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### Agency in Education for Sustainable Development

#### Abstract:

The tradition of education looks at the child as learning and developing, whereas education for sustainable development (ESD) calls for children to also play a role in shaping the environment, to exercise agency in shaping the life of others too. Children should be able to test and apply the principles underpinning ESD, not just to learn, but also to practice their agency in ESD. A balanced amount of openness is needed to allow educators, children and families to take part in the development of their community, that is, without losing the delicate existing structures that have been built up through the years. In the paper, a theoretical model for building a balanced pedagogy is proposed. In the model, it is the interaction between the organism(s) and the environment which is studied. When the organism (child) is changing, the interaction with the environment is about to change too, which, in turn, changes the environment further. Here openness and change do not have any absolute value.

Keywords: Education for sustainable development, accommodation, assimilation, adaptation, agency

# Introduction

Cultural participation is at the core of sustainable development. The standard definition (see Morris 2004) of sustainable development (or sustainability) is that of the Brundtland Commission (1987): "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." As the United Nations' Commission on Sustainable Development (1996) points out, it should be important to reorient education to address sustainable development. The alternative to this, to create an entirely new discipline and try to find room in already crowded timetables and create teachertraining courses based on a nebulous concept, would have been a tremendous waste of resources. (United Nations 1996.) The reorientation should include the very idea of education and learning. In this article the needed definition for education and learning is considered.

As McCormick, Mühlhäuser, Nordén, Hansson, Foung, Arnfalk, Karlsson and Pigretti put it, education for sustainable development is more than education *about* sustainable development. It is increasingly recognized that rather than to focus on the transfer of knowledge, education *for* sustainable development needs to enhance the capacity of individuals and organizations in dealing with change. Learning about how to influence systems and participate in decisions are, moreover, the underlying goals of education for sustainable development (see McCormick, Mühlhäuser, Nordén, Hansson, Foung, Arnfalk, Karlsson and Pigretti 2005).

Young children need secure and sufficiently permanent surroundings for a balanced development. Long-term relationships and good daily routines are foundations for a healthy childhood. On the other hand, our world changes faster every day. In consequence, children must have early experiences of some degree of change in order to adapt to the processes of change. The more used the children are to participating in the processes of his/her surroundings, the more prepared they will be for participating also as adults. (See Reunamo 2004.)

In this article, our relationship with the environment is divided into two continuums. Firstly, the child and the environment are examined on the continuum of accommodationassimilation. The central theoretician of this continuum is Piaget. Do the experiences require changes in the structure of the mental outlook (accommodation)? Or are they processed as fitting in with the existing mental structure (assimilation)? Other theoreticians have similar characteristics in their division of the processing of thinking. Heidegger for example (1966) talks about calculative (Piaget's assimilation) and meditative (Piaget's accommodation) thinking. The second continuum is characterized as that of adaptation-agency. On this continuum, change is central. But, is the change caused by action seen as happening through internalization, where the environmental change is not considered? Further, is perception accompanied by the seeds for environmental change?

## Accommodation

In this article, accommodation is defined along the lines of Piaget with the added perspective of agency. Accommodation is a relative concept. Accommodation is hardly ever manifested alone as such, but it is always paired with assimilation. According to Piaget, accommodation is the result of pressure from the environment. (Piaget 1977, 18-19.) In accommodation, the views of humans change, in order to better correspond with the environment. The environment has some element or elements that cannot be grasped by the perceiver. The idea in accommodation is that the environmental structures are absorbed during active interaction in a way that changes the perceiver's schemas and their relations. Accommodation is the process of changing one's mental outlook during the process.

In Piaget's accommodation, only people's mental outlook changes – not the environment. However, we can also consider people's views as changing the structures of the environment, which means that both people's views and the environment change at the same time. For mutual change to occur, constant contact is needed to enable two changing systems (one's mental outlook and the environment) to affect each other. Under these circumstances, children and adults must test the accuracy of their own standpoint continuously in order to persist in the change. Children and adults alike need to assess the functionality of the properties of the changing environment.

We can consider accommodation also from the environment's point of view: The ecosystem on the large scale, for example, must adapt to the pressures for change caused by

the existence of civilization. If the natural ecosystem does not accommodate, that is, if it does not include human civilization as part of the ecosystem, the ecosystem as we know it can collapse or change unexpectedly. On a smaller scale, environmental change can occur from the children's perspective in adults' behavior; adults can accommodate their view to better suit the children's views, in order to make better contact with children. We thus acquire a joint map with children to orientate in the environment together. Such a map with children helps in producing a common path.

