

The cultural context of development: language as a means for thinking and problem-solving

Abstract

The present study, located in the socio-cultural tradition of research in developmental psychology, uses experimental tasks, adapted from the groundbreaking Lurian study (Luria, 1979, 1976) to investigate South African children's acquisition and development of thinking and concepts – involving classification and generalisation, and how these concepts are linked to the specific cultural context of their manifestation. The paper provides new ways of understanding possible causes of contemporary problems that children encounter during classroom learning by examining the developmental roots of the specific modes of thinking and concept development in their concrete learning and developmental settings and specific tradition of learning within their schooling.

Keywords: concrete concepts; classification; Venda; Vygotsky

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Introduction: bringing Luria to Tshivenda language classrooms

The majority of learners in South African primary schools today continue to underperform in their school tasks. A number of factors ranging from inadequate methodologies for teaching reading and mathematics, poverty conditions, lack of resources in schools and language problems have been invoked as explanation for the crisis schooling continues to find itself in (cf. for a review, Fleisch, 2008). The present paper seeks to explore one specific problem within schooling that relates to the formation of concepts during learning, and the specific relationship that concepts have with language. In this way, the paper seeks to make a contribution to debates here in South Africa and abroad on children's use of language as a tool for thinking and problem-solving – which, in turn, has implications for children's capacity for formal learning and concept development during schooling. The paper uses data that emanated from children's responses to classification tasks that were reproduced from Luria's study in central Asia at the time when Vygotsky's work was being developed in Russia at that time. The tasks were adapted to the conditions of children in South Africa (Luria, 1979, 1976; Moll, 1994). The data derived from a larger doctoral study (Muthivhi, 2008a) conducted during the late 1990s in a remote, far northern part of South Africa with Tshivenda speaking children. The study follows on the earlier studies in South Africa (Moll, 1994; Muthivhi, 1995) and specifically seeks to consider the issues as they relate to the problems of classroom learning and concept development and functioning in South African primary school classrooms. The focus is thus on the semiotic role of language in conceptual development.

The paper, thus, situates the problem on the theoretical issues and debates emerging in South African scholarship regarding the psychology of language use and its role in thinking and problem-solving processes during classroom teaching and learning. Muthivhi (2008b) has described the language policy and practices in the linguistically homogenous context of Venda primary schools in Limpopo, South Africa. In this study, the teacher taught learners the concept of nouns in Tshivenda. Learners failed to acquire the concept because the methods of its teaching were empirical and therefore did not differentiate the theoretical nature of the concept from its empirical, everyday counterparts as in 'name'. As a result, learners continued to hold the idea that the concept 'noun' was equivalent to the everyday concept of 'name' as a proper noun as in the case of names of people.

I argue in this paper that here may be one of the sources of evidence for learning problems as located in the school system as a whole – in the practices of schooling. For instance, lack of language development for classroom teaching and learning, specifically the indigenous languages, is a persistent problem in South African schooling today and the problem is particularly salient at the primary school level (cf. Fleisch, 2008; Muthivhi, 2008b). Prinsloo and Carole (1999: 20), studying literacy as practice and arguing for models that foreground meaningful, dialogic and interactive pedagogic practices, critique the South African curriculum for framing statements on language development goals such as 'effective communication' in terms of 'culturally

neutral universals'. Indeed, such implication may even involve a curriculum framework which simultaneously called for cultural relevance.

Whereas, according to Vygotsky (1981), schooling inculcates knowledge that transcends specific local contexts and seeks to develop a theoretical mode of relating to the world on the part of learners; with thinking proceeding from the general categories established through conceptual forms of thinking (*cf.* also Arieievich and Stetsenko, 2000; Hedegaard, 2002, 1996), the specific pedagogic activities to generate the universal, generalised conceptualisation of the world should be structured so as to relate to both the abstract theoretical plane as well as to context-specific and empirical plane of the child's learning and development.

