TOWARDS CONCEPT UNDERSTANDING RELYING ON CONCEPTUALISATION IN CONSTRUCTIVIST LEARNING

Farshad Badie

Center for Linguistics, Aalborg University, Rendsburggade 14, 9000 Aalborg, Denmark

ABSTRACT

This research works within the framework of constructivist learning (based on constructivist epistemology) and examines learning as an activity of construction, and it posits that knowledge acquisition (and learning) are transformative through self-involvement in some subject matter. Thus it leads, through this constructivism to a pedagogical theory of learning. I will mainly focus on conceptual and epistemological analysis of humans' conceptualisations based on their own mental objects (schemata). Subsequently, I will propose an analytical specification of humans' conceptualisations and understandings over their mental structures in the framework of constructivism, and I will clarify my logical [and semantic] conceptions of humans' concept understandings. This research focuses on philosophy of education and on logics of human learning. It connects with the topics 'Cognition in Education' and 'Mental Models'.

KEYWORDS

Constructivism, Concepts, Concept Understanding, Conceptualisation, Interpretation, Conceptual Learning

1. INTRODUCTION

Perceived by a very general definition, the act of learning is identified as related to acquiring or modifying knowledge. Learning can be seen as the involvement of the self in increasing knowledge about a thing/phenomenon. We can interpret learning as a process that causes changes in a human's mind. The learner is someone who attempts to learn something and to acquire knowledge on that thing, and the mentor is someone who opens the world to the learner and opens the learner to the world. All the characteristics mentioned are conducive to interpreting learning as the 'activity of construction'. In this article I will focus on the constructional dimension of learning. At this point I feel the need to focus on describing and specifying 'knowledge'. Regarding [Furst (1956), Krathwohl (2002)], knowledge has a strong relationship with recognition [and understanding] of materials, ideas, methods, processes, structures and settings. Accordingly, a body of knowledge may cover (satisfy) multiple branches like, e.g., terminologies, ways and means, trends and sequences, classifications, methodologies, universals and abstractions, quantifications and qualifications, conditionings, principles and generalisations, and theories and structures. I may conclude that knowledge acquisition [and, respectively, learning] processes consist of a sort of 'transformation functions' from reality into the sets and categories of various disciplines and systematic enterprises. I have focused on this subject in [Badie (2016a), Badie (2016b)]. According to these papers, a human being has the ability to deal with different disciplines and systematic enterprises, and can transform them in her/his mind. I shall interpret these transformations as the outcomes of the self-involvement in increasing knowledge about a subject matter. In human systems, a learner is an intentional participant (agent) and attempts to know more about something in order to construct her/his knowledge about that thing. Any human has a background knowledge and tackles to carry on constructing knowledge over her/his existing knowledge. S(he) attempts to develop her/his knowledge constructions and to get the opportunity to attain deeper comprehensions and understandings. *Constructivism* is a philosophy that forms the backbone of this research. It is a learning philosophy and a pedagogical theory of learning that can also be realised as a model and a theory of knowing with separate roots in philosophy, psychology and cybernetics. According to the existential element of

