asked to categorize an object in a neutral setting without further instructions, they are very likely to provide one of the hierarchically organized categories, like bulldog or dog, rather than categories like friend, or drooling animal (Murphy, 2002). These taxonomic categories may be particularly important ones for thought and communication (similar to Bernstein's 'code theory'). Hierarchies are important because they provide one with inductive, transitive and inference power (for example, when you learn that all animals breathe, you can infer that all cats breathe) (Murphy, 2002). In addition to identifying hierarchical organizations, psychologists have noted that one particular level of specificity of categories is important. For example, people normally call a Siamese cat, 'a cat', rather than calling it 'a Siamese' or 'an animal'. There is something about the category 'cat' that makes it just the right level of identification. Considerable effort has been expended to identify this especially useful level, called *the basic level of categorization*, in a number of different domains (Murphy, 2002). According to Murphy (ibid), adult concepts form an implicit hierarchy, a *taxonomy*, in which general categories like animals are super-ordinate to lower-level categories like dogs and beagles. This hierarchy can be revealed in beliefs such as all dogs being animals, and all beagles being dogs. The level being primary in thought and language is also called the *basic level*.

Figure 1: A simplified conceptual hierarchy (based on "Taxonomic organisations", The Big Book of Concepts (Murphy, 2002, p201.)



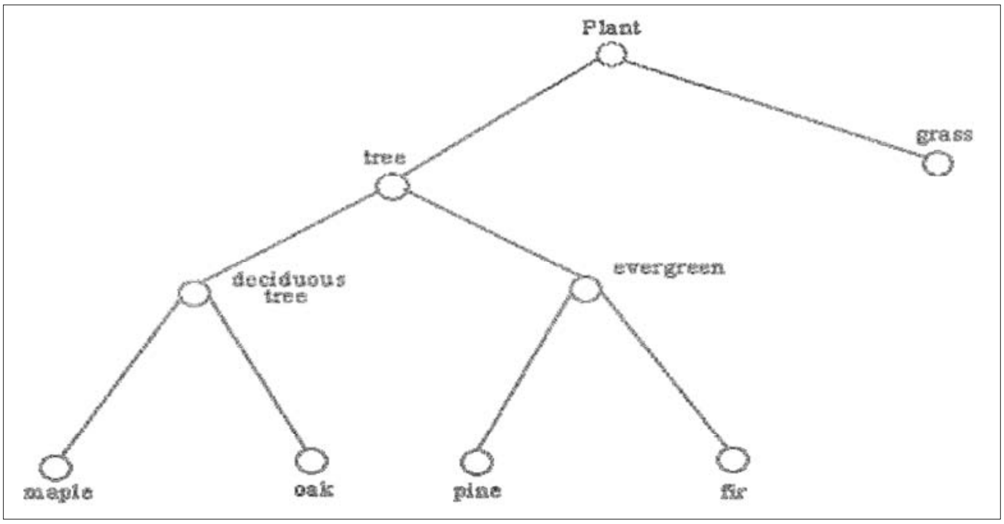


Figure 1 presents a simple conceptual hierarchy. In Figure 1 the categories that are higher in the hierarchy are *superordinate* to the lower-level categories; the lower-level categories are *subordinate* to the higher-level ones. Note that some parts of the hierarchy are 'deeper' than others. The figure above shows one may know two kinds of dogs but not any kinds of deer, therefore, the hierarchy is deeper under the dog category. A 'hierarchy' is a special kind of network. That is, it has nodes (categories) connected by relations. The only relation allowed between category members is the *set inclusion* relation (e.g. the set of animals includes the set of fish, which includes a set of trout, which includes the set of rainbow trout) (Murphy, ibid). Set inclusion is sometimes called the 'IS-A' relation (Collins and Quillian, 1969), because for the subordinate category there 'is a' superordinate. For a network to be a hierarchy, any category can have only one immediate superordinate (e.g. deer can have mammal as its immediate superordinate, but it can't also have fish as an immediate superordinate). The connecting lines in Figure1represent IS-A links that connect concepts to their superordinates or subordinates.

The nature of the IS-A relation is also important in determining the properties of hierarchies. Firstly, the IS-A relation is *asymmetric* (e.g. all dogs are animals, but all animals are not necessarily dogs). Second, the category relations are *transitive* (e.g. all pines are evergreens, and all evergreens are trees; therefore, all pines are trees. The transitivity of category membership leads to a similar transitivity of property ascription, called *property inheritance*. This is an important ability, since it allows one to immediately access knowledge about new entities that one hasn't had direct experience with. (This is why an elaborate code is important).

In another study Rips et al (1973) compared category members that were more or less typical or representative of a superordinate category (e.g. 'a robin is a bird' vs. 'an ostrich is a bird'). Both judgments would require one IS-A link to be traversed (i.e., both robin and ostrich would be directly connected to bird as a superordinate), and hence, both should take about the same time amount of time to evaluate. This somewhat confused form of the current theory should not blind us to the important generalizations. First, people are able to learn and use taxonomic relations in order draw inferences even if are not perfectly logical in doing so. Second, people are able to reason taxonomically about novel materials that have not been previously stored in memory. This is useful for generalizing new facts about one category to its subordinates. Without such ability, learning facts about the world would be much more onerous.

3.5 Cross-classification, category organization, category use and category learning in the process of categorization

The central goal of cognitive psychology is to understand how categories are learned and used (Markman and Ross, 2003) by examining cross-classification in a complex real-world domain, and the many other functions that categories may serve (such as induction, explanation, problem solving, category formation, and communication), using real-world concepts that are well integrated with human knowledge and activities. People's natural categories are acquired in the course of interacting with the categories and with category members (Markman and Ross, ibid). People classify novel items, make predictions about unknown properties, solve problems with categories, make explanations based on them, communicate about them, and form preferences. Hoffman and Murphy (2006) asserted that natural concepts can be extremely rich because people have a tremendous amount of knowledge about food, cars, rock music, birds, or heart diseases. All of this information can be used to classify entities into these categories or can be inferred from category membership. For example, a bird expert can identify a bird using a few disparate properties, such as small, blue, and seen in Mpumalanga in February (classification), and a physician can predict many symptoms of a person diagnosed with congestive heart failure (inference). This accumulation of knowledge is a striking accomplishment of the human conceptual system (Hoffman and Murphy, 2006).

Categories are groups of distinct abstract or concrete items that the cognitive system treats as equivalent for some purpose. Murphy and Medin (1985) make a distinction between a category (which is used to denote a set of items in the world) and a concept (which is used to denote the mental representations that support this grouping) and research on categorization focuses on the acquisition and use of these representations. Research on categorization has explored both the structure of people's natural categories and their ability to acquire novel categories (Markman and Ross, 2003). In this regard categorization has proved to be central to many areas of performance and skill (Medin and Smith, 1984; Rosch and Mervis, 1981) which has functional value in that it allows us to treat different things as if they were identical. Thus, we can act on an object we have never seen before as appropriate for its category membership. Understanding the principles of categorization, therefore, offers the potential of fundamental insights into complex cognitive behaviour (Massaro, 1993). In several experiments, Rosch and Mervis (1981) have shown that not all exemplars are equally good members of a category. Rosch (1975) explains that some are highly prototypical, others are only reasonable instances, and still others are peripheral or borderline cases of category membership and contrary to the classical theory of categories, its exemplars cannot be defined in terms of necessary and sufficient properties; a more useful metaphor is that of family resemblance (Wittgenstein, 1953). Markman and Ross (2003) make us aware that other aspects of categorization, such as levels of abstraction, have been studied by studying people's natural categories.

Markman and Ross (2003) suggest that there is a tendency, when thinking about categories, to focus on simple object categories – often those that can be labelled by count nouns. It must be noted that observations of natural categories make it clear that the range of categories people possess goes far beyond object categories, including categories of abstract concepts (Malt and Johnson, 1992), substances (Au, 1994), and events (Morris and Murphy, 1990). Natural categories are used for a variety of important cognitive functions, such as; people use categories to classify concepts, to make predictions, and to communicate.

Recently, Ross and Murphy (1999) provided evidence for flexibility of people's reasoning about different kinds of properties. Their interest was the domain of foods, which perhaps in comparison with other domains such as the animal kingdom leads more readily to cross classification. My study investigated the ability of Grade 8 learners to categorize food items, either thematically or taxonomically, using food domains adapted from Ross and Murphy (ibid) experiments (explained in the next chapter).

Most research on categories has focused on experimenter-defined categories in order to test models of classification (Ross and Murphy, ibid). There has also been work on real-world concepts, such as animals and plants, examining how people represent the categories that they have learned through experience. These categories often have much richer correlational structures and longer learning histories than can be captured in the laboratory (Ross and Murphy, ibid). Barsalou's (1983, 1985, and 1991) well-known work on goal-derived categories suggests that people can form alternative organizations in response to some goal, such as *'things to take out of your house in case of a fire'*. The work of Medin et al. (1997) is most directly related to the current investigation. Medin et al. (ibid) found that landscapers' sorting was influenced by the landscaping utility of trees (e.g. shade trees, ornamental trees). Medin et al. (ibid) examined the category representations and inductions of three different types of trees experts: botanists, park maintenance workers and landscapers. The results showed that the sorting of the first two groups were similar to those of the scientific taxonomy, but, as mentioned earlier the landscapers' sorting were influenced greatly by the utility of different trees in landscaping. Nevertheless, when asked to make inductions about biological properties from one tree category to another, the landscapers' judgments did not appear to be a function of this utilitarian representation but rather closely followed that is predicted by the scientific taxonomy. It is clear that the landscapers had a more standard taxonomic representation. This finding point out that people may be quite flexible in how they use their representations for different purposes (e.g. Lopez et al, 1997). The social cognition work examines person's categories that are clearly very integrated with the world knowledge we have. The examination of classification has included categories other than object categories, such as diseases (Brooks et al., 1991) and problem categories (Chi, Feltovich, and Glaser, 1981; Schoenfeld and Herrmann, 1982). These studies have focused on how new instances are classified, rather than examining how these classifications might be used.

Ross and Murphy (1999) have noted that most research on food categories, by Kruschke, 1992; Medin and Schaffer, 1978; Medin and Smith, 1984; Nosofsky, 1988;

Ross and Spalding, 1994; Smith and Medin, 1981, have focused on experimenter-defined categories in order to test models of classification. These studies and my study examine how people represent the food categories that they have learned through experience. Although, the work of the researchers has increased our understanding of conceptual representation, Ross and Murphy (1999) have highlighted three limitations that are apparent in their work namely; a single hierarchy, a single function, and isolated knowledge.

My research examines these representations and the use of a real-world concept, food, to overcome the limitations mentioned above. The following properties of food categories, namely, cross-classification; multiple functions; and integrated knowledge will form the basis of my argument.

3.5.1 Cross-classification

The primary goal of this research is to examine cross-classification in a complex real-world domain. It is common for an item to belong to multiple categories that represent alternative conceptual organizations, for example, people can be classified into categories, by their age groups, political party affiliation, and country of birth (Ross and Murphy, 1999). Very little is known about how such alternative organizations are represented and how they are used for various conceptual functions. Food is an excellent domain, as there are rich sets of ways of cross-classifying many foods. For example a bread roll is not just bread, but may also be considered a sandwich food, a breakfast food, a snack food, etc.. In many domains, such as foods, different conceptual organizations may be quite different from one another.

3.5.2 Multiple functions

Apart from classification; category representations may serve other functions such as induction, explanation, problem solving, category formation, and communication. Ross and Murphy (1999) claim that, classification, in many cases provides access to categorical knowledge that can be used in a variety of different ways. Different purposes and tasks may lead to different ways of processing the different representations so that a more complete understanding of the representations may require the use of multiple tasks. Although most laboratory studies examine classification, many categories are not learned principally for classification. Barsalou (1983, 1985) has shown that people readily form new categories that address specific goals. In everyday life, such categories would be used primarily as part of a planning process rather than for categorization (Barsalou, 1999). Purely goal-derived categories do not have strong correlational or family-resemblance structures. Instead, knowledge about an item can be processed in various ways so that the item's appropriateness to fulfilling a goal can be assessed. Clearly, according to Ross and Murphy (1999), we do not learn types of food primarily to classify – the classification is in the service of nutritional, hedonic, and social goals. Food categories clearly have both correlational structure and are used in a variety of goals. The main point is that as we consider additional functions of categories, a number of new issues arise.

3.5.3 Integrated knowledge

A real-world concept that is well integrated with human knowledge and activities is examined further. Food is something that is used every day and is an integral part of human life. Our knowledge of food is extensive and furthermore it is accessed many times per day (Rozin et al., 1998). It is not some isolated body of knowledge but is part of many aspects of our physical and social life. We know which foods to eat for energy and which may upset our stomach (Ross and Murphy, 1999). We know the foods that are likely to be served at various holidays and social events. We know which foods we can afford to buy and how long it will take to prepare. Our knowledge of food is connected, too much of our other knowledge. The knowledge of food is learned and used in an incredibly large number of ways and contexts. Our knowledge of many biological categories (trees, nonhuman animals) often comes largely from observation and communication from others. In contrast, foods, however, are interacted with extensively and in many ways. Besides eating foods, many plan meals, cook, and shop for foods. Newspapers and magazines are filled with articles on cooking and on the health implications of the different foods. The representations of foods, is bound to be affected by the large number of interactions we have with them as well the wide diversity of these interactions.

Dewey (1929) stresses that the influence of society on the learner and the psychological make-up of the individual are some of the main factors that have an impact on education. I understand this to mean that the individual learner is affected by a combination of factors; that are both psychological and sociological and as Bernstein puts it 'the outside becomes the inside and the inside becomes the outside'. Dewey (ibid) states that "all education proceeds by the participation of the individual in the social consciousness of the race" in such a way that the individual becomes "the inheritor of funded capital of civilization" (Dewey, ibid:17). This implies "funded capital" to represent intellectual and moral resources that influence the mode of production. The psychological tradition was presented above - I now present the literature review on the reproduction of inequalities. Bernstein's 'code theory' will provide the central resource followed by empirical studies in the psychological and social traditions.

The present study will go beyond those studies by examining a rich domain (food) from the perspective of multiple functions. The research will document the cross-classification of foods, investigate the accessibility of these different categories, and examine the use of such categories in induction.

3.6 Socio-economic perspective on the reproduction of inequalities

A concern in the sociology of education is the persistent achievement gap between working-class and middle-class students (Hoadley, 2005). Hoadley (ibid) argues that working-class and middle-class children come into school differently positioned for success, and the school fails on average to give working-class learners a leg up which contrary to Harding (2006) finding that schooling may interrupt the community code if the learner is able to demonstrate realization and recognition rules. Hoadley's (2004) paper raises and addresses a crucial question of 'how knowledge is specialized for learning, and how its transmission is specialized?', therefore, we need to consider the ways in which knowledge is organized that will facilitate a movement from the local to the general; from *context dependent* meanings to those that are *context independent*.

During the years of apartheid, schooling in South African education was structured so as to reproduce unequal social structures. The C2005 reform process thus extended the political project of democratic liberation into the pedagogic field in that all learners would be able to democratically learn in ways that took their own contexts seriously, allowing for differing learner paths that were all equal so long as certain specified outcomes were reached. There have been a number of studies in the sociology of education that deal with the relationship between social class and student performance and how inequalities are sustained. Gerwitz and Cribb (2003) and Morrow and Torres (1994) offer useful overviews of the shifts in the way in which social reproduction has been theorized more recently. These new theorizations consider the 'context specificity' of social reproduction, those aspects of schooling which are unconnected to or 'interrupt reproduction', and non-deterministic modes of explanation. The studies cited above provide analyses of how it is that social class differences are filtered through schools and classroom, and how school and classroom processes potentially amplify differences between students, disadvantaging the working-class.

3.7 Empirical studies

<u>3.7.1 Examples of empirical investigations in conceptual organization</u>

Setti and Caramelli (2005) studied the domain of abstract conceptual knowledge. They asserted that concrete concept nouns, such as *chair* and *book*, differ from abstract concept nouns, such as *freedom* and *language*. While the former refer to entities that are perceivable and spatially constrained, the latter refer to entities characterized by properties that are neither perceivable nor spatially constrained. The 'Dual Code Theory' of Paivio (1971, 1986; Paivio, Yuille and Madigan, 1986) attempted to explain this difference. They use the 'imagens' system to explain why concrete nouns, which are more imageable, are remembered better than abstract ones. This means that concrete nouns may benefit from two memory codes, while abstract nouns benefits from one. Moreover, the crucial role of the thematic knowledge in abstract objects was also found in children (Carameli, Setti and Maurizzi, 2004) as well as five groups of people differing in the type of expertise (Carameli, Borghi, and Setti, Mimeo). These points to the complexity of working with categorization, firstly, in terms of the recognition rules for contexts that vary dramatically on a number of complex levels (as pointed out above) but also in terms of the complexity of how categorization occurs. These kinds of studies point the way forward on how we can take the Bernstein studies on categorization that work with different classes and nuance the experiments to deal with the experiments with the factors picked up by the cognitive psychologists. In another experiment carried out Setti and Caramelli to verify whether concrete and abstract concepts are characterized by different patterns of conceptual information as well as whether the different domains of abstract concepts already studied in experiment 1 differ in the types of conceptual information they elicit. The results show that taxonomic relations were the most frequently produced in participants' definitions. Thematic relations were second most produced in all the conceptual domains considered. Thematic relations were produced more often in abstract concepts definitions than in concrete concepts ones. These results were replicated in children (Caramelli, Setti and Maurizzi, 2004).

This study by Borghi and Carameli (2001), on children (of middle-class origins) aged 5, 8, 10 and adults (university students), deals with conceptual knowledge organization using a word organization task. These tasks were similar to the tasks carried by Hoadley (2005). Participants were presented with concept nouns at superordinate, basic and subordinate level. This study aimed at shedding some light on: whether thematic knowledge concurred with the taxonomic organization of concepts in shaping knowledge in children as well as in adults, instead of losing its relevance; and can superordinate concepts, not referring to concrete objects, convey perceptual information?

The correspondence analysis suggests, at all ages considered, the main difference between superordinate and lower level concepts does not depend on the production of attributive and evaluative relations, but on the production of taxonomic and thematic relations. Superordinate level concepts elicit more taxonomic and less thematic relations than the lower level concepts. The study further reveal that superordinate level concepts elicit as many attributive relations as the other hierarchical levels. This could mean that perceptual information that is involved in attributive relations is conveyed not only by lower but also by superordinate level concepts. This result brings new evidence to the perceptual and action views of conceptual knowledge organization. Superordinate level concepts elicit mainly taxonomic relations at the subordinate level, i.e. instantiations (Heit and Barsalou, 1996), (98%, 99%, and 97% in 5, 8, and 10-year-olds respectively), thus showing their 'plural force' (Markman, 1985 , 1989; Murphy and Wisniewski, 1989a). The same was found in the basic level concepts (88%, 72%, and 76% respectively), though the percentage of instantiations decreased consistently. Subordinate level concepts, instead, elicit mostly items at the subordinate level (55%, 53%, and 52% respectively). Although, 5-year-olds produce mostly thematic relations and 10-year-olds, mostly attributive relations, the production of thematic relations decrease with age. At all age levels the production of thematic relations outnumbers that of the other relations, while taxonomic relations do not consistently change. Thus there seems to be no evidence of a thematic – to – taxonomic shift with age as suggested earlier, by the classicists.

The experiment with adults produced similar patterns of the results found in the children. A comparison of the two experiment shows that the production of thematic relations gradually decreases between 5 and 10 years, and increases as one gets older. The experiments by Borghi and Carameli (2003) show that thematic relations are most frequently produced by both children and adults. The production of taxonomic relations, instead, is more stable across the age levels than that of thematic relations.

The research by Nguyen and Murphy (2003) explored the children's use of multiple forms of conceptual organization which addressed the issue of cross-classification in children's concepts by focusing on taxonomic and script (thematic) categories of foods. Three questions guided the present examination. First, do children have taxonomic, script and evaluative categories, and do they develop at different rates or simultaneously? Second, do children cross-classify foods into different categories? That is, can children undergo a shift in their categorization style? Third, do children selectively use taxonomic, script, and evaluative categories to make inductive inferences about food?

A series of experiments were conducted. The first experiment examined whether 4-year-olds and 7-year-olds and adults classify foods into taxonomic, script, and evaluative categories. All the subjects were from middle-class communities. The results showed that children do have multiple category types, including taxonomic, script, and evaluative categories. By age 4, children do have taxonomic, script, and evaluative categories. The results of the Nguyen and Murphy's run counter to past claims that 4-year-olds undergo a qualitative shift in their categorization abilities.

Experiment 2 examined the early emergence of taxonomic and script categories by extending a modified version of experiment 1 to 3-year-olds and the claims of the developmental shift from script to taxonomic categories. The results show that the age 3, children have both taxonomic and script categories, and that one type of category does not dominate the other. There is a steady improvement in children's acquisition of different categories from 3 to 7 years, and that taxonomic and script categories are emerging simultaneously in 3-year-olds. The results do not reveal that there is developmental shift from script to taxonomic categories.

Experiment 3, examined the children's ability to cross-classify foods, i.e. whether children can treat the same item as a member of two different categories. The subjects were 4-year-olds, 7-year-olds and adults. These results suggest that young children's categorization of objects is flexible. This means that young children can classify the same object into taxonomic and script categories. In this study, the children were allowed to categorize a target item either taxonomically or thematically, spontaneously, without being cued (Blaye and Bonthoux, 2001) or primed. Other research has also found that even 3-year-olds have different words for a single object at varying levels of a taxonomy to which the object belongs (Blewitt, 1994; Dea'k and Maratsos, 1998; Waxman and Hatch, 1992), although superordinate categorization is not strictly speaking cross-classification. In the current study, children categorized items into taxonomic and script categories separately. Thus, results show that at minimum children can represent an item in terms of taxonomic and script relations at different times.

Experiment 4 investigated children's selective use of taxonomic, script and evaluative properties to make inductive inferences of foods. 4-and 7-year-olds lack inductive selectivity, because children tended to pick the category choice regardless of whether the biochemical or situational inference was appropriate. Unlike the children, adults made significantly more biochemical inferences for taxonomic than for script categories, and more biochemical inferences for the evaluative than the script categories. Adults made significantly more situational inferences for the script than for the taxonomic categories. Overall, the results from the adults are consistent with Ross and Murphy (1999), revealing that adults have inductive selectivity. Adults made more biochemical inferences for the taxonomic and evaluative categories than for the script categories. In contrast, adults made more situational inferences for the script than the taxonomic categories and evaluative categories. The results did not reveal that children have inductive selectivity. Children made a similar number of biochemical and situational inferences for the taxonomic, script, and evaluative categories. Thus, the results show that children can use all three kinds of categories from which to draw inferences.

The purpose of experiment 5 was to re-examine whether children can selectively use their categories for induction, testing conflict triads pitting taxonomic against script categories. The subjects were 4-year-olds, 7-year-olds and adults. The results suggest that 7-year-olds understand that biochemical inferences are most appropriate for taxonomic categories, whereas situational inferences are most appropriate for script categories. 4-year-olds made significantly more taxonomic choices for biochemical than for the situational properties. This suggests that 4-year-olds are beginning to develop their ability for inductive selectivity and according to Dea`k (2000) and Kalish and Gelman (1992) children know that certain categories support certain inductive inferences.

The fact that 4-year-olds were more accurate on the situational properties suggests that children may be able to make inductive inferences from script categories earlier than taxonomic categories. However it should be noted that this could simply reflect a preference for the script relation.

3.7.2 Examples of empirical investigations – using Bernstein's 'recognition' and 'realization', rules.

In 1981, Holland conducted original tests to illustrate the use recognition and realization rules as functions of classification and framing. Children from different social backgrounds (7-year-olds from working-class and middle-class learners) were shown a series of pictures of different foodstuff. They were asked to group the foods in any way they thought would be appropriate. After this task was completed they were asked the reason for their groupings. The children were then asked to group the food items for a second time.

