Chapter 1. Teaching Thinking

In this chapter we would like to present the field of teaching thinking, describe most popular approaches to teaching thinking and compare them with the approach adopted in the given research. We will also define the notion of inventive thinking and present the structure of inventive thinking as conceptualised in this study.

1.1. Reasons for teaching thinking. Driving problem of education

1.1.1. Need for changes

A need for changes is always grounded in some dissatisfaction with present conditions. Let us see what is usually mentioned in this connection by researches in the field of teaching thinking.

Reeve and Palinscar (Reeve, Palinscar, & Brown, 1987:130-131) say that "the learner is asked to acquire decontextualized bodies of knowledge for knowledge's sake, in the service of no goal other than success in school."

A similar problem is mentioned by Perkins and Salomon (D. N. Perkins & Salomon, 1990:11) when they discuss the problem of 'disconnected curriculum': "The subject matters are taught in ways encapsulated from one another and sealed off from the lives students live outside of school, not to mention the lives they will live after they have completed their schooling."

Writing an introduction to a book dedicated to Teaching for Understanding framework, Maria Stone Wiske points out that traditional instruction is no longer acceptable:

> In the past decades learning theorists have demonstrated that students don't remember or understand much from didactic instruction. To understand complex ideas and modes of inquiry, students must learn by doing and actively change their minds. New curriculum standards issued by educators in a wide range of subject matters call for schoolwork to focus on conceptual development, creative thinking, problem solving, and the formulation and communication of compelling arguments. Similarly, new assessment standards decry testing students' recall of isolated bits of information with multiple-choice tests. They recommend more authentic, embedded, performance-based assessments integrated with instruction.

(Wiske, 1998:3)

Fennimore and Tinzman (Fennimore & Tinzmann, 1990:5) write that changes in society compel education to change. Although written over 15 years ago, the societal shifts the authors invite us to consider still appear to be relevant today:

- Our economy is shifting from a traditional industrial base to an information and service base.
- Individuals will have a number of jobs in the course of their careers, and those jobs are continually redefined by rapidly advancing technology, decentralization of authority in the workplace, and changes in the norms that define the culture of the workplace.
- Social arrangements are more fluid now - people move from place to place, families are configured differently, and child-care responsibilities are assumed by different individuals both within and outside the immediate family.
- In the political realm, citizens struggle with difficult issues related to technology, concerns for social equity in a pluralistic society, and the nation's greater interdependence with other countries.
- Successful inhabitants in such a world must make sense of large and shifting bases of information, be flexible in adapting to changing environments, work effectively in teams, and truly understand and value groups with backgrounds different from their own.

Writing an overview of thinking skills approaches, Wilson (Wilson, 2000:32-33) quotes Resnick (1987) who argues that ‘a new challenge to develop educational programmes that assume that all individuals, not just an elite, can become competent thinkers’. Wilson mentions (ibid.) that a new range of competences defined as higher order thinking skills are necessary because of the following reasons:

- The ‘banking theory’ of knowledge based upon rote learning has been discredited as it is recognised that individuals cannot ‘store’ sufficient knowledge in their memories for future use.
- Information is expanding at such a rate that individuals require transferable skills to allow them to address different problems in different contexts at different times throughout their lives.
- The complexity of modern jobs requires staff who demonstrate comprehension and judgement as participants in the generation of new knowledge or processes.
- Modern society assumes active citizenship which requires individuals to assimilate information from multiple sources, determine its veracity and make judgements.

The need for changes is also reflected in various normative educational documents. For example, in addition to key skills, thinking skills are embedded in the National Curriculum in England (*The National Curriculum for England*, 1999).

