THE LOGICAL STRUCTURE OF COGNITION pdf

1: Logical positivism - Wikipedia

This chapter draws heavily on recent work in developmental psychology to argue that humans infants, without instruction, given ordinary maturation in an normal environment, come to perceive a world of so-called Spelke objects (discrete, spatiotemoporally continuous items that undergo continuous motion) that enjoy properties, stand in relations, and exhibit ground-consequent dependencies.

When we present a very well planned, logical lesson, we wonder why some students "get it" and others do not. After reexamining our methods and our curriculum, and after trying and failing again and again to reach a subset of students, we ask ourselves some hard questions: Are they unfocused, inattentive, lazy? Are they just "slow"? To try to reach these students, our schools offer after-school study programs, remedial reading and math programs, summer school, tutoring, resource services, and special education. Still there are students who do not understand and do not achieve. Concerned parents take these students to tutors and specialists or enroll them in expensive learning centers. Still these students struggle. Meanwhile, sitting in the same classroom with the struggling students are the high-achieving students. They thrive on our well-prepared lessons, and secretly we suspect that they could learn from anyone at any time with any kind of method. They can do this because they know how to gather, process, and output information. They have well-developed cognitive structures. Cognitive Structures Defined Cognitive structures are the basic mental processes people use to make sense of information. Other names for cognitive structures include mental structures, mental tools, and patterns of thought. To clarify how cognitive structures function, I group them into three interdependent categories: Comparative thinking structures process information by identifying how bits of data are alike and different. They include recognition, memorization, conservation of constancies, classification, spatial orientation, temporal orientation, and metaphorical thinking. Comparative thinking structures are foundational to learning. As the prerequisites to the more complex cognitive structures in the other two categories, they are the focus of this book. Symbolic representation structures transform information into culturally acceptable coding systems. They include verbal and nonverbal language; mathematics; music and rhythms; movements, dance, and gestures; interpersonal interactions; graphics two-dimensional drawings, paintings, logos ; sculpture and constructions; and simulation, drama, and multimedia. Logical reasoning structures use abstract thinking strategies to systematically process and generate information. They include deductive and inductive reasoning, analogical and hypothetical thinking, causeâ€”effect relationships, analysis, synthesis, evaluation, problem framing, and problem solving. Our own ability to process information quickly and work easily with abstract ideas can make it difficult for us to imagine what it is like to struggle to do these things, or to grasp that it is even possible for someone over the age of 7 or 8 to not be able to gather and organize information, recognize patterns, or see "obvious" connections. The teachers get frustrated and conclude that the students need to pay more attention, work harder, or change their attitudes. They may quit trying and become behavior problems, or they may slip through the cracks in the system, passing from grade to grade with minimal competency. Those who do get by typically do so by using memorization or imitation strategies. Although these tricks can help students find right answers, using them gets students no closer to experiencing the joy and excitement of deep understanding. They get no closer to developing metability. Two Key Points The more educators learn about how cognitive structures affect learning, the more cause there is for us to be optimistic. There are two key points to keep in mind: Each individual has to develop his or her own cognitive structures. It is never too late to develop cognitive structures. From infancy through old age, everyone who has the neurological capacity to communicate, to be reflectively aware, and to use visualization can develop cognitive structures. When I work with students who are struggling in school, I explain that they already have the capability to learn; what they need to do is learn how to use their "mental tools. An Unmotivated 7th Grader Andre was one of those seemingly unmotivated students who barely did enough to get by and really disliked school. I used an analogy to help him understand cognitive structures. His garage is full of wrenches and stuff. He knows how to use his tools and make them work for him? Would you like that? How do I use them? He just followed directions. When I worked with Andre, he began to use his cognitive structures to create meaning, change his understanding, and learn. He actually became excited about his "mental tools" and enjoyed the challenge of figuring things out on his own. How Students Use Cognitive Structures to Process Information Students use cognitive structures to process information and create meaning by 1 making connections, 2 finding patterns, 3 identifying rules, and 4 abstracting principles. Making Connections Cognitive structures help students make connections with prior knowledge and experience by bridging from the known to the unknown. It is very important to ask students what sense they make of information we share with them. As we listen to their connections, we show respect for their uniqueness, encourage them to bring something to the learning situation, and identify the need to clarify misconceptions. Finding Patterns and Relationships Cognitive structures help students compare, analyze, and organize information into patterns and relationships. Patterns are repeated motifs or units. Relationships are logical or natural associations between any two or more things. All learning is based on relationships; that is, something has meaning when compared and contrasted with something else. From early childhood, patterns are part of the curriculum. Here is an example of how Sandra came to understand patterns. Making Patterns When I worked with Sandra, a 4th grader who was struggling in school, I gave her an assortment of colored paper shapes and asked her to make a pattern. She selected three big red circles and three big blue circles and then arranged them in an alternating redâ€”blue line. She shoved all the other pieces into a pile. When I asked Sandra to tell me about her pattern, she said, "Redâ€”blue, redâ€”blue, redâ€—blue. Sandra then became a little impatient. However, for Sandra to develop her cognitive structures, she had to form patterns and relationships on her own. Too often, teachers make connections and point out patterns for students without realizing we are teaching them to imitate what we do rather than to construct meaning for themselves. Then we wonder why they cannot find patterns in reading, math, science, social studies, and life. Sandra then asked, "What do you want me to do? She started to move the pieces around and group some together. Red, blue, yellow, green circles, squares, triangles. There are lots of different ways to make patterns! She was smiling now. She paused and studied the pieces. Sandra gave me a blank look and shrugged her shoulders.