From these tests, Holland (1981) demonstrated the concept of 'code'. The experiment showed that working-class children generally used context-dependent principles for their sorting in that they referred to personal and particularistic meanings (i.e. they grouped foods according to their personal choices and according to their own experience of life) which generally referred to everyday use. They did not change their principles for sorting the second time, demonstrating a single coding orientation (restricted) which informed both groupings.

The other group of children grouped the food items according to some common feature that the foods shared or, a more general principle that applied to foods. When this group was to group the food items again, some of the children who had previously applied generalized principles used a restricted (community) code similar to that of the working-class child. This suggests that middle-class children were found to respond to the context firstly by referring to general principles (e.g. a food category), non-context-dependent meanings, and, in a second grouping, to more personalized, local meanings. Thus they demonstrated two coding orientations, elaborated and restricted codes, and context-independent meanings were privileged for the school context.

This demonstrated that those students who originally recognized the context as specialized and used context-independent principles to group the foods applied the elaborated code. They were able to move from the elaborated to the community code (application of context-dependent, personalized groupings) and back again. These learners were mainly from a middle-class background and it was concluded that they were more likely to be in a position to access the elaborated code than the working-class learners who are disadvantaged in a school setting as they did not have the capacity to move from the community code to the elaborated code and back again.

Hoadley's (2004, 2005, and 2006) study of middle-class and working-class learners took place in South Africa. She administered two tasks to determine the students' mastery of the recognition and realization rule in producing their legitimate text in term of the school code. The first task was a general coding investigation which looked at the categories the students use to sort phenomena - employing context-independent meanings (exhibiting an elaborate code), or context-dependent meanings (a more restricted code). The general coding task is an adaptation of the experiment designed by Bernstein (1970) and Adlam et. al. (1977), and analysed by Holland (1981). The students were presented with 20 pictures of food items on cards. The students were asked to explain their choice of groupings, and then group the picture again, in a different way. The criteria for their grouping was solicited and recorded. The results showed no significant differences between the students of different teachers within the working-class and middle-class contexts. In the first sorting the expectation was that the students recognized that the experiment was taking place in the school context, and accordingly deployed context-independent criteria to sort pictures of food. Hoadley (2005) noted that the working-class child deploys a context-dependent categorization by referring to his practical experiences of food, and the middle-class child, context-independent meanings prevail, using one attribute categorization and one perceptual, since the general principles for categorization were deployed in three of the five groupings, the focus was coded a context-independent.

For the second sorting, middle-class students referred to the context-dependent category everyday use at least once, thus switching codes from the first grouping. The working-class students maintained the same coding orientation in their sorting.

In the final sorting, the intention was to assess whether the students had access to recognition rules for context-independent categorizations (especially in the case of the working-class students, who predominantly did not have access to realization rules). It is interesting to note that even though the groupings were those of the researcher, the students referred to personalized meanings, their own experience, as if those meanings would make sense to someone who did not share their particular context.

The second task, considered the learner's engagement with mathematics, her interest being in the extent to which learners deployed more localized or specialized strategies for solving of mathematical tasks. Here Hoadley (2005), wanted to investigate the learner's mastery of the recognition and realization rules (i.e. how learners recognized problems and their requirements (recognition rules), and how they produced solutions, and the nature of those solutions (realization rules). For the working-class learners many of the errors resulted, from both a problem of recognition and realization. For the contextual questions, 60% of the errors were due to a lack of recognition rules and 40% were related to the absence mastery of the realization rule for solving the problem. In general the middle-class learners had acquired the recognition and realization rules, and were able to make pedagogic judgments.

3.8 Conclusion

In this chapter I have outlined some of the empirical antecedents to this study in order to locate the study and to frame the research problem. To summarize, we know that social class is reproduced through schooling, but it is unclear how this happens (Hoadley, 2005). The purpose of the experiments were to explore the way in which children of different social class backgrounds classify and talk about a particular area of their experience; how learners recognize a context (in this case, the school setting of the experiment), and what kinds of meanings they realize, or produce. A range of experiments used by Ross and Murphy (1999) using food items, have been adapted to look at the categories students use to sort phenomena – employing context-independent meanings (exhibiting an elaborated code), or context-dependent meanings (a more restricted orientation). In cognitive development these arguments lead to the questioning of the traditional cognitive economy principle based on the hierarchical organization of conceptual knowledge (Borghi and Carameli, 2001; 2003). Some authors have pointed out that the kind of task given to children biases their preference for thematic or taxonomic relations (Waxman and Kosowski, 1990; Waxman and Namy, 1997) and that thematic relations still play a role in both older children's and adult's conceptual organization (Markman, 1989; Sell, 1992).

Key to understanding these distinctions in Bernstein's work is the recognition that the restricted code is not intrinsically bad. We all work with a restricted code. Even the ruler of a country uses a restricted in his or her own comfortable contextual surroundings. While Bernstein shows 'orientations to meanings' are weakly classified or restricted in the working-class, psychology tends to explain this phenomenon in that it is not 'recognition and realization' rules that are posited weakly but that children in general are able or unable to work taxonomically. Researchers in conceptual development have identified several category types that children may use to classify things. Further research will need to work in a more detailed way with all the ways children categorize things and how this intersects with poverty and discrimination.

The theoretical assumptions informing the study were outlined in the previous chapter and the research design follows in the next chapter.

Chapter 4: Research Methodology

4.1. Introduction

There are three broad approaches to educational research. The first, based on the scientific paradigm, rests upon the creation of theoretical frameworks that can be tested by experimentation, replication and refinement. The second approach seeked to understand and interpret the world in terms of its actors and, consequently, may be described as interpretive and subjective. A third approach that takes into account the political ideological contexts of much educational research is of critical educational research. Aspects of scientific and interpretive educational research inform my study.

Cohen et al. (2007) distinguish between methodology and methods. According to Kaplan, in Naidoo (2006), methodology is a description and analysis of methods chosen, of their limitations and resources, of clarifying their presuppositions and consequences. In a nutshell, the aim of methodology is to explain and defend the methodological process chosen. 'Method' refers to the range of approaches and techniques used to gather data to be the basis for description, inference, interpretation, explanation and prediction.

The aim of the study is to determine in a middle-class / working-class school if and how learners invoke more context-independent ways of organizing knowledge, or whether more concrete, context-dependent meanings are privileged by learners. Bernstein (1990), noted that, that learners who cope in the school context, are in possession of the elaborated code that academic performance requires. He explains that learners, who come from a working-class background, often remain bounded in the community code despite the endeavours of school to 'interrupt' this code and 'amplify' the elaborated code (Hoadley, 2005). Previous studies and investigations have explored the relationship between learners, pedagogy and their social backgrounds (Fontinhas et .al., 1995), learners, pedagogy and teacher dispositions (Hoadley, 2005), learner dispositions and its impact on their demonstrations of recognition and realization rules (Harding, 2006) but this study focuses on the ability of how learners in a particular school conceptualize knowledge taxonomically and thematically, irrespective of their class background.

The previous chapters provided the literature review and theoretical background to the study. In this chapter, I present and explain the methodological processes I chose in order to generate and analyse data. Furthermore, I present the data collection techniques and procedures and provide reasons for the choices I made. This chapter is twofold; the first part will outline the methodology and the next part, the methods and instruments used in generating and analysing data for this research project.

4.2. Methodology and Methods

A quantitative and qualitative research design was employed for the purpose of this study using a positivist and interpretative approach. As this research endeavours to identify statistical prevalence to conceptual word organizations and categorization by Grade 8 learners in an Ex-Model C school, a positivist and interpretivist approach to the study is required. The justification for the choice of positivism and interpretivism as my research paradigms is that the focus of this research is both statistical (quantitative) and inferential (qualitative).

Auguste Comte, in his positivist approach to research uses observation and reason as a means of understanding behaviour and offers explanation by way of scientific description (Cohen et al., 2007). Neuman (2000) states that "positivist researchers prefer precise quantitative data that often use experiments, surveys and statistics" and relates "social science as an organized method for combining deductive logic with precise empirical observation with individual behaviour in order to discover and confirm a set of probabilistic casual laws that can be used to predict general patterns of human activity" (Henning et al., 2005). Although the positivist umbrella of research is not the most prevalent or widely accepted paradigm of research in education, it is necessary to consider it in the case of my study. In my research positivism will be the dominant approach I employ, however the school situation tends to emphasize qualitative research. I will be conducting a series of food experiments with the learners. Knowledge concerning prevalence always aims to provide professionals, using the data, with the ability to either control or predict behaviour in order to ensure prevention or intervention strategies that are required can be implemented. According to Neuman (2000), this is termed as “instrumental orientation”. Although many positive research designs aim to find a plausible explanation supported by evidence, my positivist design aims to investigate hypotheses generated from previous work. Positivism is nomothetic (legislative) in nature, which implies that it can be understood as a general system of rules or laws and hence it can be an underlying law of systems of culture.

While positivism claims that science provides us with the clearest possible ideal of knowledge, this approach is less successful in its application to the study of human behaviour where the immense complexity of human nature and the elusive and intangible quality of social phenomena contrast strikingly with the order and regularity of the natural world, especially in the context of the classroom and school where teaching, learning and human interaction take place (Cohen, et al., 2007). Positivism as a theory of research is widely criticized for its reductionist attitude towards the nature of human or social interaction; it nevertheless fulfils the requirements of a prevalence study. A strong possible criticism of the positivist paradigm is that is does not take into consideration how people make meaning or culture influences interpretation.

In order to accommodate the criticism of using a positivist approach, as already mentioned, I found it necessary to integrate an interpretative dimension to my research. The reason for this is to carry out an inquiry into the way social meanings come about in discourses and how these discourses are maintained. Part of this research is situated in the interpretivist paradigm with its emphasis on observation, experience and interpretation. Interpretive research is fundamentally concerned with meanings and it seeks to understand social members’ definition and understanding of situations. The interpretive paradigm does not concern itself with the search for broadly applicable laws and rules, but rather seeks to produce descriptive analyses that emphasize deep, interpretive understanding of social phenomena. This ties in with the focus of the proposed research, as its purpose is to gain a deep level of understanding of the thinking patterns of a specific group of learners. This research focuses on the understanding of the participant's word organization (taxonomic or script categorization) as experienced in their environment, from the stand point of their unique contexts and backgrounds, but not class. The foundational assumption of intrepretivists is that most of our knowledge is gained, or at least filtered, through social constructions such as, amongst others, language, consciousness, and shared meanings. The types of knowledge frameworks that drive society, also known as its discourses, become key role players in the interpretive project. These 'knowledge systems' are interrogated by the interpretive researcher who analyses texts to look for the way in which people make meaning in their lives, not just that they make meaning, and what meaning they make. Thus, the interpretive researcher looks for the frames that shape the meaning. It thus holds that researcher in this paradigm is extremely sensitive to the role of the context. According to Janse van Rensburg (2001) an interpretivist methodology reflects an interest in contextual meaning- making, rather than generalized rules, usually involving individuals and small groups in 'naturalistic' settings. Since I seek to obtain a deeper understanding of the participants' interpretation of a situation in their natural context, the interpretive approach seems appropriate to my purpose.

Positivism is about seeking plausible explanations through empirical means. The purpose of science is thus about what we can observe and measure, whether quantitatively or qualitatively. It can be assumed that knowledge, in the positivist paradigm, stems from experience and observation (Henning, 2005). Observation usually happens through our senses. It follows that observational data has to be verified through the senses as well (ibid). Verification leads to scientific knowledge (ibid). A quantitative research methodology centres on experimental control, structured and replicable observations and measurement, quantification, generalization and objectivity (ibid). In the instance of content-based descriptive studies the verification process is not related to generalizations to a population, but to situations where similar issues are addressed. Qualitative research involves the collection and study of a variety of empirical materials – case study, personal experience, life story, interview, observational, interactional, and visual texts – that describe routine and problematic moments and meanings in individual lives. I have therefore used, in addition to experiment 1 and experiment 2, a third experiment which is observational and interactional in nature, hoping to get a better understanding of the subject matter at hand.

Modified experimental research, as part of an interpretivist methodology, can take place in natural settings in order to collect substantial situational information (Henning, 2005). The proposed study falls into both the positivist and interpretivist paradigms and will be both quantitative and qualitative in nature. The aim is to provide an in-depth exploration and description of the ways in which learners in a particular school, irrespective of their socio-economic or class background, organize knowledge.

4.2.1 Method

Experimental research was used to gather data. The experimental research design included the following experimental tasks; category generating, category rating, category sorting. Unstructured interviews were conducted with learners as a follow up to gain a deeper understanding of their choices in the category sorting task. A fixed design using experimental research can be confirmatory (i.e. seeking to support or not to support a null hypothesis) or exploratory (discovering the effects of certain variables) (Cohen, et al., 2007). Subjects were selected purposively for experiments 1 and 2 and randomly for experiment 3.

A descriptive analysis of experimental tasks in which the learners participated was carried out. In order to understand properly how the taxonomic architecture works, it is generally assumed that the properties shared by the concepts at the higher and more inclusive level are transferred to the concepts at the lower level but not vice versa. To verify the aforementioned hypotheses a word association task was selected and adapted from that of Ross and Murphy (1999). Word association tasks have been already used with success for studying conceptual relations in children (Nelson, 1986; Hoadley, 2005; Bernstein, 1990). Sell (1992) has used both an oral word association task and a match-to-sample task with children from 2 to 10 years. Lucariello et al., 1992) have used an oral word association task, a production task, and forced-picture-choice task with children aged 4 and 7 years and with adults. The same authors have stressed that the picture-matching-task yields the thematic relations more frequently than verbal tasks, which yields taxonomic relations. For these experimental tasks I used a combination of methods, namely, word association tasks combined with a written response from the subjects.

4.2.2 Context

The school at which this study was carried out is located in an upper-class, leafy and attractive suburban setting. It is located approximately 1 km from the central business district of Pietermaritzburg and on the main transport route to Edendale and Imbali. The school is within walking distance of taxi terminus, which services the neighbouring suburbs and townships. The school is a former Model-C school (exclusive admittance of White learners under Apartheid) and was formerly administered by the House of Assembly. It is a well-resourced co-ed school with a learner population of approximately 1084. The official medium of instruction is English.

The school draws the majority of its student population from the nearby townships, the Eastern Cape and a small number from the ex-White, Coloured and Indian suburbs. The school is well resourced with a large hall, an extensive library, sporting facilities, computer laboratory, an art room, a drama room, science laboratories, domestic science laboratory, multi-purpose seminar centre, a defunct armoury, tennis courts, squash court, a swimming pool and a boarding establishment (caters for boys only). The school grounds are attractive, with well-maintained gardens, trees and school buildings. It situated well back from the main road. It is considered to be a transformed school in terms of learner demographics and staffing as the student body of the school is seen to be representative of KwaZulu-Natal. The school has a rich history of traditions and has changed very little in the practice thereof and therefore not transformed in its ethos.

The school implements an admission policy based on application. The school fees stand at R8 300 per annum, and the school could afford to employ additional staff members with fees paid by parents. The school has 51 well qualified members of staff, 14 of whom are paid by the governing body and approximately 1084 learners (including boarders). There are 201 learners in Grade 8, with an average class size of 34.

Table 4.1 Population distribution (learners) for the whole school

	Number of learners	Males	Females	%
Asian	22	14	8	2.03
Black	980	564	416	90.45
Coloured	23	10	13	2.15
Immigrant	2	2	-	0.02
White	57	36	21	5.35
	1084	**626**	**458**	**100**

There are six class sets in the organizational division of the grade. The classes are streamed according to an entrance examination in languages (English) and mathematical proficiency. The top set which constitutes those who performed well will make up the 'A' class, and so on. All learners take three languages, namely, English (home language), Afrikaans (first additional language), and isiZulu (first additional language). The medium of instruction in all learning areas is English. The sample selected for the research experimental tasks (experiment 3) spanned all the class sets, 30 subjects, 5 from each class that were randomly chosen. This school was selected because of the learner demographics, its academic achievement in matric, extra-curricular and co-curricular activities. Learners at this school fit the profile of those learners who would have difficulty in accessing the elaborate code demanded in school performance due to their working-class background (see, Harding, 2006). Despite their backgrounds, nearly 100% of learners at this school are performing sufficiently well to pass the National Senior Certificate with nearly more than 50% of them gaining access to tertiary education enabling them to study further. The school is proud of its matric pass achievement in the National Senior certificate examinations of 100% in 2008 and average of 99% in the previous years.

Table 4.2 Population distribution (learners) in Grade 8

	GRADE 8																			
	A			B			C			J			L			M				%
	Total	*Male*	*Female*	**Total**	*Male*	*Female*	**Total**	*Male*	*Female*	**Total**	*Male*	*Female*	**Total**	*Male*	*Female*	**Total**	*Male*	*Female*	Total	
Asian	**1**		1							**1**	1					**1**	1		3	1.5
Black	**28**	14	14	**33**	20	13	**34**	18	16	**32**	20	12	**30**	18	12	**29**	19	10	186	92.5
Coloured	**3**	3		**1**		1													4	2.0
Immigrant																				
White							**1**		1	**2**	2		**3**	3		**2**	1	1	8	4.0
	32	17	15	**34**	20	14	**35**	18	17	**35**	23	12	**33**	21	12	**32**	21	11	201	100

4.3 Ethical Considerations

All the Grade 8's were made aware of the purpose of of this research by the researcher. This was done on a class by class basis by the researcher. Each child was required to complete a consent form, individually. This was carried out in its entirety so as to not prejudice any one child. In addition to this the researcher asked the learners' to get their parents permission as well, Voluntary consent of both the parent and the children is absolutely essential when research is conducted with human subjects, especially children. The consent letters were collected over the next week, to allow the parents enough time to understand the intention of this research. The respondents, who participated in this research, were all made aware of the purpose of the study for the second time in the venue where the experiments were conducted. The subjects were guaranteed that no harm would come to them and were free of any victimization by the researcher or any other person at this site. The relationship between the researcher and the participants was collaborative, implying a mutual engagement with the research process. The subjects were assured of confidentiality. The research process was a continuous interaction between the researcher and the participants. This interaction buitlt trust to the extent the participants found the researcher approachable and that made coomnication easier. They were also given the freedom to stay anonymous, and to stop participation at any time as well as the right to confidentially.

4.4 Validity / Reliability / Trustworthiness

An instrument is valid if it measures what it is intended to measure and accurately achieves the purpose for which it was designed. Validity involves the appropriateness, meaningfulness, and usefulness of inferences made by the researcher on the basis of the data collected. Validity can often be thought of as judgmental (Patten, 2004; Wallen and Fraenkel, 2001in Chapter 3 RESEARCH DESIGN AND METHODOLOGY. (undated) http://dwb4.unl.edu./Diss/Hardy/chapter3.pdf Accessed on 14 May 2007). Patten (2004) reminds us that no test instrument is perfectly valid. Nevertheless, Wallen and Fraenkel

(2001) contend that researchers need some kind of assurance that the instrument being used will result in accurate conclusions.

This is the requirement that the application of a valid measuring instrument (data schedule and descriptive matrix) will result in reliable data. Smith (1975) asks the question: ‘will the same methods used by different researchers in the same context produce the same results?’ His response is that the objective of data collection is to produce reliable data. If the data is reliable then different researchers conducting the same experiment on the same group of subjects will produce the same data. Sources of error that can result in unreliable data are due to researcher effects, participant effects and context effects. I controlled this by employing a form of triangulation in using three food experiments that required the focus group to participate in different tasks and if necessary unstructured interviews for follow up purposes.

4.4.1 Reactivity effects

Human beings normally react to the fact that they are being studied and investigated, and hence their behaviour. Campbell, cited in Naidoo (2006), makes the researcher aware of a phenomenon known as ‘reactivity’. Reactivity refers to the influence of the researcher on the setting or individuals being studied. This reactivity manifests itself in a variety of forms – resistance to being interviewed or observed, supplying incorrect information as a result of apathy or wilfulness, modifying behaviour or information to create a better impression or deliberately misinforming the researcher. If reactivity is not controlled or minimized by the researcher then the data collected will not be reliable. Since I am an educator at this school I had to constantly assure the learners that these experiments were not for marks or progression and that it was for study purposes. I controlled reactivity by assuring the participants that these tasks were for research purposes and not part of the schools progression requirements. Subjects were selected purposively by the researcher for experiments 1 and 2 and randomly for experiment 3. The same subject was not selected in any of the other experiments carried out by the researcher. This was done to avoid bias, influence and contamination of the data. I believe that this was adequately achieved.

4.5 Pilot survey of "food items"

A variety of food items that represent different food categories were identified by the researcher. The pilot took place to determine 'familiarity' or 'unfamiliarity' towards the food items in their food category by the subjects. Six Grade 8 learners (who would not participate in the other experiments to avoid contamination or influence the data collection), arbitrarily chosen from a class list were required to demonstrate their 'familiarity' or 'unfamiliarity' to food types in particular food category. They were asked to complete the survey in Appendix A. The survey comprised a list of food items stated in the English medium and its isiZulu translation next to it. The learners were required to place a tick (✓) in the appropriate column to indicate their 'familiarity' or 'unfamiliarity' with the food item. Learners were asked to provide an alternate word in cases where they not familiar with the word or did not recognize the word. I had to be aware that the word had to fit into the food category.

The data gathered from the pilot survey (Appendix A) were coded using '1' to represent 'familiarity' and '0' to represent 'unfamiliarity'. Where there was a high frequency of 'zeros' those food items were excluded and replaced by another food item that had to fit into the food category. A total of 51 food items that was reasonably familiar to South African Grade 8 learners were selected for the research.

The pilot study contributed in many ways. Firstly, it helped in the refining of the food categories. Secondly, the pilot alerted me to the methodological entailments of the data collection strategies. Some of these were practical (for example, the learners would arrive late) and some related to the relationship between researcher and research subject and sensitivity of interactions and negotiations (for example, some learners thought these experiments would jeopardize their progress by counting against them). Finally, the pilot study contributed to the conceptual development of the research. Since the majority of the learners at this school are African learners, the food items were presented with its isiZulu translation. This also minimized any confusion about the understanding of the food item, especially to second language learners.

4.6 Data Gathering Techniques

As suggested above, empirical research often involves multiple sources of information for the collection of the data. The data reported here, and used in the analysis, was collected from 58 learners, over a period of two weeks, because a series of food experiments adapted from Ross and Murphy (1999), had to be carried out during the breaks and after school. This was carried out so that the focus would not be contaminated or influenced in data collection. There were three data collection tasks conducted with the learners.

4.6.1 Food experiments

Fifty eight learners in total were used in the research project. They were selected arbitrarily by the researcher across the grade to represent the school's demographics for experiments 1 and 2. The experiments were conducted individually with each learner. Three experiments that were replicated from Ross and Murphy (1999) were carried out with the learners. A different set of learners were used in each experimental task and unstructured interview were conducted for clarity on certain findings. The learner's groupings and rationales for the category generating, rating, and sorting experiments were recorded on data schedules.

The procedure set out below will form the broad outline for the data collection.

- Document the cross classification of foods
- Investigate the accessibility of these different categories
- Examine how we use these categories in induction

4.6.1.1 Experiment 1 - Category generations (Appendix C)

Rationale

To explore the various categories learners have about foods. Learners were asked to generate some categories for each of the foods.

Goal

- To find out how Grade 8 learners think about categories of food.
- To find out what kind of categories Grade 8 learners use to classify food.
- To check whether Grade 8 learners' categories match those of Ross and Murphy(1999).