Standards and frameworks developed in the US also reflect the new educational values:

> The curriculum standards and frameworks now being developed emphasize the need for students to make sense of key concepts in the disciplines, develop intellectual dispositions and habits of mind associated with inquiry, construct their own understandings rather than merely absorb the knowledge created by others, and see connections between what they learn in school and their everyday lives. Given the focus on understanding, the new standards call for teachers to make judicious selections of curriculum content, be more clear about their purposes or goals, and make assessment rooted in performance more integral to the teaching-learning exchange. Superficial coverage of overly broad content and multiple-choice tests that feature recall of information are not viewed as virtues. More thorough inquiry is recommended around a smaller number of critical ideas, concepts, and themes that are studied in depth, returned to at different grade levels, and connected both to ideas across various fields of inquiry and to students' personal lives. Evidence of these priorities can be found in virtually every recent effort to define the nature of subject matter curriculum.
> (Wiske, 1998:28)

In Latvia, learning to learn, which includes an ability to think effectively, is one of the key skills in the new standard of education. (Latvian Educational Standard *The State Standard for Basic Education. Available at www.isec.gov.lv*, 2000) Unfortunately, a mere call for changes hardly ever appears enough if one aims at implementing a change. This top down approach usually leads to rather superficial benefits. The situation is well summarized by Matthew Lipman - one of the most famous names in the field of teaching thinking:

> There is a present widespread recognition that something is amiss, but efforts at improvement often turn out to be merely cosmetic. There is nothing wrong with attempting to remodel lesson plans so as to make them more likely to encourage critical reflection and to strengthen judgement within and among the disciplines. But these efforts at "infusion" are bound to be fumbling, haphazard, and unavailing, as long as students are not permitted to examine directly and for themselves the standards, criteria, concepts, and values that are needed to evaluate whatever they are talking and thinking about. **Merely to encourage differences in opinion, open discussion, and debate will not provide a comfortable escalator to the improvement of thinking**. (highlighted by me – A.S.) This will happen only if students are given access to the tools of inquiry, the methods and principles of reasoning, practice in concept analysis, experience in critical reading and writing, opportunities for creative description and narration as well as in the formulations of arguments and explanations, and a community setting in which ideas and intellectual contexts can be fluently and openly exchanged. These are educational conditions that provide an infrastructure upon which a sound superstructure of good judgement can be erected.
> (Lipman, 2003:290-291)

1.1.2. Driving problem of education

As national standards are normative documents, they usually point out what still needs to be done rather than what has already been done. So, let us conclude the concerns of researchers, some of which we have just outlined, and attempt at a formulation of an underlying problem of modern education.

Ever-accelerating pace of change creates the knowledge avalanche. New knowledge appears much faster than earlier and education no longer manages to keep up with changes. The model of education as transmission of knowledge is not adequate any more to prepare students for future life. When intensifying the problem it becomes apparent that *today teachers must prepare students for the life neither they nor students know anything of.*

We are not the first who have tried to formulate the driving problem of the modern education. Some of our colleagues proposed similar formulation in their publications, e.g. Khomenko (N. Khomenko, 1993) and Murashkovska and Khomenko (Murashkovska & Khomenko, 2002) among others. What is important, however, is understanding that a contribution to the resolution of this problem is central when evaluating various approaches to teaching thinking. In order to survive in a rapidly changing world students must be able to face situations when no knowledge is available to them. Modern students must be able to generate new knowledge on the basis of resources already present. And here students need powerful tools for thinking, such tools which will allow them to cope with new problems they are going to face.

1.1.3. Aims for teaching thinking

In this section we will see to what extent aims for teaching thinking as defined by the researchers in the field coincide with the aims embedded in the driving problem of education we defined in the previous section.

A number of researchers (Adams, 1993:8; Jonathan Baron, 1993:199; R. Ennis, 1997a:214) point out that the idea behind the thinking curriculum is not teaching people to think – this is what an absolute majority of people already can do – but influencing when and how they think, i.e. teaching them to think *effectively*

(highlighted by me – A.S.). Some researchers see thinking curriculum as ultimately aimed at the development of useful habits of mind (Costa, 2001) (Fennimore & Tinzmann, 1990:1). Fennimore and Tinzman continue that "the thinking curriculum gives students the tools---the perspectives and methodologies and concepts they need to carry out these authentic tasks" (Fennimore & Tinzmann, 1990:2). The idea of tools that can be applied beyond the immediate context is also shared by Sternberg who writes that "our goal in teaching thinking skills is not to produce students who can identify and describe a set of thinking skills. Our goal is to produce students who regularly apply thinking skills to all kinds of problems" (Okagaki & Sternberg, 1990:75-76).

