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## **"Trojan horse" teaching in economic behavior**

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### **Abstract**

Development of individuals, social groups and societies is considered under the influence of two opposite and interrelated types of social interactions: (a) support of, and (b) counteraction and inhibition of learning, instruction, education and development. The latter type of social interaction is illustrated by an advanced strategic behavior, which we term, "Trojan horse" teaching. In this type of counteractive behavior, a "teacher", ostensibly helping his or her rival to learn something, really teaches the rival useless or disadvantageous things. This interaction is an object of interdisciplinary research related to the theory of human capital, the theory of agency, knowledge management, the theory of conflict, and to social and educational psychology.

Economic reasons for Trojan horse teaching (THT) have been considered. It has been shown that THT can be interpreted in the context of moral hazard, which relates to attempts to influence the human capital of others by using strategic disorientation in teaching. The concepts of perfect teaching / learning technologies, and a qualitative model of competitive relations between teachers and learners, have been introduced.

Results of experiential studies, including the administration of a survey concerning people's beliefs about teaching "with evil intent", and a set of experiments with participation of adults and children, have been described. The studies show that the metaphoric rule "to give a rod, not a fish", often declared in education, can be understood and applied in different ways, depending on a person's attitude to another person and the competition between them. The significance of strategic thinking and of the independent exploratory activity for the protection from THT is underlined. Both negative and positive effects of counteraction to development, and some possible trends, have been discussed.

**Keywords:** economic behavior, human capital, teaching, learning, competition, conflict, deceiving, Trojan horse teaching, damage.

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## 1. Introduction

"The ability to learn faster than your competitors may be only sustainable competitive advantage."

Arie de Geus.

This statement, logically and emotionally linked with Bacon's "Knowledge is power" becomes more and more popular. Yet understanding that knowledge is power in general and a base of economics nowadays can result in hiding knowledge and, occasionally, in disinformation, if the competition is strong.

Similarly, the awareness of the crucial importance of teaching / learning may cause advanced strategic behavior. This behavior includes the counteraction to the competitors' learning and the so-called "Trojan horse" teaching, in which a "teacher", ostensibly helping his or her rival to learn something, really teaches useless or disadvantageous things (Poddiakov, 2001).

This type of behavior may be an object of interdisciplinary research. It relates to theories of conflict, human capital, agency, knowledge management, psychology of "advice-givers for their profit", and to social and educational psychology. Let us consider some of the approaches.

On the one hand, Becker's theory analyzes how human capital is increased by education and training (Becker, 2003). Aim-directed teaching is of great importance for education and training. The teaching is conducted under the leadership of educators, instructors, and other persons, who give learners recommendations, advice, methods, techniques of work, etc.

On the other hand, in the theory of agency it has been shown that if an advisor (an agent) and a client have conflicting goals, the agent can display self-serving behavior. The advisor can deliberately conceal information from the client to stimulate him or her to make a decision, which is not good for the client, but good for the advisor (Jonas, Frey, 2003). This moral hazard concerns informal situations as well. For example, Valsiner (2000, p. 288) analyzes advice-givers' behavior aimed to their own profit in intra-gender group competition.

The concept of moral hazard in strategic advice-giving resonates with Lefebvre's theory of conflict. "The opponent's doctrine is imposed on the opponent by teaching him" (Lefebvre, 1977, p. 118). To win over a rival, it often suffices, and may even be preferable, to shape a certain image of a bridge-head in the rival. It works not only in armed conflicts, but also in economics, high technologies, sports, etc.

We have not found publications on the applicability of the concept of moral hazard or of the approach to doctrines imposed on rivals to the situations where teachers consciously disorient their learners. Paradigms of teaching / learning, like "enlightening" activity generally, seem incompatible with considering the participants of this activity as possible rivals that can use the strategy of Trojan horse teaching. This gap should be bridged.

We suggest the following statements.

Development of individuals, social groups and societies is under the influence of two opposite and interrelated types of social interactions: (a) support of, and (b) the counteraction and inhibition of learning, instruction, education and development, caused by different reasons, including economic ones.

