Systems Theory, Holism and Early Childhood Education
Introduction to the two approaches and education


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I. Systems Theory

1. Ludwig von Bertalanffy

1.1 Bertalanffy as a person

The Dutch biologist Ludwig von Bertalanffy (1901–72) is one of the great pioneers in systems theory. The theory originates in Bertalanffy's thought in the 1940s.

A memorial to Ludwig von Bertalanffy, unveiled 100 years after his birth in 2001.
1.2 Guiding Patterns

Bertalanffy was against reductionism (everything can be reduced to physical elementary principles) and for the unity of sciences (everything can be understood in elementary conceptual principles). He criticised the traditional science, which examined its research objects (for instance, atoms) apart from the system they belong to. He emphasised that real systems are open to, and interact with, their environments, and that they can acquire qualitatively new properties through emergence, resulting in continual evolution. Such systems are, for instance, the human body and the language.

1.3 Systems and Their Patterns (Organisations)

The mechanistic world view seeks universality by reducing everything to its material constituents. The systemic worldview, on the contrary, seeks universality by ignoring the concrete material out of which systems are made, so that their abstract organisation comes into focus.

1.4 Bertalanffy and the Whorfian Hypothesis

The commonly held belief that the cognitive processes of all human beings possess a common logical structure, which operates prior to and independently of communication through language, is erroneous (Bertalanffy).

In the Indo-European languages substantives, adjectives and verbs appear as basic grammatical units, a sentence being essentially a combination of these parts. This scheme of a persisting entity separable from its properties and active or passive behaviour is fundamental for the categories of occidental thinking, from Aristotle's categories of "substance", "attributes" and "action" to the antithesis of matter and force, mass and energy in physics.

Indian languages, like Nootka and Hopi, do not have parts of speech or separate subject and predicate. Rather they signify an event as a whole. When we say "a light flashed" or "it (a dubious hypostatised entity) flashed", Hopi uses a single term "flash" (occurred).

The same is typical in Finnish as well. "Tuulee" (Engl. "It's windy"). The subject–predicate expression has developed from a single nominal form in two parts: "Lintu lentävä" ("A bird flying") > "Lintu lentää" ("A bird flies/is flying"). The English equivalents hint at the probability of nominalizations in the earlier forms of English, too. The Finnish ä is pronounced like a in the English word and.

Bertalanffy emphasised wholeness (comp. holism) and used Indian languages and used Indian languages as models for that. The Whorfian hypothesis is very controversial among linguists. Anyway, Bertalanffy was right in claiming each language is an example for an open evolutionary system.
2. System and Environment

System and environment are in general separated by a boundary. For example, for living systems the skin plays the role of the boundary. The output of a system is in general a direct or indirect result from the input. What comes out needs to have gotten in first. However, the output is mostly quite different from the input: the system is not only a passive tube, but also and beyond all an active processor. For example, the food, drink and oxygen we take in, leave our body as urine, excrements and carbon dioxide. The transformation of input into output by the system is usually called throughput. This has given us all the basic components of a system as it is understood in systems theory.

Note: the text in the lower part of the figure is: environment

Apply the idea of system and environment to a school class or a nursery group.

3. Two Kinds of Boxes

The white boxes represent the known system, the black box the throughput usually unknown in detail. The box figures (down) are taken from Principia Cybernetica Web (Heylighen & Joslyn).

A Closer and a Further Look: The two complementary views of the same system, illustrated by the black and white boxes, show a general principle: systems are structured hierarchically. They consist of different levels. At the higher level, you get amore abstract, encompassing view of the whole, without attention to the details of the components or parts. At the lower level, you see a multitude of interacting parts but without understanding how they are organised to form a whole. The black boxes are not always an unknown land. They are the tops of the conceptual hierarchy of the research. As for learning, for instance, we have some knowledge of the underlying processes.
Two Kinds of Boxes

4. Downward Causation

Classical medicine is based on reductionist view. Different alternative approaches to medicine have argued that such a view misses out the most important thing: the body is a whole. The state of your mind affects the state of your stomach which in turn affects the state of your mind. These interactions are not simple, linear cause and effect relations, but complex networks of interdependencies, which can only be understood by their common purpose: maintaining the organism in good health. This "common purpose" functions at the level of the whole and is the agent of the downward causation.