In any case, accommodation refers to realism, although it is not synonymous. The environment is seen as primary and it exists irrespective of our outlooks and our observations. Accommodation is characteristic of the physicist's working method. To the physicist the conformity to law and phenomena of the environment are the value indicators of theories and applications. The physicist tries to understand the world (cf. Lines 2000, 15), and since the physicist is in doubt about its underlying nature, he/she therefore performs tests. By studying the effects of his/her tests the physicist acquires support or hints for either the acceptance or rejection of his/her theory. If certainty is secured and other scientists of the same field strengthen the matter through consensus, the new conformity of law in physics has seen daylight. The physicist aims at the concordance of his theory in similar fashion as a mathematician, but his criterion of a good theory is not in the consistency of deduction. It is above all in the agreement and consistency of observations. If a physicist notices a repeated deviation, which is not suitable for the theory, it is a sign of the need to revise the theory.

Not even the physicist is able to look at reality as such, but he/she is forced to anchor the observations in some kind of mental (often mathematical) structure. However, the direction is clear; the physicist often considers the feedback from the environment as the ultimate criterion for the value of schemas. Accommodation is probably not dependent merely on the detector. Let us consider art. Expressionism for example represents the trend in art in which reality, the art object itself, can have the effect of opening itself up to the perceiver (often emotionally). In expressionism, the work contains embedded within the paint itself the meanings which the detector can experience strongly. The contents are found by going into the work and by considering the work empathetically. In expressionism, the communication is often emotional and it has an exposed element, which characterizes it as an art form connecting to live situations. It is the spectator's task to find a similar enough experience to make a connection for understanding and feeling.

Accommodation is also related to perception. Heidegger (1966, 46-56) refers to a similar phenomenon in thinking, which he defines as meditative thinking. Heidegger describes it as a question of thinking about the nearest matters connected to us, that is, to ourselves at this historical moment and, in particular, to this place. Looking so closely can be difficult. It is not putting another layer on the structure. In meditative thinking, according to Heidegger, we are freeing ourselves in relation to things and allowing ourselves the possibility of mystery. Reorientation towards things produces new and often creative processes, which enhances the production of new roots. Piaget is also interested in the development of thought, but not in its productive nature. In his genetic epistemology, Piaget primarily considers (cf. Piaget 1970) the developmental and historical nature of schema-production, not the schemas' production-history. Heidegger, on the other hand, refers to the possibility in which thinking can be used to create new contents. In that case accommodation is not a one-way process towards assimilation. Rather, one can produce previously unheard of and unparalleled outlooks, which have previously unseen effects in the environment.

## Assimilation

Assimilation is the incorporation of given data into an internal structure (Piaget 1977, 18-19). Piaget is not very specific in his definition about assimilation, but at least we can say that in assimilation environmental actions are absorbed in such a fashion that they do not alter the already existing schemas. In assimilation we can use our schemas during interaction with the environment. We try to fit the environment into our own mental outlook. In assimilation it is not a question of processing, altering or organizing these outlooks. Children and adults acquire much new information by assimilating new knowledge from the environment. This information will remain unconnected or it will fit into a known structure like a piece in a jigsaw puzzle. Assimilation means the application of schemas in the course of events.

Structuralism and poststructuralism relate to each other in much the same way as do accommodation and assimilation. The structuralist sees, at one level or another, the underlying structure of the whole and its relations. The structuralist is actively creating a scheme of the environment as the interaction unfolds (accommodation). The product of working with the experiences is successful accommodation; we might have a more accurate or profound idea of the environmental phenomenon. When a model is wholly or partially finished, we might be satisfied with it for a while and we consume it, where appropriate (assimilation). Soon enough, however, the model will prove incomplete, controversial and insufficient. New ideas emerge, competing with each other. We enter the complicated and scattered world of poststructuralism. If we want to reach mutual understanding again, we have to open up to a dialogue with other actors. The idea of equilibrium is brought to the fore in Figure 1, below.



