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The Problem of the Development of the Intellect and Learning in Human Psychology

Among the problems most studied in psychology is that of skill and intellect in humans. Nonetheless, a number of essential difficulties are revealed with particular acuteness in this problem. These difficulties are involved in any attempt to address the issue of the formation of complex psychological processes in man from naturalistic positions.

Theories of skill and intellect usually fall short in that both processes are viewed in abstraction from overall types of relations between the subject and reality, and either directly contrast or equate them with one another.

In fact, over the course of many decades (beginning with early research into memory), *skill* was treated as a mechanical imprinting as a result of the coincidence of extensive repetition of neural excitation; the problem of comprehending the relationship between the individual and reality was eliminated, and in classical studies comprehension itself was carefully removed from experiments. Therefore, we felt that the requirement of maximal noncomprehension

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was more important for the correct study of skill, and the call to leave the process under study “schrecklich sinnlos” [awfully meaningless in German] held sway for a long time in experimental research into memory and skill. The problem of skill was increasingly deprived of its character as a psychological problem, becoming a problem of analytical physiology. One of the most important psychological processes—learning—thereby began increasingly to appear only as an elementary physiological phenomenon.

On the other hand, a number of brilliant studies laid the foundation of psychological thinking at the beginning of our century, separated intellectual activity into a special class of psychological processes, and attempted to view their essence in the “discernment of relations,” “discoveries,” or “intentional experience,” opposing any experiencing.

Psychologists engaged in studying intellect isolated this primary comprehension process from any skill or learning with the same degree of care as researchers of memory and skill had isolated themselves from comprehension. If in the study of skills the complex problem of learning was deprived of its specifically psychological character, in the theory of intellect this problem disappeared entirely.

It is easy to see that this rupture between skill and intellect—one of which was seen as an elementary associative process while the other was seen as the highest form of psychological activity (higher mental functions)—is not just a coincidence.

What we have here is merely the replication within a specific problem of the crisis in psychological thought when it attempted to approach an explanation of the entire complexity of the actual human psyche based on narrowly naturalistic positions, reducing elementary psychological processes to separate physiological deductions and leaving higher processes without adequate scientific explanation.

The theoretical basis of this crisis consists in the view of the psyche as a system of isolated functions innate to the subject and directed by his internal laws, but not arising in the process of the active relationship between the individual and reality.

Nonetheless, it is specifically these tenets that have met with particularly substantive objections in recent times.

Contemporary advanced biological thought based on numerous studies has arrived at the entirely correct conclusion that skills, like intellectual processes, are not original elements from which the complex adaptive activities of animals are built; on the contrary, it can be considered established that both skills and intellectual acts are themselves determined by the development of the objective biological relationships between the animal and his environment and take form depending on the structure of his activity.

Once again, in the history of psychology, after the classical argument on the unity of psychological processes, the problem and the postulate are changing places; the question of how comprehended activity is shaped by intellectual acts and skills is turned around: what form do skills and intellectual processes take in different psychic structures corresponding to different levels of development of the relations between subject and reality, and in what relationships do they enter into with one another at different stages of the development of activity?

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In his classical studies of anthropoid apes, Köhler succeeded in identifying intelligent action in its simplest form. Köhler described the ability to carry out action in accordance with the objective structure of the situation, without preliminary trials and as if autochthonously.* The reproduction of a solution once it had been found in new situations, only in the analysis of which could the connection between intelligent behavior and the animal's experience be revealed, was not subjected to special study by Köhler and was viewed by him as secondary and derivative. Therefore, Köhler's research, which was solid in its main content and which destroyed preconceived notions that the simple mechanism of skill acquisition lay at the foundation of animal behavior, limited himself on the issue of the relationship between experience and intelligence to the direct contrasting of the new facts to the artificial laboratory facts of behaviorism; their actual relationship remained undiscovered.

In order to see these findings in a new light, we feel that they should be introduced into a wider biological context and their correspondence should be turned around: the finding of a sudden intelligent solution (insight), which can later be transferred to a similar situation, must be included in another, more general problem: what is the relationship between this sudden solution to all forms of adaptive activity developed in the animal and in what way does it depend on the possibility of the animal transferring the action?