A study by Muthivhi (2010) on children's conception of the notion of 'possibility', reveals the fact that children may hold a different, and spontaneously generated, conception of reality from that which is assumed by the teacher from a formal, theoretical point of view. A situation where formal schooling failed to transform, in the sense of differentiating the two distinct forms of knowledge and their equally distinct methodologies, a complex situation in regard to learners' knowledge development and functioning results. In demonstrating this configuration of the knowledge of the notion of possibility on the part of children, and their ability to apply it to problem-solving situations, Muthivhi (2010: 147) states:

The notion of possibility seems to be related to these distinct forms of knowledge and concept development characterising spontaneous, everyday processes on the one hand and the formal school, scientific forms of knowledge acquisition and development on the other hand. Therefore, at the level of the everyday, spontaneous learning and development, the notion of what is possible would be closely related to the real, that is, what can be done. This notion is qualitatively different from the notion of the possible as involving thinking that proceeds from mental abstractions and not embedded in or constrained by specific practical contexts of its application. The latter constitutes the formal aspect of the concept characteristic of the modes of school learning, involving abstract and problem-based cognitive activity. Therefore, the present manifestation of heterogeneity of cognitive functions reveals the structure of the content of the participants' socio-cultural processes of formal schooling rather than a deficiency in, or lack of, the underlying conceptual capacities for this or the other of the two forms of cognitive functioning.

A body of literature pointing to the heterogeneous nature of human cognition is emerging within the Vygotskian research framework. For example, Cubero, De la Mata and Cubero (2008) studied two groups of Spanish adults participating in literacy classes; one group from the basic class and the other group from the advanced class. The participants were presented with two sets of tasks, one involving working with a set of photographs of food items from which they had to prepare menu for a family meal and the other involving clustering of cards on the basis of a criterion different from one they used in the menu task. The first task was considered an everyday, domestic task that reflected psychological functioning in activity settings in which the participants were familiar while the second task was considered school-like, and more likely to be successfully carried out by the advanced literacy group. The study found that the performance of both groups did not differ with regard to the first task while

the advanced literacy group showed a marked tendency to using genuine concepts and justifying their classifications with abstract, propositional discourse genres. This findings further support the idea that human thought processes are inextricably connected to the activities in which they participate and the psychological tools, such as language, that they employ in the course of such activity.

Against this background, the present paper explores the nature of the relationship between thinking and language by engaging primary school children in school-like tasks that required them to engage in problem-solving activities that resemble the classificatory modes characteristic of the formal school learning activities on the one hand and those that characterise the activities of their everyday life situations on the other hand.

If language use and its application in problem-solving are to be viewed as inextricably interconnected with the activities in which people are participating, we would expect that primary school children make use of their language in the best way possible to make sense of and solve the task problems. However, a related problem is whether these children would conceive of the problem fundamentally as involving their spontaneous activities of everyday classificatory processes or whether they would conceive them as comprising the classificatory practices of their formal school learning activities. The findings should have important implications for primary school curriculum development, with specific regard to language and pedagogy as well as the choice of instructional approach or, precisely, what is termed ‘epistemological approaches’ (cf. Hedegaard, 2002, 1996).

Development as related to, and arising from learners’ practical activities

Vygotsky and Luria situated cognitive performance within people’s dominant cultural practices (Luria, 1979, 1976; Vygotsky, 1981, 1978). They hypothesised that the forms of social activities in which individuals participate determined cognitive performance. That is, children manifest concrete and context-dependent forms of thinking because these forms of thinking dominated the practical activities and social relations in which they participate. Participation in social activities that required abstract forms of thinking and reasoning such as those that characterise formal school learning would, on the contrary, determine the associated forms of thought processes.

This theoretical approach was exemplified in Luria’s (1979, 1976) investigation of the development of thinking processes in the course of social and cultural transformation in central Asia. During these studies, Luria employed the method that sought to recreate the developmental history of psychological phenomena. The tasks were therefore designed to uncover the forms of thinking and problem-solving strategies that result from people’s experiences with the means or thinking tools by which and through which they act in the world.

The tasks through which participants' psychological development and functioning were investigated contained: following Vygotsky's theory-method termed 'double stimulation' (Vygotsky, 1987), the problem solutions as they derived from participants' social activities, thus enabling participants to employ the specific psychological tools that existed in their society and culture. However, this does not mean that thinking and problem-solving involved a direct instrumental employment of the immediately available cultural artifacts such as language as a means of communication. People employ psychological tools such as language – as a form of culturally mediated means for carrying out psychological actions – in the words of A. N. Leontiev (1997: 22), as 'ingrowing'.