Figure 1 The relationship of assimilation and accommodation

The ideas in our minds do not always fit in with each other, which means we have two or more views with contradicting relationships. All these contradicting views are part of our way of seeing things, but depending on the situation and our own interests, we use only one view at a time. If we use two views at the same time, it looks like two different things are happening at the same time. The two conflicting things happening in the same situation, however, remain separated during assimilation.

However, assimilation is not just about incorporating environmental elements and interaction into our existing mental structures, because assimilation also means that we use the environment in ways that our outlooks suggest. A child can use the idea of a stick to substitute that of a branch of a tree or a Lego brick. We relate to things according to our views and thus our views have an effect on our actions. When we hold on to our views and beliefs during the process, we work with the aspects of the environment that we see and that affects the course of events. As we use the environment through our visions of it, the environment is challenged by our visions. If a machine is seen as expendable, it may be destroyed more easily. If the machine is not familiar (thus not fitting into any of our ideas about reality), we may not see the machine at all. If we look at the machine with the eyes of a

museum conservator, the historical value of the machine may be considered and the machine can be conserved. The same object or entity can be seen in many ways, which may lead to environmental change, in this case regarding the future of the machine.

Assimilation refers to idealism. According to Kant our mental outlooks alter our very perceptions. As our main channel to reality, we have only our impressions. Reality cannot be perceived as such. Theoretical mathematics is a good example of a way of thinking not directly exposed to physical reality. In mathematics we can define the truth by deductive thinking, if only our axioms on which our thinking rests, is truthful (whereby the existence of truthful axioms is questionable). The same goes for logical thinking to a lesser degree. Kant, for example, described Euclidean geometry as an example of an idea that is necessarily true in spite of our perceptions (cf. Barrow 1999, 28). In mathematics, the axioms do not need to have correspondence in the real world. For some basic assumptions, huge mathematical systems can be produced, without any new feedback from the environment. In that sense, it is astonishing that these abstract ideas, which seem to be independent of all experience, seem to be so applicable to phenomena in the real world. The indifference shown by many specialized mathematicians for these environmental requirements has, nevertheless, produced many usable tools for solving problems in the real world. Which is then the right path, idealism or realism?

Pure assimilation discards the constraints of reality. In assimilation the mental outlooks are adapted as needed, and sometimes they help us in our endeavours. Different views can exclude each other; they can exist without interfering. They may seem to have nothing in common, because they may develop separately, and still they can be used within the same situation. Ideas seem to have an independent character. On the one hand, we are locked into the situation we are in right now. The pure development of ideas without practical work alienates us. Indeed, we can build thinking systems, which manifest the brilliance and power of thought, but through concentration and refinement, our ideas lose their relevance to everyday functions. Assimilation thus also means using the ideas in practice as well. When we see a person assimilating (using) a different reference system, his/her actions seem peculiar to us, even though the system may be highly refined and even though he/she is acting consistently.

Heidegger (1966, 45-46) describes the same kind of thinking when he talks about calculative thinking. In calculative thinking we can have far-reaching plans and aspirations in different fields of life and these undertakings are tied to predefined suppositions. In this way, thinking remains calculative even though it does not consider numbers. When we have reliable presuppositions, we can count on them. And when we can count on our presuppositions, we can be sure to achieve our goals.

# Adaptation

According to Kitchener (1986, 54-61), adaptation serves as the equilibrium (balance) between assimilation and accommodation. Accommodation is the moulding of the presuppositions of our outlooks to make them ready to be used in the incorporation of new objects and in new projects. Assimilation is the use of accommodated mental (or psychomotoric for that matter) representations. Adaptation is here conceived as the dialogue between internal outlooks and our perceptions. Figure 2 clarifies the idea of accommodation and assimilation working together to open up new possibilities for the actor.



Figure 2 Adaptation mediates within the existing environment for better adjustment.

Piaget is interested in the formation of knowledge in the course of interaction. Thus, Piaget's interest lies heavily in knowledge formation through accommodation and assimilation. Nevertheless, as we discussed, in assimilation (mathematics), the pure deduction of ideas can be very efficient. Some models are applicable in many situations.

According to Kitchener (1986, 8-9), to adapt is to seek equilibrium between the organism and the environment. As the equilibrium is the balance between ideas and perceptions, we can perceive only those kinds of things that our ideas permit. The mental images can remain separate and yield to data overload, if they are not actively connected. If knowledge has no equivalent that has been lived through, it cannot be applied consciously. Equilibrium here means that mental images and stimulus cannot operate without each other for long; indeed, they feed into each other. We find an internal dissonance or an external deficiency, which requires either our internal change or an environmental change.