Method

Materials required

- 51 food types were chosen that spanned a variety of categories (beverages, breads, dairy foods, fruits, grains, meats, and vegetables - taxonomic or script).
- A booklet (11 pages) including the cover page, instructions, and ten pages of food items listed in English with its isiZulu translation equivalent comprising a different page order).
- Each subject were presented with own booklet.
- Pencils.

Subjects

The test group comprised twelve (two learners from each class set in the grade) chosen by the researcher from a class list in no particular order.

Procedure

- The instructions informed the subjects that the goal of the study was to find out how learners think about categories of foods.
- Subjects were given a list of food types (in a booklet) from which they had to generate food categories. There were five food items listed to a page except one page had six.
- The instrument (booklet) comprised of ten pages in particular order (so the sequence of the pages differed amongst the learners)
- The subjects were asked to think about the food item for a while, about 30 seconds, and then write down what categories they think that food type will belong to. For each food type subjects were be asked to write down as many categories they could think

of. An example of a dog belonging to a large number of different categories (pet, canine, animal, domestic animal, mammal) was used to explain the concept of categories. This example of the 'dog' was written on the chalkboard and remained there for the duration of the experimental task.

- The learners were advised that that they could spend a maximum of 8 minutes per page. When the eight minutes had expired an indicator was sounded, they were to turn to the next page to continue.

Design

All subjects generated categories for the same food terms, though the pages are randomly collated in each booklet, verifying the taxonomic and script categories of Ross and Murphy (1999).

4.6.1.2 Experiment 2 - Category ratings (Appendix D)

Rationale

After generating taxonomic categories (in experiment 1), it is possible that subjects may generate answers that they do not really believe are categories (see Hampton, 1979; or Tversky and Hemenway, 1984). A similar experiment on category generation carried out by Ross and Murphy (1999) found that a number of answers that subjects noted were associates of the food types, such as cheese for crackers (Ross and Murphy, 1999).

Goal

- To provide both the food item and the category and ask subjects to rate how good an instance of the category the food item was.
- To determine, whether foods were rated as belonging to script categories, as suggested by the generation data, as found by Ross and Murphy (1999) in their experiments.
- To find out, how ratings (explained in procedure) of the script categories compared to those of the taxonomic categories?
- To determine, whether script categories were thought to be just as good super-ordinates of the foods as the more traditional taxonomic categories by the focus group.

Method

Materials required

- Categories chosen were be the common (frequency) responses from the category generation task.
- Some categories were combined into one category (for example, breads and grains).
- Each page had one category and all 51 food types that were used in Experiment 1
- The instrument was 17 pages (including cover page). This included the categories generated from the analysis of Experiment 1.

Subjects

The focus group comprised 12 (2 learners from each class) arbitrarily selected Grade 8 learners who were different from those learners used in Experiment 1.

Procedure

- The instructions informed the subjects that the study was to find out what people think about types of foods.
- Subjects were given an individual booklet with food categories representing six taxonomic categories and eight script categories.
- Subjects were asked to use a '0 to 7' point scale. (0- which is labelled 'Not a good member'; to 3- 'Fairly good member'; to 7- 'Excellent (Very typical) member'). The rating scale was printed on the top of each page with an illustration of a non-food category, for example – 'vehicle', rating the 'vehicle' as a 'flagpole' will be rated as '0'; rating the 'vehicle' as a 'car' will be rated as '7'; and 'skateboard' as '2 or 3'.
- The researcher was on hand to explain any misunderstanding and to avoid any confusion.
- The subjects were given 45 minutes to complete the task.

4.6.1.3 Experiment 3 - Category sortings (Appendix E)

Rationale

The category rating task carried out by Ross and Murphy (1999) indicated that people believed that foods are members not just of taxonomic categories but also that of script categories. Although the ratings task was informative it did not show how these script categories constitute an important part of the representations of food (Ross and Murphy, 1999). For this experiment the focus group was divided into three smaller groups of 10 subjects each (5 subjects from an alphabetical class list arbitrarily (from the top, middle and bottom) selected across the six class sets which constituted 30 in total).

Group 1 – Taxonomic Group (Group T)

(10 arbitrary selected learners who did not participate in any of the previous experiments). These learners were instructed to sort and organize the food items from a pack of 51 word flash cards (each card representing the food item in English with its isiZulu equivalent translation) into taxonomic categories.

Group 2 – Script Group (Group S)

(10 arbitrarily selected learners who did not participate in any of the previous experiments). These learners were instructed to sort and organize the food items from a pack of 51 word flash cards (each card representing the food item in English with its isiZulu equivalent translation) by script categories.

Group 3 – Default Group (Group D)

(10 arbitrarily selected learners who did not participate in any of the previous experiments). These learners were instructed to sort and organize the food items from a pack of 51 word flash cards (each card representing the food item in English with its isiZulu equivalent translation) into groupings that go together. This group was not given any particular basis for sorting.

Goal

To examine learner's sorting of food terms as an additional indication of their underlying organization of the category food done by Lopez et al. (1997), Medin et al. (1997), and Ross and Murphy (1999).

Method

Materials required

- The same food types were used from the two earlier experiments.
- One set of word flash cards representing the food items for each subject in the focus group.
- Each food term will be typed on a 7.3 cm X 10.5 cm index card. There will be three focus groups to represent the grade.

Group 1 – Group T

Instructed to sort by taxonomic categories, i.e. to sort the cards into similar types of food, or kinds of food.

Group 2 – Group S

Instructed to sort by script categories, i.e. to sort 'foods eaten at the same time or in the same situation'.

Group 3 – Group D

Instructed to sort the food items into groupings 'that goes together'.

Procedure

- The subjects were lined in their class sets. The numbered head system was used with the first learner being given the number 1 and the next number 2 and then number 3 for the third learner. The process was repeated with all the number 1's making up the taxonomic focus group, the number 2's the script focus group and the 3's made up the default focus group.
- Each group was housed in a different venue in the next classroom adjacent to each other where each group received their instructions for the task.
- The subjects were told to make as many piles as they could and to move the cards around until they are satisfied with the provision that each subject make at least two piles and must use at least two food items per pile.
- The same instruction was to all venues.
- After the subjects have sorted all the cards, they were asked to write the components of the food items used in the pile also write (say) why they made such groupings. ('What about these objects made you want to put them together?')

Table 4.3 Data collection strategy

Data collection strategy	Research participants	Instrument	Information sought	Data recording
Category Generation task	Learners	Response schedule	Learners category generation principles	Task protocol, observation schedule and field notes
Rating task	Learners	Experiment coding sheet	Learners category rating principles	Task protocol, observation schedule and field notes
Sorting task	Learners	Experiment coding sheet	Learners sorting principles	Task protocol, observation schedule and field notes
Unstructured interviews	Learners	Interview protocol	Information about the choice of a category	Audio-recording

4.7 Analysis of data

As suggested above, empirical research often involves multiple sources of information for the collection of the data. In considering the analysis of data, Brown and Dowling, cited in Hoadley (2006), remind us that 'the text (data) very definitely does not tell its own story. Rather, its description must be biased according to an explicit and coherent theoretical framework' (p.86). The data reported here, and used in the analysis, was collected from fifty eight learners.

I will show in detail the manner in which I conducted the analysis of the data. My purpose in doing so is three-fold. Firstly, in order to lend reliability to the study, I make as explicit as possible the process used to analyse the data. Secondly, I hope to demonstrate the particular approach to the systematic analysis of the data, which varies according to the type data collected and the way in which it is collected. Finally, the description points to the relationship theory and data in the process of analysis, by identifying in each case the 'orienting concepts' used and the external language of description developed (Hoadley, 2006). 'Orienting concepts' is a term derived by Layder, cited in Hoadley (2006), to describe specific concepts that are drawn from general theory and used to 'orient' the researcher in approaching both data collection and initial analysis of data. A general idea of the analytic approach is given by discussing each of the data sets acquired from the learner's tasks.

4.7.1 Experiment 1

The frequency of categories relating to each food item was tabulated. Five of the most frequently generated categories were identified. Some responses were not categories. If the responses were properties of foods (e.g. orange, salty) or subcategories, they were eliminated. The remaining accepted responses were then divided into three main categories, namely, taxonomic categories, organization by macronutrients, and script categories.

4.7.2 Experiment 2

In this study the food item and food category were provided and the learners were asked to rate how good an instance of the category the food item is. The analyses of the data were guided by the following questions. First, are foods rated as belonging to script categories, as suggested by the generation data? Second, how do ratings of the script compare to those of the taxonomic categories? Third, are script categories thought to be just as good superordinates of the foods as more traditional taxonomic categories?

The ratings for each food in each category were averaged. An average median of 4.0 (out of a 7.0 scale) is the boundary for being included as a good member of the category. Mean ratings were calculated for taxonomic and script categories respectively.

4.7.3 Experiment 3

This experiment required three groups of learners for the task. One group was instructed to sort the food items into taxonomic categories, the second group by script and the third group were asked to sort the foods into groups that go together. The main area for analysis concerns the data from the third group who were not given any specific basis for their sorting. The results from the data of the first two groups will be helpful in interpreting the results from the non-directed group. A descriptive analysis of the sortings for the different groups was used to examine underlying representations. The number of piles and labels given to these piles were counted, their means and medians calculated.

4.8 Conclusion

The use of multiple experiments and evidences allows the researcher to provide a convincing argument as an answer to the questions posed. Each experiment built on the other, eventually allowing some basic insights into how learners categorize everyday experience and knowledge.

Chapter 5: Results and findings

5.1 Introduction

The goals of the current research have been set out in the previous chapter. Having framed the study empirically, theoretically and methodologically in the preceding chapters, the following two chapters present the findings and a detailed analysis of the data. The purpose and aim of this chapter is to analyse the data and to provide grounding for my analyses. The crucial questions posed here are:

- What functions do different conceptual organizations (taxonomic or thematic) serve?
- How does conceptual knowledge affect learner's understanding of the environment and their actions in the world?

5.2 Results and findings

5.2.1 Experiment 1 – category generation

To begin this analysis of the representations of food items, it was necessary to determine what kinds of categories learners have about foods. The learners were given the list of 51 food types identified from the survey and asked to generate some food categories for each of the foods. To select foods, I chose examples of foods from 'familiar' food types, such as, drinks (or beverages), dairy foods, grains, breads, fruits, meats, and vegetables. Several examples of each kind of food were selected to ensure diversity and an attempt was made to choose examples of foods that were eaten at different times and for different meals and as snacks, by a Grade 8 learner. Combined food dishes, such as, 'stew' or 'curry' were avoided. A list of 51 food items is given in (Appendix A). This same set of foods was used for all the tests in this research.

Subjects were encouraged to write down any response and as many responses they were thinking of. The activity required learners to generate as many categories as possible, but it became apparent that a number of responses were not categories. Properties of foods, referring to its colour and taste, were listed. Some food associations were stated and some subcategories (e.g. 'fish cakes' and 'fish fingers' for 'fish'). It became evident that very few learners mentioned the nutritional value (‘proteins’ and ‘carbohydrates’) of food types but recognized that certain food types were either healthy or unhealthy; hence ‘healthy foods’ were included as script categories in my experimental tasks.

After seeking inter-rater reliability, my supervisor and I concluded that some responses which I considered as ‘associations’ could in fact be related to a thematic or script category (which I will use interchangeably). My data was then updated using inter-rater reliability. The number of category responses written down by the subjects in my sample varied between 2 and 5 categories. For each food item, I tabulated the number of times each category was given. Because the goal of this study was to get an idea of the kinds of categories learners use; all the categories generated for each food item was included. Each category was counted separately for each food item and when a category was generated for two different food types it was counted as two food categories. This list included 3264 responses, covering 1547 categories.

The subjects were encouraged to form as many categories as possible within the allotted time. Because the subjects were encouraged to write down any response and as many responses as possible they were thinking of at the time of this investigation, a number responses were not categories. For example, there were properties of foods (e.g. brown, sweet), associated items (e.g. ‘winter’ for food item, ‘coffee’), and subcategories (‘hot chocolate’ for the food item, ‘chocolate’). Subjects also noted a large number of super-superordinate categories (e.g. ‘animal’ for the food item: ‘margarine’ and ‘butter’). When these responses were eliminated 2578 remained. These responses were divided into three main kinds of categories (similar to those adapted from Ross and Murphy, 1999). There were superordinate level taxonomic categories, which were largely the ones used in generating the category list, namely, drinks (beverages), breads and grains, dairy foods, fruits, vegetables, and meat. Of the 2578 responses, 1202 (47%) were of these food types, which are called taxonomic categories.

Ross and Murphy (1999) noted that some subjects provided an alternative organization of foods by their macronutrients. I adopted the same approach in my study. My findings revealed a very small proportion (98 or 4%) of the responses was listed as 'proteins' or 'carbohydrates' or 'vitamins'.

Lastly, there were categories that did not show groupings of foods of the same consecutive kinds, but instead referred to the situation, in which the food was eaten, such as breakfast foods (apple, bacon, eggs, tea, coffee, porridge, cereal) or snack foods (carrots, orange, watermelon, bread, nuts, chocolate) or party foods (hamburger, boerewors, cake, biscuit, ice cream, potato chips, nuts, popcorn) or movie foods (chocolates, nuts, potato chips, soda) or referred to the healthiness of the food item, such as healthy foods (apple, orange, lettuce, butternut, carrots, yogurt, milk, porridge) or junk foods (soda, cake, pie, ice cream, potato chips, chocolate, popcorn). These categories included items from different taxonomic categories. These are called script categories (Ross and Murphy, 1999) or thematic categories because they usually indicate a time or situation in which the food was consumed. Script categories constituted 1278 (49%) of the responses. By grouping together the situational and healthiness categories referred to earlier, I considered and grouped them according to a script category. For the purpose of this study I will consider them as a group that is different from the taxonomic categories. Six taxonomic categories and eight script categories were generated in this task and presented in the Table 1.

Table 1: Categories generated from experiment 1

Taxonomic	**Script**
Drinks (beverages)	Breakfast foods
Breads and grains	Desserts
Dairy foods	Dinner foods
Fruits	Junk foods
Meats	Lunch foods
Vegetables	Snack foods
	Salad
	Healthy foods

5.2.2 Experiment 2 – category rating

This study required the subjects to rate how good an instance of the category a food item is. The investigation of category ratings required the subjects to indicate, without any time pressure, whether the categories generated are viewed as true superordinates of the food items. The category generation task in experiment 1 suggests that the learners are able to categorize and organize food items both taxonomically and thematically. According to Ross and Murphy (1999), generation tasks are often suspect in that they may create an implied demand to produce a number of responses. Furthermore, Ross and Murphy believe that after the subjects have generated taxonomic categories, they may generate answers that they do not really believe are categories, because a number of responses may be associates of the food items (e.g. cheese for crackers).

The goal of this investigation was twofold, namely, to find out whether subjects rate foods as belonging to the script categories; and then to determine how these ratings compare to those of taxonomic categories. I used some of the analytical methods set out by Ross and Murphy (1999) to give meaning to my data. I averaged the ratings for each food in each category and set at a median of 4.0 (see Ross and Murphy, 1999), on the 7-point scale, as a boundary for being included as a good or typical member of the category.

Table 2: Number of food items found in a category

Type of category	Number of categories						Total
	0	1	2	3	4	5	
Taxonomic	9	38	4	0	0	0	51
Script	0	13	15	14	8	1	51

Table 2 shows, 38 of the 51 food items that had a mean criterion rating of 4.0 or more and are were considered very good-to-excellent members of one taxonomic category. The table shows that 4 food items were rated to be very typical members of two taxonomic categories and 38 foods are typical of one taxonomic category. It is rather surprising that 9 food items were not considered good members of any of the taxonomic categories. The food items not considered good members of any of the taxonomic categories were: eggs, samp, pancakes, cake, pie, biscuits, potato chips, nuts and popcorn. Eggs had a mean criterion rating of 3.8 for taxonomic category, ‘dairy foods’. Samp (3.4), pie (3.5), nuts (3.5), and popcorn (3.7) were close to criterion rating (shown in brackets) for taxonomic category, ‘breads and grains’.

It is clear that the subjects in Grade 8 do view the foods as belonging to script categories as it can be seen in the figure below (these results are consistent with that of Ross and Murphy, 1999). For the script categories, all 51 of the food items were rated as belonging to at least one script category. However, 38 of the 51 foods items were rated as belonging to at least two script categories. For example, steak was considered as a dinner food (mean rating of 6.3) and lunch food (mean rating of 6.3), carrot was considered as a healthy food (mean rating of 6.5) and salad (mean rating of 5.1), milk was considered a breakfast food (mean rating of 6.3) and a healthy food (mean rating of 6.3) and snack food (mean rating of 6.3). Yogurt was considered a good member of five script categories, namely, desserts (mean rating of 6.9), breakfast foods (mean rating of 5.3), health foods (mean rating of 4.8), lunch foods (mean rating of 4.8), and snack foods (mean rating of 5.7). Thus, subjects do believe that the food items do belong to these script categories. However, 13 of the food items were viewed by my sample as belonging to just one script category. Rice was viewed as an excellent, very typical member of the ‘dinner foods’ script category, with a mean rating of 7.0.

Many of the food items were viewed as belonging to just one taxonomic category (e.g. carrot was judged to be an excellent member for superordinate category, ‘vegetable’, with a mean rating of 7.0). 38 of the 51 food items were viewed as belonging to one taxonomic category. In contrast, only 13 of the foods were viewed as belonging to one script category.

Upon examining food items with a mean rating of 6.0 or greater (very good to excellent member) from the data, the analysis revealed that only 19 of the 51 food types were considered very good to excellent members for some taxonomic category (for example, ‘carrot’ in the ‘vegetable’ category and ‘milk’ in the ‘dairy’ category) and 25 were for some script categories (for example, ‘bacon’ in the ‘breakfast’ category and ‘rice’ in the ‘dinner foods’ category).. Although there were two or more script categories than there were for taxonomic categories the mean average rating (6.7) of highly rated items for taxonomic categories show that there is only a small mean rating difference for script categories (6.3). These findings do not suggest that foods are poorer members of script categories.

A clearer presentation of the mean ratings is depicted in Table 3 which shows the distribution of mean ratings for taxonomic and script categories. These are the proportion of mean ratings over the six taxonomic categories or eight script categories.

Table 3: Proportion Distribution of Mean Ratings in Experiment 2

Type of category	Mean ratings (%)							Total (%)
	0-0.9	1-1.9	2-2.9	3-3.9	4-4.9	5-5.9	6-7	
Taxonomic	42	19	18	6	3	6	6	100
Script	20	17	18	15	13	11	6	100

In Table 3 the proportion of high ratings are equal (6%) for the two types of categories. The six taxonomic categories have fewer members and have a much greater proportion of foods that are rated as non-members of the six categories. The majority of the ratings are less than 1.0 for taxonomic categories (43%), whereas script categories have only 20% of the foods rated less than 1.0. Script categories have far more food items with intermediate mean ratings. Both categories have few, but equal proportion of excellent category members (6%).

This category ratings experimental task required the subjects to rate how good an instance of the category the food item is and whether the categories generated in experiment 1 were viewed as true superordinates. The results of this experimental task provided support for the category generation findings for script categories. the distribution of membership appears to be different for taxonomic and script categories, at least for this food sample, nevertheless, food items were found to be typical members of both categories.

5.2.3 Experiment 3 – category sorting

The category rating activity indicated that the learners believe that food items were members of taxonomic categories and script categories. Ross and Murphy (1999) assert that although the category rating tasks are informative, it does not show that script categories are an important part of the representation of food organization. They mention that people (learners) would be able to rate food items along a number of property dimensions (size, colour, cost), but these properties might be a relatively unimportant part of the representations of the foods, while script categories were consistently produced by subjects in experiment 1, suggesting that the script categories may have a more prominent role in food representations. In this study, learners sorting of food items, as an additional indication of their underlying organizations of food category was undertaken. I will provide a descriptive analysis of these sorts, for the different groups and further an analysis to examine the underlying representations. The descriptive analyses concern the number of piles each subject sorted the 51 foods items and the descriptive labels they gave to these piles (or clusters).

Across all groups, the number of piles that the subjects sorted the foods into ranged from 2 to 10, but the means were: 8.4 for the taxonomic group, 6.6 for the script and default group. The corresponding medians were 9.5, 7.5, and 7.5 respectively. The explanations subjects gave for each pile was classified as either being taxonomic or script.

Table 4: Proportion of sorting for each group

Sorting instruction	No. of Subjects	No. of piles	Taxonomic groupings	Script groupings	% taxonomic grouping	% script grouping
Taxonomic group	10	84	26	58	31	69
Script group	10	66	10	56	15	85
Default group	10	66	13	53	20	80

The table shows the different proportions of labels that were classified as taxonomic or script for the three different sorting conditions. The taxonomic group provided the largest number piles (84 piles), while the script and default group sorted the food items into 66 piles each. It is clear that the taxonomic and the script groups labelled their groups very differently. The instructional manipulation appears to have affected the sorting. Although each of two these groups primarily sorted into their respective kinds of categories, a substantial portion of the sorting was of the script category. A total of 167 script categories and 46 taxonomic categories were developed by the three groups. This suggests that both forms of organization are present in conceiving of foods. The default group produced a larger number of taxonomic categories and a smaller number of script categories to that of the script groups sorting. The taxonomic group produced the largest number of taxonomic piles (26) while the script group, 10, and default group 13. The script group produced, 85%; taxonomic group, 69%; and the default group, 80%, of the script category piles.

5.2.3.1 The taxonomic group

My analysis of the taxonomic group reveals that learners found it easier to group the food items according to script categories than ordering the food items taxonomically as the task required. It is worth noting some of the reasons members of the taxonomic group explained for their groupings as script categories (e.g. a pile by subject T6: oatmeal-cereal-porridge-bread: reason for this compilation is that 'this is a breakfast meal' is a description according to a 'schema' or 'theme'). Hence, I classified these groupings of food items as script categories. 69% of the taxonomic group produced groupings of food items that were consistent with script categories. Figure 2 depicts, of the 84 groupings of food items produced by the taxonomic group, 26 groupings of food items or 31% were indeed taxonomic categories (e.g. subject T6's taxonomic grouping of food items (pile), which the subject categorized as 'fruit' were 'apple-orange-banana-pear-pineapple-watermelon-mango') and 69% were script categories. These results suggest that the subjects' representations of food are strongly influenced by script categories.