THE LOGICAL STRUCTURE OF COGNITION pdf

2: Logical structure of the world - Oxford Scholarship

Logical reasoning structures use abstract thinking strategies to systematically process and generate information. They include deductive and inductive reasoning, analogical and hypothetical thinking, cause-effect relationships, analysis, synthesis, evaluation, problem framing, and problem solving.

Schemas Imagine what it would be like if you did not have a mental model of your world. It would mean that you would not be able to make so much use of information from your past experience or to plan future actions. Schemas are the basic building blocks of such cognitive models, and enable us to form a mental representation of the world. Piaget emphasized the importance of schemas in cognitive development and described how they were developed or acquired. A schema can be defined as a set of linked mental representations of the world, which we use both to understand and to respond to situations. The assumption is that we store these mental representations and apply them when needed. For example, a person might have a schema about buying a meal in a restaurant. The schema is a stored form of the pattern of behavior which includes looking at a menu, ordering food, eating it and paying the bill. The schemas Piaget described tend to be simpler than this - especially those used by infants. He described how - as a child gets older - his or her schemas become more numerous and elaborate. Piaget believed that newborn babies have a small number of innate schemas - even before they have had many opportunities to experience the world. These neonatal schemas are the cognitive structures underlying innate reflexes. These reflexes are genetically programmed into us. Shaking a rattle would be the combination of two schemas, grasping and shaking. Assimilation and Accommodation Jean Piaget ; see also Wadsworth, viewed intellectual growth as a process of adaptation adjustment to the world. Piaget believed that cognitive development did not progress at a steady rate, but rather in leaps and bounds. However, an unpleasant state of disequilibrium occurs when new information cannot be fitted into existing schemas assimilation. Equilibration is the force which drives the learning process as we do not like to be frustrated and will seek to restore balance by mastering the new challenge accommodation. Once the new information is acquired the process of assimilation with the new schema will continue until the next time we need to make an adjustment to it. Example of Assimilation A 2-year-old child sees a man who is bald on top of his head and has long frizzy hair on the sides. Sensorimotor stage birth to age 2 2. Pre-operational stage from age 2 to age 7 3. Concrete operational stage from age 7 to age 11 4. Each child goes through the stages in the same order, and child development is determined by biological maturation and interaction with the environment. Although no stage can be missed out, there are individual differences in the rate at which children progress through stages, and some individuals may never attain the later stages. Piaget did not claim that a particular stage was reached at a certain age - although descriptions of the stages often include an indication of the age at which the average child would reach each stage. Sensorimotor Stage Birth-2 yrs The main achievement during this stage is object permanence - knowing that an object still exists, even if it is hidden. It requires the ability to form a mental representation i. Preoperational Stage years During this stage, young children can think about things symbolically. This is the ability to make one thing - a word or an object - stand for something other than itself. Thinking is still egocentric , and the infant has difficulty taking the viewpoint of others. This means the child can work things out internally in their head rather than physically try things out in the real world. Children can conserve number age 6 , mass age 7 , and weight age 9. Conservation is the understanding that something stays the same in quantity even though its appearance changes. Formal Operational Stage 11 years and over The formal operational stage begins at approximately age eleven and lasts into adulthood. During this time, people develop the ability to think about abstract concepts, and logically test hypotheses. Piaget has been extremely influential in developing educational policy and teaching practice. The result of this review led to the publication of the Plowden report Discovery learning â€" the idea that children learn best through doing and actively exploring - was seen as central to the transformation of the primary school curriculum. Readiness concerns when certain information or concepts should be taught. According to Piaget , assimilation and accommodation require an active learner, not a passive one, because problem-solving skills cannot be taught, they must be discovered. Within the classroom learning should be student-centered and accomplished through active discovery learning. The role of the teacher is to facilitate learning, rather than direct tuition. Therefore, teachers should encourage the following within the classroom: He was an inspiration to many who came after and took up his ideas. His ideas have been of practical use in understanding and communicating with children, particularly in the field of education re: Criticisms Are the stages real? Vygotsky and Bruner would rather not talk about stages at all, preferring to see development as a continuous process. Others have queried the age ranges of the stages. Some studies have shown that progress to the formal operational stage is not guaranteed. Because Piaget concentrated on the universal stages of cognitive development and biological maturation, he failed to consider the effect that the social setting and culture may have on cognitive development. Dasen cites studies he conducted in remote parts of the central Australian desert with year old Aborigines. He gave them conservation of liquid tasks and spatial awareness tasks. However, he found that spatial awareness abilities developed earlier amongst the Aboriginal children than the Swiss children. Such a study demonstrates cognitive development is not purely dependent on maturation but on cultural factors too â€” spatial awareness is crucial for nomadic groups of people. Vygotsky , a contemporary of Piaget, argued that social interaction is crucial for cognitive development. This social interaction provides language opportunities and language is the foundation of thought. Piaget made careful, detailed naturalistic observations of children, and from these he wrote diary descriptions charting their development. He also used clinical interviews and observations of older children who were able to understand questions and hold conversations. Because Piaget conducted the observations alone the data collected are based on his own subjective interpretation of events. It would have been more reliable if Piaget conducted the observations with another researcher and compared the results afterward to check if they are similar i. Although clinical interviews allow the researcher to explore data in more depth, the interpretation of the interviewer may be biased. Such methods meant that Piaget may have formed inaccurate conclusions. As several studies have shown Piaget underestimated the abilities of children because his tests were sometimes confusing or difficult to understand e. Piaget failed to distinguish between competence what a child is capable of doing and performance what a child can show when given a particular task. When tasks were altered, performance and therefore competence was affected. For example, a child might have object permanence competence but still not be able to search for objects performance. However, Piaget relied on manual search methods â€” whether the child was looking for the object or not. The concept of schema is incompatible with the theories of Bruner and Vygotsky Therefore, they would claim it cannot be objectively measured. Piaget studied his own children and the children of his colleagues in Geneva in order to deduce general principles about the intellectual development of all children. Not only was his sample very small, but it was composed solely of European children from families of high socio-economic status. Researchers have therefore questioned the generalisability of his data. For Piaget, language is seen as secondary to action, i. The Russian psychologist Lev Vygotsky argues that the development of language and thought go together and that the origin of reasoning is more to do with our ability to communicate with others than with our interaction with the material world. Object permanence in young infants: Toward a theory of instruction. Central Advisory Council for Education Culture and cognitive development from a Piagetian perspective. Egocentrism in preschool children. The moral judgment of the child. Origins of intelligence in the child. Play, dreams and imitation in childhood. Construction of reality in the child. The growth of logical thinking from childhood to adolescence. The origins of intelligence in children. The development of higher psychological processes. How to reference this article: How Do Children Think? Download this article as a PDF.