This is a crucial Vygotskian idea regarding psychological functions as involving a *dialectic* between the external, social processes and the internal, individual processes. Vygotsky's methodological contribution relates specifically to the design requirement where tasks encapsulate both the internal and the external forms of psychological activity; representing activities with which participants are familiar while simultaneously serving to stimulate the most appropriate modes of thinking relevant to the participants' developmental conditions and as a result capable of uncovering the internal plane of thinking through which participants organise their actions in the world.

Therefore, Luria's task design integrated the participants' culturally organised activities by representing the two alternative ways in which the problems posed can be addressed. The experimental tasks were therefore designed to determine if participants would solve the task problems in a manner that was consistent with their newly acquired modes of thinking that were characteristic of formal school learning and participation in industrialised economic activity on the one hand, or in ways that were consistent with the ways in which they had made a living under simple, subsistence-based economic conditions that did not demand abstract and formal mode of relating to their environment on the other hand.

Luria's study established that rapid social and economic changes that were introduced to the subsistence agricultural economies of the Soviet Central Asian republics, as well as the introduction of formal schooling, had resulted in changes in the ways in which his participants organised their thinking. According to Luria, the demands of the new economic activities in the newly introduced collectivised farms and the experience of formal learning and the associated literacy practices contributed to the development of a newly emerging consciousness and psychological functioning characterised by formal, abstract modes for thinking and problem-solving (Luria, 1979, 1976).

However, the interpretation of the results in historical, universalist terms that suggested that only formal schooling and western industrial economic activities were necessary conditions for the development of abstract forms of thinking, as well as the related suggestion that western industrial socio-economic conditions represented the *telos* of human development, was critiqued as constituting a serious limitation in this, otherwise, ground-breaking study. That is, while Luria's (1976) study was credited for applying the historical-developmental method it was questioned for its assumption of

quite broad changes in people's modes of thinking and its assumption of the absence of theoretical forms of thinking in traditional societies (Cole, 1996).

The application of what today is sometimes termed as the socio-historical model of development; emphasising the historical nature of human social and psychological development and functioning, as opposed to what is generally termed the socio-cultural approaches that emphasise cultural differences in psychological development and functioning is of crucial theoretical and empirical relevance to South African scholarship and practical educational concerns. For example, Matusov (2008) observed two interpretive approaches arising from the post-Vygotskian socio-cultural research tradition. One approach, largely American (e.g. Cole, 1995, 1988; Cole & Brunner, 1971), was associated with the interpretive framework that emphasised the accommodation of cultural diversity by ensuring that formal schooling and curriculum included cultural practices and patterns of learning and development of culturally diverse learners, and the other; largely South African (e.g. Moll, 1995), but deriving directly from the Vygotsky-Luria framework, holds that spontaneous, cultural practices are inherently inadequate for formal school learning and development and as a result need to be transformed.

This is the contradiction at the heart of schooling in South Africa at present, to do with the challenges of providing a curriculum and pedagogy appropriate for the specific circumstances of learners and adequate for successful learning performance. South African scholarship was not entirely oblivious to these contradictions. For example, in responding to the criticism of their interpretive approach, Craig and Miller (1984: 21) argued:

Cole (1982) asserts "that no universal notion of a single general ability, called intelligence, can be abstracted from the behaviour of people whose experiences in the world have different life predicaments handed down to them in their ecocultural niche" [...]. I am, as would be any reasonable person, in complete sympathy with Cole's fears that if this is not recognised, some cultures will be unfairly judged against 'ethnocentric claims' [...] about reality. When this 'reality' refers to certain conceptions of mind, the relationship between mind and culture becomes the theoretical battleground, and the socialisation of cognition the process which cleaves open the debate.

The debate on the context-specificity of cognition on one hand and issues of schooling and classroom teaching and learning are pertinent for thinking about the most appropriate forms of pedagogy and curriculum that would best unleash the potential of learners in post-apartheid South African schooling. The present paper makes a case for the importance of considering the specific cultural context of learning and development and of encapsulating this in curriculum development and pedagogy as a necessary condition for improving classroom learning performance. This case is made through the discussion of the empirical data from a study of children's thinking and problem-solving that uses two distinct epistemological procedures associated with learning and development in two distinct activity settings; namely, formal school learning on the one hand and spontaneous learning in everyday-life situations on the other hand. Implicit in the discussion would be the conception of the role of

the curriculum and the teacher, as mediator; standing between the often unfamiliar subject matter content knowledge and its epistemological procedures on the one hand and the content and procedures that characterise spontaneous knowledge, guiding learners on the learning activities that disclose for them the internal structure of subject matter content and procedures so they could acquire, through their own activity, new tools for learning and problem-solving.