The transference of action to new conditions that necessitate a modification of the action is a process of moving from one particular situation to another on the basis of discerning in something new that which has been encountered before, and at the same time, that which is specific to the new situation. Such a move can be understood only as the result of generalization, that is, as a specific intellectual process. "Intellectual discovery" is nothing more than the revelation of generalization formed through the animal's previous experience, whether as

*A term used in Gestalt psychology where operations yield spontaneous and automatic groupings.—Eds.

an individual or as a species. The “first” solution to a problem situation is distinguished from subsequent modifications to it only in that it is tied to a relatively broad transfer that is often hidden from the observer and requires a rather significant change in action that developed earlier and that can occur only under maximally favorable combinations of external and internal conditions.

Consequently, intelligent acts are not independent of experience; on the contrary, they are tied to it in the closest possible way. The importance of this, however, was underestimated by Gestalt psychology, which, approaching the internal structure of action as a whole, nonetheless continued to understand experience as a series of purely external influences and was not able to place the problem of its formation specifically in the process of generalization.

Nevertheless, in each separate instance, generalization determines the levels and possibilities of activity, of which generalization itself is a product.

A number of special studies of the formation of intelligent operations through the process of transference carried out in one of our laboratories demonstrate that the process of generalization is not only revealed in transference but also is subject to development and formation in transference. These studies, which we will address below, brought us to the conclusion that generalization, typical of the active subject, develops, and that its type depends on the general type of activity of the subject, which realizes his relationship to reality.

This proposition relates equally to activity that takes the form of intelligent behavior and to behavior taking the form of skill. Both the former and latter kind of behavior can be understood through analyzing the type of relationship the animal has to reality, its type of generalization. This is why contrasting skill and intellect seems to us to be incorrect.

Actually, in the early stages of biological development, skill and intelligence are generally indistinguishable from one another because even on the lowest levels of psychological life there is no such thing as skills that are applicable to only one, single unchanging situation, while on the other hand, the very process of transference of actions depending on generalization is limited by the relative simplicity and homogeneity of environmental conditions. Therefore, only in higher animals, given their complicated relation to the environment, can we observe the special fact of actual modification of actions in new situations, as well as the clear fact of automation of actions, that is, the fact of the formation of skills. The higher the level of development of generalization, and, consequently, the deeper the connections and relations to reality in them, the broader the possibilities of transference and modification of action, the clearer both of these facts can be distinguished, and the more opposite to one another they appear to us. In reality, however, their interconnection is preserved even at these higher levels, under conditions of their subsequent complete differentiation.

Our studies of motor skills in humans (Asnin's experiments) showed that a completely mechanical skill can be formed only if, using artificial means, it is possible to separate the problem that the subject is conscious of in these experiments from the problem that the subject is objectively carrying out, that is, if the fixation of the action and even the very fact of the repetition of a certain combination of movements will not be noticed by the subject. Comparing such an artifact with skills acquired under normal conditions of fixing a system of movement—conscious movements (generalized by the subject)—we saw their differences. In the first case, the skill is formed quite slowly, remaining completely rigid until there is an awareness of it, and there is a negative effect on the formation of a skill that is close to transference in terms of its connections. In the second case, the skill is formed much more quickly, is plastic (transference of skill) and easily transformed into a skill that is similar to it in terms of the makeup of its movements. Control experiments conducted in one of our laboratories on a patient with brain damage (A.I. Rudnik's experiments) showed that given localized brain damage that makes complex generalization impossible, complex automatism is lost and the quick teaching of conscious skills turns out to be impossible.*

Other studies by us (experiments by Zaporozhets, Bozhovich, and others) allowed us to uncover another side to the connection between skill and intelligence. In these experiments we placed young children in the situation illustrated in Figure 1 [the figure is missing from the manuscript].

Target (B), where the subjects—young children—had to take possession in the experiments of things that could not be reached by them directly. The problem consisted in bringing the object closer to them by moving a lever away from them. The studies, conducted according to this method and methods essentially similar to it showed: (1) that the process itself of "trial and error" is always a comprehended process; (2) that generalization of action emerges in this process, that is, in acting, the child determines a certain principle of solution, which he uses in subsequent repetitions of this and similar problems (even if it turned out to be complex and inappropriate); and (3) that this very generalization of action determines the subsequent fate of the process, and it is at times very conservative, not only repeating, but being transmitted without change to others in the control, pair experiments, where our subject took on the role of instructor.