constructivism, the construction of knowledge is an active process, but the activity itself can be described in terms of individual cognition [and personal understanding] in different processes, see [Phillips (1995)]. As for Piaget's developmental theory of learning[1], constructivist learning is concerned with how the individual learner goes about the construction of knowledge in her/his own cognitive apparatus. This article will – conceptually and epistemologically – analyse human understanding and conceptualisation based on the proper foundation that has been provided by the constructivist model of knowing (and constructivist epistemology). I will focus mainly on the analysis of humans' schemata-based concept representations, where schemata form humans' mental structures. In my opinion, the central focus of constructivist knowledge acquisition and learning is on schemata-based conceptual representations and conceptualisations. Accordingly, this article will propose an analytical description of humans' schema-based understandings [of concepts] in the ground of their conceptualisations and in the framework of constructivism. Before offering specifications, I shall describe what I mean by the act and the process of constructivist knowledge acquisition and learning with regard to concepts. The following definition draws out the key elements of constructivist knowledge acquisition and learning, which have individual and social implications for humans, see [Watkins (2002)]. "Knowledge acquisition is the reflective activity which enables the humans to draw upon their previous experiences [and background knowledge] to conceptualise [and, respectively, to realise and to understand in order to] evaluate the present, so as to build up and shape future actions and to construct [and, subsequently, to develop the construction of] new knowledge". At this point I shall emphasise that there is, obviously, no reason to claim that concept construction, as such, must be based on the processes described by constructivism. The aim of this study is that I will use constructivism to describe human concept construction as a kind of 'conditional reasoning' in a learning context, and, accordingly, I am trying to analyse concept construction in that context relying on constructivist epistemology. Therefore, in my opinion, constructivism could provide a proper base of description of the concept construction process, if it is seen as an individual's conditional reasoning in a learning context.

2. CONCEPTUALISATION AND CONCEPT UNDERSTANDING

According to constructivist knowing [and learning], human beings' mental structures manifest themselves in the form of mental objects (schemata[2]), see [Bartlett (1932), Parker (2008)]. Schemata conceptually represent the constituents of human's thoughts for knowledge acquisition with regard to her/his perception of [parts of] the world. Regarding [Piaget (1952)], a schema is a "cohesive, repeatable action sequence possessing component actions that are tightly interconnected and governed by a core meaning". In constructivist learning and constructivist knowledge acquisition, schemata—in a broad sense—support humans in constructing concepts, developing (forming[3] and reforming) their constructed concepts, in providing their semantic interpretations and in processing their meaning construction. I shall, therefore, conclude that a human's elucidation, explication and explaining abilities all get supported by her/his schemata. Subsequently, relying on semantic interpretations, humans get concerned with meanings of their mental entities associated with different objects/phenomena. In my opinion, schemata determine the locus of meanings and thus support world descriptions and reinforce the structural and descriptive analysis of mental entities. Moreover, the semantics as the scrutiny and the analysis of meanings could focus on various conditions for definitions of truth. Then, it connects with humans' inferences and reasonings which attempt to give satisfying conditions for definitions of truth. Accordingly it seems possible to conclude that humans' inferences are given shapes over their designed schemata. In my conceptual approach, a concept is a linkage between the mental representations of linguistic expressions and the other mental images (e.g., representations of the world, representations of inner experiences) that a human has in her/his mind, see [Götzsche (2013)]. Considering this idea of concepts, humans may be said to transform the collection of (*i*) linguistic expressions, (*ii*) images of the world, and (*iii*) their interrelationships in the form of [psychological] entities and utilising generic and specific labels. I could say that concepts might be understood to be representations of actualities and objectivities in humans' minds, and those representations can affect humans' reasoning processes.

---

[1] Jean Piaget (1896 - 1980) was the originator of constructivism. He was the first psychologist to make a systematic study of cognitive development and developmental theory of learning, see www.piaget.org/aboutPiaget.html.
[2] Piaget argued that all learning was mediated by the construction of mental objects that he called schemata. Schemata gradually develop into more conceptual mental entities.
[3] See http://teachinghistory.org/teaching-materials/teaching-guides/25184