The inquiry: ‘experimental’ tasks on classification

Experimental task design

It has to be noted that what Vygotsky and his colleagues termed ‘experimental’ work refers to tasks designed to observe processes of learning (Vygotsky, 1978: Introduction) and are not to be seen as ‘experimental’ in the sense of contemporary experimental work in psychology. The design was informed by Vygotskian theory, conceiving of psychological development and functioning as inextricably connected with, and arising from the specific (socio-cultural) activities in which people participate. The tasks thus presented participants with situations that required the application of formal, abstract mode of problem-solving on the one hand, and the application of the spontaneous mode of problem-solving that derived from the concrete context of their everyday-life situations on the other hand.

The design was based on the theoretical hypothesis that learners would reveal in their task engagement, psychological tendencies that are shaped by the practices of formal school learning. They would, for example, employ linguistic concepts that subsume object relations rather than pure experience of functional relations among objects to establish their class categories.

Participants

Eighty (80) learners took part in the ‘experiment’. Participants were randomly selected from the class registers of Grade 1, Grade 3, Grade 5 and Grade 7 classes. The age of the participants ranged from six years in Grade 1, eight years in Grade 3, 10 years in Grade 5 and 12 years in Grade 7. Twenty (20) participants were selected from each grade.

Participation in the interview was voluntary and any participant expressing unwillingness to continue participation in the interview was allowed to withdraw. This was however a rare situation as the majority of the learners in both junior and senior primary schools expressed their enthusiasm about participating in the ‘game’, to the effect that most pupils had to be excused as they could not be accommodated. Consent for the children’s participation in the experiment was obtained from the school and from their parents through the school.

Materials

The materials comprised four firm A4 size white cardboard sheets, each having a set of four black-ink drawings, representing objects ranging from animals, tools and plants. The following objects were represented in each of the task situations:

- Task A: pick, panga, hoe and wheat.
- Task B: kraal, giraffe, goat and cow.
- Task C: tree, donkey, lizard and cow.
- Task D: hut, wheat, tree and mealie plant.

An additional A4 size cardboard sheet, with drawings of a ‘knobkerrie’, ‘bow and arrow’, ‘spear’, and ‘antelope’, was also used for the pre-testing or demonstration stage.

Experimental procedures

The first stage in the presentation of the tasks involved showing the participant the task materials and explaining the procedures. This was the demonstration stage where the participant was encouraged to touch the task materials and ask what the different picture representations were. All the participants knew the objects represented in the tasks, either by experience or through school learning. The participant was then informed that each of the tasks was going to be presented to him so he/she could determine how to classify three of the four objects that he/she thinks belong together. The demonstration task involving the drawings of the ‘knobkerrie’, ‘bow and arrow’, ‘spear’ and ‘antelope’ were used during this stage.

After the demonstration stage, the testing stage began with the interviewer asking the participant to classify the objects using one of the two alternative classification modes. The interviewer started by asking a question that required classification, namely, “Which of these does not belong with the others?” or “Which three of these four objects belong together?” After that the participant had classified the objects by pointing or naming one object that did not belong with the others (or pointing or naming the three objects that belonged together), the interviewer asked a second question requiring the participant to provide the reason for his/her chosen mode of classification. This was the crucial question because it determined the quality of the participant’s thinking regarding the actual classification mode of the participant’s overall response or solution to the task problem. The question seeking the participant’s reasoning behind his/her classification was along the lines of: “Why do you think the object (naming it) does not belong with the others?” or “Why do you think the three objects (naming them) belong together?”

Probing questions were asked in situations where the participant provided a concrete and functional classification that emphasised the objects’ concrete appearance or their concrete, functional relationships, to see if the participant would change his/her classification and adopt the alternative, formal-abstract and categorical classification proposed by the interviewer. For example, the interviewer proposed an

alternative classification mode, posing the question: “What if I take this (naming the object) away?” or “What if I group these three objects (naming them) and take this one (naming it) away?” Should the participant maintain his/her chosen classification mode, such classification pattern would be determined to represent his chosen mode of object classification.

Recording of data

The interview was audio-recorded, as well as the pattern of the participant’s classification and the accompanying reasoning behind it was recorded in a notebook. The participant’s response to the question requiring him/her to classify the objects is recorded as either ‘graphic-functional’ or ‘abstract-categorical’.