The fact that the functioning of skills in a person is determined by the degree of awareness "of the rule" of action is shown by an analysis of the process by which children master complex orthographic skills undertaken in one

*This last phrase is crossed out with a pencil in the manuscript.—Eds.

of our laboratories; it is important that the actual awareness occurs here on the basis of practice, that is, through the same activity in which subsequent automation of the orthogram takes place.

The key to understanding intellectual processes (and to understanding the laws of their functioning in the form of fixed operations) is always the way that the subject's activity appears to his consciousness in a given situation, that is, the structure of that generalization crystallizes activity in itself.

The outstanding works of our own L.S. Vygotsky (and after him, works by other authors, in particular, studies of the development of generalization conducted under the direction of one of us) were devoted to the process of the development of generalized reflections of reality, in which the development of consciousness as a whole also finds its particular psychological expression.

The main methodological procedure that we used in these studies consisted in the study of transference. A special feature of our "transference method" was the fact that successive situations through which the subject proceeds make it essential each time to change the action itself. In its simplest form this is expressed in the "variational problem box" we constructed, a diagram of which is introduced in Figure 2 [the figure is missing from the manuscript].

The fastening lever of this bolt is enclosed in front by glass in such a way that it is possible to reach it only through one of four openings—1, 2, 3 or 4. Because the construction of the box allows the place of the lever that fastens the door to shift (at points a, b, c or d), and also allows for the closing of any opening from the inside, it is possible to present eighteen separate problems (including the control problem) that require transference of the solution at various levels.

In contrast to classical methods of studying intelligence, the solution of the first problem is directly shown to the subject. The experiment itself begins with the subsequent problems, which are selected in such a way that the movement from each previous group of problems to the next requires a more thorough understanding of the principle of the fastener.

If for a developed consciousness all of these separate problems appear to be merely various modifications of a single problem, for a child of age two to three years, as the experiments demonstrated, these problems were perceived as being different. The fact that it was possible to solve them not on the basis of a chance correct movement points to the "transference level" attainable by a given subject and in this way characterizes his level of generalization of the experience of action in a given situation, that is, the extent to which the mechanical relations of the situation are reflected in his consciousness. Using this method with a change in sequence of the series of problems, makes it especially and clearly evident that generalization forms specifically in the process of transference, and that the

solution of each subsequent problem of the series, enriching the generalization, thus expands the level of further transferences.

These and similar laboratory experiments, taken together with more general factors, allow us to propose that different transference levels correspond qualitatively to different structures of operations, and, consequently, to different structures of generalizations at different stages of development. This leads us to the recognition that the development of intellectual processes can be characterized as one of various stages and to a general doctrine of the formation of consciousness.

* * *

As we have seen, intellect is not originally a separate psychological ability; intellectual operations arise and develop over the very course of the development of relations between the subject and reality, over the course of the development of his activity. Different forms of intellect can also be understood as a product of different stages of this development.

Historical analysis leads to the necessity of first distinguishing between the stage of biological intelligence in animals and the stage of its historical development in humans. Without studying the development of intellect in the world of animals, which is simply a *prehistory* of human thought, we must simply indicate the dividing line that fundamentally separates them.

At the same time as sensory generalization, even in higher animals, allows the transference of action to take place only within the bounds of direct, surface connections, man, reflecting deeper connections in relation to reality, moves well beyond the narrow confines of the "sensory field" in his intellectual operations. This distinction is determined by the basic fact that man has a fundamentally different relationship to the natural environment than animals do. This specific human, active attitude toward nature arises in the process of labor, which, in Engels's well-known words, "created man himself."

With the appearance of labor, the individual's previously direct connection with nature begins to be mediated by tools, and a new system of relations to other people objectively takes shape in this new form of activity. But in this process, the generalizations that reflect the relationship of the subject to reality are qualitatively restructured, and, consequently, the structure of the intellect is also altered.

