The Real Meaning of Some Buzz Words in Modern Education and Its Implications for Educational Changes in Estonia

Mari Uibo

Abstract. Many new notions have been introduced into our educational vernacular over the last decades. Those notions should be reflected in educational change. Though many changes have occurred in the Estonian educational paradigm, the impact of the new concepts does not seem to be strong enough, so the changes are not always very effective. This may be due to the fact that the essence of the new concepts is not properly understood.

The paper tries to analyse the key notions of education in terms of modern theories of information and communication as well as social psychology and to show, what impact they should have on the content of education in Estonia, if it were to keep pace with the rapidly changing world.

The paper is based on the author's personal experience and the ideas of Caglioti, Lotman, Schechter and Vygotsky.

Introduction

The role of an individual in modern open society is ever growing. The key words are *personality, competence* and *information*. The central unit of an organisation is a *competent worker* or *professional* and that should be the basis for changing the whole process of education.

A professional is a strong personality whose characteristic features are creativity and continuous self-development. The educational process should consequently be personality-centred; it should support creativity and tolerance of ambiguity.

Because of the growing entropy and the increasing need for information all the modern social systems are extremely dynamic. In order to cope in the rapidly changing world human beings must learn all the time. They must be able to obtain information in the conditions of uncertainty, to permanently adjust to innovation and to keep pace with time. For people to acquire a new way of thinking, the whole educational system in Estonia should radically change.

The main issues to be addressed are impersonality, alienation, rigidity of the system, linear way of thinking and the growth of the amount of information along with the attending increase in uncertainty.

To deal with those problems it is important to understand the dynamic essence of information and uncertainty, the role of personality in society and the dialectics of the personal and the social. Much has been said lately about breeding tolerance of ambiguity, risk-taking, creativity, individual approach and interdiciplinarity, but the essence of these notions has not been sufficiently analysed and due to that they remain just buzz words of modern education which act as slogans.

While these issues are mainly the domain of social psychology, as ours is the age of information, it would make sense to look at them also in terms of modern information and communication theories.

The Dynamics of Negentropy, Entropy and Ambiguity

Entropy and negentropy are the two opposing drives in the development of an open system. According to the theory of information entropy is the rate of disorder in a system and negentropy is the rate of order or the amount of tied information. As a simplification it can be said that negentropy is entropy with a negative sign. However, the two phenomena are not equal. Though negentropy decreases the amount of factual entropy, it at the same time automatically increases the maximum possible amount of entropy. The stability of a system depends on the amount of negentropy. In a functional system negentropy is bigger than factual entropy. The bigger amount of negentropy gives the system a disbalance, which guarantees its further development. Similarly, an overall lack of entropy would mean lack of development (see Liiv: 1998).

Entropy correlates with symmetry. Symmetry can be defined as invariance in the course of transformations. It proceeds from our inability to perceive certain transformations, to measure certain quantitative characteristics of natural structures, including human thought and perception. Order is the opposite a measure of the visible correlations of disposition, of the succession and dynamics of structural modules. Symmetry is the greatest when the system is in balance, i.e. when its entropy (disorder) is the greatest.

On the verge of entropy (transformation) and stability occurs the incompatibility of two aspects of reality, which is ambiguity. Ambiguity appears also at the contact of symmetry (i.e. invariance) and the removal of information (i.e. uncertainty).

Entropy and stability, symmetry and order, information and uncertainty are the factors that regulate the complex relations between humans and natural structures.

The spontaneous evolution of near-equilibrium structures is associated with disorder, instability and entropy, which increase until they reach their maximum value within that particular structure. On a macroscopic level this is static

equilibrium. Dissipative structures, including biological structures, are removed from equilibrium by external flows of energy, information and matter. The latter dissipate in the structures according to the order that preserves them. As Caglioti describes it:

> "In the entropic evolution of the structures near thermodynamic equilibrium, what is preserved is symmetry. Vice versa, symmetry singles out the quantities that are preserved (constants of motion). In the neg-entropic evolution of the dissipative structures, far removed from thermodynamic equilibrium, it is information and order that remain. Vice versa, information fosters a correlation among the structural modules- order-which tends to be perpetuated (think of the instinct of self-preservation in individuals and biological species, for example). The conflict between entropy and conservation, between symmetry and information is resolved, dynamically, in ambiguity"
> *(Caglioti, 1992: 14).*