Figure 2: Grouping of food items (piles) by Taxonomic Group

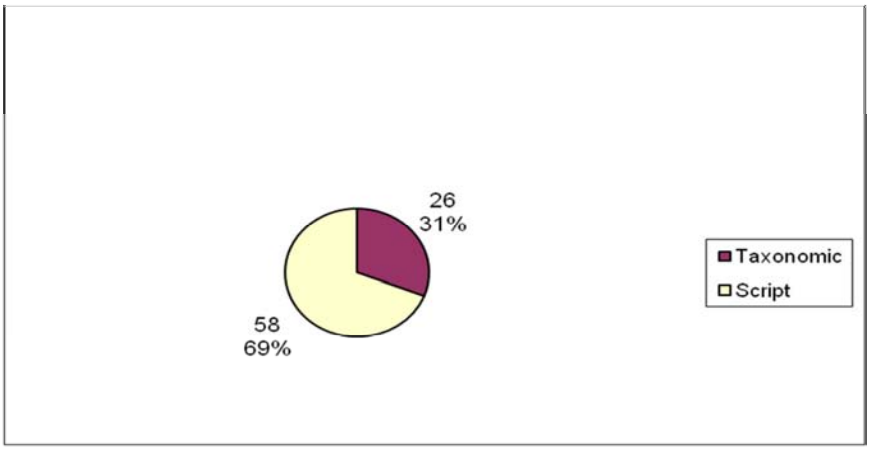
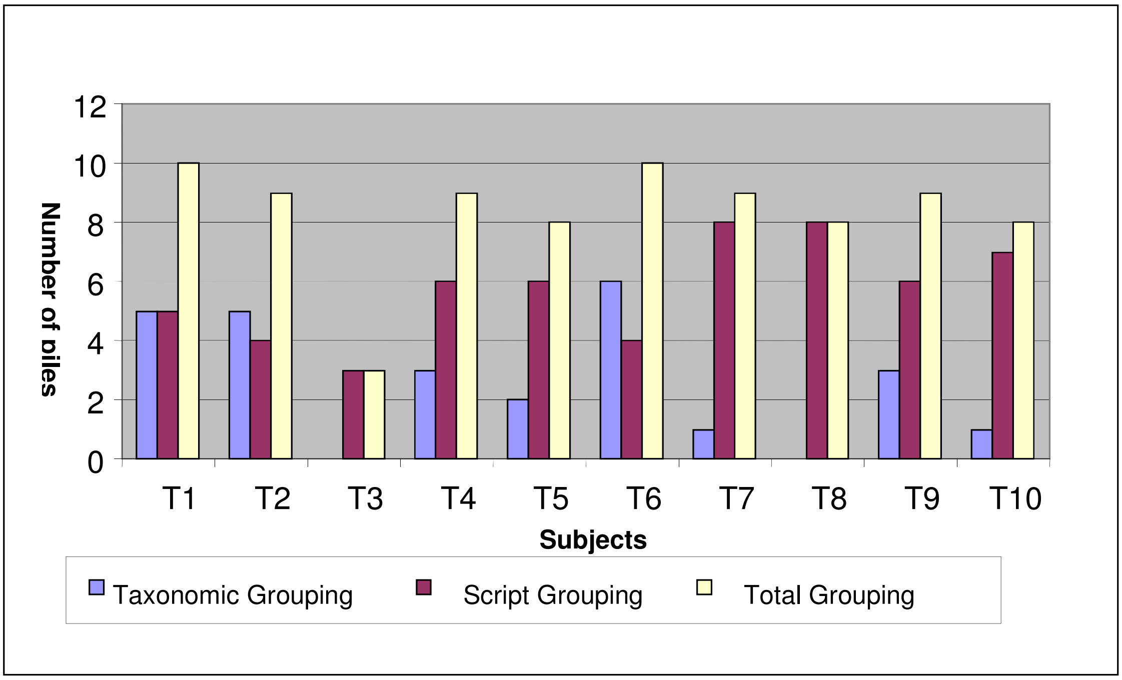


Figure 3 shows the number of category combination each learner was able to group as either taxonomic or script categories. Subjects T1, T2, T6, and T9 were able to organize the food categories in representative proportions and as required by the instructional orientation in the experiment, with the taxonomic more predominant than the script. Subject T1 was able to organize 70% of his groupings, taxonomically; subject T2, 56%; subject T6, 60% and subject Learner T9, 56%. The organizations of food items for the other subjects were dominated by script categories.

Figure 3: Grouping of food items (piles) by individual subjects in the Taxonomic Group



Subjects T3, T4, T5, T7, T8, T9 and T10 groupings were orientated, predominantly, towards the script categories because they compiled more script clusters. The learners in this group were able to organize and produce at least four to a maximum of eight script categories. Subject T3 and subject T8 were not able to produce any taxonomic groups (an in-depth discussion follows in the next chapter).

5.2.3.2 The script (thematic) group

Figure 4 reveals that an overwhelming majority of learners in this group were able to represent and categorize the food items as the task required. The learners produced a total of 56 script groupings of food items (85%) and 10 (15%) taxonomic groupings of food items that were identified by the reasons they provided.

Figure 4: Grouping of food items (piles) by Script Group

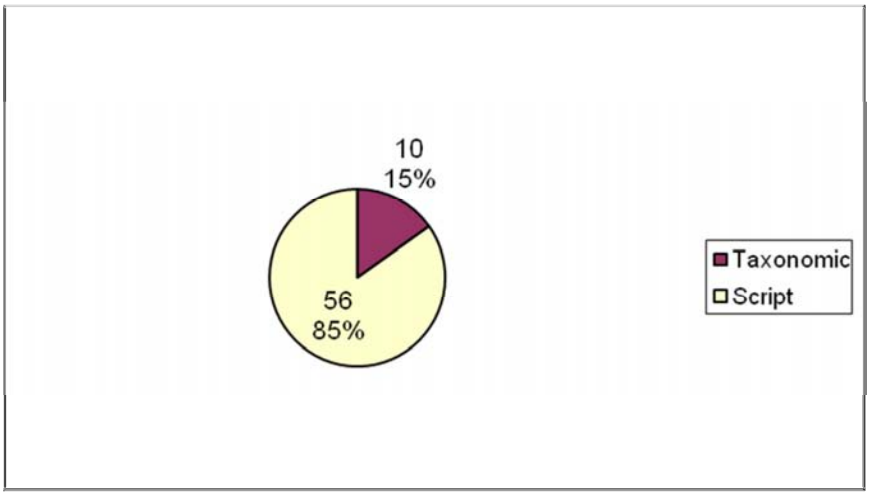
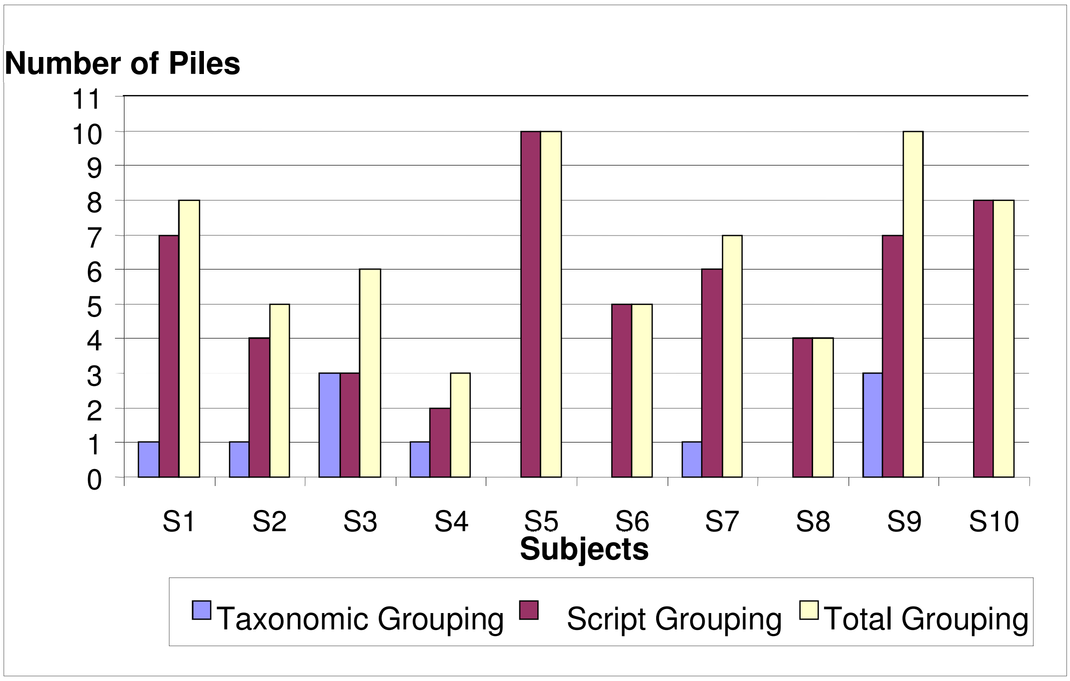


Figure 5 show that six subjects organized the food items into both taxonomic and script categories (viz. subject S1, S2, S3, S4, S7, and S9). Subjects S5, S6, S8 and S10 were able to compile only script categories in their food groupings. Subject S3 and S8 produced more taxonomic groupings of food items than the other subjects in the group. Subject S3 produced an equal number of food representations for both taxonomic and script categories.

Figure 5: Grouping of food items by individual subjects in Script



5.2.3.3 The default (non-directed) group

As mentioned earlier my main focus concerns the data from this group. This group of learners was not given any specific basis or instruction for their sorting. The default group was asked to make as many groupings as they could from their pack of 51 food types. The results show that the grouping of this group is heavily influenced by script categories.

Figure 6: Grouping of food items (piles) by Default Group

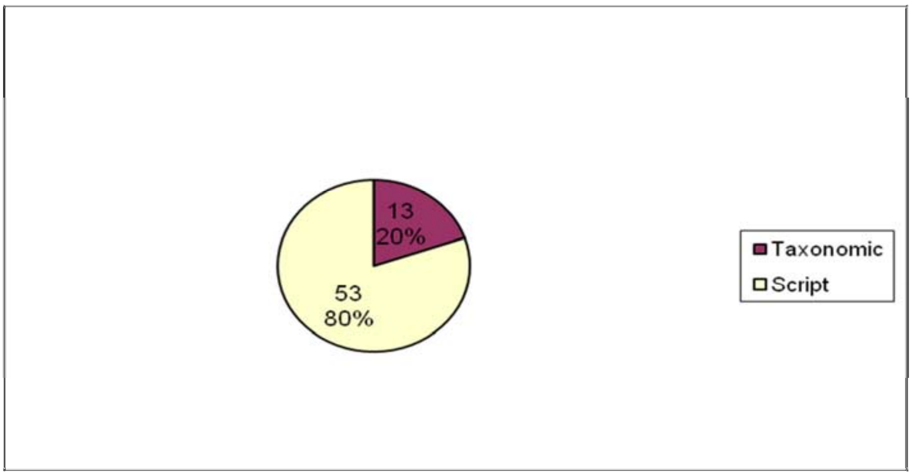


Figure 6 shows that the subjects in this group were able to organize 51 groupings into script categories (representing 77%) and 15 groupings (representing 23%) into taxonomic categories.

Figure 7: Grouping of food items (piles) by individual subjects in the Default Group

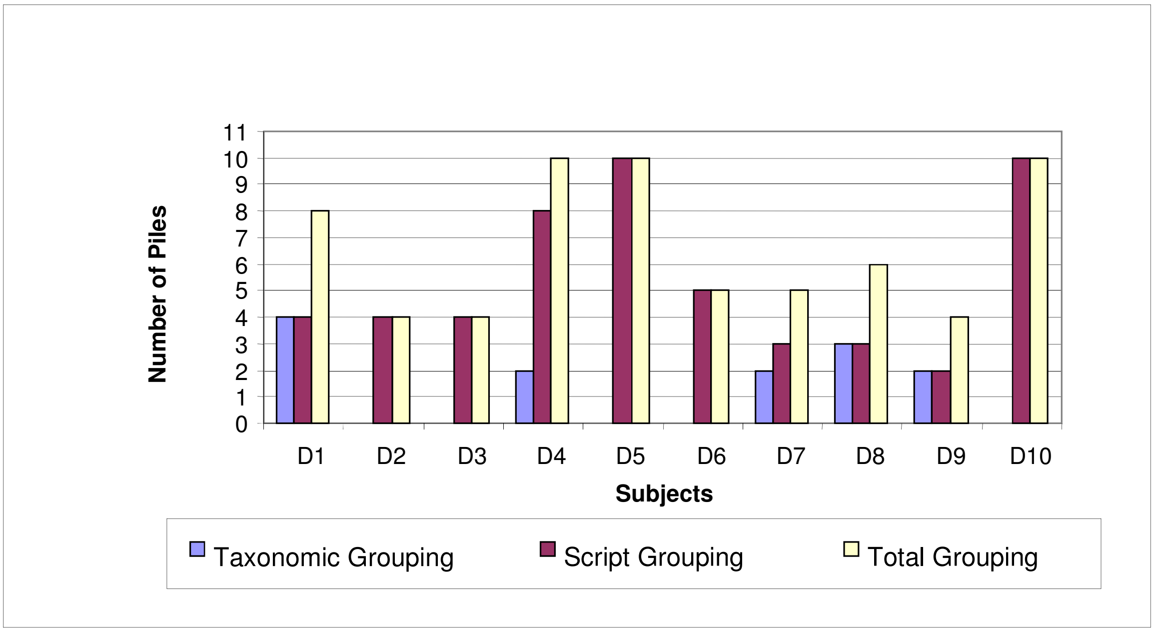


Figure 7 shows that of the 10 subjects 5 (50%) were able to represent some of their groups, taxonomically. The subjects mentioned five (e.g. drinks or liquids, meats, fruits, dairy products, and vegetables) of the six taxonomic categories, breads and grains as a taxonomic category was not mentioned (this needs to be checked for future experiments). Samp (3.4), pie (3.5), nuts (3.5), and popcorn (3.7) were close to criterion rating (shown in brackets) for taxonomic category, ‘breads and grains’. This suggests that it is difficult to categorize foods as good members of this category because they can be quite easily represented in script categories (and may have been given a lower rating for taxonomic categories). 5 subjects did not group foods, taxonomically, but produced 33 (62%) of the 53 script categories.

For script categories (in this default group), junk foods (1 subject), snack foods (2 subjects), lunch foods (4 subjects), dinner and breakfast were mentioned by 5 of the subjects. Some subjects gave reasons (e.g. 'eaten together', 'things to drink and eat', 'eaten and drink together') but did not mention the time this consumption happens. Therefore, I was not able to put these script representations into any specific script category. This, nevertheless, shows that subjects are able to group foods according to script representations and that script categories strongly influence the learners' organization of foods. The conclusion from the overall data is that the default sorting is strongly influenced by script categories.

It is important to note that some food items span (Ross and Murphy, 1999) two or more groups and connect them. This phenomenon is known as a 'spanner' which connects the two categories. For example, as mentioned earlier 'rice' (with a mean criterion 4.7) is rated as a good member for the taxonomic category, 'breads and grains', and an excellent member for the script category, 'dinner foods' (mean rating of 7.0). 'Milk' has been used by 9 of the 10 subjects, and spans to drinks (liquids), breakfast foods, and snack foods; while yogurt spans the desserts, snack, breakfast and drink categories. Potato spans the vegetable, lunch, dinner, and breakfast categories. Spanners give evidence that some foods are cross-classified very strongly (Ross and Murphy, 1999). This means that there are foods that can be simultaneously salient members of more than one group.

5.3 Conclusion

In this chapter I have shown the results and findings of the experimental task and in the next chapter a descriptive analysis of the experimental tasks in which the learners participated will be presented. Experiments 1, 2 and 3 provided a clear picture of the importance of script categories in conceptual organization. The results of experiment 1 helped to confirm that the categories generated by the sample were congruent to that of Ross and Murphy in that script categories were generated as often as taxonomic categories were. Experiment 2 – the category ratings task confirmed that learners (and by deduction, people in general) believe that food items are members of particular script categories and that the distribution of these ratings are very different for both categories. The sortings results of experiment 3 suggested that both taxonomic and script categories influence how learners sort food. Of importance here is that when subjects were given no particular basis for sorting, the script categories influenced their sorts.

Chapter 6: Analysis of Findings

6.1 Introduction

To begin this analysis of the representations of food categories, it was necessary to determine what kinds of categories learners have about foods. The learners were given a list of basic food types, like orange and steak. They were then asked to generate some food categories for each of the foods. This chapter will attempt to seek a reasonable understanding of "What categories do people use for thinking about foods?" It is likely that people employ taxonomic categories that capture the compositional similarities of foods (e.g., fruits, breads) or there might be additional organizations of their food concept.

6.2 Discussion of results

6.2.1 Experiment 1

The goal of this investigation was to examine whether a sample of children can group according to multiple category types, including taxonomic and script categories. All the subjects were able to categorize the food items according to taxonomic and script categories. The results show that learners have alternative organizations of foods or can cross-classify foods.

According to Ross and Murphy (2005) script categories are interesting to note for the following reasons. Firstly, the learner's demonstrate the existence of categories based on interactions with foods (for example, dinner foods or breakfast foods) rather than on its composition. In contrast, the taxonomic categories are much more like similarity-based categories. Some taxonomic categories represent different macronutrient profiles (such as proteins and carbohydrates). Secondly, the script organization of foods may be helpful in deciding about what foods to eat, in categorizations. Finally, the script categories were generated more frequently than taxonomic categories in my study, suggesting that the subjects have fairly salient way of thinking about foods (Ross and Murphy, 1999; and Nelson, 1986).

The first results of this experimental task (category generating) indicated that, while learners have the intuition that foods may be cross-classified, this high-level and rich set of food categories are organized simultaneously by taxonomic categories for the kind of food (e.g. fruit, vegetables and meat) and thematic categories for the situation in which foods are eaten (e.g. breakfast foods, lunch foods desserts and snacks). There might be additional organizations of the learner's food concepts and not only the taxonomic categories that capture the compositional similarities of foods.

Category generation tasks are not so reliable and often suspect (Ross and Murphy, 1999) because a number of responses were associates of the foods; therefore I conducted other experiments to gain a better understanding of conceptual knowledge organizations.

6.2.2 Experiment 2

The goal of this experiment was to confirm that learners (and people in general) believe that food types are members of particular script categories. The category generation task suggested that people have both taxonomic and script categories for foods. My study investigated, as the category generation task revealed, whether foods are rated as belonging to script categories and how these ratings compare to those of the taxonomic categories; and secondly, are script categories thought to be just as good superordinates of the foods as the more traditional taxonomic categories (Ross and Murphy, 1999)? The subjects were provided with the food item and the category and were asked to rate how good an instance of the category the food item was.

My findings show that the food items were found to be typical of both taxonomic and script categories. Table 3 shows that the distribution of membership appears to be different for these two kinds of categories, at least for this food sample. Taxonomic categories have a small number of very good members, a very large number of non-members and a few members in between. The learners used the recognition rule predominantly, in this experiment. A possible reason is that this group of learners was unable to organize their knowledge taxonomically or that their realization rules are lacking. 15% of the taxonomic categories were rated with a mean average rating of 4.0 (arbitrarily set on a 7 point scale) and above suggesting that these food items are considered to be good to excellent members of a category. The implication of this experiment is that 85% of the taxonomic categories are poor to non-members and 43% are non-members. In contrast, script categories have 20% non-members and a large portion of poor (50%) and fairly good members (30%). Taxonomic categories also have poor to fairly good members. Script categories have much more excellent members than the taxonomic category, but a much wider distribution with many food items near boundary membership (28%).

The results of this experiment are similar to the ones explained by Ross and Murphy (1999) (whose subjects were middle-class students at a university) and Hoadley (2005) (whose subjects were working-class and middle-class learners) which provide support for the category generation findings for script categories and the application of recognition rules respectively. One interpretation of the data in Table 3 is that the taxonomic category appears to have a more well-defined criterion for category membership – a food is either a good member of the category or it is not a member. The script categories, however, appear to have much more ambiguity about category membership. For example, although there were very typical lunch foods or dinner foods such as hamburgers or rice and many other things can be eaten for lunch and dinner. It is therefore very difficult to rule some food items out as lunch or dinner foods, since these script categories are primarily determined by the time of day it is eaten, rather than in terms of the kind of food consumed.

Another interpretation for the differences in the distribution of ratings, according to Ross and Murphy, is that there may be a competition among script categories that can lead to reduced ratings for some category. Some members that may be rated as very good to excellent for one category will be rated lower for another category. In conclusion, it is difficult for the exact interpretation of the differences in the ratings distribution; therefore this area requires further research. Nevertheless, it is clear that foods are viewed as belonging to script (thematic) categories.

So in general it is not surprising that the category rating task indicates that learners believe foods are members of both taxonomic and script categories, without using recognition or realization rules as claimed by the sociological tradition, but it is their interaction with food that makes classification and categorization possible..

6.2.3 Experiment 3

The goal of this experiment was to investigate whether script categories influence learners sorting of foods. While the ratings experiments are informative, it did not show that thematic categories play an important part in the representations of food. This study attempted to show that the sortings task in conjunction with the ratings will provide an additional indication of the underlying organization of food (as did) Lopez et al. (1997) and Medin et. al. (1997) and how people organize food categories. My main area of interest concerns the data from this last group (the default group) not given any specific basis for their sorting. The analysis of learner conceptual organization of food items reveals some interesting patterns of food categorization. These patterns will be analysed further in this chapter and the next.

The learners sorted the flash cards into piles (clusters) that ranged from between 2 and 10 groupings. The average number of groupings of food items for the taxonomic group is 8.4 piles (groupings); the script group, 6.6; and default group, 6.6. The learner was asked to support their composition of the grouping of food items by providing a reason as to why they placed these food representations together. The explanations the learners gave for each grouping were classified by the researcher as either a ‘taxonomic category’ or ‘script category’. Nevertheless, most explanations were either taxonomic or script and grouped as either.

Each of the directed groups was able to sort the food items into the respective categories (i.e. either taxonomic or script) suggesting that both form of organizations are salient ways of conceiving food. More script categories than taxonomic categories were created by the script group. This is justifiable as this was precisely the instruction given to the script group set. The taxonomic group created more script categories than taxonomic categories, contrary to the instruction.

Figure 8: Results of Experiment 3

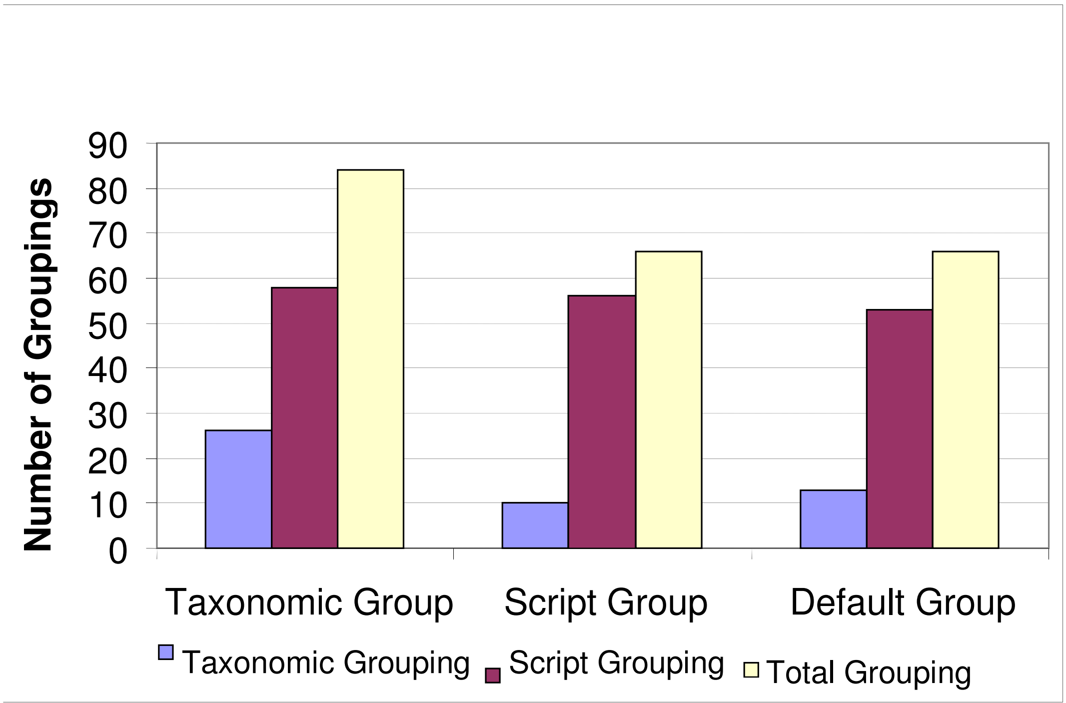


Figure 8 provides a representation of the evidence that the learner's script representations predominates categorization but that they are able to create some taxonomic categories. The default group's sorting strategy closely resembled the script group's sorting in that 80% of the groups formed were script groups. Most importantly, the results provide some evidence for cross-classification. The subjects were able to classify and categorize food items in two rather different ways because there were clear cases of script groupings; although subjects were given taxonomic instructions. The default group's sorting strategy closely resembled the script group's strategy, in that 80% of the groupings of food items formed were script categories. By contrast, the default group created only 20% taxonomic categories.