2.1 Understanding, Explanation and Conceptualisation in the Framework of Constructivism

From the constructivist learning perspective, human beings focus on knowledge construction and on developing the constructed knowledge over their background knowledge. The most significant objective of constructivism is producing one's own understanding of the world, see [Husén (1989), McGawand Peterson (2007), Keith Sawyer (2014)]. Let me take into consideration the SOLO[4] taxonomy in order to focus on understanding in the framework of constructivism. According to SOLO, the sequence 'pre-structured knowledge → uni-structured knowledge → multi-structured knowledge → related knowledge → extended abstracts' represents a flow from shallow understanding to deep understanding, see [Burville Biggs (1982)]. A shallow understanding of an object may support humans in identifying some isolated facts and matters related to that object. On the other hand, a deep understanding of an object supports humans in linking lots of related facts as conceptions [about a certain object] and in linking those conceptions to other complicated conceptions. Additionally, deep understanding of an object supports analysing, justifying, criticising, hypothesising and theorising about that object. Before getting into details I shall emphasise that 'understanding' is a very complicated term in philosophy, psychology and cognitive science. In my opinion, there cannot be any absolute and comprehensive description for understanding, but there can be acceptable descriptions of 'realisations of understanding'. Actually, there could be a very strong relationship between 'understanding' and 'explanation'. Explanation (i.e. the actual process of explaining something) can shed light on the produced personal understandings of that thing. I have assumed that humans' linguistic expressions and the produced meanings [based on humans' conceptions], strongly support knowledge construction processes and understanding in the framework of constructivist learning. Thus, an explanation could also be assumed to be the actual explanation of expressions and meanings. Therefore, humans rely on their own explanations in order to shed light on their produced personal comprehensions and understandings.

At this point I focus on the term 'conceptualisation' in order to provide a supportive specification of understanding. In [Badie (2016b)] I have described conceptualisation as "a uniform specification of separate understandings [of concepts]". I concluded that a specific conceptualisation provides a global (a universal) manifestation of local concept understandings. Furthermore, a human's grasp of concepts provides a proper foundation for generating her/his own conceptualisations. So the personal conceptualisation could be elaborated by the outputs of the processes of concept formation [and reformation] with regard to the basis that is provided by the individual realisation. When a human forms her/his conception (as an outcome of her/his constructed concept) from its attributes, qualities, properties and its relationships with other conceptions, s(he) gets to know [and gets to understand] more than just some isolated facts about that conception [and of that concept]. This qualifies deep knowledge acquisition rather than superficial knowledge acquisition over concepts. Note that [Parker (2008)] has also (from another point of view) focused on this subject in analysing inductive teaching strategies.

A person who understands something, directly or indirectly, gets concerned with the taxonomy of various concepts. I have focused on the last statement from the structuralist point of view. The structuralist description and analysis of understanding supports me in explaining a variety of facts about 'understanding' and 'understanding something'. The individual who understands something, needs to move through a chain of various related concepts. Then, we could see 'Concept' and 'Generality' as two significant aspects that support the structuralist account of understanding. According to [Kuczok (2014)], the notion of conceptualisation pertains to central terms in cognitive linguistics. According to [Langacker (1991)], it can be defined as the locus of meaning or even equated with meaning in lexical semantics, which should describe abstract entities like thoughts and concepts through structural analysis. So, considering the analysis of schemata and the humans' mental structures, I conclude that conceptualisations are highly dependent on schemata.

3. SEMANTICS OF CONCEPT UNDERSTANDING

In this section I clarify my logical conceptions of understanding and focus on logical description of understanding concepts through the lenses of semantics. The conclusions will be used for designing a

---

[4] Structure of Observed Learning Outcomes (SOLO) taxonomy is a proper model that can provide a structured framework for who acquires knowledge in order to promote the efficiency of her/his knowledge acquisition.

semantic representation of humans' concept understanding. Suppose that a person undertakes to acquire knowledge about a concept and to understand it. Then understanding is a type of relation between person and concept. Therefore, this relation transforms the characteristics, attributes and qualities of that concept into the person's mind. It also transforms the properties of that concept and its relationships with other concepts into mind. I interpret an understanding[5] as the limit (or as the type) of a conceptualisation. Considering understanding as a limited conceptualisation, it could be explained as a kind of process of forming [and reforming] concepts. So, an understanding focuses on concepts on the basis that is provided by a conceptualisation. Then, one who undertakes to understand something, needs to have that thing conceptualised. As mentioned, a conceptualisation provides a global manifestation of local understandings. Therefore, all understandings (of concept C) are conceptualisations (of concept C). Therefore, understanding C has been interpreted as the subset of conceptualising C. But not all conceptualisations are understandings. In fact, all conceptualised concepts may not be understood, but all understood concepts have been conceptualised. Considering the person P and the concept C, "P understands C" then: "P conceptualises C".