As we can see from the references above, the aims for teaching thinking proposed to researchers do not contradict the driving problem of education, moreover, practically all of them are useful aims that can help us move in the right direction. Thinking curriculum is about developing new habits of minds which are based on acquiring tools that can help us solve problems across the fields At the same time, we would like to note that the acceptance of the driving problem as defined in section 1.2.2 makes it possible to formulate more specific aims that will provide us with more instrumental tools for monitoring and evaluation of our efforts. Thus, in the context of the given research we will speak about thinking curriculum that is aimed at educating the learner who wishes and is ready to:

- constantly "grow" and improve one's own skills, thus taking full responsibility for his/her learning;
- have a system of new and worthy personal aims behind every activity and work on their achievement no matter what;
- find, pose and resolve problems across fields.

If we think metaphorically, the driving problem of education calls us to educate the problem manager of tomorrow. This person must be interested in constant improvement as this is the only chance to come closer to the horizon of the future. The aims this person works on should all inevitably be new as they lie on the other side of the horizon and worthy as he/she undertakes to bring us all closer to this horizon. Finally, finding, posing and resolving problems will be an essential part of

this person's life, as one merely cannot avoid problems when working behind the horizon.

1.2. Current situation in teaching thinking

When analysing what the market offers for teaching thinking, one should distinguish between specific programmes for teaching this or that aspect of thinking, approaches to teaching thinking and theoretical frameworks which constitute the basis for various approaches. Let us consider all these in turn.

1.2.1. Programmes

Programmes for teaching thinking is something one is most likely to come across on the market. Thinking programmes are traditionally divided into two types: enrichment and infusion (D. N. Perkins, 2002; Swartz, 2000; Wilson, 2000). The former offer a general training in this or that aspect of thinking as a separate subject in the curriculum while the latter offer thinking instruction as an integrated part of a subject matter course. Thinking programmes are usually developed within some approach to teaching thinking[3]: numerous programmes for teaching elements of critical thinking (see a list in Baumfield (Baumfield et al., 2004)), programmes developed within Teaching for Understanding approach (Wiske, 1998), a large variety of Developing Education programmes (Davydov, 1996) and many others. When such programmes are developed by the authors of approaches or people close to them, they become the programmes – the ones mostly known and quoted. We can mention Feuerstein's (Feuerstein, 1990) Instrumental Enrichment programme, de Bono's (Bono, 1973-1975) CORT Lessons, Lipman's (Lipman, 1985) (Lipman, Sharp, & Oscanyan, 1984) novels and accompanying manuals, etc. As a result, they may often be situated somewhere between programmes and approaches, as more specific programmes can be developed on their basis when adapting them to peculiarities of a particular situation.

[3] We believe that the higher is the demand for thinking programmes on the market, the less the approach is primary in the development of the programme. Individuals and institutions develop a programme that they believe they can sell in a particular situation and its connection to some approach becomes just a matter of formality for justification of a programme rather than the pivot for the programme development.

1.2.2. Approaches

Unlike programmes, which are primarily aimed at solving a local problem[4], approaches are developed to solve a much more global problem. Contribution to solving this problem is the reason for the development of the approach. An approach should also follow a certain theoretical framework(s). Due to various reasons, approaches can be developed with a different degree of precision – compare, for instance, a very elaborate description of Teaching for Understanding approach developed within the Project Zero and rather general and fragmented data on educational approach to teaching lateral thinking developed by Edward de Bono. A good approach gives a possibility to develop various programmes for teaching thinking. Lipman's Philosophy for Children, Elkonyn and Davydov's Developing Education and what is known as the Montessori Method are examples of approaches. It is necessary to mention that in time some approaches develop to a degree when just a name remains and there already exist many, often quite different smaller approaches developed within the umbrella one[5].