3: Cognition - Wikipedia

A logical fallacy is an erroneous pattern of reasoning that contains a flaw, either in its structure or in its underlying premises. Fallacies, in their various forms, play a significant role in how people think and in how they communicate with each other, so it's important to understand them.

In general, judgments of plausibility are made after a claim has been formulated, but prior to rigorous testing or proof. The next sub-section provides further discussion. Note that this characterization is incomplete in a number of ways. The manner in which we list similarities and differences, the nature of the correspondences between domains: Nor does this characterization accommodate reasoning with multiple analogies i. To characterize the argument form more fully, however, is not possible without either taking a step towards a substantive theory of analogical reasoning or restricting attention to certain classes of analogical arguments. An assertion of plausibility within the context of an inquiry typically has pragmatic connotations as well: On both points, there is ambiguity as to whether an assertion of plausibility is categorical or a matter of degree. These observations point to the existence of two distinct conceptions of plausibility, probabilistic and modal, either of which may reflect the intended conclusion of an analogical argument. On the probabilistic conception, plausibility is naturally identified with rational credence rational subjective degree of belief and is typically represented as a probability. There can be no doubt that every resemblance [not known to be irrelevant] affords some degree of probability, beyond what would otherwise exist, in favour of the conclusion. The meaning, roughly speaking, is that there are sufficient initial grounds for taking p seriously, i. There is no assertion of degree. The intent is to single out p from an undifferentiated mass of ideas that remain bare epistemic possibilities. The set of epistemic possibilitiesâ€"hypotheses about electrostatic attraction compatible with knowledge of the dayâ€"was much larger. Individual analogical arguments in mathematics such as Example 7 are almost invariably directed towards prima facie plausibility. The modal conception figures importantly in some discussions of analogical reasoning. But in order that a theory may be valuable it must â€¦ display an analogy. The propositions of the hypothesis must be analogous to some known lawsâ€¦. Some analogy is essential to it; for it is only this analogy which distinguishes the theory from the multitude of othersâ€¦ which might also be proposed to explain the same laws. Possible defeaters might include internal inconsistency, inconsistency with accepted theory, or the existence of a clearly superior rival analogical argument. The point is that Campbell, following the lead of 19th century philosopher-scientists such as Herschel and Whewell, thinks that analogies can establish this sort of prima facie plausibility. Snyder provides a detailed discussion of the latter two thinkers and their earlier ideas about the role of analogies in science. In general, analogical arguments may be directed at establishing either sort of plausibility for their conclusions; they can have a probabilistic use or a modal use. Examples 7 through 9 are best interpreted as supporting modal conclusions. In those arguments, an analogy is used to show that a conjecture is worth taking seriously. To insist on putting the conclusion in probabilistic terms distracts attention from the point of the argument. The conclusion might be modeled by a Bayesian as having a certain probability value because it is deemed prima facie plausible, but not vice versa. Example 2 , perhaps, might be regarded as directed primarily towards a probabilistic conclusion. There should be connections between the two conceptions. Indeed, we might think that the same analogical argument can establish both prima facie plausibility and a degree of probability for a hypothesis. But it is difficult to translate between modal epistemic concepts and probabilities Cohen ; Douven and Williamson ; Huber ; Spohn , We cannot simply take the probabilistic notion as the primitive one. It seems wise to keep the two conceptions of plausibility separate. Further discussion of this point is found in section 5. Schema 4 is a template that represents all analogical arguments, good and bad. It is not an inference rule. Despite the confidence with which particular analogical arguments are advanced, nobody has ever formulated an acceptable rule, or set of rules, for valid analogical inferences. There is not even a plausible candidate. This situation is in marked contrast not only with deductive reasoning, but also with elementary forms of inductive reasoning, such as induction by enumeration. Of course, it is difficult to show that no successful analogical inference rule will ever be proposed. But consider the following candidate, formulated using the concepts of schema 4 and taking us only a short step beyond that basic characterization. It is pretty clear that 5 is a non-starter. The main problem is that the rule justifies too much. The only substantive requirement introduced by 5 is that there be a nonempty positive analogy. Plainly, there are analogical arguments that satisfy this condition but establish no prima facie plausibility and no measure of support for their conclusions. Here is a simple illustration. Both relations are reflexive, symmetric, and transitive. Yet it would be absurd to find positive support from this analogy for the idea that we are likely to find congruent lines clustered in groups of two or more, just because swans of the same color are commonly found in groups. The positive