Concept Formation of Latin Prefixes in Students with Learning Disabilities

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ABSTRACT:

This qualitative study examined concept formation of Latin prefixes in three students diagnosed with learning disabilities through a theme-based analysis. The study had two purposes. Conceptual processes underlying the learning of Latin prefixes were explored through dynamic assessment and Vygotsky’s stages of concept formation were empirically tested. There were five major findings in this study. First, when Vygotsky’s concept formation model was applied to everyday scenarios, the theoretical underpinnings of his work were called into question. Second, concept formation was a highly individualized process. Third, concept formation called upon a large body of existing and constructed knowledge. Fourth, the movement between Latin and English meanings necessitated an additional step in forming concepts as students negotiated Latin meanings which lacked English equivalents. Finally, Vygotsky’s stage theory failed to provide a reasonable paradigm through which concept formation of Latin prefixes could be explained; script-based and context dependent theories of concept formation offered more viable means of interpreting the data in this study.

KEYWORDS: concept formation, Vygotsky, prefixes, learning disabilities, Latin

Introduction

The study of concepts strikes at the heart of learning. To capture an individual’s conceptual assumptions reveals the genesis and direction of thought. These as-
sumptions are both explanatory and predictive, helping us understand where people start to learn new material, how they incorporate new information and how they draw conclusions based on that information set.

This study constitutes a qualitative analysis of the concept formation process surrounding Latin-based prefixes in dyslexic students. The origins of this study have both practical and theoretical roots. When tutoring dyslexic students using Orton-Gillingham methodology, I began to wonder why the study of morphology eluded four out of the five students and likewise, why the one student was able to grasp the instruction so readily. Secondly, approaches to defining learning disabilities (LDs) in terms of their developmental, neurobiological and genetic genesis (Shaywitz, 2003; Wadsworth et. al., 1992; Catts et. al, 2002) have failed to reliably identify student with LDs or to suggest effective remediation. Understanding the conceptual factors underlying performance may transcend current definitional knots. Finally, Vygotskian psychology (Vygotsky, 1986) offered a method of studying the learning of morphs from the starting point of conceptual understanding.

This study had two purposes. First, through a thematic analysis of the outcomes of a dynamic assessment conceptual processes that underlie the learning and understanding of Latin prefixes were elucidated. Second, this study was an empirical test of Vygotsky’s stages of concept formation. By understanding concept formation of Latin prefixes in students with LDs we gain perspective on individual differences that function on the conceptual plane, namely how they perceive relationships, determine category inclusion and see equivalence among phenomena which in turn permits an understanding of the fundamental assumptions participants make in constructing meaning.

For the sake of brevity, the data presented here reflect only a small fraction of the findings and analysis and have been selected based on their representativeness of the entire set of findings.

**Review of the Literature**

This study reviewed contemporary work on concept formation by researchers who, for their emphasis on interaction and the shaping of development by forces external to the child, take an experientialist perspective that embraces both biological and socio-cultural perspectives on human development. Piaget & Inhelder’s (1964, 1969) work on concepts and their formation was focused on mathematical and physical concepts such as time, space and volume. Piaget’s work on concepts was concerned with the use of classification tech-
niques and how they reflected the developmental stage in which the child operates.
Bruner, Goodnow & Austin (1956) studied the ways students learned categories defined as logical sets designated according to specific attributes and combined by logical rules.
Nelson (1978, 1989, 1991) contributed some of the most significant findings concerning the emergence of linguistic symbols and their bearing on the conceptual lives of children, namely that the place of objects in significant events in the child’s life evokes scripts that yield the conception of objects and construction of higher-level categories (Nelson, 1985).
Rosch changed the field of concept formation significantly with prototype theory, the study of color concepts and conclusions regarding the participatory nature of concepts (Rosch, 1999) as well as the continuousness of categories (Rosch, 1978).
Finally, based on his block design experiments, L.S. Vygotsky postulated that concept formation moves through three fixed stages and emerges based on the functional use of the word. In syncretic thought the word refers to nothing more than a vague conglomeration of individual objects. Complex thinking is characterized by the bringing together of objects on the basis of both concrete bonds and subjective impression (Vygotsky, 1986) while conceptual thinking demonstrates the ability to engage in simultaneous generalization and abstraction.
A search of the literature turned up no studies on concept formation of linguistic concepts so this study comprises a preliminary foray into the field.

Method

Since concepts are so personal and context-dependent, case-study methodology was used so that a small number of participants could be studied in detail. The resulting sessions were transcribed and analyzed thematically to elucidate both the patterns and anomalies present in the participants’ performance.