A classification was recorded as graphic and functional if it reproduced the relations that objects had in real-life situations or if it emphasised the concrete form of the objects to be classified. That is, a ‘panga’ and ‘hoe’ may be grouped together with ‘wheat’; or a ‘goat’ and ‘cow’ grouped together with ‘kraal’, because in the participants’ everyday-life situations, these objects were experienced as functioning together.

A classification action alone was not considered sufficient for a decision about the nature of the participants’ classification mode. The participants’ overall response was recorded as abstract and categorical if it was supported by reasoning based on the use of linguistic concepts such as ‘animals’, ‘tools’, ‘plants’, etc., subsuming objects relations under abstract linguistic terms rather than in their concrete appearance and functional relations.

Method of analysis of the results

The analysis focused on whether the participants’ response revealed a contextual, graphic-functional or abstract-theoretical, categorical classification.

A graphic-functional classification emphasises real-life relations the objects are deemed to have as experienced by the participants. For example, in an item that comprised a ‘giraffe’, ‘goat’, ‘cow’ and ‘kraal’, the ‘goat’ and ‘cow’ would be grouped with the ‘kraal’ on the assumption that the ‘goat’ and ‘cow’ are kept inside the ‘kraal’, but the ‘giraffe’, as a wild animal, would not be kept in the ‘kraal’.

Meanwhile, a reasoning that justified a categorical classification action such as: ‘giraffe’, ‘goat’ and ‘cow’, in functional terms, was equally identified as an essentially functional classification response. The emphasis that the participants placed in justifying their classification determined what underlying mode of reasoning they are deemed to be using to get to such classification.

The abstract and categorical classification involved relating objects together on the basis of an underlying linguistic concept such as ‘animal’, ‘tools’, ‘plants’, etc., and using this as a sole basis for the objects’ classification, thus ignoring the contextual and functional qualities the objects may be deemed to have.

Results: graphic-functional and abstract-categorical modes of reasoning

The results from the Grade 1 group seem to be consistent with Vygotsky's (1986) idea of pseudo-conceptual reasoning as these participants did not manifest any consistent pattern of thinking regarding the task problems. They were, for example, not classifying an object in one way or the other because of any clearly articulated reason. For them, this should be expected given the destabilising role that school learning should have on their thinking; as they are just beginning, this year, to settle into a formal learning situation in their first year of schooling.

On the contrary, a clear pattern of thinking characterised the performance of the Grade 3, Grade 5 and Grade 7 participants. These participants' pattern of thinking about the task problems seemed not to be abstract-categorical or concrete-functional, but in-between, somewhat transitional and therefore abstract-functional. That is, they mostly placed the task objects into formal categorical relations that needed abstract linguistic justification, but proceeded to justify their classification in abstract terms articulated in Tshivenda, extending the reasons to include functional characteristics of the objects in their practical situations.

Table 1: Summary of the participants' overall response patterns

Grades	Grade 1 (n = 20)		Grade 3 (n = 20)		Grade 5 (n = 20)		Grade 7 (n = 20)	
Abstract-categorical classification	2	2.5%	36	45%	39	49%	45	56%
Functional-graphic classification	78	97%	44	55%	41	51%	35	44%

Grade 1

The Grade 1 participants emphasised a functional and graphic mode of object classification. Only 2.5% of their responses to the task questions were abstract. Only in two occasions, in Task A and Task B, did the Grade 1 participants offer categorical responses, one on each of the two task situations. Almost all of the reasons for the Grade 1 participants' classification (97%), emphasised what could generally be termed a graphic and functional mode of thinking, albeit in its most rudimentary form as there was no clear pattern of thinking that characterised the participants' performance.

Grade 3, Grade 5 and Grade 7

The Grade 3 participants obtained an overall performance of 45%, Grade 5, 49% and Grade 7, 56% (cf. Table 1). The results showed that these participants used both the graphic-functional and the abstract-categorical modes, with almost equal emphasis. None of the two distinctive modes stands out as particularly dominant.

The pattern that dominated the responses of these participants revealed an interesting phenomenon. Three modes of reasoning underlay the participants'

classification performance and these were connected to the practical learning and developmental activities in which learners participate within their schooling as well as during spontaneous, everyday situations.