A broad analysis of individual clusters in each of the target groups will give us a better indication, insight, and understanding as to how the subjects were able to arrive at their choices. The analysis of the default group is presented in the Table 5.

Table 5: default group instructed to 'create groupings' with no basis

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Taxonomic Grouping	4	0	0	2	0	0	2	3	2	0
Script Grouping	4	4	4	8	10	5	3	3	2	10
Total Grouping	8	4	4	10	10	5	5	6	4	10

Table 5 shows the number of groupings (piles) complied by individual subjects in the default group, and clearly shows a strong influence of script categories. The default group classified and categorized thirteen taxonomic categories and fifty three script categories. An examination of the individual piles provides a clear and reasonable answer. Of the 10 subjects (see table 5) three individuals created an equal number of script and taxonomic categories, two created fewer taxonomic categories than script categories (subjects D4 and D7), and five created no taxonomic categories. Four taxonomic categories were mentioned by one subject (D1), three taxonomic categories by subject D8, two taxonomic categories by three subjects (D4, D7 and D9) and D10 named ten script categories. The five subjects who did not produce any taxonomic categories display a strong influence of script (contextual or localized) conditioning, nevertheless, all the subjects were able organize the food items into some script categories.

Table 6 presents a summary of the categories (indicated by an 'X' under the specific category which best described the category) identifiable from the reason given by the subjects of the default group. For example, subject D2 constructed four groupings which were regarded as script categories because they described a schema (situation or event) but could not be identified as a category used in the experiment. Since the explanations described a situation or event, it was counted as a script category. Subject D10 put together ten groupings, but only five could be categorized for the purpose of this experiment. It is alarming that none of the subjects from this group were to classify any of their food groupings by referring to its macro-nutrients, carbohydrates or proteins.

Table 6: Showing individual piles of subjects in the default group

Individual piles of subjects in the Default Group																		
	TAXONOMIC CATEGORIES						**SCRIPT CATEGORIES**											
Subject	**Breads and grains**	**Vegetables**	**Dairy foods**	**Fruits**	**Meats**	**Drinks (Beverages)**	**Dinner foods**	**Breakfast foods**	**Junk food**	**Lunch foods**	**Salad**	**Snack foods**	**Desserts**	**Healthy foods**	**Carbohydrates**	**Protein**	**Total number of piles**	**Taxonomic % correct**
D1		X		X	X	X	X	X				X	X				**8**	50
D2																	**4**	0
D3								X		X							**4**	0
D4				X		X			X		X						**10**	20
D5							X	X		X							**10**	0
D6										X				X			**5**	0
D7		X		X					X								**5**	40
D8		X		X		X					X						**6**	50
D9					X	X											**4**	50
D10						X	X X	X				X					**10**	10

Taxonomic categories were easily identifiable, but it was difficult to determine script categories, although the reasons were thematic in nature. Taxonomic categories constituted 50% of the groupings (piles) constructed by D1, D8 and D9; and 40% for D7, while D10 constructed 10%, demonstrates that the subjects are able to group food items in two salient ways. D2, D3, D5 and D6 were strongly influenced by script categories and hence, were not able to produce any taxonomic categories. A majority of the subjects (60%) in the default group can classify and categorize foods in two different ways. There may be many reasons for food items to be put together and in interpreting the groupings as either taxonomic or script categories or both, as a result of its influence. Meats may be together in a script sorting as it tends to be a ‘dinner’ food and at the same time in a taxonomic sorting, in the ‘meat’ category. Thus, the conclusion from the overall data is that script categories influenced default sortings, holds true at the individual level.

The analysis of the next group of subjects (different from the other group of subjects) who were given the instruction, “You must divide the foods into groupings ‘of foods that are eaten at the same time or in the same situation’, that is, ‘you should group together items related by when and how they are encountered”, is presented in table 7. This group is referred to as the ‘script group’ and it was hoped that the learners would be able string clusters according to a ‘theme’ or ‘script’. Table 7 presents the total number of taxonomic and script categories complied by each subject.

Table 7: Script group with script instruction

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Taxonomic Grouping	1	1	3	1	0	0	1	0	3	0
Script Grouping	7	4	3	2	10	5	6	4	7	8
Total Grouping	8	5	6	3	10	5	7	4	10	8

Table 8: Showing individual piles of subjects in the Script Group

Individual piles of subjects in the Script Group																		
	TAXONOMIC CATEGORIES						**SCRIPT CATEGORIES**											
Subjects	**Breads and grains**	**Vegetables**	**Dairy foods**	**Fruits**	**Meats**	**Drinks (Beverages)**	**Dinner foods**	**Breakfast foods**	**Desserts**	**Junk food**	**Lunch foods**	**Salad**	**Snack foods**	**Healthy foods**	**Carbohydrates**	**Protein**	**Total**	**% of Script categories correct**
S1					X		X	X	X		X						**8**	50
S2				X						X							**5**	20
S3		X		X		X		X X			X						**6**	50
S4				X			X										**3**	33
S5														X			**10**	10
S6							X	X	X								**5**	60
S7				X				X	X		X						**7**	43
S8																	**4**	0
S9		X	X	X			X	X X		X							**10**	30
S10																	**8**	0

All except S3 created more script categories than taxonomic categories. 60% created one or more taxonomic categories, despite the instruction. The default group compiled 80% of its categories as script categories, which are similar to the 85%, create by the script group. Further analysis of individual subjects responses from the script group have revealed some interesting patterns. All the subjects were able to compile script categories, just as the instruction required, six subjects compiled both taxonomic (at least one) and script categories (at least two) and four subjects produced groupings of food items that were purely of the script condition. Subject S5 was able to group together ten script categories and subject S9 also produced the same numbers of groupings (10 groupings) of which three were taxonomic categories, S1 produced seven script categories and one taxonomic category. This suggests that script classification and categorization, although not clearly differentiated by the learners, are influenced to some extent by taxonomic categories, in spite of the instruction. S5, S6, S8 and S10 were not able to categorize any of the food types taxonomically and are strongly influenced by script conditioning. This finding in no way suggest that subjects S5, S6, S8 and S10 are not able to classify food items taxonomically because they adhered to the script instruction. S3 and S9 had produced three taxonomic categories each although the instruction required otherwise, and are influenced by taxonomic categories; nevertheless, they are able to form both taxonomic and script categories. None of the learners from this group were able to categorize food items by its macro-nutrients.

Table 8 depicts the food representation classification presented by the subjects of the script group by analysing the reasons they gave for their choice of the string of food items. The explanations given by the subjects for each grouping were classified as being either taxonomic or script. Table 8 shows the different proportions of labels that were either classified as a taxonomic or script category by each subject in the script group.

Table 8 reveals a substantial majority of script categories. Subject S8 produced four groupings and S10 constructed eight groupings , which showed an inclination towards a script conditioning but not for the script categories identified in experiment 1, and therefore is not reflected (with an 'X') in the table. Although their reasoning implied a schema of an event, it could not be placed under any specific script category, and was counted as a script. For example, subject S10 compiled eight groupings of food items that were counted as script categories, but could not be placed under a specific script category the experimenter identified from the category generation task. This suggests that script categories are vast and there could be any number of possibilities. S5 and S9 produced ten groupings each. One of reasons provided by S5 referred to the 'healthiness' of the food string and was then correctly placed in the script category, because the reason explained the condition of being 'healthy'. The suggestion here is that the subject understands that foods have nutritional value and does not only refer to a situation or event when it is being consumed or eaten. The other 9 bundles produced by S5 could not be placed into any of the script categories in the experiment, but described a schema of an event which reflected an orientation towards the script category and was categorized as such. Both S3 and S9's categorization of food items showed an influence of taxonomic conditioning as they were able to form strong 'vegetables' and 'fruit' categories. A deeper analysis of individual groupings of food items from this script group will be looked at in the following chapter.

The analyses of the default group and the script group showed that there is a strong script influence not only as a group but also in the categorization and classification at an individual level. Analysing the food groupings of the taxonomic group set whose instruction was to divide the food into groupings 'of similar food types' has revealed a different set of interesting patterns. A different set of subjects from the default and script group sets, randomly chosen, participated in this activity.

Table 9: Group with taxonomic instruction – Taxonomic group

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Taxonomic Grouping	6	5	0	3	2	6	1	0	3	1
Script Grouping	4	4	3	6	6	4	8	8	6	7
Total Grouping	10	9	3	9	8	10	9	8	9	8

Table 9 shows that only 31% of the categories generated by the subjects were taxonomic in nature and that the subjects were able to provide taxonomic labels such as, fruit, vegetables, dairy foods, meats, and drinks (beverages). Eight subjects were able to construct at least one grouping of food items as a taxonomic category. Two subjects (T3 and T8) did not produce any taxonomic categories, although they were given clear instructions to group together 'similar food types'. There is a strong script influence evident because all the subjects produced between three and eight script categories and for seven subjects more than 50% of the bundles were script. Subjects T1, T6 and T2 compiled more taxonomic categories than script categories (which was what the activity required), with T1 referring to the macro-nutrient, 'carbohydrate' in one of the grouping. This implies that foods can also be classified by its macro-nutrients, an alternate way of classifying foods. The social tradition did not take this aspect of classification and categorization into account.

Table 10: Showing individual piles of subjects in the Taxonomic group

Individual piles of subjects in the Taxonomic Group																		
	TAXONOMIC CATEGORIES						**SCRIPT CATEGORIES**											
Subjects	**Breads and grains**	**Vegetables**	**Dairy foods**	**Fruits**	**Meats**	**Drinks (Beverages)**	**Dinner foods**	**Breakfast foods**	**Junk food**	**Lunch foods**	**Salad**	**Snack foods**	**Desserts**	**Healthy foods**	**Carbohydrates**	**Protein**	**Total**	**Taxonomic % correct**
T1		X	X	X	X	X		X	X					X	X		10	60
T2		X	X	X	X	X		X	X								9	56
T3										X				X			3	0
T4		X		X	X			X									9	33
T5		X		X				X	X	X	X						9	22
T6		X	X	X	XX	X		XX						X			10	60
T7				X													9	11
T8								XX X		X							8	0
T9				X X	X												9	33
T10				X				XX									8	13

From table 10 it is evident that three subjects (T1, T2, and T6) identified (recognized) at least five taxonomic categories, namely, vegetables, dairy foods, fruits, meats and drinks or beverages. 'Fruits' as a taxonomic category were recognized and realized by 80% of the subjects, followed by 'vegetables' and 'meats' of 50% each. The sortings results provide further evidence that the study group's representations of foods are dominated by script categories but influenced by taxonomic categories as well. As mentioned earlier that while it was easy to identify taxonomic categories (although fewer), it was rather difficult to identify a script category because of its wider interpretations that are affected by localized and contextual influences, implying that are many more possibilities for script categories. For example, subject T7 produced nine groupings , but only one grouping could be categorized as a taxonomic category ('fruits') and the other groupings could not be placed under any specific category the activity required but since they represented a schema they were counted as a script category. Subjects T1, T3 and T6 were able to explain the situation in which the food items will be used by referring to the generally 'healthy' value of foods and to any specific nutritional value (such as proteins or carbohydrates), and was categorized as a script category. Subject T8, who put together three different script groupings and labelled each of the three groupings as a 'breakfast foods' category, a script category. T8's clustering reveals a very strong script conditioning as the subject did not group together food types in any taxonomic category. T8 produced just one other script category, that is, 'lunch foods', which described the time and situation the food items were consumed. In general the subjects were able to label many script categories, namely, breakfast foods, lunch foods, and junk foods. Subject T1 is the only subject to categorize a food group that referred to the nutrients (such as, carbohydrate) of the food items. T1 and T6 put together ten piles of which a large number was able to be categorized appropriately. Table 10 shows that there is a stronger taxonomic representation for the taxonomic group than the ones found in the default group and the script group. The taxonomic group was able to put together the largest number of food groupings (bundles). The implication here is that the learners were able to classify food items taxonomically but with much difficulty.

To test further reliability of the data presented in table 4, consideration was given to the fact that the subjects could have become bored with the repetitive production of food clusters because monotony could have set in and could have made groupings for the sake of the exercise or to abide time. I decided to further analyse the data by taking into account the first five groupings of food items realized by each sample group.

Table 11: Proportion of food groupings (showing first five groupings)

Sorting instruction	No. of Subjects	No. of groupings	Taxonomic categories	Taxonomic categories (%)	Script categories	Script categories (%)
Taxonomic group	10	49	20	41	29	59
Script group	10	46	6	13	40	87
Default group	10	47	9	19	38	81

Table 11 shows the proportion of groupings that were categorized as either ‘taxonomic categories’ or ‘script categories’ for the three sample groups. The groups averaged forty seven groupings each. The ‘taxonomic group’ constructed a higher proportion of script categories than taxonomic categories and the ‘script group’ primarily sorted food items into its respective kind of categories because of the instructional condition. The default group sortings fell in between the two other groups, but it is much closer to the script conditioning. The inter-correlations among the groupings provide additional support for these observations, although the default and the taxonomic instructions were very similar, the results for the script group correlated very well with the default group, showing similarity among the different groups. Table 11 above shows further evidence that the learners’ representations of food are dominated by script categories but to an extent influenced by taxonomic categories.

Table 12: Group with no instructional orientation – default group (first 5)

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Taxonomic Grouping	4	0	0	0	0	0	2	1	2	0
Script Grouping	1	4	4	5	5	5	3	4	2	5
Total Grouping	5	4	4	5	5	5	5	5	4	5

Table 12 depicts the distribution of the first five food groupings for the default group and confirms the strong script influence evident in table 11, although this group was not given any specific conditioning. Four subjects (40%) were able to create taxonomic groupings, namely, D1, D2, D8, and D9 but display a strong influence of script conditioning. Although the instruction did not require any particular basis for the organization of the food items, nine taxonomic groupings were recognized and realized by the subjects which support an earlier conclusion that the subjects can organize foods in two ways. In most cases the subjects produced a substantial number of script categories.

Table 13 reflects the distribution of groupings realized by the script group. The data in the table depicts an overwhelming majority of script categories. This is expected as this was what the script conditioning instruction required. A total of forty script categories were created by this group and is similar to that of the default group. Like the script group four learners constructed at least one taxonomic category. This again suggests the dominance of the script conditioning in the conceptual classification and categorization in the organizations of foods. There is an element of congruency reflected in the results of the script group and the default group suggesting that learners (and people in general) evoke thematic or schematic meanings first in conceptual organizations.

Table 13: Group with script instruction – script group (first 5)

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Taxonomic Grouping	0	1	2	0	0	0	1	0	2	0
Script Grouping	5	4	3	3	5	4	4	4	3	5
Total Grouping	5	5	5	3	5	4	5	4	5	5

It is evident from table 14 the taxonomic condition has influenced 80% of the subjects because they were able to produce at least one taxonomic category. Subjects in this group created a total of twenty taxonomic groupings. Three subjects were able to produce groupings as the instructional orientation required. Subjects T1, T2, and T6 created 100%, 80% and 80% taxonomic groupings, respectively, and this constituted 65% of the total number of taxonomic groupings produced by this group of subjects. 90% of the subjects show a strong script influence, especially subject T3 and T8.

Table 14: group with taxonomic instruction – taxonomic group (first 5)

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Taxonomic Grouping	5	4	0	2	1	4	1	0	2	1
Script Grouping	0	1	4	3	4	1	4	5	3	4
Total Grouping	5	5	4	5	5	5	5	5	5	5

6.3 General discussion

The Piagetian view that young children do not have taxonomic concepts has been largely discarded in recent years (Nugyen and Murphy, 2003). The literature shows that many researchers in this field have argued that Piaget's results really reflect children's use of script-based concepts, which often include members of the same taxonomy category, and that these script-based categories may eventually develop into complete taxonomic concepts (Nelson, 1986).

My goal in this investigation was to explore complex conceptual structures that involve cross-classification and to examine how this cross-classification is represented and used in taxonomic and thematic relations.

The answer as to whether the learners in this study have taxonomic and thematic relation is yes, however script relations were always used whereas taxonomic classifications were not salient forms of organization of children's concepts. In experiment 1, I found that children, and consistent with the findings of Ross and Murphy (1999) and Nguyen and Murphy (2003), like adults, also, have taxonomic and script categories of food. This implies that both script and taxonomic forms of organizations for foods are prevalent in children's concepts.

Cross-classification is an important conceptual ability. The investigation reveals that script and taxonomic categories exist simultaneously in the food domain. As children gain greater knowledge of the world, they become aware that the same entity can be perceived in different ways, ranging from the specific to the general, and differing in the particular perspective brought to bear on it. Therefore it is essential to our full understanding of the world that we be able to cross-classify items and use different categories to derive relevant information.

Many studies have shown that the organization of concepts develops thematically before it develops taxonomically (Osborne and Calhoun, 1998). It has been shown that 20-month-old children group together objects that are included in the same routine (Fivush, 1987) and that pre-school children use more thematic than taxonomic relations in sorting tasks (Gelman and Bairgellon, 1983; Markman and Callanan, 1984). These preferences are accounted for by the way children deal with their environment as they build up concepts from everyday actions and events: i.e., from situations or themes (Mandler, 1992, 1998); Nelson, 1986). This means that the early use of thematic relations helps children's later acquisition of more abstract, hierarchical relations such as those required by the taxonomic conceptual organisation (Lucariello and Nelson, 1985;

Lucariello et al., 1992). Thus, according to many authors, once children are able to organize their knowledge in a hierarchical structure, they undergo a thematic-to-taxonomic shift which is responsible for their relying on the taxonomic organisation of conceptual knowledge in their dealings with the environment. At all ages, concepts convey more thematic than taxonomic information. This means that the production of taxonomic relations does not change across the age levels (Borghi and Caramelli, 2003; 2001). This finding is supported also by recent evidence on the lack of consistent preference for either thematic or taxonomic relations by pre-school children (Osborne and Calhoun, 1998; Waxman and Namy, 1997) and on conceptual flexibility and variability (Smith and Samuelson, 1997; Barsalou, 1993). My findings show that both taxonomic and thematic do exist in Grade 8 learners' conceptual organisation. The results reveal further that concepts convey more thematic than taxonomic information.

With development, children's knowledge rests less on events and action relations and more on spatial relations (Borghi and Caramelli, 2003). This means that children embed actions into spatial frames that provide a principled way to generalize objects and actions. This change may be the result of an increase in capacity for abstraction which leads children both to generalize events according to the spatial contexts in which they take place and to detach objects from the events. This process allows them to focus on the properties of objects as well as the spatial layout where they can be located independently from the specific actions occasionally taking place there (Borghi and Caramelli, 2003). With age, event relations disappear and action relations lose their primacy, the children's perceptual and contextual relations increase their relevance in shaping knowledge. Also the influence of education on food types and diet is dealt with in Life Orientation and Natural Sciences; so taxonomic concepts would be expected to be present through the education process.

6.4 Conclusion

The chapter presented the analysis of the tasks conducted with learners in the school context. The purpose of the tasks was to examine the extent to which the subjects were to organize food items either taxonomically or thematically. Using multiple tasks will provide a more complete picture of how differences in content can lead to knowledge about the problem category and its use. It was found that the subjects were able to organize foods items; however, thematic organizations were more dominant than the taxonomic organization. While Bernstein shows 'orientations to meanings' are weakly classified or restricted in the working-class, psychology tends to explain this phenomenon in that it is not 'recognition and realization' rules that are posited weakly but that children in general are unable to work taxonomically. Researchers in conceptual development have identified several category types that children may use to classify things.

Chapter 7: Micro analysis and discussion of the learners taxonomic and script categorization

7.1 Introduction

In the previous chapter an analysis of the findings was discussed. As mentioned in Chapter Four, three experimental activities were conducted with the learners. In this chapter, I focus my attention to the micro analysis of aspects of individual learner's taxonomic and script categorization to find out to what extent each learner is able to organize food concepts, taxonomically and or thematically (by script). A closer study of the learner's backgrounds is necessary to check whether the sample is representative of the groups that fit the profile of those learners who have difficulty in accessing the elaborate code which is required to enter the boundaries of the school. In chapter 4 it was mentioned that my sample school has a proud history of a successful pass rate in the National Senior Certificate examinations, which suggests that learners at this school are performing sufficiently well with many obtaining exemptions to study further, despite their background. All the learners in this sample study English Home language and Afrikaans and isiZulu as additional languages, in grade 8 and 9. The learners are allowed a subject choice in grade 10. For this study it is assumed that the learners are able to understand and express themselves in English although this is not their mother tongue, since English is the medium of instruction at this school. Since I could not be sure of this, the isiZulu translation of food types was presented to the subjects so that there would not be any confusion in classifying and categorizing of food items.

7.2 In-depth Analysis of Learner Taxonomic and Script categorizations

An analysis of a variety of examples of the subject's bundles will be carried in this chapter to find out to what extent each learner is able to categorize and classify food items, either taxonomically or by script as they apply to the micro-context of Grade 8. This analysis will take into account the background of the subjects. The background analysis will form the interpretive analysis of the study and to familiarize the reader with some of the learners who make up the sample. The background information on each of the subjects was obtained from their application forms that the subject presented upon entry for acceptance at this school and with consent from their parent or guardian.

Subject D1 is a 12-year-old male of African origin, who received a primary education at an Ex-Model C school in the Pietermaritzburg area. This learner resides with both his parents in a lower middle-class, formerly white suburb. His mother is an educator at a primary school, his father, a taxi driver (who is self-employed) and his home language is isiZulu. Table 15 shows the different proportions of labels that were classified as either taxonomic or script by subject D1, suggesting that both forms of organizations are important ways of conceiving foods. D1 produced eight bundles of which four were categorized as script categories and four as taxonomic categories. This indicates that the subject is aware that foods are members both taxonomic and script categories.

Table 15: Default group: Subject D1

Pile/cluster													Reason	Category
A	soda	water	milk	milo	coffee	tea	ice-cream	yogurt					liquids	tax
B	pork	polony	lamb	boere wors	bacon	goat	chicken	fish	steak				meats	tax
C	pineapple	apple	pear	orange	mango	banana	nuts	water melon					fruits	tax
D	cabbage	butter nut	mealie	potato	peas	carrots	lettuce						vegetable	tax
E	margarine	ham burger	pan cake	onion	cheese	eggs	bread	oatmeal	porridge	cereal	milk	butter	breakfast	script
F	yogurt	ice-cream	cake	pie	chocolate	pan cake							desserts	script
G	cabbage	butter nut	samp	rice									dinner	script
H	soda	pop corn	potato chips	biscuit	pie								snacks	script

D1 correctly labelled taxonomic categories (such as, liquids or drinks, meats, fruits, and vegetables) and script categories (such as, breakfast foods, dinner foods (supper), desserts and snacks). The table shows grouping B was correctly labelled as a taxonomic category 'meats'. Groupings E, F, G, and H were labelled as script categories, namely, breakfast, desserts, dinner and snacks, respectively. It is important to note that D1 grouped together foods that are not of the same constitutive kind, but instead referred to the situation or event in which the food was eaten, such as breakfast (cluster E), or dinner (cluster G), or snacks (cluster H), or desserts (cluster F). Script categories are defined because they demonstrate interactions with the foods rather than its composition (as taxonomic categories do). Cluster A (soda, water, milk, milo, coffee, tea, ice-cream, yogurt) was labelled as 'liquids or drinks', a taxonomic category. The subject labelled cluster E as 'vegetables', but included 'nuts' in this string. Upon making enquiries from the teacher of isiZulu languages at the school, she explained that 'nuts' maybe regarded as a vegetable, but is more a 'fruit'. The teacher explained that in the Zulu culture some concepts are very broadly interpreted and meanings are diverse and some are all encompassing. 'Nuts' in this context is connotated as culturally specific, and this aspect needs to be investigated further. This suggests that borderline foods because they come from the same family type may provide some confusion for the learners in their early years of development and shared experiences.