Participants

Three students, aged 10-13 years with learning disabilities (LDs) were drawn from a school for children with LDs in the Lower Mainland. Adam, a bilingual child and John, who was friendly and scattered were both comfortable talking throughout the testing while Cole spoke very little.
Each child was dynamically assessed on four Latin prefix activities, the data from two of which are presented here. Dynamic assessment imbeds intervention within the assessment procedure and eliciting responses from the learner; the fo-
cus of dynamic assessment is on the processes rather than the products of learning (Lidz & Gindis, 2003).

**Materials**

Participants worked on a four-phase series of assessment tools. The last two phases, Latin number prefixes (uni-, bi-, tri-) and Latin prefixes (ex-, dis-/de-, co-/con-/com-, in-, super-/supra-, sub-, ac-/ad-/at-) yielded the richest data and are presented below.

For the Latin number prefix exercise, I placed in front of the participants fifteen word cards, each of which showed words with the prefixes uni- (unicorn, uniform, unison, unicellular, unicycle), bi- (bicolor, bicycle, binoculars, biped, bisect) or tri- (tricolor, triangle, triceratops, tripod, tricycle) and simply asked the participants to sort them. Students then matched the words to pictures and completed a worksheet.

For the Latin prefixes exercise, participants were shown six prefix groups; each group consisted of three pictures illustrating a Latin prefix. For example, the ex-group contained a picture of an orca jumping out of a pool, a lady taking a cookie out of a jar and a caterpillar emerging from a cocoon. Participants were then given a stack of six picture cards and asked to match the picture cards with the group of pictures that had the same meaning. They were then asked to match prefix cards with their picture groups, define the Latin prefix and then complete a worksheet.

**Procedure**

Each session was videotaped, transcribed and analyzed thematically. Five themes were identified and described in terms of features, examples and feelings emoted. Each theme was then designated a color code and the transcript of each session was read over until the majority of the conversation was divided into excerpts and identified with the color denoting the particular theme for which it provided evidence. In cases where one excerpt supported two or more themes, they were circled with two colors and analyzed accordingly.

**Results**

The results of the data analysis were organized according to five themes: language use, anecdotal knowledge, forming concepts based on concrete attributes versus relational attributes, drawing relationships, defining the concept versus
Language Use

Since language is the primary vehicle by which we understand thinking and thus concepts, patterns of language use are a critical starting point in an analysis of the formation of those concepts. Data were analyzed for features of language use such as production and manipulation of vocabulary, word patterns, error correction, specificity of vocabulary, requests for help and response to the help provided.

The first two participants, Adam and John were both talkative, yet used language in strikingly different ways to conceptualize Latin prefixes. The third participant Cole, spoke relatively little during the testing and as a result, yielded negligible data on the topic of language use. Overall, each participant had a unique way of using language to construct and revise concepts; each participant was successful at all the activities but the amount and type of assistance they required, the language they used to express relationships and the way they used words as a means of forming and expressing linguistic concepts varied dramatically.

Using the word as signifier Adam created linguistic *pivots*. He structured the concept in terms of a single word to demonstrate group membership -- as though the explanation containing the word as placeholder for the concept is sufficient grounds for group membership.

Adam: (says to himself, “chain”)
Adam: Is this like, a chain breaking? I think this would go here... because breaking this apart (velcro) and the egg breaking open.
ST: how does sweeping the dirt fit into that?
Adam: ‘Cause it could have been like something that broke
ST: What might have broken?
Adam: A dusty old pot?

Adam used *breaking* as representation of the *dis/-de-* group. Although there was no pot evident in the picture and only the dust, the concept of breaking had been abstracted from the picture series and used as the analytical pivot to inductively reason the meaning of the final picture.

John’s conversation seemed scattered and hesitant at first, with many pauses and non-sequiturs. However, on deeper examination, it became apparent that John’s language use was paradoxical and belied a deeper and more sophisticated
thought process. In order to understand how these scattered descriptions function in the larger relationship between language and concept formation, it is important to understand the role of what might be described as linguistic triggers. As John discussed the pictures, described the appearance and function of particular objects, abstracted meanings and observed relationships, he stumbled on words or images that ignited meaning for him and helped illuminate additional paths of thought. As he followed the new paths of thought, additional triggers were activated.