Now I shall draw your attention to the concept formation process. Relying on concept formation processes, a person gets concerned with manipulating, formatting, classifying and structuring concepts. Accordingly, these processes all provide supportive foundations for her/his concept understanding process. Concept formation and concept reformation are the salient products of conceptualisation in constructivist learning. From the methodological point of view, the person needs to focus on the attributes, characteristics, qualities and properties of something in order to consider it as an instance of the concept C. One person may have focused on formation of C before acquiring knowledge about it, and thus, s(he) reconsiders her/his initial formations after reconstructing her/his knowledge in order to reform C in her/his mind. On the other hand, another person may not have focused on C before the knowledge construction is processed, and then s(he) can form C with insights based on acquired knowledge. I have identified the sequence 'Concept Formation → Concept Transformation → Concept Reformation' as the main foundation of the concept construction within meaning constructions, see [Badie (2015a), Badie (2015b)]. Note that the formed concepts could be affected by acquired knowledge within constructivist discussions, dialogues and interactions in order to be transformed and to support concept reformations. Therefore, understanding constructed (or reconstructed) concepts could be realised to be the limit of conceptualisation. Then, the person gets concerned with the attributes, characteristics, qualities and properties of concepts in order to distinguish them when they belong to different categories. In fact, s(he) identifies, specifies and relates the generalised concepts. Subsequently, as a salient product of understanding, s(he) could be able to make her/his personal labels and identifiers for identifying the [understood] concepts. These labels could be employed in categorising different things.

Moreover, by engaging the personal interpretation the person explicates what s(he) means by the concept C. The interpretations make bridges between a person's 'expressions and explanations' and 'semantics and meanings'. Taking semantics into my analysis, it's possible to infer that someone who has focused on the concept C, needs to provide a manner of determining the truth values of her/his statements, expressions, theories and explanations concerning C. Consequently, I identify all understandings [of concept C] as the interpretations [of concept C]. Therefore, understanding C has been interpreted (and is expressed) as the subset of interpreting C. But, all interpretations are not understandings. In fact, all interpreted concepts could not be understood, but all understood concepts certainly have been interpreted. Considering the person P and the concept C, " P understands C " then: " P interprets C ".

More specifically, the collection of the rules and the processes that manage different terms and descriptions in linguistic expressions, do not (and cannot) have any meaning until the non-logical parts[6] and constructors of the language are given interpretations and are interpreted. The interpretations prepare the person for producing her/his personal meaningful [and understandable] concept descriptions. By learning and acquiring knowledge in the framework of constructivism, a human being attempts to provide a way to determine the truth values of the non-logical parts through her/his conceptions. Consequently, (I) the understanding (as a conceptualisation) focuses on the domain of conceptualisation. Actually, it conceptualises the objective of conceptualisation, and, respectively, focuses on the objective of understanding. Therefore, the understanding focuses on the domain of understanding. (II) The understanding (as an interpretation) focuses on the domain of interpretation. In fact it focuses on the objective of interpretation, and, respectively, on the objective of understanding. Therefore, the understanding focuses on

---

[5] See www.cocon.com/observetory/carlbereiter
[6] The words like, e.g., *and, or, not, since, then, so, all, every, any*, have logical consequences and are identified as the logical parts (words) in a natural language with regard to classical symbolic logic and predicate logic.

the domain of understanding. (**III**) The understanding (as a conceptualisation) conceptualises the concepts belonging to the domain of conceptualisation. Therefore, the understanding understands the concepts (works on the concepts). (**IV**) The understanding as an interpretation interprets the concepts belonging to the domain of interpretation. Therefore, the understanding understands the concepts (works on the concepts).