Learning and development, related to counteraction, are not isolated and exceptional but a fundamental psychological and educational phenomenon. A blow to the abilities to learn and acquire competence in new activities and domains is the most effective means if one wants to make a competitor inadequate in the technological and social world (Poddiakov, 2000, 2001, 2002). Trojan horse teaching is regular work aimed to decrease competitors' human capital.

## **2. Reasons for the counteraction to other persons' learning**

Significant reasons for premeditated counteraction to learning, instruction and development are dishonest competition and rivalry between individuals, social groups, societies, etc.

On the whole, all the reasons for Trojan horse teaching can be divided into two types:

(a) obtaining profit, satisfaction, etc., from the imperfect performance of the persons taught;

(b) avoiding disadvantages, troubles, etc., which might be caused by too perfect performance of the persons.

The types can work in combination as well. As a result, there may be a variety of particular reasons for conducting Trojan horse teaching in various formal and informal situations. Some private instructors artificially drag out the process of instruction so as to be paid for a larger number of sessions. In financial pyramid schemes instructors train "recruits" to recruit and teach other "recruits" of the next generation - until the pyramid collapses. A person can conduct Trojan horse teaching to protect third-party interests, e.g., protégés, relatives, etc. Finally, a person can conduct Trojan horse teaching just for fun.

Below we will consider one type of economic reason for Trojan horse teaching related to competitive relations, first, between the teachers and, second, between the learners who are working or are going to work in the same area and are able to achieve approximately equal (or, at least comparable) competence. In these situations, moral hazard can be related to attempts at decreasing the rate of human capital growth of other people, and Trojan horse teaching is a means to achieve this aim.

Yet, first of all, let us consider the situations in which the moral hazard is absent.

### *2.1. Perfect teaching / learning technologies*

Let us introduce the concepts of teaching / learning technologies, which are perfect from learners' and teachers' economic and educational views.

From the learners' view, perfect teaching / learning technologies are idealized technologies, which provide learners with an opportunity to achieve a teacher's level of knowledge and competence or to surpass this level in a (extremely) short period of time with the minimal (to infinitesimal) expenditure of material, financial, psychological, moral, and other resources.

In more detail, a perfect teaching / learning reproducing technology is such an idealized technology that provides a learner with an opportunity to achieve the teacher's level of knowledge and competence, i.e., master all the things and only the things that the teacher has mastered, in minimum time with minimum resource expenditures.

A perfect teaching / learning productive (or developing) technology is an idealized technology, which provides a learner with an opportunity to surpass the teacher's actual level of knowledge and competence and to achieve the levels, which are still in the teacher's potential (within the zone of her or his proximal development, to use the Vygotskian term), but may be explicated and translated to the learner by this or another technology. Also, in the case of group teaching / learning, the perfect technology should allow learners to share their acquired competencies without limitation and to achieve the level of the best student in the group.

Concerning the teachers, a perfect technology of teaching and self-development is an idealized technology that provides them with an opportunity to develop their potential from any level up to the highest level owing to the teaching / learning (contacts with learners and other sources) in minimal time with minimal expenditure of material, financial, psychological, and moral resources, and to receive (unlimited) high rewards for this teaching and developing activity.

One can see that the perfect interaction of these technologies will lead to extremely fast and synergetic mutual development in a collective of learners and teachers. The more competencies the teachers acquire and develop, the more competencies their students acquire and develop, and the wider is the base for their productive interaction.

## *2.2. Competition for competencies: A model of relations between teachers and learners*

Yet real relations may be far from the perfect ones. A teacher and a learner, as well as learners among themselves, may have conflicting goals. In particular, the conflicts can be related to rates of the growth of competencies, which are finite and can be different in different people. As a result, some students can reach levels of competence, which are comparable with the teacher's level (at least, in some dimensions) in a shorter time than that spent by others. The teacher can be late (or does not wish) to leave this zone of comparable competence. This situation may result in finding mutual interests, support and partnership in equal rights, and in rivalry of different extent, including very strong rivalry. It depends on social sets, subject areas (e.g., professional areas), personal attitudes, etc.