In addition to the two classificatory modes identified in the theory; involving graphic functional and formal-abstract modes, participants classified the objects using categorical mode, but justified the classification through abstract, yet functional reasons. The discussion below elaborates on the patterns of responses to the task questions.

Task A: For task A, the majority of the participants' responses (90%), classified 'pick', 'panga', and 'hoe' together and excluded 'wheat' as not belonging with the others. However, when it came to supporting this classification mode with appropriate reasons, only 45% of the responses made use of the linguistic terms such as 'tools', 'animals', and 'plants' as a sole basis for their classification action. That is,

[...] 'pick', 'panga' and 'hoe' belong together because they are 'tools'.

The remainder of the participants' classification responses (10%) were concrete and the reasons provided to support these were similarly concrete and graphic-functional. For example, a 'panga', 'hoe' and 'wheat' were grouped together and 'pick' excluded from the grouping. The common reason for this classification was that

[...] 'panga' and 'hoe' are used in the fields for planting 'wheat', while 'pick' is not used for that purpose.

A third mode of classification appeared in the participants' responses to the task questions. Although this was initially categorised as a functional mode of object classification, it in fact seems peculiar to the participants' specific socio-cultural and linguistic context. In this task, 45% of the 90% categorical classifications were justified through reasons that can better be described as abstract because they used a linguistic term to subsume objects in conceptual relations, but proceeded to relate this to the functional and graphic features of the objects. Therefore, this mode of reasoning was 'abstract-functional' in that participants argued that

[...] 'pick', 'panga' and 'hoe' belong together because they are implements that complemented each other in their use.

While the reasons that the participants provided for this task were not exclusively based on the use of a single abstract linguistic term such as 'tool', the basis of their classification was abstract with the functional reasons deriving specifically from the peculiarities of the participants' cultural-linguistic context of learning and development.

Task B: In this task, 80% of the participants' classified 'giraffe', 'goat' and 'cow' together and excluded 'kraal' as not belonging with the others. However, only 61% of the reasons the participants provided were based on an abstract linguistic term, arguing that

[...] 'giraffe', 'goat' and 'cow' belong together because they are 'animals'.

The participants who classified the objects in a concrete manner (20% of the responses) offered concrete-functional reasons for their classifications. For example,

[...] 'goat', 'cow' and 'kraal' belong together because 'goat' and 'cow' are kept in the 'kraal' at night while 'giraffe' is a wild animal that is found in the bush and cannot be kept with domestic animals.

The rest were abstract-functional reasons (19%), emphasising the functional relations the objects had in real-life situations. They argued that,

[...] 'giraffe', 'goat' and 'cow' belong together because they eat grass.

Even in instances where the participants made use of the term 'animals' in their justifications, they would extend their reasoning to include the functional aspect of the objects. They would, for example, argue that

[...] 'giraffe', 'goat' and 'cow' are animals that eat grass and plant leaves and have four legs.

For Task C, 80% of the participants' responses were categorical, but only 58% of the reasons provided were based on abstract linguistic concepts. The participants reasoned that

[...] 'donkey', 'lizard' and 'cow' belong together because they are animals.

Participants who classified the objects using a concrete classification mode (20% of the responses) usually excluded 'lizard' from their classification and argued that

[...] the 'lizard' was not an animal or that the 'lizard' did not eat plant leaves and would therefore not need to feed on tree leaves, as would 'donkey' and 'cow'.

These participants generally disagreed with the interviewer's identification of 'lizard' as 'animal'. They preferred to identify it as a 'creature' (*tshikhokhonono*), or something similar to the concept 'organism'. In Tshivenda, 'donkey' and 'cow' are identified as 'zwifuwo' (domestic animals). A 'lizard' would not normally be identified as a 'domestic animal' (*tshifuwo*) or a 'wild animal' (*tshipuka*), because it is neither kept domestically (as pet or livestock), nor does it live in the 'wild', similar to other wild animals such as a giraffe or elephant. A 'lizard' is identified as a 'creature' (*tshikhokhonono*), a concept that seems to suggest that it is neither 'wild' nor 'domestic', but a creature that is found both in the wild and in houses. The concept 'animal' in Tshivenda does not, therefore, seem to equate directly to the English concept, as it seems to be more differentiated in its Tshivenda occurrence. Hence, participants argued:

We cannot group 'lizard' (tswina) with 'domestic animals' (zwifuwo) because 'lizard' is not kept in the home like domestic animals.