1.2.3. Theoretical frameworks

Theoretical framework is a theory, or a set of theories, which constitutes the basis of a given approach. This theory should not necessarily be a pedagogical theory – it can come from a different field of studies. Moreover, we believe that the theory should NOT be pedagogical in most cases as the scope of problems it is supposed to solve should lie beyond the field of education. For instance, formal and informal logic are the underlying basis of Critical Thinking Approaches to teaching thinking while dialectical logic (Ilyenkov, 1984) and a number of theories developed by Russian psychologists (Leontyev, 1974) (Vygotsky, 1982) constitute the basis for Developing Education approach. It is necessary to note that our understanding of a framework is different from what is often seen as a theoretical framework in teaching thinking discourse (Moseley et al., 2004). Thus, such widely quoted theories as Perkin's et al (D. N. Perkins, Jay, & Tishman, 1993) dispositional theory of thinking, Baron's (J. Baron, 1985) theory of intelligence or

[4] Despite the fact that global problems are normally mentioned in the programmes, everyone seems to accept that their main purpose is more specific than something mentioned under aims.

[5] This is, for example, what we believe happened to Critical Thinking which can no longer be considered the approach. This tendency seems to work across fields. Compare, for example, the Communicative Approach to language teaching which is also hardly more than just an umbrella term today.

Sternberg's theory of rationality (Sternberg, 1985) will belong to the group of approaches in our classification.

1.2.4. Conclusions

If one considers what is offered in the field of teaching thinking through the prism of this classification, it becomes clear that the offer gets more and more limited as we go from the level of programme to the level of theory: one can hardly calculate the number of programmes available on the market, it is quite possible to enumerate available approaches, especially if one groups them under the so-called umbrella approaches and there is absolutely no difficulty to list the theories that serve as bases for teaching thinking.

At the same time, it is necessary to note that the niche still exists at each level of the market, even at the level of programme. McGuinness and Nisbet's conclusion about the absence of the "thinking revolution" despite a large number of various programmes (C. McGuinness & Nisbet, 1991:182) and a remark of a group of researchers from Harvard on the absence of systematic thinking instruction (D. N. Perkins, Simmons, & Tishman, 1990:285) still appear relevant today and are supported in more recent publications:

> Despite numerous recent educational projects whose goals are to enhance reasoning skills, the optimal means of 'teaching for thinking' are still far from clear. (Wilson, 2000:549)

One of the most recent reviews on teaching thinking (Moseley et al., 2004) explicitly states the need for research on teaching thinking in such fields as teaching English for speakers of other languages (Moseley et al., 2004:58)

1.3. Driving problem of education in approaches to teaching thinking

1.3.1. Teaching for Understanding

1.3.1.1. General description

The authors of the approach distinguish between knowledge, skills and understanding. Knowledge is seen as 'information on tap'. Skills are 'routine

performances on tap'. 'Understanding is the ability to think and act flexibly with what one knows.' (Wiske, 1998:40) and is recognised through flexible performance criterion. (Wiske, 1998:42) It is stressed that the performance view of understanding should not be seen as just attaining a representation, a matter of 'getting it'. 'Developing understanding should be thought of as attaining a repertoire of complex performances. Attaining understanding is less like acquiring something and more like learning to act flexibly.' (Wiske, 1998:52)

There are four guiding questions underlying Teaching for Understanding Framework (TfU):

- What topics are worth understanding?
- What about these topics needs to be understood?
- How can we foster understanding?
- How can we tell what students understand?

(Wiske, 1998:61-62)

These four questions are the basis for four elements of the TfU: generative topics, understanding goals, performances of understanding, and ongoing assessment. The authors speak about four dimensions of the TfU: knowledge, methods, purposes and forms. The master level of understanding is characterized by the following features:

- Performances are predominantly integrative, creative and critical.
- Students are able to move flexibly across dimensions, relating the criteria by which knowledge is built and validated in a discipline to its object of study or the purposes of inquiry.
- Students see the construction of knowledge as complex, driven by often conflicting frameworks and worldviews, and emerging as a result of public argumentation within communities of practitioners in various domains.
- Students can use knowledge to reinterpret and act upon the world around them.
- Knowledge is expressed and communicated to others in creative ways.
- Performances often go beyond demonstrating disciplinary understanding to reflect students' critical awareness about the construction of knowledge in the domains (for example, metadisciplinary understanding) or students' ability to combine disciplines in their tasks (for example, interdisciplinary understanding).
  (Wiske, 1998:199-200)