The zone of comparable competencies and, consequently, of potential rivalry can be fuzzy, and the images of this zone can be different for different participants of teaching / learning. The teacher can either underestimate the danger of rivalry (e.g., the rivalry can seem absolutely unthinkable for her or him) or overestimate it, or else estimate adequately real opportunities for rivalry. Learners can either underestimate, overestimate or adequately estimate both themselves as potential competitors and the potential actions of the teacher and other learners. Different combinations of the images are possible, determining different types and dynamics of social interactions in teaching / learning.

If a teacher or a learner expects (or is afraid of) rivalry, they can act in two ways. They can try to change the area and/or level of their own competence at a rate, which is high enough not to get into the zone of actual comparable competencies. This is a person's work on himself or herself. Another way is negative work with rivals, including premeditated decrease of their learning and development rate and attempts to disorient and to use Trojan horse teaching.

The most efficient Trojan horse teaching makes the re-training, which a learner needs to achieve the required level of competence, more energy-consuming than would be necessary

without the disorientation. In such a case, one can say that Trojan horse teaching decreases, in its intellectual and psychological dimensions, the human capital of the person taught.

### *3. Examples of Trojan horse teaching and the counteraction to other people's learning*

Cases of hidden counteraction to other people's learning and of the use of Trojan horse teaching can be found in various age, social and professional groups, and in various domains - from children's plays to teaching military activities and high-competitive business. Some examples are described below.

*Myths, tales, proverbs.* Many situations of counteraction to other people's learning are presented in the cultural form of preserving, narrating and transferring social experience as myths, fairy tales, proverbs, etc. They describe aims, means and results of counteraction to learning and the use of such situations to do damage to one's learning. A classical example is the myth about Prometheus. Zeus prevented men from learning how to use fire. He cruelly punished Prometheus, who gave fire to men and taught them how to use it. Many tales contain situations in which a master, a magician, or a god prevents his underling from learning the secrets of his trade. Often, the characters teach each other to do things, which are dangerous or disadvantageous to them, for example in the tale in which Brer Rabbit teaches Brer Fox how a deceased person should appear. In Brer Rabbit's words, the deceased must shout: "Ogo-go!" (according to the Russian translation of Harris' tales). More examples can be found in literature and films.

The Russian language has many proverbs, not only about the necessity of learning (e.g., "Learning is light, and ignorance is darkness"), but also about the necessity of counteracting education and about potential danger of cognition, learning and teaching in some situations (e.g., "to teach on one's misfortune", "to teach something bad", etc.).

Now let us address some real situations.

*Relations between children.* A kindergarten teacher shared with me what she observed when the children in her kindergarten played a board game. Elder preschoolers, who are part of a mixed age group in the kindergarten, teach younger preschoolers losing strategies of the game in which they want to win themselves. The teaching is accompanied by the elder children's hidden smiles and an exchange of glances. It confirms that they understand what they do. The next year, the "ex-victims of the instruction", who are now in the elder group, teach the same Trojan teaching strategy to the novices, and this situation is repeated.

*Relations between young adult students.* Ageev (1983) conducted the following provocative experiment. Being a university teacher, he organized competitive relations between two groups of his students. He declared that all students belonging to the group that shows the best results during a certain marking period would get good marks for his course without the final examination. By contrast, all students of the other group would have to take the examination. It was shown that the situation of competition caused the students to act against the winning group. The students tried to inhibit successful performances of the competitors and they gave to the teacher negative recommendations concerning the competitors.

*Relations between specialists.* A staff psychologist, who works in a commercial bank, may try to conceal the secrets of his job from a new psychologist who has been assigned to him for training during his probationary period, and may even disorient him in some situations of

the job. During the skills upgrade training for specialists in the area of oil processing, a lecturer may purposely not give the audience the most effective methods of calculation he knows.

*Interpersonal relations in everyday life.* A friend of mine told me that she hid instructions for the use of a new telephone from her husband, so that she could be the sole user of the new telephone.