The connection between entropy and information (symmetry and the breaking of symmetry) embraces all our entire life, not only the physical world, but also the sphere of psychology, language and aesthetics: it defines the rhythm of our internal life and represents the biggest drama of the humankind. Through times the moments when human taste, culture and sensitivity have been captured by the 'symmetric' dream of nirvana-like ecstasy, the liberating entropic drives, have exchanged with the opposite phases, when people have been attracted by the myth of a perfect form, which could shape the disorders of life into a sublime informative structure. Even on an individual psychological level there are periods, when we would like to solve all our problems by fitting them into an absolute structure, removing all ambiguity, and periods, when we would like to let go, to go along with the flow. Both extremes can be harmful. The dominance of complete information will crystallise life into predictable formulae, excluding all development; at the same time a total lack of informative structure would mean anarchy, loss of identity, lack of correspondence between content and form (see Fenoglio, 1983).

The Estonian educational system was in a stagnatory balance till the end of the 80-ies, when entropy in its limits achieved the maximum rate. In the beginning of the 90-ies the rapid changes in the political and economic situation of the country brought about lots of chaos. New solutions have been sought after and educational models have been imported from the West, which very often did not fit in the Estonian informational structures, so that the information did not dissipate according to the system-sustaining order. The breaking of symmetry is successful only when it does not distort the essence. Essence without shape does not exist.

The Concept of Personality

Understanding the essence of personality is crucial for understanding human culture, language and history in general and human learning in particular.

In modern sociology, psychology and education the terms 'individual' and "personality" are usually used interchangeably. We speak about 'individual' or 'learner-centred' approach, not 'personality-centred' approach.

Igor Shechter maintains that for understanding the process of teaching and learning it is necessary to make a distinction between the two terms (Schechter, 1982). He claims that all living creatures in the biosphere are organized in coordinated systems and non-coordinated systems.

Non-coordinated communities have no signals similar to language. Theirs is the level of *species* with very simple patterns of behaviour and frequent multiple procreation (a shoal of fish, for example).

Coordinated communities have communication systems similar to language with signals exhibiting semanticity, but lacking in naming and flexibility, along with features like displacement and productivity characteristic of human languages (see Ashcraft, 1989 for comparison). Coordinated communities are also characterised by complex hierarchy with sophisticated patterns of behaviour. This is the level of *specie + individual* (a pack of wolves or a beehive, for example).

Both species and individuals are confined in the biosphere which is a fairly closed system guided by the law of preservation of the kind of species. The behaviour of its members is highly predictable as it is determined by a genetic code. The creatures of the biosphere cannot refuse to behave in the way they are programmed to behave.

Human beings have developed from the biosphere into the sphere of reason. The major difference is that the noosphere (Vernadsky's term, see Lotman 1992: 2021) is an open system. The behaviour of human beings is not predictable, as they have the notion of future in their mind and thus have the ability to plan their activities. This creates the problem of *autonomous choice*, the ability to say *no*. That is the essence of *personality* in Shechter's terms (Schehter, 1982).

'Me' started to emerge with the development of levels of freedom. We are all part of nature and as such are species of humankind. We are all social beings and as such perform different individual functions in life: pedestrian, driver, teacher, student, sister, brother, etc. At the same time we do not cease to be personalities - we are not programmed 'not to behave otherwise'.

There are millions of other people resembling me physically and performing the same social roles. What makes me unique is my own personal *freedom of choice*, the ability to decide for myself, to be different, i.e. *creative*.

The latter being the essence of humanity may not sound very convincing as, unfortunately, people seldom stop to think about it. As Kierkegaard has said, freedom is not a given characteristic of the human individual, but derives from the acquisition of an ontological understanding of external reality and personal identity (cited in Giddens, 1993). According to Immanuel Kant, laziness and cowardice are the reasons, why the majority of people, though long ago released by nature from other people's will, still retain a slavery attitude (Kant, 1990: 801).

The concept of *creativity* is admittedly hard to define. According to Child (1993), up to this day there has been no

clear unambiguous and widely accepted definition of creativity. Experiments show, that people who have a high creativity potential, also have a high tolerance of ambiguity. The latter is closely connected with *the ability of humans to think, speak and act for themselves*, which due to social pressures few adult people seem to freely exercise. I.Kant says:

> "Revolutions can do away with the despotism of a single person, with the oppression caused by the lust for gain and power, but they can never provide a true reform of thinking. New prejudices take the lead of the mindless human breed in exactly the same way as the old ones" *(Kant, 1990: 803, author's translation).*

The concept of freedom as a source of creativity is close to Hannah Arendt's definition of freedom through action:

> "What remains untouched in times of stagnation and predictable destruction is freedom itself, the pure ability to start, which spiritualises and inspires all human activity and is a hidden source for creating big and beautiful things" *(Arendt, 1991: 714).*

The whole history of humankind has been that of struggle between the individual and the personality. Out of necessity society always maintains the prerogatives of the individual, as differences endanger the stability of the society (see Arendt, 1991 for opposition between politics and freedom). The controversy is that suppression of differences leads to stagnation and lack of development. Without an increase in entropy there is no increase in negentropy.