ST: Ok, tell me what binoculars are
John: Binoculars are, um, things that uhhh...
ST: What do you use them for?
John: Like seeing far or looking, like if you see an animal and you’re trying to hunt it then you could use binoculars (gestures with fingers around eyes)
ST: So which part of your body do you use with binoculars?
John: Ummmm, your eyes? (does the binocular gesture again)
ST: So tell me, do the words binoculars and bicycle, do they have anything in common?
John: They both have b’s... oh! They both have (makes the binocular gesture again and moves hands up and down) two... bicycles have two wheels and binoculars have two (gestures again) seeing...
ST: So what do you think bi- might mean?
John: Means, multi. It has two (gestures two with fingers).

The italicized section highlights one event during which John experienced a language trigger. He discussed one concrete aspect of the commonality between binoculars and bicycle but then made a sudden shift to understand that each object had two of something (i.e., binoculars have two lenses and bicycles have two wheels). Although it is apparent that John had trouble naming the lenses, his gestures conveyed that he understood the structure of binoculars and that they share a structural attribute with a bicycle.

Anecdotal Knowledge

John and Adam both relied heavily upon anecdotal knowledge, recalling National Geographic articles, films and made morphological analogies. Of unique and particular interest was the means Adam used to match biped with the correct picture in Stage Three. Adam first matched biped with the picture of scissors cutting a bank note, the reasoning being that scissors have two blades, which captured the meaning of the bi- prefix. I then drew Adam’s attention to the root of the word.
ST: Ped is a Latin word...
Adam: Legs
ST: Right, how did you know that?
Adam: ‘Cause... I’m French. So it kind of looks like pied which is foot in French.

Not only did Adam’s knowledge of pied mean that he could compare and contrast units of meaning, but he could correlate those meanings with the structural aspects of words, thus solidifying his understanding of the networks of meaning and structure inherent in English words derived from Latin.

In an example from Stage Four, John immediately noticed the photo of the woman taking a cookie out of a cookie jar.

John: The mother’s taking a cookie from the cookie jar?! (laughs) That’s kind of weird!
ST: Maybe she’s on a diet. She doesn’t want anyone to know she’s stealing a cookie.
John: Or maybe she’s sick, or she’s supposed to be getting groceries and she steals a cookie. (laugh)

This example demonstrates the richness of interpretation that was be derived from a simple picture and how powerful initial impressions were in shaping the participants’ conceptualizations. Knowing to which aspects of a phenomenon a student is attending has a direct correlation with the manner in which they are forming a concept; knowing how the student uses anecdotal knowledge is a key in fathoming the depths of their interpretation.

**Forming Concepts Based on Concrete versus Relational Attributes**

Since the cornerstone of Vygotskian concept formation is the distinction between complex and concept, it is important to explore interpretations of both the concrete and relational attributes present in the pictures in Stage Four as they were the only series of pictures that depicted action where participants had to observe the situatedness of the objects.

All three participants oscillated in their observations of concrete and relational attributes, attending to whichever feature jumped out or was particular meaningful upon first glance. A significant part of the dynamic assessment involved demonstrating how to attend to different attributes and understand the nature of their relationship to other objects. For example, after John observed the color of the jetstream emitted by the group of planes, I reminded him to observe the relational characteristics of the planes.
ST: Have a look at the configuration of planes so look at the way they are organized.
John: Making color.
ST: Ok, so don’t look at the colors, just look at planes. So abstract the planes.
John: It’s a v-shape
ST: If you had to pick another category... where would that go? So have a look at all of them again, here hold onto that (plane picture), and have a close look. See what that would go with.
John: (matches with co-/con-/com-) Maybe here?
ST: That’s right, so why does it go there?
John: (examines pictures serially) That’s in, together, that’s together, that’s together...
ST: So when you say together, tell me a little bit more.
John: They’re like, all working together, they’re shaking hands with each other and they’re walking with each other.

John struggled in switching his attention from concrete to abstract attributes yet when he made the preliminary attempt at matching the planes with the co-/con-/com- group he was able to form the concept based on the idea of togetherness with relative ease. In fact, the Latin prefix task became broken into two phases: in the first phase, the three participants made preliminary matches and discussed their first impressions while the second phase consisted of a review of each of those matches through instruction surrounding the manner by which we are able to attend to varying aspects of the same picture.

Drawing Relationships

According to Keil (1989) concepts are construed as intrinsically relational sorts of things. Since concepts are linked with other concepts and experiences (as opposed to isolated theoretical propositions) there are many ways that people can perceive, interpret and understand the nature of these relationships. In this section, focus is drawn to the finer nuances in the process of understanding relatedness among objects and phenomena. Participants not only made use of broader experiences in forming concepts, they followed different routines and patterns in assembling perceptual information as a precursor to forming the concept.