5. Norbert Wiener

5.1 Cybernetic systems

The systems approach distinguishes itself from the more traditional analytic approach by emphasising the interactions and connectedness of the different components of the system. Although the systems approach in principle considers all types of systems, it in practice focuses on the more complex, adaptive, self-regulating systems which we might call "cybernetic".
5.2 The Cybernetic Background

Norbert Wiener, a mathematician, engineer and social philosopher, coined the word *cybernetics* from the Greek word for a steersman. He defined it as the science of communication and control in the animal and machine.

Today, cybernetics is applied to processes of cognition, to such practical pursuits as psychiatry, family therapy, the development of information and decision systems, management, government and social processes (like education).

6. Niklas Luhmann

In many Central European obituaries, Niklas Luhmann (1927–98) was described as the most important social theorist of the 20th century. Outside of Central Europe he was rather unknown. Luhmann used systems theory in most of his studies.

By system Luhmann means a chain of events related to each other, or of operations. In the case of living creatures, for instance, these are physiological processes; for psychic systems, ideas; and in relation to social interactions, communications. Systems are
formed by distinguishing themselves from an environment of such events and operations that cannot be integrated into their internal structures.

To think in terms of systems first implies "that we are no longer speaking of objects, but of differences and, furthermore, that differences are not conceived as existing facts (distinctions), going back instead to an imperative to execute them, since one could otherwise give nothing a name, thus having nothing to observe and would thus also not be able to continue anything" (Luhmann 1995, 60).

Luhmann seems to concentrate on studying processes instead of things. Processes again manifest as events and events as differences. This refers to Luhmann's fondness for post-modern thought. (Cf. Bechmann & Stehr 2002.)

7. Bateson and Systemic Psychology

Systemic psychology is a branch of psychology that treats groups as systems that exhibit homeostasis (i.e. have an active method of remaining stable). Based chiefly on the theoretical work of Gregory Bateson, therapeutic applications were developed by Virginia Satir, the Milan group and others.
The picture above was taken by Kai de Fontenay and published in the portal to the website for the 'conference celebrating Bateson's centennial and his continued influence' at Berkeley in 2004. Systemic psychology and systemic education science lean on the research practices developed by Bateson in his path breaking work 'Ecology of Mind' (1970) and in his later books elaborating the idea of mental ecology. Bateson (1904–80) was born in England and lived since 1940 in the United States. He never held an academic position, not even in anthropology, his main field. In an attachment to the English and (later German) editions of the 'Ecology of Mind', his systemic thought emphasises the social order caused and produced by the differences in social behaviour. Bateson thought mental illnesses were a manifestation of a disorder in the family. If families might become ill, so might do the whole cultures, as well.

II. Holism

1. Adrian Snook

Adrian Snook (2005): "My definition of Holistic Learning involves looking at the whole system of learning processes within an organisation rather than just concentrating on individual components or modes of delivery. This overall result can actually be greater than the sum of the individual parts, thanks to the efficiencies offered by a well-designed system."
2. Wolfgang Köhler

The holistic approach is contained in the focus on the openness and wholeness of the systems approach. The holistic approach is, though, older. Its roots are in the German Gestalt psychology in the 2nd decade of the 20th century (Wolfgang Köhler and others). The Gestalts are cognitive patterns: 'The whole is more than the sum of its parts.'

3. Jan (J.C.) Smuts

Jan Smuts (1870–1950) was a South African. He was a statesman, soldier (general), naturalist and philosopher.

Holism (< Gr. holon 'entity') is the idea that the properties of the system cannot be determined or explained by the sum of its components alone. Holism and holistic are terms coined Jan Smuts in his book 'Holism and Evolution' (1926). New printings are available.

Smuts's definition of holism (cf. in particular the introducing chapter 5 to holism, Smuts 1926: 85–117):
"The tendency in nature to form wholes, that are greater than the sum of the parts, through creative evolution."

Phenomena such as life, mind and conscience only arise in systems. This means these things cannot be explained by the study of nerves, cells or atoms. Many religions take a holistic approach to consciousness.

4. Arthur Koestler

One theory of holism is based on the hypothesis that nature consists of a hierarchy of "wholes" (also called holons, a term created by Arthur Koestler). These wholes are quarks, protons, atoms, molecules, minerals, cells, tissues, organisms, and populations.
5. Filtering the Educational Processes

Holism also means an object or a system can be recognised as a type, only with a few well-chosen characteristics. Hence, it is the basis of conceptual filtering and classification or typology.