analogy is antecedently known to be irrelevant to the hypothetical analogy. In such a case, the analogical inference should be utterly rejected. Yet rule 5 would wrongly assign non-zero degree of support. To generalize the difficulty: Some similarities and differences are known to be or accepted as being utterly irrelevant and should have no influence whatsoever on our probability judgments. To be viable, rule 5 would need to be supplemented with considerations of relevance, which depend upon the subject matter, historical context and logical details particular to each analogical argument. To search for a simple rule of analogical inference thus appears futile. Norton , and â€”see Other Internet Resources has argued that the project of formalizing inductive reasoning in terms of one or more simple formal schemata is doomed. His criticisms seem especially apt when applied to analogical reasoning. If analogical reasoning is required to conform only to a simple formal schema, the restriction is too permissive. Inferences are authorized that clearly should not pass musterâ€¦ The natural response has been to develop more elaborate formal templatesâ€¦ The familiar difficulty is that these embellished schema never seem to be quite embellished enough; there always seems to be some part of the analysis that must be handled intuitively without guidance from strict formal rules. These local facts are to be determined and investigated on a case by case basis. To embrace a purely formal approach to analogy and to abjure formalization entirely are two extremes in a spectrum of strategies. There are intermediate positions. Most recent analyses both philosophical and computational have been directed towards elucidating general criteria and procedures, rather than formal rules, for reasoning by analogy. The next section discusses some of these criteria and procedures. Here are some of the most important ones: G1 The more similarities between two domains , the stronger the analogy. G2 The more differences, the weaker the analogy. G3 The greater the extent of our ignorance about the two domains, the weaker the analogy. G4 The weaker the conclusion, the more plausible the analogy. G5 Analogies involving causal relations are more plausible than those not involving causal relations. G6 Structural analogies are stronger than those based on superficial similarities. G7 The relevance of the similarities and differences to the conclusion i. G8 Multiple analogies supporting the same conclusion make the argument stronger. These principles can be helpful, but are frequently too vague to provide much insight. How do we count similarities and differences in applying G1 and G2? Why are the structural and causal analogies mentioned in G5 and G6 especially important, and which structural and causal features merit attention? More generally, in connection with the all-important G7: Furthermore, what are we to say about similarities and differences that have been omitted from an analogical argument but might still be relevant? An additional problem is that the criteria can pull in different directions. Each of the above criteria apart from G7 is expressed in terms of the strength of the argument, i. The criteria thus appear to presuppose the probabilistic interpretation of plausibility. The problem is that a great many analogical arguments aim to establish prima facie plausibility rather than any degree of probability. Most of the guidelines are not directly applicable to such arguments. In his theoretical reflections on analogy and in his most judicious examples, we find a sober account that lays the foundation both for the commonsense guidelines noted above and for more sophisticated analyses. Although Aristotle employs the term analogy analogia and talks about analogical predication , he never talks about analogical reasoning or analogical arguments per se. He does, however, identify two argument forms, the argument from example paradeigma and the argument from likeness homoiotes , both closely related to what would we now recognize as an analogical argument. The argument from example paradeigma is described in the Rhetoric and the Prior Analytics: Enthymemes based upon example are those which proceed from one or more similar cases, arrive at a general proposition, and then argue deductively to a particular inference. If then we wish to prove that to fight with the Thebans is an evil, we must assume that to fight against neighbours is an evil. Conviction of this is obtained from similar cases, e. Since then to fight against neighbours is an evil, and to fight against the Thebans is to fight against neighbours, it is clear that to fight against the Thebans is an evil. The argument from example thus amounts to single-case induction followed by deductive inference. The first inference dashed arrow is inductive; the second and third solid arrows are deductively valid. The paradeigma has an interesting feature: Instead of regarding this intermediate step as something reached by induction from a single case, we might instead regard it as a hidden presupposition. This transforms the paradeigma into a syllogistic argument with a missing or enthymematic premise, and our attention shifts to possible means for establishing that premise with single-case induction as one such means. The argument from likeness homoiotes seems to be closer than the paradeigma to our contemporary understanding of analogical arguments. The most important passage is the following.

4: Project MUSE - Logico-cognitive structure in the lexicon

A Study Module in the Logical Structure of Cognitive Process in the Context of Variable-Based Blended Learning Smirnova, Galina I.; Katashev, Valery G. European Journal of Contemporary Education, v6 n1 p