Dialectics of the Social and the Personal

The interpretation of a personality through the ability of human beings to think for themselves draws largely upon Vygotsky's developmental theory, which, as Bruner puts it "is a description of the many roads to individuality and freedom" (Bruner, 1962: 15). Bruner believes that in this sense Vygotsky (1896-1934) as the theorist of the nature of man "transcends the ideological rifts that divide our world so deeply today"(ibid.)

Vygotski capitalizes on the personal yet social nature of human beings. A personality can express its uniqueness only through society, through being useful for other people. There is no greater loss than the loss of one's personal identity and no greater punishment than total isolation.

This notion of personality is similar to that of Halliday's:

> "...by virtue of his participation in a group the individual is no longer simply a biological specimen of humanity - he is a person" *(Halliday, 1977: 14).*

Jury Lotman describes the social nature of a human being and the entropic evolution of culture as follows:

> "… the inadequacy of information at the disposal of a thinking individual makes him turn to another entity of the same kind. If we could imagine a human being acting in the conditions of complete information, it would be natural to assume that in order to make decisions he would not need another being of the same kind. The normal state of a human being is that of acting in the circumstances of inadequate information. However much we increase our knowledge of reality, the need for information will go ahead of the progress we make in science and technology. With the growth of knowledge the lack of knowledge will grow. While our activities become more effective they will also become more complex. In these conditions the insufficiency of information is compensated by its 'stereoscopicity' - the possibility of getting a completely different projection of the same reality, its translation into a completely different language. The utility of a communication partner is in the fact that he is different. The collective gain for the participants of a communicative act is in the development of non-identity of the models reflecting the outer world in their minds. This is achieved by the non-identity of the codes comprising their consciousness. In order to be mutually useful, the participants of communication have to "speak different languages". Furthermore, the entire mechanism of culture, making one person necessary for the other, works in the direction of increasing the individuality of each person, which will lead to complications in communication…
>
> The difference of culture as a superindividual entity from superindividual entities of a lower rank (of the anthill type) is in the fact that, belonging to the whole as a part, the individual does not cease to be whole... As a result the relations between the parts are not automatic, there is tension between them, which sometimes leads to conflicts of a dramatic character.
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> The structure-binding principle described above works in two ways. On the one hand, it leads to the possibility of appearing within the individual consciousness of human beings of 'psychological' personalities with all the complexities of relations between them, and on the other hand - the individual personalities integrate very strongly into semiotic entities. This richness of internal conflicts provides culture with exceptional flexibility and dynamics" *(Lotman, 1992: 44; author's translation).*

Classroom culture should be characterised by richness of conflict based on the individual differences of the learners and their need for mutual understanding.

This is related to the *theory of activity* and the *principle of the collective.*

The Theory of Activity and the Principle of the Collective

The historico-cultural theory of activity was developed by Vygotsky and his followers (see Leontjev, 1975; Luria, 1975 and Galperin, 1972).

According to the theory of activity, as human beings have the ability to consciously plan their actions, they do not simply adjust to reality, but *actively influence and control their environment.* The ability to forecast and plan is made possible by the use of facilities which have been worked out by society and are stored in its *collective memory*; in practical activities they are tools and in theoretical activities they are signs.

The concept of learning based on the theory of activity emphasises the *target-oriented* nature of human activity. The application of the *heuristic principle* involves emphasising the *creative character* of learning.

The theory of activity in general psychology is closely connected with the theory of the collective in social psychology.

This principle reflects the dialectics of the social and the personal, the beneficial influence of personal differences on social development. Society develops through personalities and personalities develop through the society.

A collective is *a highly developed group* in which interpersonal relations are formed on the basis of a *socially valuable and personally significant joint activity* and are defined primarily by *responsible dependency in interaction* that is mediated by the actual content of activity (see Petrovsky, 1979).

> "According to the collective principle, learning is optimal in a collective which operates as a *mobilizing force* for each member's personal reserves and through which these reserves can be put to effective use" *(Laihiala-Kankainen, 1988: 72).*

The Essence of Communication

At its highest-level communication happens because of the need to change the internal or external reality. The received information changes the receiver. Communication is always motivated. It is a means of mutual influence. The initiator of communication always expects from the addressee a reaction as to what has changed in his thinking or behaviour as a result of the forwarded information. If a change had not been hoped for, he would not turn to his communication partner; information must always be followed by something.