The field of the systems theory has been developed in recent years to tackle a wide range of issues using holistic concepts. (Jämsä)

III. How to apply systems thinking to early childhood education and preschool education

1. First approach through pedagogues’ thinking

The author has studied the educational ideas of several philosophers/pedagogues like Johann Heinrich Pestalozzi (1746-1827), Friedrich Fröbel (1782-1852), Georg Kerschensteiner (1854-1932), John Dewey (1859-1952), Rudolf Steiner (1861-1925), Maria Montessori (1870-1952), Alexander Neill (1883-1973), Helen Parkhurst (1887-1959), Célestin Freinet (1896-1966), Vasili Suhomlinski (1918-1970) and Loris Malaguzzi (1920-1994). Historically we move from the 18th century to our days. (Härkönen, 2003a, 30; Härkönen, 2003b.)

The philosophers/pedagogues have presented the contents of their educational thinking in written form in several works. Researchers and educators later have given their evaluations of these ideas.

The author has determined the general categories of pedagogues’ educational thought. In one article (Härkönen 2003a, 27-29) I studied especially Friedrich Fröbel’s and Aleksander Sutherland Neill’s pedagogical thinking. The same categories can be found from their thoughts, but separate contents of thinking may also differ from each other. Speaking in modern terminology, it is the question of the philosophers/pedagogues’ concepts. Concepts encompass assessments, scientific information, commonplace wisdom, beliefs and other factors. The concepts are subjective, but they take shape within a socio-cultural and historical context. Concepts relate to both philosophical principles and elements of educational practice.
The discoveries made through the analysis of Fröbel’s and Neill’s educational ideas were the following:

- the perception of general categories of educational thinking in literal texts, even though in no text were the issues presented in this order and arranged according to a common logic,
- the contents of the categories became evident only placing the issues in their classes,
- the connection between the categories was observed after finding the inter-connection between different contents,
- the systems character of the entity was discovered.

The systems character of Fröbel’s and Neill’s educational thinking can be seen in the fact that

- educational philosophy forms internally logical entity,
- educational philosophy in general influences the educational practice in general, and moulds it in accordance with philosophical principles,
- each part of philosophy influences others,
- each part of educational practice influences others,
- all parts of the entity influence all others,
- influence of part has a certain direction,
- the direction of influence reveals a certain hierarchy of the parts,
- as a rule, more general category influences more particular one, wider one narrower one, more valued one - a less valued one (evidently), more theoretical one - more concrete one, etc.,
- the system entity holds inside its philosophy and a number of different “theories” of educational practice,
- by means of philosophy and “theories” it is possible to conduct an analysis of Fröbel’s and Neill’s entire educational thinking and through its contents rediscover its systems character and possible internal contradictions in their thinking.

The mentioned educational thinking systems principles remain true, even if the historical era, social circumstances and stages of development are different.

In their philosophy there are differences in principal ontological and epistemological approaches. In the implementation of practical educational process there are similarities and differences and they can be explained through the content analysis of the categories. The common nominator is the systems character of thinking. A central finding was to notice that between educational thinking and educational activities there was both unity and separation.

I have created (Härkönen, 2003a, 31) The General systems model of educational thinking, presented in Figure 1. It has been drawn up on the basis of the philosophers’/pedagogues’ educational ideas and complemented with certain categories of educational practice (like basic activities, celebrations and outings) and important branches of science together with a mention of curricula. Checkland (1981) also speaks about systems
thinking and systems practice. In Figure 1, the model of educational thinking refers to early childhood education and also to preschool in the context of Finland.

The usefulness of the model (Figure 1) covers the following aspects:

- It is a systems model that underlines the nature of education and educational thinking.
- It is an educational model for describing its object - an education.
- It asserts the presence of educational thinking.
- It refers to different educational thinking contents that in this model are referred to through the concepts.
- Concepts of teaching, childcare, other methods and factors become components of a wider educational entity.
- The model is applicable to the analysis of educational concepts related to the children of preschool age.
- It points out the existence of different scientific points of view and allows the other different views to come forth as well.
- The model refers to a constructivist interpretation of educational thinking.
- It makes it possible to empty the contents and re-build them through creative thinking.
- The model can be used for the analysis, comparison and building of parts of education.
- The model is helpful in reflecting upon, comparing and developing subjective visions.
- The model allows not only for the individual, but also for the community to study and develop ideas in historical perspective.