In Piagetian adaptation, thinking becomes reversible in the end. Although perceptions are not reversible (because time is not reversible), ideas can be seen as being reversible. Reversibility presumes the internalization of perception to thoughts, those inner models of perceptions, which have been worked on. When our thinking system is ready, and when we have gathered experience enough, and worked on the idea, we can establish an inner resemblance of the action or the underlying principles. Only then are we ready (according to Piaget) to use the principles in our thinking operations, group and combine them, and make these operations reversible. One plus one is two. Two minus one is again one. As we do not consider the environment changing, the perceptions and images can sharpen endlessly. Because Piaget was interested in the internalization of permanent structures, the agentive and dynamic nature of mental images must be considered separately.

# Agency

In the real world, knowledge is relational (cf. Heidegger 1988, 14). Knowledge must always be evaluated in relation to something else, which means that separate absolute knowledge cannot be found. Our knowledge presupposes some background information. In addition, entropy is part of this background experience, such as when we spill porridge on the floor; the porridge will not fly back to our plate. We can fuse separate pieces of clay together into a single lump, but without work these cannot be separated again. When we work with clay, one plus one can be one. With enthusiasm and work a piece of clay can be almost anything. When we do something, our actions often have an effect on those things, and we might even see the consequences of our actions.

Agency refers to action that has an effect on something. When we in the real world influence environmental change, it does not self-evidently restore itself. To restore the environment to its original state, we have to work with it again. However, as we are restoring

the thing we have changed; our interaction causes further changes in the environment, because we do not act in an endless vacuum. To get things back as they were requires our resources, time, and energy. In a broad sense, agency involves the real world consequences of actions in the environment. Figure 3 clarifies the distinction between adaptation and agency.



Figure 3 As people change, the environment can also change.

Change is something other than doing more of the same. Change refers to the conditions of actions. When something changes, the presuppositions of the action change. The effective causes of the action alter. We can say that the motive or motives of action re-orientate. As we look at things adaptively, the action looks symmetrical; the effects of the action are apparently reversible. In agency, however, the effects alter even the conditions of the course

of events, which means that the process is not reversible. In agentive perception, things are connected to each other in such a way that changing one alters the others. In the real world, working on things results in a new composition, and the course of events is guided by probability.

The shaping of things acquires a direction. When things move according to our liking, we can talk about development. Sometimes we talk about development also when we talk about the organizational process of complication and hierarchy. According to Piaget (1978, 159) there are two kinds of evolution, an organizing evolution and a modifying evolution, which means that actions, in this case, can get more organized or differentiated. Piaget is interested mostly in this type of organizing evolution. We must also consider the possibility that the complexity of things may lead to the disorganization of these things. There is no unanimity, as to the underlying cause or direction of change, but for our purposes in this paper, it is enough to say that agency induces change through actions. To anticipate the effects of action we need some familiarity with the actions at hand. The further ahead we anticipate agency, the more likely it will be that the turbulence of the environment will bring forward unfamiliar surprises and thus prohibit the realisation of our visions.

### Adaptive accommodation (Piaget)

Adaptive accommodation is a central point of reference in current theoretical and practical discussion about childhood and the development of children's thinking. The pivotal theoretician in this regard is Piaget, whose ideas originate in biology (cf. Donaldson 1983, 151-153). Piaget studied the variation between species and their ability to adapt in different environments. It is typical in Piaget's thinking, that species and individuals develop as they adapt to the environment through active and self-regulating processes. The Piagetian idea of

evolution originates in his study of the development of species. (Cf. Noschis 1988, 10; and Donaldson 1983, 151-153.)

Piaget sees us as self-regulating systems, which use mental images as tools in adaptation. We experience our tools sometimes as being inadequate, which leads to disequilibrium. After such a discrepancy we need to reshape and actively reorganize our mental images. Thus our equilibrium between learning and applying improves. (Cf. Piaget 1988, 21-23; and Turner 1975, 14-15.) Equilibrium means that both accommodation and assimilation are present in our orientation. In accommodation, better equilibrium means the successful reshaping of our structures in a given environment.