A human being can be considered an open system. Information transfer is always accompanied by some noise or loss of information. The ability to receive information is the greater, the bigger is the negentropy of the system. The acquisition of information increases the entropy of the system, evokes lots of questions and provokes further thinking. To be able to acquire information, a person must tolerate ambiguity, give up his habitual way of thinking (be able to break symmetry in terms of info dynamics).

The educational process must allow for a maximum of tension in the dynamics of entropy and negentropy. Unfortunately, in very many cases this requirement is not met in the teaching and learning process. Interactivity often means activity on one side only. The teacher transfers information, but does not provoke thought, does not support the interaction of entropy and negentropy.

If at testing students' knowledge the teacher receives the same information that has been transferred ($x=x^1$), she checks but the student's memory. The act of communication has not happened. This kind of quasi-communication does not bring about any change in the teacher and the learner. The information received by the learner is of temporary quality; it does not help his development. The amount of the teacher's information does not increase either. True communication increases knowledge, which means a mutual increase of communication partners' entropy.
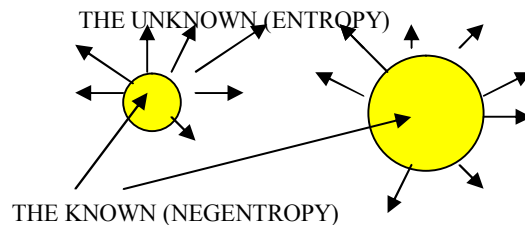

Fig.1. The Increase of the Area of the Unknown at Acquisition of Knowledge

Convergence of Sciences and Humanities and the Heuristic Way of Thinking

The traditional Estonian educational system made a clear distinction between humanities and sciences. Such rigid distinction is not acceptable in today's world. As mentioned before, the lack of information is compensated by its stereoscopicity, the possibility of getting a different projection of reality, its translation into another language. Humanities can inform sciences and the other way round. That is why inter-disciplinarity obtains such great importance in modern education.

Our relations with nature are mediated by our thought. These relations are characterised by such unifying factors as entropy or uncertainty, the removal of uncertainty or information, symmetry and the breaking of symmetry, order, consistency and ambiguity. Among these factors ambiguity plays a decisive role. It appears at the point of convergence of entropy and order, evolution and stability, symmetry and the breaking of symmetry. It appears at every moment of critical choice, also when the sensorial stimuli merge to become an idea, which results in thinking. Wittgenstain would have said that it is the moment when information reveals itself, but does not express itself explicitly (see Fenoglio, 1986; Caglioti, 1992).

As human thought is guided by uniform laws, similar features can be identified in the ways of reasoning typical for humanities and sciences. Emotions and aesthetical intuition play a significant role in the rational scientific reasoning, and artistic creativity has a rational basis. Thanks to that the subjective sphere can be explained rationally and freed of its assumed imponderability.

It should be noted, that if there is such a thing as scientific objectivity, it exists only theoretically. It offers some scientific community's intersubjective hypothesis of the structure of the universe. It is a cognitive basic theory, which has little impact on our practical everyday life. The assumed 'objectivity' of the empirical-experimental method is in reality an extended subjectivity of anthropological kind. Its truth is acceptable only to us as human beings. It allows us to dominate in our environment and to make use of nature to our own ends, but not to perceive the real nature of things (Immanuel Kant's "noumeno"- the thing as such vs. "phenomenon"- the thing as it appears to us). So the objectivity of scientific knowledge is "objectivity" based on phenomena, the way things appear to be. Scientific knowledge is not something that exists outside the physical and emotional sphere like some god, who watches the world from outside and registers its phenomena "objectively"; it is part of

ourselves and is tinted by our emotions (see Fenoglio: 1983).

Both artists and scientists in their search for truth and beauty follow the fundamental laws of nature and the mechanisms of evolution, though they express them in different languages. The language of an artist is usually synthetic, ambiguous, instinctive, exoteric; the language of a scientist is mainly analytic, precise, rational and esoteric.

But where the arts and sciences converge, where beauty meets the truth, the language becomes analytical and synthetic, precise and ambiguous, rational and instinctive, exoteric and esoteric at the same time. In other words it achieves a surprising form that accepts ambiguity and gives room to creativity (see Caglioti: 1992). This is the essence of heuristic thinking.