*Relations between firms.* The following is an example of how high quality instruction may be used to counteract to a rival's development. Moscow Physical Institute of Nuclear Power was offered, by another firm, free training in the use of computer programs for nuclear reactors. A legal investigation disclosed that if the firm's proposals were accepted, the firm could use the intellectual property law to veto any international transaction the Institute might engage in while using these programs. The Head of the Institute thinks that the teaching was intended to be a means of counteracting the competitor's development, a hidden means to "enslave rivals" (Konovalova, Konovalov, 1998). The more projects use the results of the training, the greater damage the training causes. If used consciously, it is real Trojan horse teaching.

#### **4. People's beliefs about teaching with "evil intent"**

Do people believe in teaching "with evil intent"?

An original survey concerning adults' beliefs about counteraction to other people's learning and teaching "with evil intent" was administered on a Russian sample (Poddiakov, 2004). On the basis of its results, in cooperation with Prof. Silvia von Kluge, from Eastern Michigan University, we elaborated a survey, which was then administered on American and Russian samples.

##### *Method*

Poddiakov's - von Kluge's survey has the following introduction.

"We study interactions that a person can come across in the process of formal or informal learning and instruction, and how they think about these situations. We would appreciate it if you would answer these questions".

The questions concerning Trojan horse teaching are the following:

1. In a Russian tale a fox teaches a wolf how to catch fish in an ice-hole, using the wolf's own tail. As a result, the wolf freezes to the ice and experiences other troubles. In your opinion: are there similar situations of "instruction with evil intent" in real life?
2. Do they happen in schools or universities?
3. Has anyone tried to conduct teaching or instruction with "evil intent" towards yourself?
4. Have you conducted teaching or instruction with "evil intent" towards anyone?
5. Has anyone tried to conduct teaching or instruction with "evil intent" towards yourself during the fight for school (university, etc.) grades and opportunities?
6. Have you conducted teaching or instruction with "evil intent" towards anybody during the fight for school (university, etc.) grades and opportunities?

Options of answering these questions are "no", "rarely", "from time to time", "often", "very often".

This version of the survey was administered to American undergraduate university students without regard to their major (i.e. non teachers) and to a sample of Russian participants, a portion of which were students and a portion of which were laypeople.

A very similar version of the survey has also been offered to school and university teachers. Changes in this version were the following. The 5th and 6th questions included words "during the fight for social status, estimates, financial profit, and other outcomes" instead of "during the fight for school (university, etc.) grades and opportunities".

In all the versions answering is anonymous.

#### *Participants*

Samples without differentiation of teachers - non-teachers include 211 North-American (134 females, 77 males; of 18-51 years, mean age - 21.9 years) and 212 Russian persons (137 females, 75 males; of 16-58 years, mean age - 24.4 years).

A sample of teachers includes 32 teachers from Russian schools and universities (27 females, 5 males; of 23-59 years, mean age - 34.8 years).

Thus, the total sample has included 455 participants.

#### *Results and discussion*

Table 1 contains general results concerning beliefs about Trojan horse teaching.

Table 1. Participants' answers about Trojan horse teaching

Questions	Percentages of participants giving affirmative answers		
	Participants without differentiation of teachers – non-teachers		Teachers
	American	Russian	Russian
1. In a Russian tale a fox teaches a wolf... Are there similar situations of "instruction with evil intent" in real life?	95.7	95.5	96.9
2. Do they happen in schools or universities?	94.8	89.6	84.4
3. Has anyone tried to conduct teaching or instruction with "evil intent" towards yourself?	52.1	40.6	34.4
4. Have you conducted teaching or instruction with "evil intent" towards anyone?	22.3	17.9	6.2
5. Has anyone tried to conduct teaching or instruction with "evil intent" towards yourself during the fight for...?	37.9	22.3	46.9
6. Have you conducted teaching or instruction with "evil intent" towards anybody during the fight for ..?	11.4	12.7	9.4

One can see that the pattern of answers of the ordinary participants is very similar in the American and Russian samples. One should emphasize that the answers "rarely", "often", "very

often", etc., reflect a whole, cognitive and affective estimation of frequency of the phenomenon, personal sensitivity to it and level of representation of the phenomenon in consciousness. So these estimations are not necessarily objective: both underestimations and overestimations are possible because of some reasons.