When we concentrate our attention in the organism's change, the environment looks stable. The theory of child development has examples of the consequences of this type of concentration. Because the environment exists, the task is to become acquainted with it and to cope with it better. Further on, Piaget confines his attention to genetic epistemology, which crystallizes the question: How do the representations of environmental operations become internalized? Figure 4 describes this point of view.



Figure 4 In adaptive accommodation the orientation is towards the environment, so the environment does not change.

In Piagetian structuralism it is central to look at the emergence of the mental structure, which eventually also reveals the important relations within structures. Although Piaget acknowledges that when the relationship between organism and environment change both actors in the interaction, his tenacious interest in the development of thought leaves the environment as it is, which makes it look static. When we can look at the structures of an organism through static laws, we do not need to remake our cognitive structures every time we encounter a new situation.

When we can rely on the static conditions of events, we do not need to constantly reshape the whole. This is especially important when the structures become more complicated. In a given environment, we succeed the best when we adapt to the pressures it produces. We need to understand the static environment. We look at the environment through the images matched by the meanings produced during the course of our lives. Phenomenology originates from a different philosophical tradition, but it ends up having a similar view of reality as that of Piagetian structuralism. The essence of phenomenology is not to discover the developmental history of knowledge, but rather the phenomenologist is also interested in the developments during the interpretative processes. The phenomenologist is not interested in the environmental change, but in the interpretations which have emerged during the course of events. In this sense, we can say that the phenomenologist studies the accommodative process of interpreting the experiences presented to us. When we study language, meaning, interpretation, and understanding in phenomenology (cf. Niiniluoto 1986, 41-43), different interpretations usually refer to different modes of understanding, not to a different reality produced by that understanding. The experience is important; the experience is interpreted and observed.

### Adaptive assimilation

Adaptive assimilation is here discussed in accordance with a Piagetian interpretation. When discussing assimilation as the fitting of environmental experiences to personal mental structures, and adaptation as the interchange of personal and environmental meanings, adaptive assimilation refers to the application of one's own images in the given environment. The adaptation of the organism is never perfect, which means that the mental images are deficient.

Because Piaget does not discuss the environmental change, adaptive assimilation refers to the use of our own mental images and tools, as best we can in this existing world. Assimilation represents our way of looking at things, not for the factual moulding of the environment. In assimilation, we simply use our mental images as they are. The schemas are closed; they do not change during interaction. Because (in Piaget's view) the environment does not change, our use of two mental images means that we act in two different ways. The purpose of Figure 5 is to capture the essence of adaptive assimilation.



Figure 5 In adaptive assimilation, one's own ideas are applied as such. Ideas do not change the conditions of events.

According to Piaget, it is possible to assimilate new knowledge into the existing knowledge structures without changing the existing structures. Thus, we can have information that is not related in any way and we can acquire new information without changes during the process. As the relations of this knowledge remain unclear, the knowledge is often restricted for use within the specific situation or the specific context within which it was acquired. As fragmented knowledge has different points of reference, so too the relations of knowledge in this configuration do not integrate.

Piaget was more interested in the construction of knowledge, that is, accommodation. As the information accumulates, the schemas can include more and more accurate information on an increasingly specified situation, but as the information accumulates its scope decreases. When there is no pressure to integrate knowledge, the amount of accumulated information can proliferate as long as memory allows. There is no criterion for more relevant or more important knowledge. A human being that has acquired a lot of knowledge through assimilation can have an exact and strict view of the environment, but it would be alienated, as wise decision-making needs the possibility to compare ideas.

As the old knowledge remains in force, new revolutionary views do not result in change but in chaos. In assimilative adaptation, the human view of reality starts to resemble that of poststructuralism (cf. Peters 2001), where the event is on a complicated crossroads of preferences, discourse, needs and social forces. When the whole is not integrated within itself, moral judgements cannot be made across situations. The feeling for good and bad weakens. When something happens, the result is not synthesis but different alternatives and more differentiation. Therefore, evolution does not look like development but merely becoming different.