What are the psychological states that children pass through at different points in their development? What are the mechanisms by which they pass from one state to another? Piaget proposed that children progress through an invariant sequence of four stages: Being controlled by the logical structures in the different developmental stages, learners cannot be taught key cognitive tasks if they have not reached a particular stage of development. The major concepts in this cognitive process include: Children and adults tend to apply any mental structure that is available to assimilate a new event, and they will actively seek to use a newly acquired structure. This is a process of fitting new information into existing cognitive structures Accommodation: This is a process of modifying existing cognitive structures based upon new information. Anomalies of experience create a state of disequilibrium which can be only resolved when a more adaptive, more sophisticated mode of thought is adopted. The ACT production system proposed a distinction between procedural knowledge and declarative knowledge. In ACT-R, the current goal acts as a filter to select relevant productions. There are two long-term memory stores: The knowledge in the declarative memory, i. At the symbolic level, chunks are structured as a semantic network. On the other hand, the knowledge in the procedural memory is represented as production rules in forms of condition-action pairs, in which the flow of control passes from one production to another when the actions of one production create the conditions needed for another production to take place. It is these production systems that provide the basis for a unitary theory of cognition. The selected production and the current goal will influence together the retrieval of information via their connections to declarative memory. Hierarchically organized goal structures are used to represent plans of action, and to control the course of cognitive processing. The acquisition of a cognitive skill is a progressive process from cognitive stage to the autonomous stage, which, in terms of the ACT-R theory, is the transformation from declarative knowledge to procedural knowledge. The process starts with the interpretive application of declarative knowledge in the cognitive stage. Then it proceeds to compile declarative knowledge into production rules during the associative stage. Gradually the production, a set of condition-action rules, becomes increasingly fine-tuned. During the autonomous stage, the effort required by condition-action rules continually decrease. At the beginning of the process of skill acquisition, new information enters in declarative form. In this stage, learners learn about a set of facts relevant to the skills, such as descriptions of the procedure. The knowledge of how to carry out a procedure is declarative, as step-by-step performance statements. At this point the learners generate actions through interpretations of the verbal statements, and carefully monitor the results of the actions when they carry out each step of the procedures. The processing in this stage is conscious, deliberate, slow and requires full attention. The major development of this stage is knowledge compilation. The compilation process is aimed to produce successful procedures in order to speed up the execution of procedures, drop the verbal rehearsal and eliminate piecemeal application. During the associative stage, we have in the process of composition and proceduralization a means of converting declarative facts into production form. Composition is the process of organizing a series of actions together into a unified production. This produces considerable speedup by composing sequences of steps into one single action. Also, once the skill is proceduralized, the new integrated production no longer requires the domain specific declarative information to be retrieved into working memory. An important consequence of proceduralization is that it reduces the load on working memory, and thus achieves a great deal of efficiency. After a skill has been compiled into a task-specific procedure, the learning process involves an improvement in the search for the right production. In this stage, the procedure becomes more and more automated and rapid. The process underlying this stage is tuning. Three learning mechanisms serve as the basis of tuning: The basic function of the generalization process is to extract from different productions what they have in common. The generalization process produces broader production rules in their range of applicability. It facilitates the transfer of knowledge in a novel situation. On the contrary, the discrimination process produces narrow production rules. The discrimination process restricts the ranges of application of productions to the appropriate circumstances. It helps identify specific conditions and multiple variants on the conditions controlling the same action. The discrimination process facilitates the development of powerful, domain specific productions. Moreover, the specificity of the condition statements can help resolve conflicts. In this stage, learners are also getting better at selecting appropriate production in a particular context. The criterion of selection is degree of strength. Each production has a strength that reflects the frequency with which the production has been successfully applied. It has also developed an explanation to the question of how people select the appropriate knowledge in a particular context Anderson, Using the rational analysis, the ACT-R theory claim Anderson, that the mind determines what knowledge is available according to its odds of being used in a particular context. In fact, the mind implicitly performs a Bayesian inference to calculate these odds by keeping track of general usefulness and combining this with contextual appropriateness Anderson, The basic equation is as follows: So, the need is eliminated to maintain the declarative information. A dependency is created when a person sets a goal t understand a bit of an example or instruction When this dependency goal is popped, a production rule is induced form the dependency and added to the production system. Four special slots of the dependency structure: According to Bartlett, the story is assimilated to pre-stored schemata based on previous experience. Rumelhart defined a schema as "a data structure for representing the generic concepts stored in memory. In other words, schema is an "organizing and orienting attitude that involves active organization of past experience" Driscoll, Alba and Hasher examined all schema theories and identified four major processes: It explicitly illustrates how memory and comprehension operate. One of the central issues that cognitive psychologists are interested in is mental structure. According to schema theory, the knowledge we have stored in memory is organized as a set of schemata or mental representations, each of which incorporates all the knowledge of a given type of object or event that we have acquired from past experience. Schema theory provides an account to the knowledge structure and emphasizes the fact that what we remember is influenced by what we already know. Schemata facilitate both encoding and retrieval. Moreover, the mental structures are active. Memory can be reconstructed through the integration of current experience with prior knowledge. In other words, schemata represent an active process and can change over time as a result of new experiences and learning. There are two information resources: The analysis of the sensory information coming in from the outside is known as bottom-up processing or data-driven processing because it relies on the data received via the senses. The information already stored in the memory in the form of prior knowledge influences our expectations and helps us to interpret the current input. This influence of prior knowledge is known as top-down or conceptual-driven processing. Schemata operate in a top-down direction to help us interpret the bottom-up flow of information from the world. Research on functions of the schema focused on the impact of prior knowledge on comprehension and memory Driscoll, Characteristics of schema Rumelhart and Norman list five characteristics of schema: Schema represents knowledge of all kinds from simple to complex. Schema can be linked together into related systems. A schema has slots which may be filled with fixed, compulsory values or with variable, optional values. Schema incorporates all the different kinds of knowledge we have accumulated, including both generalizations derived from our personal experience and facts we have been taught. Various schemata at different levels may be activity engaged in reorganizing and interpreting new inputs. Winn and Snyder also described the characteristics of a schema as follows: Schema as Memory Structure: Schema exists at a higher level of generality than our immediate experience with the world. Schema consists of concepts that are linked together in a proposition. Schema as Dynamic Structure: Schema is dynamic, amenable to change by general experience or through instruction, assimilation, and accommodation. Schema provides a context for interpreting new knowledge as well as a structure to hold it. The processes of schema acquisition and modification Three different processes have been proposed to account for changes in existing schemata and the acquisition of new schemata due to learning Rumbelhart and Norman, Tuning occurs when existing schemata evolve to become more consistent with experience. It involves the creation of entirely new schemata which replace or incorporate old ones. The influence to Instructional Systems Design Information Processing Theory to ISD Two key assumptions in information processing theories have great influence in the formulation of instructional principles: The memory system is an active organized processor of information Research studies in attention and perception, such as the pattern recognition filter models of attention, and dual coding theory, have great impacts on the instructional message design both in text and visual message in order to maximize the attention and perception of the learners. Studies in the characteristics of short-term memory, such as limited space and short duration, give rise to the importance of mnemonic devices to reduce the workload of the short-term memory, information organization in chunks or smaller components to increase capacity. Also, the information processing models proposes the use of rehearsal strategies to maintain information, and content organization, such as elaboration theory, to help encode information by relating incoming information to concept and ideas already in memory. Theoretical explanations on the retention in long-term memory emphasize the effects of different conditions on levels of processing. Meaningful encoding facilitates later retrieval. Graphic representations have been particular effective in facilitating encoding and memory storage of information Prior knowledge plays an important role in learning The influence is evidenced by the use of advance organizers and any instructional strategies to strengthen activation of the existing memory structure. Also, the use of the metaphors and analogies provides instructional effectiveness.