Owing to the fact that the above model can be used for the analysis of parts of education, for their comparison and building, it is also applicable to different part of education, for instance to the analysis, planning and evaluation of sustainable education or work education (Härkönen, 1996; 2004). Nevertheless, it is the question about a model of thinking and therefore it is still the question about clarifying the issue of realistic educational practice and realistic teaching contents.
Figure 1. General systems model of educational thinking
2. The second approach through the concept analysis

The author has studied (Härkönen, 2002; 2003a; 2003b; 2003c) the general early childhood education, early childhood pedagogy, preschool textbooks and a number of articles printed in Finland over the past thirty years which have been written by specialists of early childhood education. In these works the author’s attention was focused on the definitions of early childhood education. In all works preschool (6 year olds) was included into early childhood education (0-7 year olds). The early childhood education concept in every definition was modeled. These models were then used as the basis for the ensuing concept of preschool models. It is the question of concept analysis and interpretation of meaning.

In general, it can be said that in all preschool definitions preschool has been understood as having three dimensions: practice and science and a subject. The contents of the dimensions reflected in different definitions have suffered gradual changes. Preschool, the dimensions and their contents have always been defined as parts of early childhood education and their changes have been in line with the changes in early childhood education. Preschool practice and preschool as a subject have always been distinct phenomena, though preschool does not exist as a separate field of science. Preschool is seen clearly as a part of early childhood educational science, though in Finland the latter is often thought to be just an element of pedagogy, not a separate field of science.
Explanation: ECE=early childhood education

Figure 2. Systems theory four dimension model of the concept of preschool.
The philosophers/ pedagogues’ educational thinking features such a concept as educational thinking. In the definitions, elaborated by the early childhood education specialists of our time, there is an idea of concepts, leading further to understandings and meanings. Lately, it has become trendy to study any person’s or group’s subjective understandings and traditional understandings of different things. These lines of departure push to the forefront of educational thinking or in the case of preschool - preschool thinking. Educational thinking is an activity of human mind and in pedagogy it must be focused on the contents of thinking. The contents of thinking about education may be any person’s traditional thinking, subjective opinions, impressions, beliefs, doubts, etc. It can be developed or undeveloped thinking.

By analyzing the concept preschool I have found three concepts practice, subject and science. By connecting them with preschool thinking I could create a new Systems theory four-dimensional model of the concept of preschool (Figure 2).

The thinking of philosophers /pedagogues points to the systems character of educational thinking. Also Parsons (1968, 458) and Chang-Gen (1990, 101) and Rapoport (1968, 452-453) speak about language systems, thinking systems and systems of concepts. According to Gochman (1968, 489), every concept is a system. Thus, the preschool concept is a system. Every dimension deducted from the definitions and their contents is a system. In relation to the preschool system they are its part-systems and again these part-systems. Part-systems form different one-factor entities or two, three or four-factor combinations. The numerous inter combination relationships can be studied. The numbers in Figure 2 refer to these combinations. Scientific research may be focused on all these factors as well as on itself. In Figure 2 this has been illustrated by the concept ‘life’.

IV. Systems theory and holism give new possibilities to understand early childhood education

When speaking about new possibilities in trying to understand education it can be studied through systems and holistic approaches. In education just a language is needed, and even the concept ‘education’ is language. Language can be understood in a systemic way. Jämsä (2005) says that Bertalanffy was right in claiming each language as an example for an open evolutionary system.

Luhmann’s theory is also very interesting. By systems Luhmann means a chain of events related to each other. What does it mean in human being’s thinking, for instance in educational thinking?

Holism also means that an object or a system can be recognised as a type, only with a few well-chosen characteristics. Hence, it is the basis of conceptual filtering and classification or typology. The field of the systems theory has been developed in recent years to tackle a wide range of issues using holistic concepts. Phenomena such as life, mind and conscience only arise in systems. That kind of phenomenon is also early childhood education - still quite a whole phenomenon, a whole system. This article shows that a continued study of systems and holistic approaches opens up new horizons in early childhood education.
References