Under conditions of objectively mediated labor activity, human speech emerges, which has a designating, objective nature and replaces the expressive voice reactions of animals; beginning to reflect objective connections of reality, it opens new possibilities of generalization and becomes a powerful

tool of thought. Human cognitive, verbal awareness emerges, an element of which, in the words of L.S. Vygotsky, is *meaning*, that is, the generalization that stands behind this word; in it appears the specific unity of human thought and speech. The subsequent development of the intellect is also tied to its fate. This takes place over the course of the sociohistorical process and reflects all new forms of specifically human activity and all new forms of generalized reflections of reality in the human consciousness.

Experimental studies of L.S. Vygotsky [published posthumously book, in *Thought and Speech* (Myshlenie i rech')—Eds.], in which, in the process of actively using an artificial word, subjects had to form corresponding generalizations, allowed the revelation of the main fact of speech development: it turned out that *the meaning of words develops* and that at different stages of psychological development, the generalization represented in a word has a nonuniform internal structure reflecting the general structure of consciousness overall. The structure of meaning turns out to be the structure of the intelligent operations that crystallize in it.

Initially, when child activity is oriented toward the satisfaction of primary needs, it is immediate and directly practical; thus, his intellectual operations coincide with his actions overall, his generalization directly correlates to empirical reality, and its structure reflects the logic of primitive concrete action. This is the first stage of child intellect.

However, beginning with school age the first differentiation of activity occurs, the separation of the action itself from verbal intelligent operations. Generalization, represented in the meaning of a word, begins to separate from the logic of action; a period of specifically human forms of play begins. A characteristic feature of play, as studies begun by Vygotsky and continued by D.B. Elkonin showed, is the creation of imagined (supposed) situations, the transference of verbal meanings, and the creation of rules. Specifically in this period, the basis of those generalizations is established—at first, syncretic, and then outwardly integrated—reflecting the successive stages of relations between the child and reality. In this period, intelligent “egocentric” speech also emerges and verbal intellectual operations develop that reflect evident—subject to immediate perception and action—connections to reality and that with difficulty go beyond the confines of their direct reproduction.

The subsequent development of verbal intellect takes place in connection with the change in the structure of actual speech activity and the significant change in the structure of generalization. A special form of speech emerges—internal speech—and intellectual operations themselves, definitively separating from direct action, become an independent type of “theoretical activity”; emerging for the first time on the threshold of school age is a new type of

generalization that allows the actual meaning of a word to become an object of consciousness; actual discursive thought is born.

Here, again, the structure of generalization changes significantly: meaning begins to generalize facts of reality not directly, but through the medium of preliminary generalizations; thought emerges that, in a complex hierarchy of concepts, is in a state capable of reflecting the deeper and more essential connections and relationships of reality. Human thought reaches its highest form and increasingly goes beyond the confines of direct experience.

We have only been able to outline the stages of the changing forms of the relationship between subject and reality; each has its own dominant form of intellectual operations, the place that this operation occupies in the overall structure of activity, a characteristic structure of generalizations, and, finally, the interrelation between the psychological processes that carry out this activity during separate stages of development.

Study of the development of human consciousness leads us, thus, into a circle of rich and complex forms and special functional features of human intelligence.

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A proposition about the role of generalization in the structure of psychological processes allows us to approach one of the most important questions in human psychology—determining the role played by *education* in the development of consciousness.

It is most likely not correct to think of human education as the mechanical formation of skills. Everything that we know on this subject (including the above) leads us to view education as a process that significantly changes forms of activity; in the process of generalization and education, the child acquires speech, masters advanced concepts, and relates to reality in new, indirect ways; education becomes the core of human-specific forms of psychic development.

In studying anthropoid apes, Köhler has noted an interesting fact: it turns out that the possibility of *imitation* in monkeys goes very little beyond the confines of their own actions and that the animal cannot be taught using imitation in the specifically human sense of the word, that is, to independently solve a number of more complex problems in the future. In this, the behavior of monkeys is radically different from the behavior of the human child.

From the very start, the behavior of the small child is tied to association. In observations of young children it is possible to see that when they have difficulty in solving any problem, they turn to an adult for help; his independent behavior is helpless from the very beginning—however, his subsequent strength

lies in this. In entering into association with adults, resolving his difficulties with their help, the child develops specifically human forms of behavior. The operations that he first carried out in association with adults are later performed through his own psychological operations. Observations of how, in the early stages, adult indicative gestures enter into the structure of the voluntary attention of the child and of how from cooperation and imitation forms of his active action are born demonstrate the role association plays in the origins of complex forms of independent child activity.