The term 'heuristic thinking' comes from the word 'heureka', which is an exclamation of joy at some discovery or emergence of a new idea. The word is associated with the discovery of the laws of hydrostatics by Archimedes. 'Heuristics' is the art of discovery, though in the philosophy of science it has come to denote a set of logical devices and methodological instructions for theoretical research. This approach robs 'heuristics' of its essence: tolerance of ambiguity, creativity and emotion.

Conclusions

Speaking in terms of info dynamics, Estonian education should seek to reach a state, that would reduce the amount of factual entropy and increase the flow of external information and energy, i.e. the maximum possible increase of entropy, while maintaining the traditionally evolved system-sustaining order, that would sort the information out to serve the specific needs of our society. Having the interests of learning society in mind, we must see to it that the system is holistic. The state should control and support both the public and private sectors of education. Schools should become centres of continuous education, where instruction is given to all members of society without any age discrimination. Big companies and enterprises should be part of learning society structures, providing their employees with means for continuous self-development both within and outside the organisation.

The educational system should make maximum use of the dynamics of entropy and negentropy, expressing itself in the freedom of choice on the one hand and control / order on the other hand exploit the dialectics of the social and the personal.

The educational process should liberate itself of the linear way of thinking, accept the role of ambiguity and emotion, develop heuristic thinking by using methods like project work, brainstorming, problem-solving, reflection, raising awareness, etc. The methodology should be truly communicative. It should make the most of the conflict between entropy and negentropy, which is dynamically solved through ambiguity.

Though the popular concept of learner autonomy may suggest to some people, that learners should be left alone with their problems, optimal learning takes place in a collective. The learning-teaching process should be

personality-centred. It should capitalise on the creativity potential of both the learners and the teacher, the source of which is the freedom of choice attended by the social essence of a human being, their need for self-expression, exchange of information. Group work should be alternated by individual and frontal work, where the role of the teacher is that of a source of information, facilitator and, in a sense, a learner. For this to be possible, the teacher himself has to be tolerant of ambiguity: not to limit the students' world by setting rules of thinking and behaviour, but offer an orderly structure for systematising their knowledge while providing scope for creativity and self-development.

A personality-centred educational system cannot mean anarchy, as freedom is impossible without responsibility. Tolerance of ambiguity should not mean an end in itself. Its purpose is the development of heuristic thinking, supporting the creativity of the learner and the teacher. People must realise that ambiguity is a positive phenomenon: there are no and cannot be any ready-made recipes for whatever situation in life. Teaching styles must leave space for ambiguity and uncertainty, they must evoke independent thinking and doubt. At the same time the goals must be clear. The teacher must know, what information is to be transferred, but the information must provide food for thought, it must obtain new quality. The information must be relevant for the learner; it must help his self-development and provoke new questions.

And last, but not least, we must do away with the rigid distinction between sciences and humanities. Both rationality and emotion should be present in the teaching/learning process. In addition we must seek to provide more interdisciplinary courses, offer combined degrees in sciences and humanities.

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Mari Uibo

Nauja sąvokų interpretacija ir jų reikšmė švietimo sistemos pokyčiams Estijoje

Santrauka

Šiame staipsnyje autorė analizuoja šiuolaikinių reformų Estijos švietimo sistemoje eigą. Deja, pokyčiai ne visada yra efektyvūs. Viena iš priežaščių – neteisingai interpretuotos naujos sąvokos. Straipsnyje analizuojami reformuojamoje Estijos švietimo sistemoje dažnai deklaruojami žodžiai: neapibrėžtumo tolerancija (tolerance of ambiguity), rizika (risk-taking), kūrybiškumas (creativity), individualumas (individual approach), tarpdiscipliniškumas (interdisciplinarity) ir keliama problema – ar šios sąvokos atspindi tikrąją reformų eigą? Kertines švietimo sistemos sąvokas autorė analizuoja šiuolaikinių informacinių bei socialinių teorijų, pagristų Caglioti, Lotman, Schechter ir Vygotsky idėjomis, plotmėje.

The author

Mari Uibo, MA TEFL from Birmingham University. Assoc. Prof., PhD student of Public Administration at Tallinn Technical University.
Main scientific interests: theory of language and language learning, language teaching methodology, LT management, theories of organisation, information and communication, psychology, semiotics.
Main scientific results: has published some text-books and language teaching materials, a number of articles on language teaching methodology, sociology and psychology; co-author of CD-ROM B.A.L.T.I.C. and audio-visual package "Arresting Images".
Address: Tallinn Technical University, Ehitajate tee 5, Tallinn 19086, Estonia. *E-mail:* mariuibo@edu.ttu.ee.