5: Commonalities between Perception and Cognition

Cognition is "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses". It encompasses processes such as attention, the formation of knowledge, memory and working memory, judgment and evaluation, reasoning and "computation", problem solving and decision making, comprehension and production of language.

Received Sep 6; Accepted Nov This is an open-access article distributed under the terms of the Creative Commons Attribution Non Commercial License , which permits use, distribution, and reproduction in other forums, provided the original authors and source are credited. This article has been cited by other articles in PMC. Abstract Perception and cognition are highly interrelated. Given the influence that these systems exert on one another, it is important to explain how perceptual representations and cognitive representations interact. In this paper, I analyze the similarities between visual perceptual representations and cognitive representations in terms of their structural properties and content. Specifically, I argue that the spatial structure underlying visual object representation displays systematicity â€" a property that is considered to be characteristic of propositional cognitive representations. Furthermore, I argue that if systematicity is taken to be a criterion to distinguish between conceptual and non-conceptual representations, then visual representations, that display systematicity, might count as an early type of conceptual representations. Showing these analogies between visual perception and cognition is an important step toward understanding the interface between the two systems. The ideas here presented might also set the stage for new empirical studies that directly compare binding and other relational operations in visual perception and higher cognition. Perceptual information guides our decisions and actions, and shapes our beliefs. At the same time our knowledge influences the way we perceive the world Brewer and Lambert, To the extent that perception and cognition seem to share information, it seems there is no sharp division between the realm of cognitive abilities and that of perceptual abilities. An example is visual perception. Visual processing is composed of different stages Marr, Roughly, at early stages of the visual system, processes like segregation of figure from background, border detection, and the detection of basic features e. This information reaches intermediate stages, where it is combined into a temporary representation of an object. At later stages, the temporary object representation is matched with previous object shapes stored in long-term visual memory to achieve visual object identification and recognition. While early visual processes are largely automatic and independent of cognitive factors, late visual stages are more influenced by our knowledge Raftopoulos, this issue. Examples of cognitive influence on how we perceive the world â€" that modulates late vision â€" are visual search and attention Treisman, Knowing the color or shape of an object helps a person to quickly identify that particular object in a cluttered visual scene Wolfe and Horowitz, Phenomena like visual search highlight the fact that visual perception at later stages depends on both sensory and cognitive factors. Late vision is at what philosophers call the personal level: This is apparently not the case for early visual stages, which occur at a subpersonal level, without a person being aware of the information being processed at that stage. Intermediate stages, on the other hand, are probably accessible at a personal level. The degree of representational awareness occurring at this stage is commonly identified with phenomenal consciousness Lamme, ; Raftopoulos and Mueller, It is a matter of debate to what extent intermediate stages of visual processing are influenced by our knowledge i. Some authors argue that those stages are purely visual Raftopoulos and Mueller, and that the transition between pure perception to cognition occurs only at later visual stages, when temporary object representations are matched for recognition and identification. In this paper, I will not propose an argument for whether early and intermediate stages of visual perception are cognitively penetrable. However, I would like to stress that some of the common properties between visual perception and cognition that I will consider already occur at intermediate stages, thus, casting doubt on the claim that mid-level vision is purely perceptual. Cognitive information influences perceptual processes, but, at the same time, cognitive processes depend on perceptual information Goldstone and Barsalou, Recent work in philosophy brought new vigor to the hypothesis originally proposed by British Empiricists that cognition is inherently perceptual Prinz, Such theoretical proposals are supported by empirical findings from psychology. Work on concept acquisition shows that functions e. The basic hypothesis is that a concept is represented by means of a simulation at the sensory level of an experience of that to which the concept truly applies. For example, to represent the concept APPLE 1 , perceptual systems for vision, action, and touch partially produce the experience of a particular apple. Though it seems to be common ground that cognitive and perceptual representations influence each other, they are not taken to be the same kind of representations. Neurophysiological studies distinguish different functional areas for sensory and cognitive systems. Those areas process specific inputs and specialize in different kinds of information processes Zeki, ; Felleman and Van Essen, And distinct sensory areas can be treated as separate modules Barrett, that deal with their specific representational primitives. From a philosophical point of view, visual perception and cognition process information by means of representations that differ in both their structure and content Heck, ; Fodor, One of the main characteristics of cognitive states, paradigmatically of thoughts, is that they have a propositional combinatorial structure that satisfies the requirement of the Generality Constraint Evans, The Generality Constraint describes the pervasive ability of humans to entertain certain thoughts that they have never had before on the basis of having entertained the components of these new thoughts in other preceding situations. For example, from the fact that a person can think that the sky is blue and the car is gray, she can also think that the sky is gray and the car is blue, even if she has never had this thought before. The new thought depends on her conceptual ability to combine already acquired concepts in different ways. This regularity of human thinking is explained by appealing to the fact that thoughts are mental representations with a sentential combinatorial structure Fodor, Thoughts are built up by combining primitive constituents according to propositional rules. The constituent structure of thought is such that whenever a complex representation is tokened its constituents are simultaneously tokened. Failure to represent car or grayness leads to failure to represent that the car is gray. The appeal to the constituent structure of cognitive representations allows us to explain a further property of these representations: Systematicity, similar