For example, an interesting feature of the teachers' answers is that the teachers, in contrast with the ordinary participants, more often gave affirmative answers to the questions with the specification "during the fight for..." (i.e., to the 5th and 6th questions) than to the previous more general questions without the specification (i.e., to the 3rd and 4th questions). Though this logical contradiction concerning logical class inclusion has also been observed in a small part of the ordinary participants, in the professional teachers it was a stronger trend. It may mean that for them this issue is more important.

This is in correspondence with Tversky's and Kahneman's results, concerning conjunction fallacy. For example, in their experiments most of participants thought that a character in the task given, Linda, resembled a feminist bank teller rather than a bank teller (Kahneman, 2003). Slovic's affect heuristic (Kahneman, 2003) could work in the teachers' answers as well. Anyhow, it is important for our study of teaching with "evil intent" that these paradoxical results have been shown by professional teachers.

To summarize, approximately 90% of all the participants believe that teaching with "evil intent" does exist in real life and takes place in schools and universities. Approximately half of the participants think that such teaching has been directed towards themselves. Approximately 10-20% of the participants have conducted teaching with "evil intent" towards someone. These results highlight the problem of Trojan horse teaching and show its importance. It is a topic worthy of attention and systematic research. Beliefs about Trojan horse teaching can be a part of implicit theories of education and of teaching / learning.

## **5. Teachers' aims and strategies of making decisions**

In areas of strong competition, persons may be motivated to give to others or to teach others the least significant material, to conceal the most valuable strategies and to impede their own discovery of strategies for as long as possible. Yet the "teachers'" task is ambivalent because, at one and the same time, some level of learning must be achieved (or at least the person should believe this) and the true goals must not be revealed.

Taking into account these difficulties of investigation of Trojan horse teaching strategies and the conditions related to their secrecy, we have designed and conducted laboratory experiments with participation of adults and children.

### *5.1. Play as "the Devil's advocate": An experiment with adults' participation*

To study strategies of teaching with "evil intent", Polina Vykolova had designed and conducted the following experiment under our supervision (Poddiakov, 2002).

*Method.* A participant was asked to help to reveal dishonest strategies of competition, playing the role of "Devil's advocate". After the participant's agreement, s/he was taught to use a certain mathematical formula to predict meanings of an abstract mathematical variable, using some data patterns. (A real analogue of this task might be prediction of exchange rates based

on different data, but the formula used was not related to any real financial calculations and transactions.)

After having learned the formula and achieved sufficient mastery, the participant became an "expert" in this area and s/he was told to design a plan of teaching an imagined student, who would be going to compete with the expert-teacher in preciseness of predictions.

The participant was given 48 cards with pieces of information about the formula for selection and sequential presentation of 20 of them to this virtual learner-rival. There is no any disinformation on the cards. Each card contained true but incomplete information about some part of the formula and the operations with it. Different combinations of 20 cards presented information of different degrees of completeness and clearness about the formula.

*Participants:* 16 Russian students aged 18 to 25 years.

*Results.* The participants' teaching strategies included: decrease of essential information for the learner and increase of non-essential information; selection of information which looked unclear and was most difficult to understand; sudden changes of the order of presentation of information to distort the naturally required logic ("jumps" in the content taught); and hiding "the evil intent". In other words, playing the role of "Devil's advocate", the participants successfully demonstrated abilities to conduct an "upside-down" teaching aimed to make effective learning as difficult as possible for a potential competitor.

### 5.2. *To teach or not to teach? Children's decisions about "bad and good guys"*

Two experiments with participation of preschool children have been conducted (Poddiakov, 2000). The aim was to find out what the preschoolers' think about help and counteraction of other people's exploration and learning, and how they make decisions.

#### *Study 1.*

*Method.* A child was shown how to construct and use a simple exploratory tool (named "a treasure seeker") to find "gold coins" (plastic yellow circles) in a board game, which required intuitive understanding of geometric probability. The tool could be efficient or not depending on the method of combination of two simple details. After playing the game, the child was shown a picture of three cruel and repugnant hyenas from the popular cartoon "Lion King" and was told that they had resolved themselves to find gold coins in order to buy bane and poison the young lion Simba's father. The child was then told to construct a treasure seeker for the hyenas.