Very early, however, this child association takes on complex forms; it ceases to resemble affective contagion, typical of infants, and is tied to speech, which the child first perceives and then begins to use himself. This fact reflects a major turn in the child's psychological development.

The human word, being a medium of association, always carries the function of generalization, which provides the child with the possibility of having adult experience in its most general, historically established forms, and, in later development, to move on to more complex forms of relating to reality.

The social genesis of verbal thought and its influence on the development of the psyche has served as the subject of an entire series of special studies.

In his observations, Vygotsky showed that so-called egocentric speech, described by [Jean] Piaget, is a stage in the transition from communicative speech to internal speech and plays an intellectual role that nevertheless always remains tied to association. In a child of age four to five years, it was sufficient for the solution to a problem to pose difficulty for the coefficient of "egocentric" speech to increase twofold; nevertheless, it was sufficient to decrease the possibility of association of children, depriving them of the illusion of mutual understanding (for instance, by placing a child in the company of deaf children), or to weaken social contact (for instance, seating a child far away from his peers), and the coefficient of "egocentric speech" fell several times over. "Egocentric" speech proved to be a stage in the development of the intellect of the preschooler, translating forms of the collective "interpsychic" behavior into individual, "intrapsychic" forms.

These facts turn out to be typical, however, for all child psychological development. The concept of simple "maturing," according to which the environment only modifies what nature has endowed, as the concept of skills instilled by the environment along the lines of conditional reflexes to "social irritants" both turn out to be equally inadequate for expressing a complex and specific process of child psychological development. Careful observation shows that it is not the transition from individual forms of behavior in the child to social forms, but, more likely, development on the basis of increasingly complex social forms of child behavior of complex individual activity that is the

typical path and the most important condition of psychological development. Education, beginning well before preschool age, enters intimately into the structure of complex psychological processes, moving them forward and creating its specific human core. It was observed in a series of studies conducted in Vygotsky's laboratories that in communication and imitation the child goes well beyond the bounds of his independent activity and thus, in cooperation, a "zone of proximal development of the child" emerges. These studies led to a number of important theoretical and practical conclusions.

It turned out that in evaluating the child's mental development, it was especially indicative not just that he independently solves the tests he is presented with, but how far beyond the boundaries of his independent solutions he can go on these same tests with the aid of the experimenter. Indexes of the "zone of proximal development"—attained by [L.S.] Geshelina using this method in studies of mentally retarded children, by A.I. Mironova on identical twins educated separately (in both cases using Koos's tests), and by D.N. Uznadze, who used it systematically in evaluating the development of child intellect—demonstrated the great predictive significance of this technique and led to the inclusion of the ability to go beyond the boundaries of their immediate abilities with cooperation as one of the indicators of potential development in children.

The role of association and education in the development of complex psychological processes does not end, however, at the source of child psychological development. On the contrary, with the transition to later psychological formations, the relationship between education and development becomes particularly rich and the role of education in the development of new psychological formations is particularly significant.

The systematic education of school-aged children can least of all be reduced to the simple mastery of skills; from the very beginning it places the child in new relationships to reality; placing the child in a position where he has to volitionally and consciously relate to his own operations, education creates completely new relationships between his motives and actions and forms the conditions for the emergence of new structures and functional features of psychological processes.

The interrelation of formal education and psychological development can be seen in a cycle of experimental studies tied to the development of *written speech and scientific concepts*.

Observations of the teaching of written speech in elementary school showed all of its significance for the development of complex new psychological formations; its characteristic feature is that verbal processes that are unconscious in early childhood, here, for the first time, become objects of awareness and volitional activity.

The simplest of facts are sufficient to show that a child age four to six years who speaks without difficulty cannot make this speech an object of awareness. To the question “How many words are in the phrase ‘the little boy tripped?’” the child will answer “two,” clarifying that the first is the boy, and the second is the rock that tripped him. The ability to separate a word from a thing and make it an object of consciousness first comes only much later. This fact turns out to be closely tied to another: being unconscious of his speech, for a long time, the child cannot volitionally relate to it, separating word from phrase, sound from word, arbitrarily constructing a monologue, and so on.