It is clear from the table that subject D1 is able to classify foods into two salient but different ways, that is, taxonomically and thematically. For example, 'yogurt' in cluster A is labelled correctly as a 'liquid or drink' in the taxonomic category and also as a 'dessert', a script category member. According to Ross and Murphy (1999), 'yogurt' is regarded as a 'spanner', because it connects and spans two different categories. This suggests that D1 is able to cross-classify food items, which suggests that he is not context bound and therefore is able to function in a context-independent way. There are many examples of 'spanners' evident in subject D1 clusters in the table (namely, soda, milk, cabbage' butternut, and ice-cream). 'Pancake' in cluster E and F and 'pie in cluster F and H are correctly labelled as script category members as they appear to be 'spanners', because they connect to different categories. Spanners give evidence that that some foods are cross-classified very strongly, because they are simultaneously salient members of more than one category. The results above suggest that D1 has the ability to have alternate organizations and cross-classifications of foods.

Subject D2 is a Coloured male, aged 12, who resides with both his parents and his home language is English. His mother is a wedding planner and his father a deputy director in a government department. He lives in an upper class middle, formerly white suburb and attended an Ex-Model C school in his primary years in the same area. Subject D2 grouped foods mainly as the ‘things that go together’ in his reasoning for the choice of category (Table 16). He compiled a total of four groupings for this task, all of which were orientated towards the script condition. He repeats the same reasoning for different categories, suggesting that he is not able to work taxonomically and is context bound. Although he uses ‘butter’ as a spanner in two different script categories, it is not convincing that he is able to cross classify foods. He seems rather restricted in the organization of foods.

Table 16: Default group: Subject D2

Pile/Cluster				**Reason**	**Category**
A	Milk	Milo	Chocolate	Great flavour goes together	Script
B	Cabbage	Lettuce	Samp	Meant to be together	Script
C	Popcorn	Butter	Potato chips	Great taste	Script
D	Mealie	Butter		Too dry to eat without butter	Script

The reasons do not fit perfectly into any of the script categories identified for the experiment, but all are context dependent and explain an event or situation the food is consumed.

Subject D3 is a 12-year-old female who lives with her mother, a nurse. Her father is deceased. She resides in a formerly white, middle-class suburb and attended the primary school in the same area. She is of African origin and her home language is isiZulu. Like D2, she views foods as belonging to script category and this suggests that she subject is able to organize food items in just one way. The table suggests that this learner is strongly influenced by script categories and is unable to organize foods taxonomically. Her real word experiences of foods are limited and are context bound. The table below shows four clusters that are reasonable script piles.

Table 17: Default Group: Subject D3

Piles/clusters						**Reason**	**Category**
A	hamburger	soda	popcorn	apple		nice to eat and at the same time have a fruit	script
B	potato chips	polony	eggs	bread	coffee	lunch	script
C	cereal	milk	apple			breakfast	script
D	rice	chicken	potato	soda		delicious	script

She correctly labelled two script categories as breakfast foods (cluster C) and dinner foods (cluster B) while cluster A and D are ambiguous, but suggest a script condition. ‘Soda’ and ‘apple’ are spanners which are used in different a cluster. This suggests that she is able to cross-classify foods based on its interactions in a situation or event, the food is consumed. The learner is restricted and context dependent.

Table 18: Default Group: Subject D4

Piles/clusters										Reason	Category
A	bread	butter	lettuce	polony	cheese					sandwich	script
B	onion	carrot	peas	chicken						cook a meal	script
C	apple	pear	pine apple	orange	banana	water melon	mango			fruits	tax
D	chocolate	ham burger	pop corn	cake	pie	ice cream	soda	potato chips	biscuits	junk food	script
E	fish	water								swim in water.	script
F	tea	coffee	soda	milk						liquids	tax
G	goat	cabbage								goat eats cabbage	script
H	biscuit	yogurt								better taste	script
I	cereal	milk								milk gives more nutrients	causal
J	nuts	chocolate								give you pimples	script

Subject D4, a 13-year-old male of African origin, received his primary education at an ex-House of Delegates school that is situated in a predominantly Indian suburb. He resides in a black township on the outskirts of Pietermaritzburg. His father is a minister of a church in the township and his mother, a nurse, at the local state hospital. D4 put together ten piles in the time allotted to him in this activity. He labelled two categories as taxonomic and eight as script. A majority of the script conditions referred to context dependent situations, for example, "cook meal ', 'goats eat cabbage' and 'better taste', or referred to the healthiness of the foods, such as 'milk gives more nutrients'. He correctly labelled cluster C and F as taxonomic categories, 'fruits' and 'liquids' but shows a strong influence of the script conditioning. Although D4 is strongly influenced by script categories, it is clear that he can also classify foods taxonomically. This means that D4 can represent food items in two salient ways through cross-classification. 'Soda' is a spanner, as it correctly used in cluster D in the script category of 'junk foods' and in cluster F, a taxonomic category of 'liquids'. Cluster J, (nuts, chocolate – 'gives you pimples') is an interesting organization as it tends to reveal a causal connection. Cluster J, therefore cannot be classified as neither a script category nor a taxonomic category because its action describes a cause. This suggests that there are other ways to organize food items, not only by script or taxonomically. Cluster E, shows that 'fish and water' are contiguous. This cluster displays a script relationship. By placing these two concepts together the subjects reasoning ('swim in water') depicts an action response.

The next subject D5 is a resident of an African township in the Pietermaritzburg area. D5 is a 12 year old isiZulu speaker, a female who completed her primary education at an Ex-Model C school. Her mother is a single parent who is a promotions representative.

Table 19: Default Group: Subject D5

Piles/clusters			Reason	Category
A	bread	Butter	eaten together	script
B	hamburger	potato chips	lunch	script
C	soda	Biscuits	eaten together	script
D	bacon	Eggs	breakfast	script
E	water	Tea	drink together	script
F	cake	Tea	when family/friends get together	script
G	polony	Pork	need pork to make polony	script
H	lamb	Samp	they rhyme and also make great stew	script
I	chicken	Rice	supper	script
J	fish	potato chips	eaten together	script

D5 produced ten piles each of only two items that were classified as script categories. Like subjects D2 and D3 she could not classify any of the food items taxonomically. All of the script categories refer to an event or situation in which the food items are eaten. The explanations related to the learner's personal experience of the situation in which the food is being consumed. 'Potato chips' (in cluster B and J) and 'tea' (in cluster E and F) are spanners.

Subject, D6, is a 13-year-old female who resides in a lower middle-class, formerly white, suburb. Her mother is self-employed and works from home. Her father is a school teacher. She studied at an Ex-Model C primary school. She is of African origin and her home language is IsiZulu. Five script piles were sorted by the learner. The explanations the subject gave for the piles were classified as script categories.

Table 20: Default group: Subject D6

Piles/clusters									Reason	Category
A	bread	butter	tea	milk	water				eaten/drink together	script
B	cheese	lettuce	steak hamburger	soda	potato chips				lunch foods	script
C	peas	onions	butternut	water	cabbage	carrot	rice	chicken	healthy full meal	script
D	mealie	cereal	butter	porridge					healthy breakfast	script
E	banana	milk	margarine	eggs					to make cake	script

Table 20 shows the different labels that were classified as script categories. Subject D5 classified two clusters (C and D) as a 'health' category. 'Water' (in cluster A and C), 'butter' (in cluster A and D) and 'milk' (in cluster A and E) are spanners. This suggests that the learner is able connect different categories. Subject D6 like some of the previous subjects in the default group are strongly influenced by script categories although there is some evidence of cross-classification. D6 did not produce any taxonomic categories. The implication is that she is context dependent although she was able to produce some elaborate strings of food representations.

The next subject resides in a lower middle-class, formerly white suburb, which is situated on the fringe of a black township. Subject D7 attended an Ex-Model C primary school. She lives with her parents. Her mother is an educator and father, a self-employed motor mechanic. D7 is 13 years old and her home language is isiZulu. Table 19 presents the proportions of taxonomic and script categories.

Table 21: Default Group: Subject D7

Piles/clusters									**Reason**	**Category**
A	pineapple	pear	banana	nuts	watermelon				Fruit	Tax
B	onion	mealies	potato	carrots	cabbage	peas	lettuce	butternut	Vegetables	Tax
C	pie	biscuit	cake	chocolate	ice-cream	yogurt	popcorn		Junk food, also have fat	Script
D	cheese	milk	steak	bacon	Pork	fish	egg		Food we get from animals.	Script
E	cheese	polony	margarine	butter					Put on bread, sandwich	Script

The sorting results provide evidence that the learners used both script and taxonomic categories as well. Cluster A and B are correctly explained as taxonomic categories (fruits and vegetables). For cluster D, the explanation ‘food we get from animals’ has a script conditioning and classified as such. It is interesting to note that subject speaks of the concept ‘animal’, because here she refers to super-superordinate taxonomic category of ‘meats’. ‘Cheese, milk, and eggs in Cluster D are animal products but not meat. The results above suggest that this subject can surely categorize food items in two rather different ways placing ‘cheese’ with ‘milk, steak, bacon, pork, fish, and egg’ in one case and with ‘polony, margarine, and butter’ in another. These two ways can be found together in the same sort, they are not thought of as incompatible or contradictory. ‘Cheese’ can be in a ‘dairy food’ taxonomic category as well as with a cluster of ‘breakfast foods ‘or ‘lunch foods’ or a whole range of categories in a script category. In the table 19, ‘cheese’ is a spanner, which provides evidence that the subject can cross-classify food items into two different categories.

Subject D8 is a 13-year-old male whose home language is isiZulu. His parents are employed in the public sector. The mother is a nurse, father, a policeman and their residential area is a formerly white suburb. His primary schooling was obtained from an Ex-Model C school. Subject D8 (Table 22) identified a food item (milo) that spanned two clusters. Milo appears to be a ‘spanner’ and is connected to cereal, oatmeal, bread, pancakes, (which are mainly breakfast foods), and a cluster of beverages (drinks), such as, water, tea, soda, and coffee. Tea and bread are also spanners. Tea spans a taxonomic category (cluster F) and a script category (cluster E). This provides evidence that the learner is able to cross-classify foods, by showing simultaneous salient members of more than one category.

Table 22: Default Group: Subject D8

Piles/clusters															Reason	Category
A	polony	pork	bacon	bread	margarine										eaten together	script
B	water melon	pear	mango	banana	orange										fruits	tax
C	chocolate	milk	ice-cream	biscuits	cheese	cake									dairy product made of milk	script
D	cabbage	lettuce	nuts	potato chips	mealie	carrots	potato	butter nut	onions	peas					vegetables	tax
E	cereal	tea	coffee	milo	oatmeal	eggs	fish	pie	bread	boere wors	steak	pan cakes	ham burger	chicken	eaten morning, evening and afternoons	script
F	water	soda	tea	milo	coffee										drinks	tax

Subject D9 is a female, 12 years old and of African origin. She resides in a disadvantaged lower income formerly Coloured suburb and obtained her primary education in a school in the same area. Her mother is a nurse and a single parent, and her father is deceased.

Table 23: Default Group: Subject D9

Piles/clusters										Reason	Category
A	soda	coffee	milo	water	tea	milk				drinks	tax
B	cheese	margarine	yogurt	butter	cake	fish	pancakes	pork	steak	things to drink and eat	script
C	lamb	goat	chicken	pork	fish	steak				meat	tax
D	bread	cakes	hamburger	pancakes						bake these.	script

D9 is able to classify foods both taxonomically and by script. For example, 'fish' in cluster B describes a script event of 'things to drink and eat' and in cluster C as a taxonomic category. 'Fish', 'pancakes', 'pork', and 'steak' are spanners. While the subject is able to classify foods taxonomically, the table shows further evidence of a script influence or vice versa. There is a strong meat cluster. There is some evidence to show that some of the food representations are not made strictly on the basis of the constitutive basis of the food. A 'hamburger' appears in the script category for cluster D, rather than in the 'meats' food cluster.

Subject D10 resides outside Pietermaritzburg. His residential area is located on the lower south coast of KwaZulu-Natal. He is 12 years old and is currently residing in the boarding establishment of the school. His parents are both managers at the local supermarket in his home area. His home language is isiXhosa. Table 22 depicts the food representations of subject D10.

Table 24: Default Group: Subject D10

Piles/clusters												**Reason**	**Category**
A	bacon	boerewors	cereal	onion	margarine	polony	eggs	yogurt	tea	water	bread	starts the day nice.	Script
B	chocolate	biscuits	nuts	popcorn								if you have a bad day at work,	Script
C	potato chips	steak	pie	bread								make the rest of the day feel good and comfortable	Script
D	apple	banana	watermelon	pear	orange	water						gives you energy	Script
E	lamb	pork	lettuce	peas	potato	steak	rice	soda				supper	Script
F	milo	coffee	milk									drink can you warm	Script
G	milk	cereal	oatmeal									breakfast	Script
H	bread	milk	margarine	lettuce								snack	Script
I	orange	watermelon	apple	banana	pear	cheese	pineapple					more hyperactive	Script
J	pork	lamb	steak	samp	potato	rice	cabbage	lettuce	yogurt			sunday night meal	Script

D10 produced ten piles that were classified as script categories. Like subjects D2, D3, D5 and D6 he could not classify any of the food items taxonomically. All of the script categories refer to an event or situation in which the food items are eaten. There is strong script influence in the categorization of the food items. Her reasons reflect very strong context dependence without being given any kind of conditioning or instructional manipulation. Many spanners can be identified from table 24. 'Bread', 'steak', and 'lettuce' span three categories. This suggests that the learner is able to connect foods from different categories and displays alternative organizations of foods. 'Yogurt' reflects a script condition by 'starting the day nice' in cluster A and as a 'Sunday night meal' in cluster J.

Subject D1 was able to compile at least 4 taxonomic clusters and at least 4 script clusters in the allotted time, and subject D8 produced a minimum of three taxonomic clusters and two script clusters but the reasons given are ambiguous and since they explained an event or situation, 'of eaten together', was regarded as a script condition and classified as a script category. Subject D6 referred to the 'healthiness' of foods, for example healthy full meal ('peas, onions, butternut, water, cabbage, carrot, rice, chicken') and healthy breakfast ('mealie, cereal, butter, porridge) which shows that these categories were not grouped together as foods of the same constitutive kind (Ross and Murphy, 1999) are different from the taxonomic categories and for the purpose of this research was grouped in the script category, because these clusters indicate the nutritional value, time and situation in which they (foods) are eaten. It is evident that subjects D2, D3, D5, and D6 were not able to string any taxonomic categories. Experiment 2 revealed that ice-cream (a spanner) as being rated a good member of both 'desserts', a script category, and 'dairy' foods, a taxonomic category.

The analysis above concerned data from the default group set not given any specific basis for their sortings. The conclusion drawn is that there is a strong script influence in the organization of foods. Further analysis of the sortings and organizations of the taxonomic group set and script group set will be helpful in interpreting the results of the non-directed (default) group set.

Subject S5 is a 12-year-old male who resides in a working-class suburb. He is a Coloured and his home language is English. His mother is a pensioner and his father is late. He attended and obtained his primary education at a school in a nearby formerly Coloured suburb. He commutes to the current school daily. Table 25 presents the ten piles that subject S5 was able to string together for this task. It is worth noting that the subject only compiled clusters of two food items each throughout the whole sorting exercise. The instruction required a minimum of two food items per pile and it seems that he stayed is within the parameters of the condition.

Table 25: Script Group: Subject S5

Number of piles			**Reason**	**Category**
A	samp	Steak	eaten together	script
B	butter	porridge	taste and colourful	script
C	yogurt	chocolate	taste like milkshake.	script
D	potato chips	Lamb	nice taste.	script
E	rice	cabbage	healthy team.	script
F	polony	Bread	good for energy.	script
G	milk	Tea	better than drinking black tea.	script
H	biscuit	ice-cream	like having christmas cake.	script
I	bacon	hamburger	taste better.	script
J	cheese	Bread	no reason given	script

The explanations supplied by subject S5 as motivation for his choice of food items could not be placed under any specific category but allocated to script categories. The reasons explained general properties (e.g. taste) and functions (e.g. good for energy) of the cluster which oriented his explanations towards the script conditioning and was categorized as such. The subject made reference to the category ‘healthy foods’ (e.g. rice and cabbage are a healthy team) and because this referred to a situation in which the food is consumed, it was classified as a script category. ‘Bread’ is a spanner and connects two clusters (F and J) which are both script categories. This provides some evidence that this learner is able to cross-classify food items.

This next subject (S10) has produced a similar pattern of clusters as the previous subject, S5. Subject S10 has produced eight food clusters which are presented in table 24. This learner, a female, 14 years old, is of African origin and an isiZulu speaker. She resides in a formerly white residential area and attended an Ex-Model C primary school. The father is a Correctional officer and her mother is late. Subject S10 (table 26) made longer strings of food items, with an average of 4 food items per cluster. The explanations the subject gave for each cluster were classified as script categories. Subject S10 compiled 8 clusters, whose reasoning is that these food items are ‘eaten together’ to explain the situation in which the food is being eaten. The same reason, ‘eaten together’ was given for 7 of the 8 clusters she compiled. This reflects the inability of the learner to explain clusters or categories or has run out of ideas. Since these clusters reflected a strong script conditioning and the ambiguous nature of the explanations, it is assumed to be in some script category.

Table 26: Script Group: Subject S10

Number of piles					**Reason**	**Category**
A	bread	butter	cheese	eggs	eaten together	script
B	rice	chicken	cabbage	fish	eaten together	script
C	porridge	milk	butter		eaten together	script
D	bacon	bread	eggs	cheese	eaten together	script
E	biscuit	yogurt	milk	soda	eaten together	script
F	cakes	tea	coffee	milo	eaten together.	script
G	yogurt	banana	mango	pear	nice together.	script
H	bread	chicken	steak	polony	people like to eat	script

Nevertheless some interesting connections and food representations are evident in table 24. ‘Bread’, ‘cheese’, ‘butter’, ‘milk’, ‘eggs’, ‘yogurt’ and ‘chicken’ are spanners. ‘Bread’ spans three categories. This is as a result of the learner’s personal experience with the interaction of foods.

S3’s parents are educators. She resides in the nearby township and attended an ex-Coloured primary school in the city centre. Her home language is isiZulu and is 12 years old. The subject was able to produce three taxonomic categories and three script categories. The subject was able to identify taxonomic categories of fruit, drinks or beverages, and vegetables. The explanations were explicit and clear so that the researcher could easily place the food clusters into the respective taxonomic and script category.

Table 27: Script Group: Subject S3

Number of piles													Reason	Category
A	banana	orange	apple	mango	pear	water melon	pine apple						fruits	tax
B	chicken	steak	lamb	goat	pork								all animals we eat them as meat	script
C	milo	tea	coffee	milk	water	soda							drink.	tax
D	cheese	margarine	fish	lettuce	ham burger	eggs	boere wors	bread	bacon	polony	butter	potato chips	use them for lunch and breakfast.	script
E	cereal	oatmeal	porridge										breakfast	script
F	nuts	peas	potato	cabbage	carrots								vegetables	tax

The cluster (cheese, margarine, fish, lettuce, hamburger, eggs, boerewors, bread, bacon, polony, butter, and potato chips) is a long string of food items. The explanation for this cluster shows that the subject is able to motivate for the situation in which these food items are used, that is, for breakfast and lunch. The subject was careful not to repeat any of the food items used in one cluster in another cluster, although the learners' were allowed to re-use the food items in other clusters. This does not suggest that the subject is unable to cross-classify or use spanners. Of note here, is that the instruction required a script condition and the learner has not understood what is required of her. In the cluster (chicken, steak, lamb, goat, pork) the super-super-ordinates category 'all animals' for the taxonomic category 'meat' was the reason for her bundle, but when the subject further explains the cluster 'we eat them as meat', it describes an event, and hence it was classified as a script category. From the table it is evident that both forms of classifications are evident, although the instructional conditioning required script categories. Subject S3's sortings show strong script influence for food organizations although she is able to produce taxonomic categories.

Table 28: Script Group: Subject S9

Number of piles								**Reason**	**Category**
A	potato	onion	peas	lettuce	cabbage			vegetables	tax
B	chocolate	biscuit	cake	nuts				junk foods	script
C	orange	banana	mango	watermelon	pear	apple	pineapple	fruits	tax
D	bacon	eggs	bread	pork				eaten in mornings	script
E	milo	coffee	tea					drink anytime during day	script
F	lamb	goat						animals eaten.	script
G	yogurt	ice-cream	milk	apple				dairy products	tax
H	bread	lettuce	polony	butter	cheese			sandwich	script
I	oatmeal	samp	porridge					eaten at mornings	script
J	chicken	rice	peas	carrots	water			eaten at supper	script

Table 28 shows that subject S9 is able to categorize food representations into taxonomic and script categories, and one category influences the other. S9 is a 12-year-old female, an isiZulu speaker, of African origin and resides in an African township. Her mother is an administration clerk and her father a manager at a bank. Clearly the table shows that the taxonomic categories are in the minority, and a domination of script categories exist. This may be as a result of the instruction. There are strong 'vegetables', 'fruits', and 'dairy products' clusters. 'Peas' a spanner, is presented in two clusters and hence connects two categories- the taxonomic category (potato, onion, peas, lettuce, cabbage), vegetables, and the script category (chicken, rice, peas, carrots, water), dinner. This suggests that she can cross-classify foods in two different ways. Other spanners evident in the table 28 are 'lettuce' and 'apple'. Although 'apple' appears in cluster G, it is not a 'dairy product'. This subject can categorize food items in two different ways.

The analyses of the default group and the script group show that there is a strong script influence on taxonomic categories. An analysis of the food representations of the taxonomic group set whose instruction was to divide the food into groups 'of similar food types' has revealed some interesting patterns. The subjects had to group together items that are of the same kind of foods.

A descriptive analysis of the taxonomic group sorts were presented in the previous chapter. This section presents the micro-analysis of individual subjects in this sample set. Briefly, there were eighty four bundles produced for this activity with a mean average of 8.4. Figure 8 shows that there was some influence of script categories in spite of the instruction to sort taxonomically (by 'similar food type'). The conditioning and instructional manipulation did not affect this group set. The explanations of the subjects for each pile were classified as either being taxonomic or script. Although the subjects sorted the food items into taxonomic or script categories a substantial minority was of the taxonomic kind.

T6, a subject of the taxonomic group set, is a 12-year-old female, who received her primary education at an Ex-Model C school in Pietermaritzburg city centre. She resides at a nearby black township. Her mother is a school teacher and father is a labourer for an asphalting company. Her home language is isiZulu. To begin this analysis of the food representations it is important to note that T6 is able categorize foods both taxonomically and by script as is represented in table 27. This ability to classify food as being either taxonomic or script suggests that the learner have alternate organizations of food based on their interactions with the foods. Subject T6 labelled 60% of the clusters as taxonomic categories, while the remaining script categories represented the minority. Although there is a strong taxonomic organization of food, the evidence from the table suggests the presence of the script influence as well.

Table 29: Taxonomic Group: Subject T6

Number of piles											Reason	Category
A	apple	orange	banana	pear	pine apple	water melon	mango				fruit	tax
B	chicken	boerewors	steak	lamb	pork						meat	tax
C	milk	cheese	ice-cream								dairy products	tax
D	milk	soda	tea	coffee	water						drinks	tax
E	ice-cream	hamburger	biscuit	chocolate	cake	pancake	potato chips	pop corn	nuts	pie	unhealthy foods	script
F	carrot	onion	peas	butternut	lettuce	potato	mealie				vegetables	tax
G	oatmeal	cereal	porridge	bread							morning meals	script
H	goat	lamb	fish	chicken							meat	tax
I	cheese	margarine	polony	lettuce							sandwiches	script
J	eggs	bacon	butter	potato chips	bread						breakfast	script

She has identified many spanners in the various clusters. T2 also resides in a black township outside the central business district of Pietermaritzburg. T2 is a female, aged 12. Her home language is isiZulu and she received her primary education at an Ex-Model C school. T2's mother is a housewife and dad is unknown to her. Both of them reside with her grandmother.