When we think of Piaget's ideas of development, adaptation and self-regulation, they are different from that of Darwinian natural selection. Piaget did not see himself studying only change, but more specifically development. Development means direction; it has rationality and reason beyond chance. In this sense, we can say that the Piagetian approach differs from the established view of evolution. Thus the answer to the fundamental question, Is change a rational (e.g. adaptive) or Is change based on chance (e.g. natural selection), is still waiting for an affirmation at least on Piaget's behalf. In this context, it is important to notice that Piaget's adaptation and equilibrium as the central points of development rule out chance and chaos from the important factors of child development. This theoretical observation might sound distant from the everyday reality of the practical educator, but it has direct consequences for praxis, for example: for the curriculum. When we concentrate only on the child, the dissimilar and chaotic elements of education are not processed and thus, subsequently, are not integrated into the situation, which leaves the child as an autonomous self-regulating entity without cultural footprints.

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## Agentive assimilation (Aristoteles, Hegel)

Agentive indicates the human impact on something and assimilation is the application of ideas without changing them. Thus agentive assimilation here indicates an environmental change according to a certain view. According to Aristotle, nature adapts to the intention, not on the contrary. Kitchener (1986, 29-36), for example, sees that Piaget's theory, while producing the natural development towards the mastery of reversibility, includes a teleological model. Although Piaget's theory as a whole can be considered teleological, whereby Piaget agrees with the idea that the perceiver has an effect on the course of events, Piaget does not study children's perception as the motor of change, which means that only Piaget's theory is teleological, not his interpretation of human adaptation. According to Piaget, development has a motive, an even more balanced adaptation, but he does not study the production of environmentally effective motives. That is why Piaget is not considered in this case a teleological theoretician. In Figure 6 a simplified model of agentive assimilation is presented.



Figure 6 In agentive assimilation we apply our own ideas in the situation. The conditions of the environment are seen as changeable.

As Vogel (2001, 40) describes, although evolution is based on natural selection, nature often seems to follow a purposeful course of development. The same kind of development or function can manifest itself although there is no interchange of genes. Thick, thorny, leafless plants were developed in the deserts of the old world. They belonged to the same class of the euphorbia, but equivalent plants developed in American deserts into a very different class constituting that of the cactuses. The common ancestor for the euphorbia and the cactus was not thick, thorny, and leafless. In addition, the human eye and the octopus's eye look alike and they function in a similar way, but their genetic heritage is different. (Vogel 2001, 40.) In this sense, we can say that modern genetic research confirms the old Aristotelian view of nature adapting to an intention, motive, or function.

Teleological (Aristotelian) examination and anticipation of the future is important (see Bulajeva, Duoblienè, and Targamadzè 2004, 24). According to Brandstädter (1984) development is affected by culture and, in turn, depends upon the cultural situation. Human actions and decisions both have an effect on culture and are affected by culture. Thus, development is fundamentally reshaped and controlled by action systems. This is not the case only in the development of rules (as in socialization and education), but also individual experiences are important in development. In that case, the individual tries to actively adjust patterns of behavior in his/her own development and to control it. (Brandstädter 1984, 113.)

Hegel's dialectics is also teleological. In Hegel's dialectical model (thesis-antithesissynthesis), human conscience changes during interaction with a conflicting idea, and the result of two ideas (phenomenon, systems) is synthesis, which gives people opportunity to redirect their lives more effectively than before. In the Hegelian tradition, both the environmental systems and people's ideas have an effect on the course of events. Engels describes the model: The basic idea is that the world should not be examined as a finished product, nor our mental images about them, but both are under a process of continuous change. (Cf. Vygotsky 1978.) Vygotsky's situation is much the same as Piaget's. Vygotsky's theoretic orientation (dialectic materialism) includes a teleological model of human ideas as tools for producing new environmental substance, but Vygotsky also centers his attention on the child changing, not on the changes that children's thoughts produce. In his model of proximal development, Vygotsky describes children's learning with the support of a more advanced peer or adult. By working together with others, a child is able to act in a more advanced manner and the child's development is quicker; but for some reason, Vygotsky restrains himself from examining the children's effect on the other, e.g. on the interacting adult.

The innermost truth-value of the teleological point of view is not unanimous. However, that does not mean that it does not have an effect on the conclusions grounded on the basic assumptions of the theory. When teleological thinking is interpreted in such a way that the ideas' real value or nature is situated in the future, things happening right now seem to be inadequately developed. Important things are not located here and now, but exist in the forthcoming future. In a teleological model, events are easily located on a timeline one after the other, from the past into the future. The meaning of the action flourishes fully only later. This emphasizes the importance of human intentions and motives. Our perception organizes the environmental systems, in a way which assists in their planning, organization and control in such an order that facilitates in fulfilling the desired outcomes.