Of the remaining participants' responses (22%), were abstract-functional. These participants argued that

[...] 'donkey', 'lizard' and 'cow' belonged together because they all live on trees.

That is, the 'lizard' would be found in the tree, while both 'cow' and 'donkey' eat tree leaves and rest in its shade when it is hot. While the responses were apparently based on abstract categorical relations that the objects had, the participants made no

explicit use of linguistic term under which they could be included, but rather referred to the relational reasons such as they eat plant leaves.

Task D: For task D, 83% of the participants' classification responses were categorical. That is, 83% of the participants identified 'wheat', 'tree' and 'mealie' as belonging together, and excluded 'hut' as not belonging with the others. However, only 33% of the reasons given to support the classification action used the linguistic term 'plants' as conceptual basis for the classification.

The remaining 17% of the responses to this task used concrete classification. They classified 'hut', 'mealie' and 'wheat' together and argued that

[...] 'mealies' and 'wheat' are stored in huts at harvest.

The majority of the participants who grouped 'wheat', 'tree' and 'mealie' (50% of the 83% above), provided abstract but functional reasons for their grouping. They argued, for example, that

[...] 'wheat', 'mealie' and 'tree' provide food while 'hut' does not.

Even in situations where a linguistic term *zwimela* (plants) is used to justify the classification, this is further extended to relate to the functional relations of the objects in concrete situations. In Tshivenda, 'tree' is called *muri* while 'wheat' and 'mealie' can collectively be called *zwimela* (literally meaning 'things that grow'). There is therefore, in Tshivenda a peculiar distinction between plants that are *miri* (trees) and plants that are *zwimela* (such as mealies and wheat). There is therefore an apparent tension, in the responses of the participants, between the school-specific concept of 'plants' on the one hand, and the indigenous concept of 'plant' as differentiated between *zwimela* (things that grow) and *miri* (trees), as growing naturally outside substance agricultural activity.

Conclusion

Children's performance on these tasks suggests that the development and functioning of concepts, and the specific modes of thinking and problem-solving, is connected to the social and cultural context in which they participate. This context, for the children participating in the present study, is multifaceted and multilayered; encapsulating the traditions of learning in their specific schooling as well as their development in traditional and yet rapidly changing cultural context of Venda and South Africa.

The structure of the participants' thinking and problem-solving in the tasks related to the nature of the activities of learning and development that characterise their schooling and everyday-life situations. For example, participants employed the differentiated Tshivenda language conceptual categories which differed from the analytical approach derived from the Vygotsky-Luria framework (Luria, 1976).

The experimental tasks introduced to the participants, problems that were located within their activities of classroom teaching and learning on the one hand, and problems that characterised their spontaneous, everyday activities of learning and

development. The interviewer's role involved asking questions that invoked one or the other of the two distinct modes of problem solution procedures – something akin to operating in their zone of proximal development; a space that, according to Vygotsky (1978), connects learning with development. This may be a fruitful space for curricula and pedagogy to exploit in relating culturally specific modes of thinking and problem-solving to the specific demands of the subject matter content and procedures.

The predominant mode of task response – where the participants grouped the objects appropriately in categorical terms and used abstract, but functional reasons to justify their classification – does not seem inconsistent with their practical conditions of learning and cognitive development in the schooling context where they do not normally acquire abstract forms of thinking and problem-solving through classroom learning (*cf.* Muthivhi, 2010; Muthivhi, 2008b).

Meanwhile, the concrete and functional classification mode presented the participants with familiar problem situations for which they had ready methods for application to the problem. However, the possible influence of formal schooling becomes clear in the predominance of the categorical grouping of the objects while the limitation of classroom learning becomes clear in their inability to use abstract linguistic terminologies to justify their classifications. Meanwhile, the limitation of Tshivenda, in its present form, to carry out the function of formal learning is manifested in the learners' emphases on functional relations of objects – which they articulately express in, and through the language – an indictment to their schooling system's failure to develop their language for formal learning purposes.

This abstract, but functional classification mode, may in fact be a developmental transition between formal processes on the one hand and spontaneous processes on the other hand. The real nature and extent of the manifestation of these transitional processes, as well as the specific implications they may hold for concept development and functioning, need further systematic investigation so the regularities of these learners' learning and development could be more adequately understood and appropriate intervention programmes developed.

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