to the Generality Constraint, describes the human ability to entertain semantically related thoughts. For example, the ability to entertain a certain thought about cars is connected to the ability to entertain certain other thoughts about cars: Systematic recombinations are necessary to satisfy the Generality Constraint but not sufficient. According to the Generality Constraint, once a thinker can entertain a thought, elements of this thought could be in principle indefinitely recombined with every other appropriate concept that a person possesses. This requirement is not part of systematicity, since it leaves open whether it is in principle possible that a finite type of systematicity exists Fodor and Pylyshyn, For what concerns the analysis of the structure of visual representations, I will mostly focus on whether those representations implement a systematic structure of constituents. Acceptance of the Generality Constraint, or the weaker systematicity requirement, also affects how we characterize the content of cognitive and perceptual representations. Philosophers distinguish between two types of content: Typical cases of mental states with conceptual content are cognitive mental states, like thought, belief, desire, and so on: Perception, both personal and subpersonal, is considered a paradigmatic example of states with non-conceptual content. In other words, to have the thought that an apple is red, one has to possess the concepts involved in that thought, but to have a perceptual experience characteristic of seeing a red apple one does not need to possess the concepts involved in the specification. It has been argued that perceptual representations, specifically visual representations, do not satisfy the requirement of systematicity, and, hence, unlike cognitive representations, do not have conceptual content Heck, The argument is based on the idea that visual representations have a pictorial nature. Pictorial theories equate visual representations to images or maps. Like images or maps, visual representations are spatially characterized: Furthermore, like images or maps, visual representations have a holistic character. Unlike cognitive representations, there is no unique structured propositional representation that determines the content of a visual representation. There are many distinct possible decompositions of the same image, such that it is impossible to both identify which are its constituent parts and disentangle the role of these parts in the building up of the pictorial representation. Thus, visual representations, like maps, seemingly lack the syntactic structure of constituents typical of cognitive representations. The lack of a constituent structure entails that visual representations are not systematic. Satisfying systematicity is a necessary condition on satisfying the Generality Constraint. For the reasons above, visual representations do not seem to satisfy systematicity, and hence the Generality Constraint. Therefore, they have a content of a different kind than the content of cognitive representations: This is both an empirical and theoretical question. From the philosophical point of view, finding out the relationship between perception and cognition will be of benefit to explain phenomena as different as concept formation and acquisition, belief justification, and demonstrative thinking, each of which partly depends on perceptual information. In this paper, I will focus on commonalities between visual perception and cognition that might help explain the communication between those systems. In the first part, I will show that the spatial recombination underlying visual object recognition satisfies the requirement of systematicity. The analysis will take into account the so-called Feature Integration Theory Treisman and Gelade, ; a model that explains visual object representation by considering the spatial nature of visual representations. Although Feature Integration Theory characterizes visual representations as spatially organized, it differs from pictorial theories of visual representations, since it does not commit to the view that visual representations are holistic. In fact, visual representations can be seen as states of the visual system that can be neuronally specified, such that each part of an object representation can be spelled out by considering the different neuronal activations Treisman and Gelade, ; Goldstone and Barsalou, Each neuronal activation roughly corresponds to a part, or primitive constituent, of the representation. Thus, one can decompose an object representation into its primitive constituents and analyze whether a systematic structure of constituents is displayed by visual spatial recombinations Tacca, In the second part, I will argue against the claim that visual representations have non-conceptual content. Based on the analysis in the first part of the paper, I will propose that, if one takes systematicity to be a necessary requirement for having conceptual content, visual representations might be an early type of conceptual representations. I conclude that understanding the link between perception and cognition requires considering whether they satisfy common requirements in terms of structure and content. These similarities might be at the basis of the translation of perceptual representations into cognitive representation and elucidate the mechanism of their interaction. Primitive Visual Features and the Binding Problem Recombination in cognitive processes depends on operations on primitive constituents. A primitive constituent is an entity that corresponds to the smallest meaningful representation carrying relevant information for the processing of more complex representations. Different theories posit different types of primitive constituents Smolensky, ; Fodor, However, there is agreement that the primitive mental representations involved in thought and other cognitive processes, like belief and desire, are concepts. According to an atomistic perspective, concepts cannot be further decomposed into more primitive elements and as such they are the building blocks of thoughts Fodor, However, others have argued that concepts can be further decomposed into their perceptual components e. Those elementary constituents are taken to be symbolic perceptual representations stored at late perceptual stages that become part of cognitive recombinations. Therefore, they share with cognitive representations systematicity, compositionality, and productivity Barsalou, In the following, I will show that intermediate visual representations that contribute to object perception but are not yet stored at late visual stages also display systematicity. The hypothesis that concepts have a structure of constituents that involves perceptual representations is based on anatomical, physiological, and psychophysical evidence for the existence of distinct representations for primitive visual features. Neurobiological Zeki, ; Livingstone and Hubel, ; Felleman and Van Essen, and psychophysical studies Treisman and Gelade, report the existence in visual areas of so-called feature maps. Feature maps code for specific object features, like color, motion, and orientation. They are also topographically organized; namely, they represent a specific feature and the specific location in which the feature occurs in the visual field.