Then the child was shown a picture of the main positive personages of the cartoon, that is Simba and his friend Nala, who wanted to find the coins in order to buy medicine for the father, who was in trouble. The child was told to construct a treasure seeker for Simba and Nala.

*Participants:* 25 Russian children aged 5 years and 28 children aged 6 years.

*Results.* 22 children aged 5 years (88%) and 26 children aged 6 years (93%) constructed an inefficient search tool for hyenas, but an efficient search tool for lions. The children's verbal comments clearly showed their understanding of both situations and their aims, which were of counteraction ("I'll construct in such way that they [the hyenas] will find nothing!"), and of help ("The larger seeker for them [for the lions], in order that there will be more coins").

Thus, the experiment showed that preschoolers can intentionally construct simple tools, appropriate for helping or counteracting others' efforts in exploration and getting profit.

*Study 2.**Method.*

A child was told the following story about the characters of the cartoon, "Lion King". Three hyenas (i.e., bad characters) wanted to hunt defenseless nestlings and their mothers while their fathers were absent. Young brave lion Simba (i.e., a good character) decided to prevent it.

The child was instructed to choose from a variety of skills for these personages (e.g., to teach them to turn into other animals, to speak other animals' language, to climb trees, to smoke, etc.). At first, the child was asked 5 questions about teaching the negative characters, and then 5 questions about teaching the positive characters.

*Participants:* 36 children aged 5 years and 29 children aged 6 years, who did not participate in the previous experiment with the treasure seeker.

*Results and discussion.*

On average, the children aged 5 and 6 years gave, respectively, 94% and 95% of the answers, which could help to save the nestlings. They gave opposite answers about teaching the positive and negative characters. That is, the children "helped" the positive character to learn something good, but "prevented" him from learning something bad, wrong or unnecessary. By contrast, the children "prevented" the negative characters from learning something that could help them to reach their bad aims. Also, the children "helped" the negative characters to learn something wrong, disadvantageous or even bad for them (e.g., to smoke).

Thus, the preschoolers had definite and similar beliefs about different social situations of teaching and learning, which require either help or counteraction to other people's learning.

As a whole, the analysis of real-life cases and the results of all the studies described above show that the metaphoric rule "to give a rod, not a fish", often announced in the process of economic education as a principle, can be understood and applied in different ways, depending on the person's understanding of morality, on her or his attitude to another person, and on the character of their relationship and whether it involves either competition or cooperation. The "rods" given can be of different quality, and this is a problem of moral hazard in education and teaching.

At the same time, the experiments with making decisions about the "hyenas" show that moral hazard can be connected, not with educators' and teachers' immoral behavior, but with the immoral behavior expected of the persons wishing to be taught. It is evident that people, who are going to become robbers, must not be taught to shoot - if we have information about their intents.

*5.3. Teaching to see Trojan horse teaching*

A (honest) teacher can pursue the special aim of teaching students to see situations of Trojan horse teaching, whether potential or real. Different ways are possible. One of them is a provocative imitation of Trojan horse teaching with consequent discussion (Poddiakov, 2002).

*Method.*

A teacher in a technological university, training specialists in upgrading their skills, deliberately made a hidden change in a computer program for the design of oil industry equipment in order to decrease its efficacy, but presented the program to the students as

efficient. Yet the defect had been designed in such a way that it could be revealed through experimenting with the program and comparing it with the information from the recommended literature. (Naturally, a real rival would not do such things in a premeditated way.) The learners were not told about the defect. Their activity was recorded for one week.

*Participants:* 38 specialists aged 23 to 45 years.

*Results.* Twenty seven students (71%) did not explore the program by comparing its work with the data from the literature. Eleven students (28%) did so and found the contradictions. Four of them (11%) revealed the hidden reason for the contradictions through independent cross-testing of the program with the data from the literature.

After a week, the teacher revealed the hidden defect and organized a discussion of the problems of competition in the area in which students were going to work. In particular, he underlined that independent exploratory activity during learning could protect one against dishonest actions from competitors (even if the learners did not know about the actions).

The discussion caused considerable interest among the students.