In pure agentive assimilation, the ideas have an obligatory or intimidating effect. The human being that perceives things through agentive assimilation is an engineer, who uses the environment for anticipated results or products. However, intentionality should not be considered too mechanically. As Breuer (1985, 71) puts it, intentionality is a concept, that not only has an effect on development, but also has a genetic nature of its own. In this way, human intentional action can be examined more broadly. As Galperin (1979, 160) observes, the basic method for studying human orientation is to look at the development of that orientation.

#### Agentive accommodation

Accommodation refers to the openness and change in symbolic representations. Agentive here refers to the effects of action. Agentive accommodation refers to the change of both the environment and the mental representations of it. While in assimilation, the representation and action can exist independently, or the image is applied; accommodation refers always to the relatedness of action and the image of that action. The image is not just applied here, but it is open for environmental feedback, that is, it is open to change. In accommodation, there is a mutual contact between persons and the environment. Agentive accommodation is a process, which also results in perceptible changes caused by symbolic representations. Figure 7 clarifies the idea of agentive accommodation.



Figure 7 In agentive accommodation both the mental images and the environment are open for change, which provides an underlying relevance for the agentive schemas.

As Vogel (2001, 31) observes, biological nature must follow the inherited plan. Nevertheless, planning humans can use tools invented by other planners. In this sense, culture and ideas can become the agents of change. It is true that our ideas and perceptions cannot, of course, determine the laws of nature. In accommodation, however, the ideas do not come across as such. When we test our ideas, it causes an environmental change, which can to some extent be anticipated, but as the environment changes, it must be monitored constantly in order to keep up with the changes. Agentive accommodation thus begins to resemble that existentialist spirit of a constant re-evaluation of self in the flow of events. Here, we are approaching the ecological way of seeing nature, wherein it is the change in the relations among all participants which is important. Not only species change, but their relationships with others change (cf. Costall 1986, 11). The whole ecosystem can be triggered in a cycle of change when one part of it changes. The tighter the integration between ideas and actions, the more conscious the change is. In the end, we can say that reality is becoming more conscious

of itself. We could draw an analogy to Hegel's idea of subject and object sublimating together as a result of a historical process.

Karl Popper was interested in the interaction of mental and physical events (cf. Popper and Eccles 1984). According to Popper, by testing our hypotheses and evaluating the effects of this testing we can arrive at an increasingly valid picture of reality. As the perceptions are related to the effects, the actual phenomenon and the truthfulness of it remain unclear. We can get a closer look at the environmental systems by persistent processing. We make new experiments, design new ways to work, and thus our ideas and reality become increasingly more congruent with one another. An important idea in Popper's thinking is that of falsification. According to Popper, we can eliminate wrong ideas as we test them. Still, in fact, there is no fundamental difference between verification and falsification, as the falsification can later also be proved to be as false as any other hypothesis. Therefore, what is left of Popper's idea is the tireless activity of testing, which more clearly manifests the deeper problems embedded in their tightly woven details. The continuation of testing does not eliminate the possibility of mistakes, but rather promotes the interchange between ideas and the environment thereby opening it up for potentially modifying feedback.

According to Popper, the perception of our unending test results is not a mere copy of the environment, but an outcome of a creative action (Popper and Eccles 1984). In Popper's view, theory is always situation-specific and it is related to the historical and cultural process. When we test the properties of new things, our conception has an effect on the tests we carry out. We can, for example, think that the era of steam engines affects our thinking, wherein the focus is on pressure, power, and force. In the era of the information society, conversely, we might rather test our beliefs through the lenses of information processing. Focus on knowledge produces many results concerning knowledge. When we look at people as data processors, our perceptions are selective. As we work with and elaborate creatively different

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types of information technology, this focus escalates the cultural changes as well as our ideas. Thus, when our views and environment integrate simultaneously, we accommodate agentively.

Popper (Popper and Eccles 1984, 210) defines cultural evolution as a possible result of the emergence of mind through natural selection. Experimentation and testing produce new content. Sometimes the perceptions remain inconsistent; sometimes they integrate into a larger whole. A small thing gets more complicated and the content becomes richer. Testing, in this light, requires creative new ways to look at things, which further escalates the diverse and abundant interaction. Thus, a simple thing can reveal itself as an endless source of potential. Creative processes are often inductive and cumulative.