Table 30: Taxonomic Group: Subject T2

Number of piles										**Reason**	**Category**
A	carrots	lettuce	cabbage	peas	butter nut	potato	onions			vegetables	tax
B	apple	pine apple	orange	banana	nuts	mango	pear	water melon		fruit	tax
C	cheese	yogurt	margarine	butter	milk	ice cream	chocolate			dairy products	tax
D	soda	water	milk	milo	tea	coffee				beverages	tax
E	popcorn	ice cream	chocolate	ham burger	potato chips	biscuits	cake			junk food	script
F	pan cakes	porridge	oatmeal	pie	bread	cereal	mealie	samp		breakfast cereal foods	script
G	goat	steak	chicken	bacon	polony	boere wors	pork	fish	lamb	meats	tax
H	eggs	pan cakes	cakes							ingredients	script
I	oat meal	water	porridge							make porridge	script

T1 (like T2 and T6) is able categorize foods both taxonomically and by script as represented in table 30. T1, a 13-year-old female is an isiZulu speaker. She resides in a formerly white suburb. Both her parents are employed, but are separated by divorce. Her mother is a nurse by profession and the father is a sales consultant for an insurance company. Interestingly, T1 displays a high degree of taxonomic classification as the first five clusters are taxonomic categories. She correctly interpreted the taxonomic instruction and in my opinion allowed her shared experiences of her context to influence her script categories. She could not classify any other clusters as taxonomic as she had already labelled five of the six categories identified in the category generation task. My interpretation is that created as many taxonomic categories as was possible, and then started to make script categories to occupy time or please the researcher. The important point is that she constructed five taxonomic categories.

Table 31: Taxonomic Group: Subject T1

Piles/clusters												**Reason**	**Category**
A	potato	onion	peas	cabbage	carrots	lettuce	butternut					vegetables	tax
B	mango	apple	orange	pear	pine apple	water melon	banana					fruit	tax
C	milo	ice-cream	yogurt	milk	biscuit	cheese						dairy product	tax
D	chicken	goat	polony	steak	lamb	boere wors	fish	pork				meats	tax
E	water	coffee	soda	tea	milk	milo						liquids	tax
F	milk	cereal	butter	margarine	bread	porridge	oatmeal	eggs	bacon	water	yogurt	things for breakfast	script
G	soda	nuts	pan cakes	ice-cream	popcorn	cake	chocolate	pie	ham burge	potato chips		junk food	script
H	samp	mealie	rice									starch	script
I	water	yogurt	potato	butternut	banana	water melon						healthy stuff	script
J	lettuce	carrot	polony	margarine	bread							sandwich	script

All the learners mentioned above display strong taxonomic organizations but also tend to make script categories. This shows that taxonomic categories and script categories are salient ways of conceiving foods. T1, T2 and T6 are able to connect different categories by means of spanners. For subject T1, cluster C needs further analysis. T1 has correctly labelled the cluster as 'dairy products' in the taxonomic category, but has included 'biscuit' (a snack food or junk food) in the pile. This item is misplaced in this cluster. Cluster H in table 31 is also interesting. Subject T1 labelled cluster H (in table 29) as 'starch', which provides an alternative organization of food by their macro-nutrients.

Tables 32 and 33 show the different proportions of labelled that were classified as being either taxonomic or script. From the explanations given by the subjects the food representations were classified as either taxonomic or script. Subjects T3 and T8 display a strong script influence because the majority of the categories were of the script kind.

Table 32: Taxonomic Group: Subject T3

Piles/clusters					**Reason**	**Category**
A	bread	potato chips	soda		things to eat	script
B	bread	butter	lettuce	soda	sandwich and drink	script
C	hamburger	steak	soda		easy to make	script
D	bread	bacon	eggs	soda	lunch - healthy	script

Table 30 shows that subject T3 did not organize foods into any taxonomic category. Subject T3 is a male, aged 12, of African origin and isiZulu speaker. He resides in a working-class suburb. He went to an Ex-Model C primary school. His father is unknown and mother is a cleaner.

Table 33: Taxonomic Group: Subject T8

Piles/clusters			Reason	Category
A	eggs	bacon	eat at breakfast	script
B	milk	cereal	breakfast	script
C	bread	butter	cannot eat bread only	script
D	coffee	pancakes	breakfast	script
E	tea	biscuit	old ladies eat it	script
F	bread	polony	for lunch	script
G	bread	margarine	taste good at home	script
H	biscuit	soda	taste nice	script

Table 33 shows the proportions of labels that were classified as script categories from the explanations. Like T3, subject T8 was not able to organize food taxonomically and is influenced by script categories. Subject T8 is the 12-year-old son of a domestic worker. His father is a cleaner and is divorced. T8 received his primary education from a school in the township.

7.3 Discussion

The fundamental distinction between the school (formal) knowledge and everyday knowledge which is well illustrated by the research of Hoadley (2005) and Bernstein (1990), as discussed in detail in the literature review. To gain a better understanding and as a further indicator of the learners' ability to classify and categorize taxonomically or by script in the school context where this research is conducted, the learners marks achieved in the various learning areas, in their Grade 8 year is analysed. If the learners are able to classify foods taxonomically, then there is the assumption it could be easier access to school (formal) knowledge, and the learners could have achieved well in the school setting by obtaining above average marks in the various learning areas offered at school.

The taxonomic group is analysed further, to check whether (after approximately nine years of schooling), the script influence (everyday knowledge) has been interrupted. While the everyday knowledge is important and essential, it is not enough to access the school code of knowledge. If the learner is able to demonstrate the ability to organize food representations taxonomically, then this means that learners are able to apply general tools of analysis that are specialized to context independent situations and therefore is probably able to access the school code of knowledge more proficiently.

Subject T1 lives in a middle-class area. She received his primary education at an Ex-Model C school. T1 comes from a middle-class background. Despite her parents being divorced she has made good academic progress in Grade 8 with a average of 68.4%. This suggests that she has above average intelligence. Seeing that the instructional motivation required that the learners work taxonomically, Table 31 shows the first five explanations were convincing taxonomic categories. Attention is also drawn to the fact that as more clusters were put together T1 switched her classification principles to one based on the local context and personal experiences, hence the next five clusters were orientated towards the script categories. This means that T1has access to two principles of classification: one taxonomic (formal and specialized) and the other by script (personal and localized). In other words T1 is able to access the school knowledge and everyday knowledge.

T2 lives in a working-class area, a black township near the city centre. Adjoining the township is sewerage and waste disposal purification plant and the cities refuse dump site. She lives with her grandmother, her mother is a housewife but her father is unknown to her. These indicators suggest that the learner comes from a working-class background. T2 studied at an Ex-Model C primary school and commuters by public transport to my sample school. Like subject T1, T2 classified five taxonomic categories. The first four being taxonomic labels and the others were of the script type. During the Grade 8 academic year she has made excellent progress and achieved a average of 76.1%. Table 30 has provided further evidence that subject T2 is able to access two organizing classificatory principles. She has demonstrated that schooling has interrupted her script influence giving her access to school and context independent knowledge.

T3 resides in a lower middle-class residential area. His father is unknown to him while he lives with mother who is a cleaner.His mother's occupation is an indicator of a working-class background. Nevertheless, T3 has obtained his primary schooling at an Ex-Model C school. The instructional motivation for this group explicitly required foods 'of similar types' to be bundled together. The evidence shows that subject T3's organization of foods are strongly influenced by script conditions and the everyday knowledge. This display of everyday context dependent knowledge suggests that T3 was unable to realize what was required by the instruction. Therefore, his years of schooling in the primary phase has not interrupted the script influence of knowledge, hence he will find it very difficult to access the school code of knowledge. His academic progress for the Grade 8 year is below average. He obtained an average of 34% in English and 29% for Maths, while his average for academics is 48.3%. Table 32 shows that there is strong evidence of the script influence as the explanation for each of the clusters only indicated relevance to the learner's personal context. T3's explanations focused on the general sense of food representations, e.g. 'things to eat' and 'easy to make'. The evidence in the table shows that the learner fails to demonstrate taxonomic organization of foods because his reason for the cluster grouping is embedded in his local context and the personal experiences of the learner. In my opinion, for T3, schooling has not interrupted the script influence of his community and he will not be able to gain access to school knowledge easily.

Subject T4 lives with her grandmother because her mother is deceased. Her father is a site agent for a construction business. She resides in a black township and travelled to a former Coloured primary school across town. These are some of the indicators to reflect that T4 comes from a working-class background. T4 produced three taxonomic clusters and six script category clusters as table 32 displays.

Table 34: Taxonomic Group: Subject T4

Piles/clusters			Reason	Category
A	carrot	lettuce	vegetables	tax
B	polony	butter	sandwich	script
C	chicken	pork	meat	tax
D	milo	coffee	similar	script
E	potato chips	potato	similar	script
F	cabbage	lettuce	similar	script
G	apple	pear	fruit	tax
H	cheese	polony	sandwich	script
I	cereal	porridge	breakfast	script

The instruction for this activity required 'similar foods' to be put together. The learner put together cluster D, E, and F, but explained each as 'similar'. This implies that the learner is not able to provide suitable explanations. She tends to repeat the same explanation and appears to be situation bounded. Despite her explanations being strongly dominated by script conditions, she at times does demonstrate some access to school knowledge as she is able to recognize and realize that 'fruit', 'vegetables', and 'meats' are taxonomic categories. There is evidence in table 34 to suggest that T4 can organize foods in two ways and that the impact of script conditions has been interrupted. She has access to both school knowledge and everyday knowledge, each influencing one another and vice versa.

Subject T5 resides in the same township as T4 and they went to the same primary school. She has a working mother, but lives with a guardian. Like T4, T5's home background is working-class. Similar to T4, T5 produced two taxonomic labels and six script categories. Her academic achievement at school is below average. Her average achievement in the Grade 8 examination is 46.8%, and the year's average in English and Maths is 34% and 29% respectively. Despite the poor achievement in English, Maths and many other learning areas she demonstrates a weak ability to organize food taxonomically. Labelling cluster D 'fruits for fruit salad' seems to suggest, that she is able to recognize 'apple, pineapple, orange, banana, watermelon, pears and mango' are 'fruits' (a taxonomic category), but is strongly influenced by her personal and everyday experience that 'fruits' are ingredients for a fruit salad. These are shown in table 35.

Table 35: Taxonomic Group: Subject T5

Piles/clusters								**Reason**	**Category**
A	chicken	eggs						chicken makes eggs to eat.	script
B	potato chips	fish						lunch	script
C	bread	butter	cheese	polony				sandwich	script
D	apple	pine apple	orange	banana	water melon	pears	mango	fruit for fruit salad	tax/ script
E	lettuce	butter nut	mealies	potato	onions	cabbage	carrots	vegetables	tax
F	bacon	eggs	potato chips	bread	margarine	cheese	soda	breakfast meal	script
G	ham burger	potato chips	soda					what kids like to eat	script
H	yogurt	ice-cream	chocolate	biscuit	pancakes	cake	pie	junk food	script

Coincidently T6 resides in the same township as T4 and T5. Subject T6's parents are both employed; her mother is a teacher and her father a labourer. While her parents occupation seem to indicate some social class mobility (see Hoadley, 2005), T6 lives in a working-class area and went to at an Ex-Model C school, unlike T4 and T5. T6 produced, as depicted in table 27, ten food representations, of which six are taxonomic categories and four of the script type. She produced labels as the instructional motivation required for this group of subjects and then switched her classificatory principles to her local and personal experience of the everyday. T6 demonstrated the ability to organize foods in a more formal and specialized way by forming suitable taxonomic categories. This implies that schooling has interrupted the script influence thereby amplifying her ability to organize taxonomically; by moving from the general and everyday knowledge to formalized and specialized school knowledge. This ability to organize food items taxonomically is correlated by her English average of 51% and Maths average of 59%.

T7 currently resides in a middle-class, formerly white suburb of Pietermaritzburg. His primary schooling took place in a formerly Indian school in Durban. T7 comes from a middle-class background; his mother is an administrative assistant and his father a project buyer. Table 34 shows that T7 has a weak ability to work taxonomically and suggests he may struggle academically.

Table 36: Taxonomic Group: Subject T7

Piles/clusters						**Reason**	**Category**
A	water melon	pineapple	pear	apple	mango	fruit family	tax
B	biscuit	pancake	cakes	milk	eggs	eggs and milk used to make these	script
C	potato chips	potato				no potato no potato chips.	script
D	milk	butter	ice-cream	yogurt	cheese	all made out of milk.	script
E	mealie	popcorn				used together	script
F	pork	bacon				close together	script
G	chicken	hamburger	polony			use chicken to make the rest.	script
H	lettuce	cabbage				same colour	script
I	milo	tea	coffee			need sugar	script

His performance in the Grade 8 examinations is average (50.4%). He has produced very little evidence that school is an interrupter of the script influences. His explanations are essentially script and limited to his personal experiences and have not accessed the school code of knowledge.

On the other hand T8 was offered an academic scholarship to gain access to my sample school. He resides in a working-class area and attended a primary school in a township. His mother is a domestic worker and the father, a cleaner, but divorced. Table 33 represents the proportion of categories labelled by T8. The evidence in the table suggests that T8 has access to only non-specialized principles of classification that are context dependent and situational. From the table it can be inferred that T8 has failed to produce any evidence that schooling has been an interrupter of the everyday knowledge, but instead perpetuated it. He has failed to use any context independent principles to explain his choice of food items. Academically his mean average is 49.1% and in my opinion, is of average intelligence. He has achieved moderate results in English, averaging 41% over the year and fared poorly in Maths (average 24%).

Table 37: Taxonomic Group: Subject T9

Piles/cluster				Reason	Category
A	mango	watermelon	pear	fruit	tax
B	fish	chicken		come from animals, meats	tax
C	cake	bread		made from bread.	script
D	milk	ice-cream		ice-cream made from milk	script
E	potato	cabbage		come from the ground	script
F	margarine	cheese		come from milk.	script
G	water	soda		make soda from boiling water	script
H	banana	orange	apple	fruit	tax
I	boerewors	polony		come from animal body	script

T9 grouped his cards representing food items that required ‘similar food types’ for three taxonomic clusters (this is what the instruction required). He was able to recognize similar food types as shown in cluster A, B, and H. These represent taxonomic categories, for example, ‘fruit’ and ‘meats’ (table 37). Although his mother is a Minister of Religion at a church in a township, he does not have a family background as he is being brought up in a children’s home. He is classified as a Coloured person and is English speaking, unlike other subjects in my sample. His reason for choosing my sample school as his second choice school is because he could not gain admission to another Ex-Model C high school in the area. He obtained his primary education at an Ex-Model C school. His average of 55.5% in academics (65% in English and 29% in Maths) reflects a moderate success at school. Living in a children’s home may have offered a structured but simulated home background and this may have reflected in a positive attitude to schooling. This positive experience of schooling in the primary years and in Grade 8 would enable him to negotiate the requirements of school knowledge. Therefore, schooling will serve as an interrupter by allowing him to access the school code with little difficulty because he can organize foods taxonomically.

T10's mother is a nurse and the father, a chemical technician. He resides in a black township, about forty kilometres away from Pietermaritzburg. He schooled at an Ex-Model C primary school. Although T10 resides in a working-class area his family background is middle-class.

Table 38: Taxonomic Group: Subject T10

Piles/cluster				**Reason**	**Category**
A	apple	orange	pear	fruits	tax
B	ice-cream	chocolate		children like it	script
C	bread	milk coffee	tea	put milk in it	script
D	porridge	oatmeal		eat in morning	script
E	butternut	butter		put butternut on food.	script
F	bacon	pork	steak	breakfast food	script
G	pie	pancakes		battered	script
H	biscuit	cake		similar	script

Table 38 shows the proportions of taxonomic and script labels produced by T10. Interestingly, T10 does not demonstrate success in his academics. The mean average for the Grade 8 year is 34%. He has learning difficulties in many learning areas. His English average is 25% and Maths average is 22%. The evidence in the table demonstrates he employs general principles to justify his explanations for his choice of categories and that he is context dependent, for example, 'put milk in it' for cluster C –'bread, milk coffee, and tea'; and 'children like it' for cluster B. In the above table, T10 demonstrates a taxonomic representation of 'apple, orange and pear' as the category 'fruits'. However, only one cluster is classified as a taxonomic label. This demonstrates, at an elementary level, he can use classificatory principles to produce taxonomic categories of real world objects. Further analyses suggest that T10 is bound by script conditions in terms of his reasoning. The majority of the clusters which illustrate criterion drawn from the learner's personal experience and local context are indicators of working-class. School will not act as an interrupter of the everyday code of knowledge if that is what table 38 depicts and therefore T10 has not gained access to the school code of knowledge.

7.3 Conclusion

Contextual and thematic information plays a relevant part in organizing knowledge not only in children but also in adults. At the age level considered for this research concepts convey more script (thematic) information than taxonomic information. The default group was not given any specific basis for their sortings. The evidence in the chapter brought to light that the sortings of the individuals are strongly influenced by script categories. While the data depicted the ability to classify food items taxonomically, there were clear cases of script groupings, even for the subjects given taxonomic instructions. Some foods items appeared to span two food categories indicating that they are viewed to good members of taxonomic and script categories. This means that the groupings of foods into taxonomic and script categories are not completely independent.

It would be too simplistic to think of every food items as having one 'real' categorization as other categories are readily accessed and used (Ross and Murphy, 1999), because they are connected to all the categories they exemplify by shared category membership or by shared properties. The results of all the experiments provide strong evidence for the importance of script categories in people's representation of and inferences about food.

In closing the correlations looked at in this chapter between social class, school performance and food classification are all very difficult to put together in any definite way that makes causal claims, but there are still some interesting patterns that can be described.

Chapter 8: Conclusion

8.1 Overview

The initial focus of this study is to ascertain to what extent Grade 8 learners in a developing context, are able to organize knowledge, by script (thematically) and/or taxonomically. Next, the study examined the influence of the socio-economic background on the ability of the learner to classify concepts thematically and taxonomically and further to explore their ability to access the school code of knowledge.

8.2 Summary of the study

The study set out to investigate how Grade 8 learners represent, access and make inferences about real world category domain; food, in the organization of conceptual knowledge. Chapter 1 introduced the study's motivation and focus question, and located the study in South Africa. Chapter 2 focused on the theoretical and conceptual framework. I looked at theories in the cognitive psychology of conceptual development and social reproduction of inequalities theory and located Bernstein's Code theory within this. Chapter 3 provided an in depth review of the literature from both the psychological and social perspective that impacted on the study. Chapter 4 addressed the methodological issues of the study and showed the experimental research design. It considered the production of data and its analysis. The chapter also considered validity and reliability in the study. Chapter 5 presented the results and findings yielded from experiments 1 – Category generation, experiment 2 – Category ratings, and experiment 3 – Category sortings to demonstrate thematic and taxonomic concept organizations. Chapter 6 presented the general analysis and chapter 7 the micro-analysis of the findings from the thematic and taxonomic clusters produced by the learners. In this chapter, the interpretations of the findings are presented.

8.3 Summary of findings of the default group for the first five clusters

Subject	Piles/cluster				
	A	**B**	**C**	**D**	**E**
D1	taxonomic	taxonomic	taxonomic	taxonomic	script
D2	script	script	script	script	
D3	script	script	script	script	
D4	script	script	script	script	script
D5	script	script	script	script	script
D6	script	script	script	script	script
D7	taxonomic	taxonomic	script	script	script
D8	script	script	script	taxonomic	script
D9	taxonomic	script	taxonomic	script	
D10	script	script	script	script	script

The summary above highlights that when no instructions were given to the default group about sorting, the script categories influenced their sorts. While some taxonomic categories are evident there are clear cases of script influences, even for the subjects given the taxonomic instruction, irrespective of class background.

8.4 Implications of the study

This study has worked on increasing our understanding of conceptual representations. According to Ross and Murphy (1999) many items belong to multiple hierarchies. While many studies examined single hierarchies (Rosch et.al., 1976) but ignored many cases that have alternative organizations, which is called cross-classification. This study highlights the learners' ability to cross-classify by identifying 'spanners' that connects two or more category clusters. The presence of 'spanners' suggest that food item is a good member of both categories.

The study also highlights some difficulties in the sorting of food items. Different purposes and tasks may lead to different ways of processing the category representation. Some learners are able to get their classifications right according to the instructional motivation and as a result put together many clusters of the minimum of two foods while other learners put together fewer clusters with a long string of food items. Does this imply that subject T4 is better at identifying taxonomic categories than subject T1? Within the classification of categories there are occasional mistakes, for example, subject S4, labelled one of his taxonomic cluster as 'fruit' after organizing the cluster as '*lettuce*, watermelon, pear, banana, mango, orange, *peas*, pineapple'. Clearly 'lettuce' and 'peas' are mistakes in this cluster against the background of the reason. This draws attention to the orientation of meaning. This raises the possibility of the need to examine other functions that categories may serve in the study of classification of concepts. Ross and Murphy (1990) suggest the possibility of looking at induction, explanation, problem solving, category formation and communication as other functions of category representation. Barsalou (1983, 1985) has shown that people readily form new categories that address specific goals and concluded that in everyday life, such categories would be used primarily as part of a planning process rather than for categorization (Barsalou, 1991).

Many other studies and my study suggest that the knowledge of food is learned and used in a large number of ways and contexts. Therefore ones knowledge of food is connected to one's other knowledge of real world concepts that are integrated with knowledge and activities. My study shows some correlation with the findings of Hoadley's (2005) research of what different groups of children bring to school and reinforces their position to succeed in schooling and learning. My study highlights that although the learners are differently positioned in terms of their background, their ability to organize concepts taxonomically or by script, is not necessarily because of their class background or inability to classify. Sometimes class is a predictor and sometimes it is not. Hoadley (ibid) argues that:

> Through an experiment designed to elicit categorization principles from learners, and through a mathematics task focused on examining the acquisition of recognition and realization rules by the learners, and their deployment of localizing and specializing strategies, we were able to discern the coding orientation of the learners in the two contexts. In the middle-class context students were able to recognise and realise context-independent meanings, or an elaborated coding orientation. The working-class students on the other hand in the main operate solely with context dependent meanings, a more restricted orientation. We are not claiming that these particular orientations are necessarily derived

from the schooling experiences of the learners; they most likely come from the home.

Subject S3, whose parents are teachers (and according to Hoadley's (2005) research suggested that these parents are of middle-class stature), was not able to follow the instruction for the script group but instead labelled some clusters as taxonomic. Although very difficult to extrapolate from this, it suggests that working with the complex domain of food has many factors playing a role. Obviously learners' ability to classify foods may not be resultant of their background but rather their inability to work taxonomically, because there are more complexities involved in doing categorizations and it these complexities that require attention.

This study draws attention to the fact that working with foods is complicating when it comes to category formation. Subject S10 repeated the reasons as an explanation for her category formation. This implies that she employed the same strategy of classification over and over again in a number of different categories. These further suggest that food experiments are far more complex than initially meets the eye.

According to Muller (2000) the dream of transformational OBE by South Africa was of a creative and empowered teacher facilitating the education of an active learner in ways that suited their own contextual conditions. This means that the political project of democratic liberation was extended into the pedagogic field. The suggestion is that all learners would be able to democratically learn in ways that took their own contexts seriously, allowing for differing learner paths that were all equal so long as certain specified outcomes were reached (Hugo 2005a). Muller's concern was about the way in which poor kids in South Africa would be taught. Hugo (2005a p.8) is also concerned by questioning "how do structures of knowledge intersect with structures of social inequality within the pedagogic field?"