## **6. Counteraction and development**

Negative results of counteraction to learning, education and development are evident, and many of them are described above. It should be emphasized, however, that the effects of counteraction on development are ambivalent. Of course, counteraction can decrease the efficiency of the learner's activity because this is its main goal. But it can also have a positive influence on development. Tikhomirov (2002) has analyzed the increase of creative activity as a result of conflict. Lefebvre (1977) has shown that some strategies of behavior are much more effective under the condition of counteraction than without it. Yaroshevsky (1995) has formulated a concept of an opponent circle of a scientist. He has shown that various types of conflicts with the opponents can be important sources of the scientist's creative activity. Cognitive and interpersonal conflicts can equally have positive effects on learning, education and development (Perret-Clermont, 1986).

Developmental trajectories in the process of help and counteraction tend to change the direction of development in different ways (Poddiakov, 2003). Help and support tend to change the direction of development in a predictable way, a way desired by the helping party (an educator, a teacher, etc.). Counteraction most often changes the direction of development in an unpredictable way. Let us consider it in detail.

Help and support provided in effective education change the course of development in a way desired by the educator. Otherwise the aims of education will not be reached (if the main aim is not the stimulation of spontaneity and self-development). Counteraction to learning and development also tries to keep the activity of the counteracting subject in a definite channel, but the aim of the subject is to break out of this channel. The instability, dynamics and variety of situations that arise means that this break can happen in any area and can develop in an unpredictable way.

A very important part of creative thinking is the development of divergent abilities, i.e., the abilities to consider an object from different views, to reveal its various hidden features, to generate multiple decisions, etc. (Guilford, 1967). Situations of counteraction, rivalry and struggle lead to potentially endless variety, complexity and simplification of new situations and

decisions because the aim of each side is to find ways to deceive its competitor (Lefebvre, 1977; Lotman, 1992).

The logic of resistance in social relations includes formalisms with recursive functions (Bauer, 1995). A recursive function can result in a great variety of trajectories and final effects, even in conditions of very small (including infinitesimal) differences in variables in very similar initial situations.

In supportive education, this tendency to variety is presented to a lesser extent, if at all. (It can, however, be introduced especially by the educator).

One should note, however, that supportive education, which causes real development, will inevitably bring about positive and negative effects of spontaneity and unpredictability of this development because of the features inherent in the development in its own right. But usually it will be in a lesser extent and in a less critical form than through counteraction, which can lead to both regression and progress with unpredictably high results.

## 7. Conclusion

Future development of civilization and the emergence of new domains and high-competitive activities may result not only in the development of motives, aims and means of education, and in attempts at designing perfect teaching / learning technologies, but also in the development of new motives, aims and new means of counteracting this education. The future of humans is determined not only by the achievements in learning and instruction which stimulate cognitive and personal development, but also by the achievements in counteraction of learning, instruction and development, in strategic disorientation and the decrease of human capital.

Development of various teaching technologies may cause attempts to deliberate spread the negative effects of teaching by giving Trojan horse teaching technologies to potential competitors. For example, it has been shown that the use of certain instructional programs in multi-variable environments may predispose students to develop so-called "eunuch intelligence". Students who have such instruction may begin to reason at a higher level about how to operate in such environments, but this "acquired eloquence" does not affect their actual performance in these environments (Dorner, 1997, p. 233). These and other similar effects, once accidentally discovered, could be consciously exploited when the specialists in technologies instruct possible competitors.

Concerning such an important part of modern economies as computerized systems, we may expect that the area of artificial intelligence will develop towards designing systems that are able to:

- (a) counteract other systems' learning, teach them "with evil intent" (e.g., by designing and presenting patterns of irrelevant examples), and make them take decisions which contradict the aims of owners and/or users of the systems taught;
- (b) counteract humans' learning;
- (c) learn in conditions of counteraction to their own learning.

First of all, these three kinds of activities will be developed in artificial intellectual systems for military purposes, high-competitive business, etc. Then these high-tech devices can also be turned into devices for people's everyday life. Computer wars between contemporary hackers and different institutions can be a source of hardware and software development. (I use the terms "intelligence" and "learning" in relation to artificial devices in the limited sense that

includes not real creativity, but improving decision-making, based on modification of bases of data collected.)

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