Things change radically with the transition to written speech. It is here, in the educational process, that speech becomes an object of consciousness for the first time. The child who is learning to write not only masters motor skills; he learns to consciously and volitionally relate to his own speech, and through it—to his own thought. For this reason, as experiments by L.S. Vygotsky, D.B. Elkonin and S.V. Klintin have shown, in written speech, for the first time, new features for the child appear such as the ability to break down a story into separate thoughts, to volitionally construct a monologue and an argument, and to abstract speech from a situation and volitionally relate to it. In all these qualities, as studies of beginning school age children have shown, written speech is markedly ahead of oral speech. In it, for the first time, a new relationship to internal speech is created; learning to write turns out to be at the same time the development of thought.

Especially important, however, is the fact that in subsequent development, qualities acquired in written speech become qualities of speech in general, and a person develops the abstract, conscious, and voluntary relationship with speech that constitutes the typical feature of discursive thought and raises intellectual activity to a higher level. Analysis of the decline of speech after brain damage, conducted by one of us over the course of several years, shows that under the influence of the pathological process, the first things to be disrupted are these structural and functional features.

What began as a “skill” nurtured from the outside led to the development of a new system of psychological operations that are built and realized on its structure, which is voluntary in its functional features.

The development of essential new formations within the framework of education is manifested as particularly salient in the history of the child’s thought; it has been traced in a series of Soviet studies devoted to the interrelation of scientific and everyday concepts in the development of the child (L.S. Vygotsky and Zh.I. Shif in Leningrad; A.N. Leontiev, A.V. Zaporozhets, P.I. Zinchenko, and others in Kharkov; and A.V. Zankov in Moscow).

In contrast to the works of J. Piaget—who painstakingly isolated his studies

from concepts acquired by the child in school and whose attention was exclusively devoted to spontaneous concepts in the child—these studies were founded on the thought that concepts in school are not assimilated as ready-made skills, and that their process of development does not end at the moment of their assimilation, but rather begins with it. This assumption prompted the comparative analysis of the course of *everyday* concepts (acquired outside of formal education) and *scientific* ones (acquired through the process of formal education); it led to the conclusion that their psychological development is constructed in entirely different ways.

As the studies showed, the central distinction of both types of concepts lies in the dissimilar relationships between their usage and their realization. The well-known proposition that the child can use an everyday concept in his activity without being able to express it verbally is reversed when it is a matter of concepts established in school. Here, as a rule, a child masters the verbal expression of a concept before he is ready to apply it adequately to the entire wealth of facts of reality that are generalized within it. Only in the process of subsequent development, once they have passed through the phase of idiosyncratic verbalism, do they become full-fledged forms of thought. However, the weakness of scientific concepts is tied to their strength. It is with scientific concepts that the characteristic awareness of discursive operations and the voluntary relation to complex acts of thinking develop; it is in them that the new structure of intellectual processes develops—a critical aspect of which there are relations of unity—placing concepts within complex, hierarchical subordination and making the development of a full-fledged discursive process possible.

In all of these regards, scientific concepts are notably ahead of everyday aspects; in an experiment involving the completion of a phrase ending with the conjunction “because” or “although,” sentences with school content were two years ahead of everyday sentences (experiments by Shif). It turned out to be particularly important that everyday concepts, providing a basis for scientific ones, themselves depend on them in their subsequent development; only the presence of systematic “scientific” concepts promotes the elevation of everyday concepts to full awareness and the discursive application that they acquire only at the end of the school age.

It is easy to see that the profound process of intellectual development begins from a condition of scientific concepts; education and development are again intimately connected—it is this connection that creates the complex and contradictory process of psychological development that so distinguishes it from the development of animal behavior. In this process, *thought* takes increasingly complex forms, and through education, increasingly enters into connections with historically established human experience, and comes to know

objective reality with increasing breadth and depth; in it, *education* becomes increasingly mediated, increasingly intellectual. Here intellect becomes less and less subordinate to the laws of the immediate field, while a “skill” (as our special studies showed) displays less simple dependence on its laws of memory.

Having developed out of initially undifferentiated forms of relations to reality, only in man, with his historically established forms of consciousness, do skill and intellect enter into the relations of a higher unity that comprises the specifically human core of psychological development and allows man, in mastering nature, for the first time to become master of his own conscious activity as well.