4. CONCLUSIONS AND FUTURE WORK

Constructivist learning is concerned with how the individual learner goes about the construction of knowledge in her/his own cognitive apparatus. Conceptually and epistemologically I have focused on analysis of human understanding and conceptualisation. I have been concerned with human concept representations over her/his schemata. Schemata support humans in constructing concepts, and developing their constructed concepts, in providing their semantic interpretations and in processing their meaning construction. According to this research, conceptualisation provides a global (a universal) manifestation of local concept understandings. Consequently, I have focused on a more specific logical description of conceptualisations and concept understandings based upon individual constructed concepts. The conclusions have been applied in a logical and semantic description and representation of 'concept understanding'. This research has formed a building block of my PhD research, which is dealing with Semantic Analysis of Constructivist Concept Leaning. In future research, I will, logically and semantically (mainly based on Description Logics), focus on formalising and analysing humans' concept understanding and on proposing a semantic model for concept understanding in the framework of constructivism.

REFERENCES

Badie, Farshad, 2015a. *A Semantic Basis for Meaning Construction in Constructivist Interactions*. Proceedings of the International Conference on Cognition and Exploratory Learning in Digital Age (CELDA). Dublin, Ireland.

Badie, Farshad, 2015b. *Towards A Semantics-Based Framework For Meaning Construction in Constructivist Interactions*. Proceedings of the 8th Annual International Conference of Education, Research and Innovation (ICERI). Seville, Spain.

Badie, Farshad, 2016a. *A Conceptual Mirror: Towards A Reflectional Symmetrical Relation Between Mentor And Learner*. Proceedings of the 3rd International Conference on Education and Psychological Science (ICEPS): International Journal of Information and Education Technology. Florence, Italy.

Badie, Farshad, 2016b. *Concept Representation Analysis in the Context of Human-Machine Interactions*. Proceedings of the 14th International Conference on e-Society (ES). Algarve, Portugal.

Bartlett F. C., 1932. *A Study in Experimental and Social Psychology*. Cambridge University Press.

Burville Biggs, John, 1982. *Evaluating the quality of learning: the SOLO taxonomy (Structure of the Observed Learning Outcome)*. Educational Psychology.

Furst M. D., Hill E. J., Krathwohl W. H., Bloom D. R. And Engelhart B. S., 1956. *Taxonomy of Educational Objectives: The Classification of Educational Goals*. Handbook I: Cognitive Domain. New York: David McKay Company.

Götzsche Hans, 2013. *Deviational Syntactic Structures*. Bloomsbury Academic: London / New Delhi / New York / Sydney.

Husén T. and Postlethwaite T.N., 1989. *Constructivism in Education*. The International Encyclopaedia of Education. Oxford/New York: Pergamon Press.

Keith Sawyer R., 2014. *The Cambridge Handbook of The Learning Sciences*. Cambridge Handbooks in Psychology.

Krathwohl David R., 2002. *A Revision of Bloom's Taxonomy: An Overview*. Theory Into Practice. Routledge Publishers.

Kuczok, Marcin, 2014. *The Conceptualisation of the Christian Life in John Henry Newman's Parochial and Plain Sermons*. Cambridge Scholars Publishing.

Langacker, R, 1991. *Foundations of Cognitive Grammar*. Stanford University Press, Stanford, CA. .

McGawand Peterson, P., 2007. *Constructivism And Learning*. International Encyclopaedia of Education, Oxford: Elsevier.

Parker W. C., 2008. *Pluto's Demotion and Deep Conceptual Learning in Social Studies*. Social Studies Review.

Phillips, D. C., 1995. *The Good, the Bad, and the Ugly: The Many Faces of Constructivism*. Educational Researcher.

Piaget, J., & Cook, M. T., 1952. *The Origins of Intelligence in Children*. New York, NY: International University Press.

Watkins Chris, Carnell Eileen, Lodge Caroline, Wagner Patsy And Whalley Caroline, 2002. *Effective Learning*. National School Improvement Network.