Five subthemes emerged which characterized how participants drew relationships in forming Latin prefix concepts: serial, perception/function, moving from the familiar to the unfamiliar, visual organization and morphological analysis. The three participants used all the strategies in turn but morphological analysis was indeed the least common strategy and had to be accompanied by instruction to a significant degree. Participants predominantly focused on both perceptual and functional attributes, used familiar images and in Cole’s case, used elaborate
visual organization to draw relationships e.g., he arranged number prefix words in a Z pattern to illustrate group membership along the lines; words at each intersection indicated shared attributes between word groups

Defining the Concept vs. Using the Concept

According to Vygotsky (1986), if a child has fully formed a concept, they should be able to give an accurate verbal definition. In order to tease out the interaction between concept definition and concept usage, each stage was followed by a worksheet with questions that necessitated the manipulation of the Latin prefix concepts.

John and Adam both had difficulty with the semantic aspects of the questions, particularly in Latin Prefixes) and struggled with the referents for the prefixes that were necessary to establish meaning. For example, one question asked, “Your cat threw up a mouse. It’s a (what kind of mouse)?” Adam replied “ex-mouse” which would mean that the mouse came out of the mouse rather than the cat.

Most interesting was that despite Cole’s struggle through the bulk of the prefix activities, his performance was effortless on the worksheets. Curiously, he got all the answers correct although he could not explain why e.g., Cole knew instantly that distended was the correct way to describe a full stomach but he could not describe or gesture what a distended belly would look like.

Overall, the results demonstrate the idiosyncrasy of concept formation of Latin prefixes in the three participants and illustrate how varied interpretations of objects and scenarios can be.

Conclusions and Discussion

The first conclusion is that Vygotsky’s experimental design was narrow, artificial and grounded in the existence of objective knowledge. Vygotsky’s tasks were based on wooden shapes whose color and thickness attributes had clearly defined boundaries e.g., a block could either be yellow or not yellow, thick or thin. Once the concept formation process was studied in terms of everyday objects, the subjective nature of concept formation became evident which in turn called into question the theoretical underpinnings of the model.

Secondly, concept formation was highly individualized with no common pathway. Participants used gestures, manipulated language, observed relationships and used anecdotal knowledge in different ways to form Latin Prefix concepts e.g., where Adam formed number prefix categories based on structural and functional elements of objects, John remained glued to print and focused predomi-
nantly on spelling patterns. Different still was Cole who created an elaborate visual representation of his conceptual scheme of number prefixes. This study demonstrated that everyone has concepts, but the more appropriate question is what kind of concept does he have?

Third, concept formation implicated a large body of knowledge. Significantly, this knowledge both existed and was constructed through the dynamic assessment. Adam and John were able to supply theories and anecdotes, ask questions and supply a broad knowledge base. Cole relied on me to supply questions that helped him refine his language, attend to detail and generate specific attributes and terminology. e.g., geyser = water (superficial analysis). Considerable effort was made to delve into a deeper, more detailed description and it was through this interaction that Cole was able to form Latin prefix concepts as evidenced by his worksheet performance.

Fourth, forming concepts of Latin morphs is peculiarly complex. Since Latin prefix meanings are extremely literal and lack English equivalents, a surfeit of English words is used to cobble together an approximation of the Latin meaning. Take for example the Latin prefixes in- (meaning in, on, on, into, towards, not) and dis- (meaning apart, away, not, from). Both prefixes can mean not but with slight nuances in meaning. Particularly for the prefix in-, it is difficult to distinguish to which of the two meanings in- refers. In fact, the very idea that in- had two meanings was difficult for the three participants to understand. I would argue that this is at least part of the reason that morphology is so difficult to teach (and learn); students require linguistic, situational and morphological knowledge in order to understand word parts to effectively manipulate structure and meaning.

Finally, Vygotsky’s stage theory failed to provide a reasonable paradigm by which concept formation of Latin prefixes may be captured. The study did not reflect a stage-based theory of concept formation. It did not reflect concept formation as a process of simultaneous abstraction and generalization of a single attribute, nor the functional use of words. What we conceptualize is at least as important as how we conceptualize which is apparent once the process is focused on everyday objects. Since concepts are formed in everyday settings, they must be studied in everyday settings.

Future research must be aimed at understanding the contextual, subjective nature of concepts as they emerge and function through the lifespan.
References