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6: Logical structure of cognition - Oxford Scholarship

intuitive and stable logical structures involved in the interpretation of dynamic scenes may TÃ©glÃ¡s, L. L. Bonatti, Cognition , ().

The goal is to develop object permanence; achieves basic understanding of causality, time, and space. Pre-operational stage Toddler and Early Childhood 2â€"7 years Symbols or language skills are present; memory and imagination are developed; nonreversible and nonlogical thinking; shows intuitive problem solving; begins to see relationships; grasps concept of conservation of numbers; egocentric thinking predominates. Concrete operational stage Elementary and Early Adolescence 7â€"12 years Logical and systematic form of intelligence; manipulation of symbols related to concrete objects; thinking is now characterized by reversibility and the ability to take the role of another; grasps concepts of the conservation of mass, length, weight, and volume; operational thinking predominates nonreversible and egocentric thinking Formal operational stage Adolescence and Adulthood 12 years and on Logical use of symbols related to abstract concepts; Acquires flexibility in thinking as well as the capacities for abstract thinking and mental hypothesis testing; can consider possible alternatives in complex reasoning and problem solving. Consequently, information given in the middle of the sequence is typically forgotten, or not recalled as easily. This study predicts that the recency effect is stronger than the primacy effect, because the information that is most recently learned is still in working memory when asked to be recalled. Information that is learned first still has to go through a retrieval process. This experiment focuses on human memory processes. By theory, the subject should be better able to correctly recall the letter when it was presented in a word than when it was presented in isolation. This experiment focuses on human speech and language. After the distractor task, they are asked to recall the trigram from before the distractor task. In theory, the longer the distractor task, the harder it will be for participants to correctly recall the trigram. This experiment focuses on human short-term memory. After being presented with the stimuli, the subject is asked to recall the sequence of stimuli that they were given in the exact order in which it was given. In one particular version of the experiment, if the subject recalled a list correctly, the list length was increased by one for that type of material, and vice versa if it was recalled incorrectly. The theory is that people have a memory span of about seven items for numbers, the same for letters that sound dissimilar and short words. The memory span is projected to be shorter with letters that sound similar and with longer words. The participant is to identify whether there is a green circle on the window. In the "featured" search, the subject is presented with several trial windows that have blue squares or circles and one green circle or no green circle in it at all. In the "conjunctive" search, the subject is presented with trial windows that have blue circles or green squares and a present or absent green circle whose presence the participant is asked to identify. What is expected is that in the feature searches, reaction time, that is the time it takes for a participant to identify whether a green circle is present or not, should not change as the number of distractors increases. Conjunctive searches where the target is absent should have a longer reaction time than the conjunctive searches where the target is present. The theory is that in feature searches, it is easy to spot the target, or if it is absent, because of the difference in color between the target and the distractors. In conjunctive searches where the target is absent, reaction time increases because the subject has to look at each shape to determine whether it is the target or not because some of the distractors if not all of them, are the same color as the target stimuli. Conjunctive searches where the target is present take less time because if the target is found, the search between each shape stops. One of the oldest paradigms is the leveling and sharpening of stories as they are repeated from memory studied by Bartlett. The semantic differential used factor analysis to determine the main meanings of words, finding that value or "goodness" of words is the first factor. More controlled experiments examine the categorical relationships of words in free recall. More dynamic models of semantic networks have been created and tested with neural network experiments based on computational systems such as latent semantic analysis LSA , Bayesian analysis, and multidimensional factor analysis. The semantics meaning of words is studied by all the disciplines of cognitive science. The term comes from the root word meta , meaning "beyond". On the Soul and the Parva Naturalia.

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7: Jean Piaget's Theory of Cognitive Development | Simply Psychology

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8: Cognitive Structures: What They Are and Why They Matter

an acronym for "Adaptive control of Thought-Rational"; this approach uses a series of network models in an attempt to account for a wide variety of tasks including memory, learning, spatial cognition, language, reasoning, problem solving, and decision making.

9: Analogy and Analogical Reasoning (Stanford Encyclopedia of Philosophy)

Logical positivism and logical empiricism, which together formed neopositivism, was a movement in Western philosophy whose central thesis was verificationism, a theory of knowledge which asserted that only statements verifiable through empirical observation are cognitively meaningful.

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