In the psychological perspective, conceptual knowledge and conceptual relations are links that interconnect different concepts and among the wide variety of conceptual relations, taxonomic and thematic relations play a key role (Barsalou, 1993; Markman, 1989). The indications from the food experiments are that the learners engaged in the experiments struggled with conceptual classifications.

The results of Ross and Murphy's experiment 3 (on undergraduate university students) provides further evidence that although peoples representations of foods are dominated by taxonomic categories, they are, however, strongly influenced by script or thematic categories as well. My experiment, which is similar to Ross and Murphy's experiment, yielded results that show subjects in Grade 8 have a tendency towards the script category being dominant. The default group's sorting contains many script clusters and very few taxonomic clustering. According to Borghi and Caramelli (2003) the production of thematic relations at all ages levels (between 5, 8, and 10-year olds) greatly exceeds the production of taxonomic relations and that both of these kinds of knowledge organizations co-exist in children aged 5 years and older. This is crucial as it points to why thematic categories dominate taxonomic categories for internal reasons because only a couple of taxonomic categories that fit a concept but there are lots of thematic categories for the same concept. For taxonomic categories concepts can be categorized, recognized and realized precisely and accurately

Hoadley looked at the extent to which students were able use Bernstein's recognition and realization rules in organizing knowledge. She found that 89% of middle-class and 13% of working-class learners were able to recognize context-independent groupings. Hoadley (2005) used a Mathematics task to determine whether middle-class and working-class learners were able to make pedagogic judgments using recognition and realizations rules. In deploying their strategies for addressing the task, working-class learners showed little grasp of the recognition and realization rules (Hoadley, 2005), however, this is all not that bad as Borghi and Caramelli's (2003) findings reveal that there are complicating factors, especially as children across class and age tend to use more thematic categories than taxonomic categories. Therefore, the experiments carried out by both traditions has to be revised so that it can take into account all the nuances knowledge inherits through abstraction from direct experience from our complex dealings with the environment.

The fundamental distinction between formal knowledge of schooling and everyday knowledge is well illustrated in Bernstein, Holland and Hoadley. They found that working-class children were able to classify common food items using categories drawn from their local experiences to patterns on the cards whereas middle-class children used organizational patterns to have a conceptual basis. When the task was repeated, Hoadley found that middle-class children had shifted their organizing principle to local contextual factors, the working-class children continued in the same mode as they had started. Middle class children had access to two organizing principles in terms of the food experiments, and were able to switch between the two, whereas the working-class children used one (Hoadley, 2005).

Hugo's (2005b) analysis of Hoadley findings is useful, if we accept that one of the main functions of schooling is to introduce learners into various formal bodies of (conceptual) knowledge and also accept that middle-class children, because of their upbringing in their home, show an ability to work more comfortably with conceptually ordered patterns than working-class learners, then one can assume that working-class learners will find the conceptually organized world of school knowledge harder to master than their middle-class colleagues. The food experiments conducted in this study do indicate that the learners at my sample high school struggled with conceptual patterns, even when these focused on a terrain they were familiar with – food. That said, the experiments of this study point to a range of complicating factors:

- It is too simplistic to think of every item as having one 'real' categorization as other categories are readily accessed and used (Ross and Murphy, 1999), therefore the analysis must take the complexity of working with foods into account.
- The results suggest a 'criss-cross' Wittgensteinian network of category relations because of the transitive nature and shared properties of items, e.g., yogurt is both a breakfast food and a dairy food. These suggest that foods do not fit into pure taxonomic categories because script categories form a large part of ones memory by generating exemplars. According to Ross and Murphy (1999), the contexts of other

foods, the time of day, the setting, or other cultural indicators can all determine which category is activated for a given food.

- Other functions of category formation need consideration in order to understand why concepts have the structure they do.
- Food experiments in this research are more detailed than the one carried out by Hoadley (2005). The micro-analysis highlights that different learners show specific individual traits and is not about race and class background. For example, in a family where one parent is an educator and the other a (backyard) motor mechanic demonstrates different variables impact on this family and the school.
- Ross and Murphy (1999) and Hoadley (2005) make food experiments look quite simple for different reasons, the first ignores class and poverty, the second the complex conceptual world of classification as opened out by cognitive psychologists. Hoadley used food experiments to show the impact of class while Ross and Murphy showed patterns for categorization. Many complicating factors need be considered and future experiments must hold these factors in place.
- Using food experiments to determine class is more complex than meets the eye. While middle-class children can organize foods both, taxonomically and by script there is no clear interruption of the reproduction of inequalities through schooling and further it is not clear how this happens.

8.5 Limitations of the study

- The research is limited to one sample and one school, therefore the sample is not representative.
- The subjects were chosen randomly to avoid any bias. It is possible that the dichotomy of working-class learners and middle-class learners could be skewed to one class group. However, it was my intention to obtain a hybrid group that would include all learners irrespective of class.
- The study did not take into account the coding orientation in the subject's homes as it was my intention for the analysis to reveal this. This area needs to be explored further.

- Cognitive resources that do exist in the school (library, media centre, internet access, etc.) and in the community from which the subjects emerge, needs to be further explored.

8.6 Conclusion

The study reveals that it is common for a concept to belong to multiple categories that represent alternative conceptual organizations which affects people's understanding of the environment and their actions in the world. Category classifications and conceptual organizations are important because they serve multiple functions by examining other functions that categories may serve, such as, induction, explanation, problem solving, category formation, and communication (e.g. the presentation of a bread roll leads subjects to access knowledge of both 'breads' and 'breakfast foods'). The study also shows those concepts are integrated with human knowledge and activities. Food is not an isolated body of knowledge but part of many aspects of our physical and social life.

Concepts may have a great variety of forms and contents, and this is part of what has made this field so complex. Concepts are ubiquitous across different populations and ages – "it is hard to see how any intelligent creature could do without them" (Murphy, 2002). It used to be thought that infants and young children were lacking in true conceptual abilities, which had been onerously acquired over the preschool years. However, more recent studies have found basic conceptual abilities in infants (only a few months old) and preschool children now appear to have sophisticated conceptual abilities, even if they are lacking much of the conceptual content that adults have.

That said, there seems to be a very weak ability by learners to work taxonomically in any sample of the study conducted. Although taxonomic categorization improved when learners were instructed to work in a taxonomic way, there was still substantial confusion between script and taxonomic ordering patters, with the script pattern dominating. There was also confusion the other way round with subjects given the script instruction also represented foods taxonomically. Nevertheless, script patterns dominated in all forms of the food experiments indicating a strong dominance of script categorization and a weak use of taxonomic categorization. This supports the findings of the food experiments of Bernstein, Holland and Hoadley. Given that schools work with increasingly abstract conceptual categories this is a worrying conclusion and points to the need for educators to pay specific and explicit attention to the development of abstract categorization skills for learners within a developing state.

There was considerable temptation to make larger claims based on the study, but there are many limitations based on the size of the study that has kept the substantive claims of the thesis modest. With further replication and detailed exploration of the conceptual categorization abilities of learners and students in a development context within South Africa, more extensive claims will be possible.

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APPENDIX A

Pilot: Task 1 - Survey

State whether you are ‘familiar’ or ‘not familiar’ with the following food items. Place a tick (√) in the appropriate block. If you would like to replace any particular food item, you may write your appropriate word in the column labeled ‘Other Word’.

Food item	Familiar	Not Familiar	Other Word	Food item	Familiar	Not Familiar	Other Word
Carrots				Soda			
Lettuce				Water			
Mealie (Corn)				Tea			
Potato				Coffee			
Onions				Milo			
Peas							
Cabbage				Spaghetti			
Butternut				Bread			
				Rice			
Apple				Cereal			
Orange				Mieliemeal			
Pineapple				Oatmeal			
Banana				Pancakes			
Watermelon							
Pear				Cake			
Mango				Pie			
				Biscuits			
Chicken				Ice cream			
Hamburger							
Fish				Potato chips			
Steak				Nuts			
Pork				Chocolate			
Lamb				Popcorn			
Goat							
Boerewors							
Bacon							
Crab							
Milk							
Eggs							
Yogurt							
Butter							
Cheese							
Margarine							

APPENDIX B Food items – Pilot

No.	Food items			A	B	C	D	E	F	Total
1	Carrots	uKheloth/iZaqathi	Ukheloth/izaqathi	1	1	1	1	1	1	**6**
2	Lettuce	uLethisi	Ulethisi	1	0	1	0	1	1	**4**
3	Mealie (Corn)	Umbila	Umbila	1	1	1	0	1	1	**5**
4	Potato	iZambane	Izambane	1	1	1	1	1	1	**6**
5	Onions	uAnyanisi	Uanyanisi	1	1	1	1	1	1	**6**
6	Peas	Uphizi	Uphizi	1	1	1	1	1	1	**6**
7	Cabbage	iKhabishi	Ikhabishi	1	1	1	1	1	1	**6**
8	Butternut	iThanga	Ithanga	1	1	1	1	0	1	**5**
9	Apple	iAphula	Iaphula	1	1	1	1	1	1	**6**
10	Orange	iWolintshi	Iwolintshi	1	1	1	1	1	1	**6**
11	Pineapple	uPhayinaphu	Uphayinaphu	1	0	1	0	1	1	**4**
12	Banana	uBanana	Ubanana	1	1	1	1	1	1	**6**
13	Watermelon	iKhabe	Ikhabe	1	0	1	0	1	1	**4**
14	Pear	iGanandoda	Iganandoda	1	1	1	1	1	1	**6**
15	Mango	uMango	Umango	1	1	1	1	1	1	**6**
16	Chicken	iNkhukhu	Inkhukhu	1	1	1	1	1	1	**6**
17	Hamburger	iBhega	Ibhega	1	1	1	1	1	1	**6**
18	Fish	iNhlanzi	Inhlanzi	1	1	1	1	1	1	**6**
19	Steak	iSicubu	Isicubu	1	1	1	1	1	1	**6**
20	Pork	iNgulube	Ingulube	1	1	1	1	1	1	**6**
21	Lamb	iSiklabhu	Isiklabhu	1	1	1	1	1	1	**6**
22	Goat	iMbuzi	Imbuzi	1	1	1	0	1	1	**5**
23	Boerewors	iSosishi	Isosishi	1	1	1	1	0	1	**5**
24	Bacon	uBhekeni	Ubhekeni	1	0	1	1	0	1	**4**
25	Crab	iNkalankala	Inkalankala	1	0	0	0	1	0	**2**
26	Milk	uBisi	Ubisi	1	1	1	1	1	1	**6**
27	Eggs	Amaqanda	Amaganda	1	1	1	1	1	1	**6**
28	Yogurt	Yogathi	Yogathi	1	1	1	1	1	1	**6**
29	Butter	iBhotela	Ibhotela	1	1	1	1	1	1	**6**
30	Cheese	uShizi	Ishizi	1	1	1	1	1	1	**6**
31	Margarine	iMajerina	Ibhotela	1	1	1	1	1	1	**6**
32	Soda	Soda	Soda	1	1	1	1	1	1	**6**
33	Water	aManzi	Amanzi	1	1	1	1	1	1	**6**
34	Tea	iTiye	Itiye	1	1	1	1	1	1	**6**
35	Coffee	iKofi	Ikofi	1	1	1	1	1	1	**6**
36	Milo	iMilo	Imilo	1	1	1	0	1	1	**5**
37	Spaghetti	iSipagethe	Isipagethe	1	0	1	0	0	1	**3**
38	Bread	iSinkwa	Isinkwa	1	1	1	1	1	1	**6**
39	Rice	iLayisi	Ilayisi	1	1	1	1	1	1	**6**
40	Cereal	iPhalishi	Iphalishi	1	1	1	1	1	1	**6**
41	Mieliemeal	iMpuphu	Impuphu	1	0	1	1	1	0	**4**
42	Oatmeal	uKolweni	Ukolweni	1	0	1	1	1	1	**5**
43	Pancakes	Amaqebergwane	Amaqebergwane	1	0	1	0	1	1	**4**
44	Cake	iKhekhe	Ikhekhe	1	1	1	1	1	1	**6**
45	Pie	uPhaye	Uphaye	1	1	1	1	1	1	**6**
46	Biscuit	Amabhisikidi	Amabhisikidi	1	1	1	1	1	1	**6**
47	Ice cream	Ayisikhilimu	Ayisikhilimu	1	1	1	1	1	1	**6**
48	Potato chips	aMazambane	Amazambane	1	1	1	1	1	1	**6**
49	Nuts	aMantongomane	Amantongomane	1	1	1	1	1	1	**6**
50	Chocolate	uShokoledi	Ushokoledi	1	1	1	1	1	1	**6**
51	Popcorn	Amaphephukhona		1	1	1	1	1	1	**6**
				51	**42**	**51**	**42**	**47**	**49**	

APPENDIX C

Task 1

Aim: to find out how learners think about categories of food.

Instructions:

1. In your booklet there is a list of food items.

2. Browse through the booklet, page by page so that you have a good idea of the various food items on the list.

3. State the category you think the particular food item would belong to.

4. For example, **a dog** would belong to a number of different categories, such as: **pet, canine, animal, domestic animal, mammal.**

5. Write down as many categories as possible for each food item.

6. If you are not sure of an appropriate category, you must write it down anyway.

7. Each word is written in both English and isiZulu.

8. shirt –clothing , work, school, pants, events.

carrots (uKheloth/iZaqathi)					
watermelon (iKhabe)					
potato chips (amazambane athosiwe)					
milk (uBisi)					
bacon (uBhekeni)					

ice cream (Ayisikhilimu)					
lettuce (uLethisi)					
polony (uPholoni)					
water (aManzi)					
banana (uBhanana)					

boerewors (iSosishi)					
tea (iTiye)					
mealie (corn) (Ummbila)					
pineapple (uPhayinap hu)					
nuts (aMantong omane)					

steak (iSicubu)					
biscuits (Amabhisikidi)					
cereal (iPhalishi)					
potato (iZambane)					
eggs (Amaqanda)					

soda (Soda)					
yogurt (Yogathi)					
coffee (iKhofi)					
pork (iNgulube)					
onions (U-anyanisi)					

margarine (iMajerina)					
fish (iNhlanzi)					
porridge (iPapa / uPuthu)					
orange (iWolintshi)					
cake (iKhekhe)					

rice (iLayisi)					
cabbage (iKhabishi)					
mango (uMango)					
lamb (iSiklabhu)					
chocolate (uShokoledi)					

apple (iAhula)					
milo (iMilo)					
chicken (iNkhukhu)					
pie (uPhaye)					
butter (iBotela)					

samp (iSitambu)					
pancakes (Amaqebergwane)					
peas (Uphizi)					
popcorn (Amaphephukhona)					
hamburger (iBhega)					

pear (iGandandoda)					
cheese (uShizi)					
mieliemeal (iMpuphu)					
goat (iMbuzi)					
bread (iSinkwa)					
butternut (iThanga)					

APPENDIX D

Data Book

Dear Grade 8 learner

1. This study is to find out what learners think about types of food.

2. In your data book you would find a list of food items and food categories.

3. In your data book there is a rating scale which ranges from **0 – 7**, where **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".

4. Your task will be to rate each food item on the page in terms of how good of an instance it is for that particular category, according to the rating scale displayed on the top each page.

5. For example – **Vehicle - as a flagpole - 0**
   - as a car - 7
   - as a skateboard - 2 or 3

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Drinks (Beverages) - Iziphuzo

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Breads and Grains – Okwenziwa ngommbila

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Dairy foods – Okwenziwa ngobisi

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Fruits – Izithelo

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Meats – Okusanyama

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Vegetables – Izitshalo

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

<u>Experiment 2 – Category Ratings</u>

<u>Rating Scale</u>:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

<u>Food Category</u> <u>Salad</u>

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Breakfast foods

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Desserts

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Dinner foods

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Healthy foods

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Junk foods

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Lunch foods

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Snack foods

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Proteins

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

Experiment 2 – Category Ratings

Rating Scale:

0	1	2	3	4	5	6	7

(Rating scale of **0 to 7** must be applied to each food category; where a **'0'** rating will represent "**Not a Member**"; a **'3'** rating will represent "**Fairly Good Member**"; and a **'7'** rating will represent "**Very Typical Member – Excellent Member**".)

Food Category Carbohydrates

		Rating			Rating			Rating
Carrots	(uKheloth/iZaqathi)		**Pork**	iNgulube		**Rice**	iLayisi	
Lettuce	uLethisi		**Lamb**	iSiklabhu		**Cereal**	iPhalishi	
Mealie (Corn)	Umbila		**Goat**	iMbuzi		**Mieliemeal**	iMpuphu	
Potato	iZambane		**Boerewors**	iSosishi		**Porridge**	iPapa/uPhuthu	
Onions	uAnyanisi		**Bacon**	uBhekeni		**Pancakes**	Amaqebergwane	
Peas	Uphizi		**Polony**	uPholoni		**Cake**	iKhekhe	
Cabbage	iKhabishi		**Milk**	uBisi		**Pie**	uPhaye	
Butternut	iThanga		**Eggs**	Amaqanda		**Biscuit**	Amabhisikidi	
Apple	iAphula		**Yogurt**	Yogathi		**Ice cream**	Ayisikhilimu	
Orange	iWolintshi		**Butter**	iBhotela		**Potato chips**	aMazambane	
Pineapple	uPhayinaphu		**Cheese**	uShizi		**Nuts**	aMantongomane	
Banana	uBanana		**Margarine**	iMajerina		**Chocolate**	uShokoledi	
Watermelon	iKhabe		**Soda**	Soda		**Popcorn**	Amaphephukhona	
Pear	iGanandoda		**Water**	aManzi		**Fish**	iNhlanzi	
Mango	uMango		**Tea**	iTiye		**Steak**	iSicubu	
Chicken	iNkhukhu		**Coffee**	iKofi		**Samp**	iSitambu	
Hamburger	iBhega		**Milo**	iMilo		**Bread**	iSinkwa	

APPENDIX F

Category sorting - Default

Dear Grade 8 learner

6. This study is to find out how learners categorize types of food.

7. You will be given a set of cards with the name of the food item in English and its isiZulu translation.

8. Please read through the cards once and then divide them into groups.

9. You are required to make at least **TWO groups** and place at least **TWO cards** into each group.

10. You may use the card again, and after you have recorded your groupings.

11. After you have sorted the cards into groups, you must say why you made that particular group.

1. You must divide the foods into groups **‘of things that go together’**.
That is, you should make as many groups as you like and to move the cards around until they were satisfied.

Write the grouping in the space provided.
Please write below each choice your reason for making such a choice. You must provide a reason for the following question: **Why did you make such a group? (What about these objects made you put them together?**)

A	
B	
C	
D	

E	
F	
G	
H	
I	
J	

Category sorting – Taxonomic

Dear Grade 8 learner

1. This study is to find out how learners categorize types of food.

2. You will be given a set of cards with the name of the food item in English and its isiZulu translation.

3. Please read through the cards once and then divide them into groups.

4. You are required to make at least **TWO groups** and place at least **TWO cards** into each group.

5. You may use the card again, and after you have recorded your groupings.

6. After you have sorted the cards into groups, you must say why you made that particular group.

1. You must divide the foods into groups **‘of similar food types’**. That is, you should group together items that are **the same kind**.

Write the grouping in the space provided.
Please write below each choice your reason for making such a choice. You must provide a reason for the following question: **Why did you make such a group? (What about these objects made you put them together?**)

A	
B	
C	
D	

E	
F	
G	
H	
I	
J	

Category sorting - Script

Dear Grade 8 learner

7. This study is to find out how learners categorize types of food.

8. You will be given a set of cards with the name of the food item in English and its isiZulu translation.

9. Please read through the cards once and then divide them into groups.

10. You are required to make at least **TWO groups** and place at least **TWO cards** into each group.

11. You may use the card again, and after you have recorded your groupings.

12. After you have sorted the cards into groups, you must say why you made that particular group.

1. You must divide the foods into groups **'of foods that are eaten at the same time or in the same situation'**. That is, you should group together items **related by when and how they are encountered.**

Write the grouping in the space provided.

Please write below each choice your reason for making such a choice. You must provide a reason for the following question: **Why did you make such a group? (What about these objects made you put them together?**)

A	
B	
C	
D	

E	
F	
G	
H	
I	
J	

APPENDIX G

Carrots **uKheloth/iZaqathi**	**Eggs** **Amaqanda**
Lettuce **uLethisi**	**Yogurt** **Yogathi**
Mealie (Corn) **Umbila**	**Butter** **iBhotela**
Potato **iZambane**	**Cheese** **uShizi**
Onions **uAnyanisi**	**Margarine** **iMajerina**

Peas **Uphizi**	**Soda** **Soda**
Cabbage **iKhabishi**	**Water** **aManzi**
Butternut **iThanga**	**Tea** **iTiye**
Apple **iAphula**	**Coffee** **iKofi**
Orange **iWolintshi**	**Milo** **iMilo**
Pineapple **uPhayinaphu**	**Samp** **iSitambu**

Banana **uBanana**	**Bread** **iSinkwa**
Watermelon **iKhabe**	**Rice** **iLayisi**
Pear **iGanandoda**	**Cereal** **iPhalishi**
Mango **uMango**	**Porridge** **iMpuphu**
Chicken **iNkhukhu**	**Oatmeal** **iPapa/uPhuthu**
Hamburger **iBhega**	**Pancakes** **Amaqebergwane**

Fish iNhlanzi	**Cake** iKhekhe
Steak iSicubu	**Pie** uPhaye
Pork iNgulube	**Biscuit** Amabhisikidi
Lamb iSiklabhu	**Ice cream** Ayisikhilimu
Goat iMbuzi	**Potato chips** aMazambane
Boerewors iSosishi	**Nuts** aMantongomane

Bacon **uBhekeni**	**Chocolate** **uShokoledi**
Polony **uPholoni**	**Popcorn** **Amaphephukhona**
Milk **uBisi**	

APPENDIX H

CONSENT DOCUMENT

11 Alita Place
Allandale
Pietermaritzburg
3201

February 14, 2007

Dear parent/guardian/caregiver,

Re: Masters Research – on Conceptual Knowledge Organization

I, Pravine Sha, residing at the above address and a member of staff at Alexandra High School do hereby seek your permission to conduct a study on the cognitive development in the organization of knowledge among Grade 8 learners at this school. The research will consist of a series of word recognition tasks (4 tasks). These tasks will be carried out, outside the instruction time of the learners. The duration of each task will be approximately 30 minutes.

An experiment using a food classification task by Holland and Bernstein (1970) and Hoadley (2005) has been used to show working class and middle class children tend to conceptually organize concepts differently. However, since their researches there have been many and very sophisticated experiments done on 'food classification' that they did not use. By using these newer experimental situations it is hoped to shed more light on their claim.

These tasks are safe and will not compromise the integrity of the participants. The results are completely confidential and will not affect the learners' progress at school in any way at all. Participation is voluntary and the decision not to participate will not affect the learner. Also a learner may withdraw from the study at any stage and for any reason. No learner will receive any form of payment or reward for participation in this study.

Thank you for your cooperation in this regard.

____

Pravine Sha
Cell No: 082 9580602

Supervisor: Wayne Hugo
Contact No. 033 2605535

EXAMPLE OF DECLARATION

I………………………………………………………………………… (full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to my child/ward, ____________________________ (learner name), Grade 8 ______, admin no. ______________ participating in the research project.

I understand that I am at liberty to withdraw my child/ward from the project at any time, should I so desire.

SIGNATURE OF PARTICIPANT DATE

_____________________________ ______________________