Fröbel tightly interwove the aspects of perception and process. Both Fröbel's and Piaget's thinking have been influenced by the evolution of nature. When Piaget looks at the development of knowledge processes in the environment, Fröbel sees the knowledge processes changing the environmental development process itself. According to Fröbel, life is an evolutionary process, and education enriches this evolution. Human beings thus discover a more profound idea of their own evolution and, in such a manner, the idea can become an evolutional property itself. (cf. Curtis & Boultwood 1958, 374-375.) Figure 8 summarizes the basic suppositions here presented.



Figure 8 Different views of the relationships between perception and environmental change.

We need to redefine sustainable education and sustainable learning. Sustainable education

should include producing culture together with children. Sustainable learning should thus

include finding ways to consider the effects of actions.

#### References

- Barrow, J. (1999) *Lukujen taivas. [Pi in the sky]* Fälth & Hässler, Smedjebacken: Art House Oy.
- Breuer, K. (1985) Intentionality of perception in early infancy. *Human development* 28/2, 71-83.
- Brundtland, G. (ed.) (1987) *Our common future: The World Commission on Environment and Development*. Oxford: Oxford University Press.
- Bulajeva, T., Duoblienè, L. & Targamadzè, V. (2004) Master Study Programs of Teacher Education in Lithuania Regarding Sustainable Development. *Journal of Teacher Education and Training*, 4, 25-35.
- Costall, A. (1986) Evolutionary gradualism and the study of development. *Human development* 29/1, 4-12.
- Galperin, P. (1979) Johdatus psykologiaan. [Introduction to psychology] Helsinki: Kansankulttuuri.
- Heidegger, M. (1966) Discourse on thinking. New York: Harper & Row.
- Kitchener, R.F. (1986) Piaget's theory of Knowledge. Genetic epistemology & Scientific Reason. USA: Yale University Press.
- Lines, M.E. (2000) Jättiläisen harteilla. Matematiikan heijastuksia luonnontieteeseen. [On the shoulders of giants] Jyväskylä: Art House.
- McCormick, K., Mühlhäuser, E., Nordén, B., Hansson, L., Foung, C., Arnfalk, P., Karlsson,
  M. & Pigretti, D. (2005) Education for sustainable development and the Young
  Masters Program. *Journal of Cleaner Production*, 13(10/11), 1107-1112. Retrieved
  from EBSCOhost database 17.11.2005.
- Morris, N. (2004) Sustainability: What is it? *Power Engineer*, 18(5), 11. Retrieved from EBSCOhost database 09.09.2005.

- Niiniluoto, I. (1986) Pragmatismi. [Pragmatism] In Niiniluoto, I. & Saarinen, E. (ed.) Vuosisatamme filosofia. [The philosophy of our century] WSOY: Juva.
- Noschis, K. (1988) Johdanto. [Introduction] In Piaget, J. Lapsi maailmansa rakentajana. [Child as a constructor of his/her world] WSOY: Juva.
- Peters, M. A. (2001) Postsructuralism, marxism, and neoliberalism. Between theory and politics.USA: Rowman & Littlefield publishers, inc.
- Piaget, J. & Inhelder, B. (1977) Lapsen psykologia. [Child psychology] Jyväskylä: Gummerus.
- Piaget, J. (1970) Genetic epistemology. New York: Columbia University press.
- Piaget, J. (1978) Behavior and evolution. New York: Pantheon books.
- Popper, K. R. & Eccles, J. C. (1984) The self and its brain. London: Routledge & Kegan Paul.
- Reunamo, J. (2004) Peer orientation in kindergarten. 2004, in Veisson, Anneli & Veisson, Marika (ed.) Sustainable development. Culture. Education. Tpü Kirjastus: Tallinn, 101-110.
- United Nations Economic and Social Council/Commission on Sustainable Development. (1996) *Promoting education, public awareness and training.* E/CN.17/1996/14/Add.1. Retrieved 09.09.2005 at http://www.agora21.org/cdd4/ecn17183.htm.
- Vogel, S. (2001) Kissan tassut ja katapultit. Luonnon ja ihmisen mekaaniset maailmat. [Cat's paws and catapults. Mechanical worlds of nature and people] Terra Cognita: Helsinki.

Vygotsky, L. (1978) Mind in society. Cambridge: Harvard University Press.