Although it is not explicitly stated, we assume that a list of dispositions proposed by Perkins, Jay and Tishman (D. N. Perkins et al., 1993:7-8) can also be considered a part of TfU based syllabus as at least David Perkins was involved in both projects. If this assumption is correct, there are seven main dispositions that

are aimed to be developed in the TfU classrooms: to be broad and adventurous towards sustained intellectual curiosity; to clarify and seek understanding; to be planful and strategic, to be intellectually careful; to seek and evaluate reasons and to be metacognitive.

1.3.1.2. Aim and theoretical basis

The view that "what students learn needs to be internalized, able to be used in many different circumstances in and out of classrooms, serving as a base for ongoing and extended learning, always alive with possibilities" can be considered the aim of the TfU framework. (Wiske, 1998:13)

As well as with most thinking approaches, the theoretical basis of the TfU framework is constructivism, or as Perkins puts it, a brand of constructivism that might be called performance constructivism because of its emphasis on building learners' repertoire of understanding performances more than on cultivating the construction of representations. (Wiske, 1998:57) The difference, according to the authors, lies in what gets constructed: representations or performance capability. "Learning a topic with understanding is not so much constructing a representation to fit the topic as developing a flexible performance capability around the topic." (Wiske, 1998:55)

1.3.1.3. Conclusions

Teaching for Understanding definitely appears an attractive approach to teaching thinking. Unlike in many other approaches, many details have been elaborated and tested with various subjects of the curriculum. However, if analysed from the point of view of the underlying problem of modern education, the situation does not look that positive. What are those generative topics worth understanding if we speak about tomorrow? We are discussing the knowledge which has not appeared yet, thus no generative topics could possibly exist. If there are no generative topics, the whole planning becomes problematic.

Problems also exist with other dimensions of understanding. It is not only knowledge which will be different tomorrow. Methods and forms will probably change as well TfU is grounded in what we see as good performance today rather than what will be a good performance tomorrow. TfU seems to aim at producing a

professional knowledge manager of today rather than the manager of tomorrow's knowledge which will be necessary for solving what we called the underlying problem of modern education. Although certain features of these two managers will be the same, we believe that these are essentially two very different tasks.

1.3.2. Critical thinking

1.3.2.1. General description

As we have already pointed out critical thinking is an umbrella term and quite many approaches may hide behind this name. Our purpose here is not to generalise about what is happening in the field of teaching critical thinking, but an attempt at defining problems aimed to be solved by this kind of teaching on the basis of various critical thinking publications.

The content of a critical thinking skills instruction is not so easy to identify as practically each more or less distinguished author has come with his/her list of critical thinking skills[6].

In one of his models, Richard Paul describes 35 dimensions of critical thought (Paul, Binker, Jensen, & Kreklau, 1990). They are divided into three groups: affective strategies, cognitive strategies (macro abilities) and cognitive strategies (micro skills). In a later version, Paul (Moseley et al., 2004:33-34) has reorganised the structure of his model and added elements of reasoning, standards of critical thinking and intellectual traits.

Summarising the opinion of a group of experts in critical thinking, Facione (Facione, 1990:13) proposes six groups of critical thinking skills: interpretation, analysis, evaluation, inference, explanation, self-regulation and two groups of dispositions: approaches to life and living in general and approaches to specific issues, questions or problems.

One of the most compact lists is offered by Robert Ennis (R. H. Ennis, 2002). He suggests three main dispositions: 1. Care that their beliefs be true, and that their decisions be justified; that is, care to "get it right" to the extent possible; 2. Care to

[6] We mean skills in a very general sense here.

present a position honestly and clearly, theirs as well as others' and 3. Care about the dignity and worth of every person (a correlative disposition) and 15 abilities.

Critical thinking approaches stand out from the rest of approaches due to the most developed assessment tradition. In addition to a number of various critical thinking tests developed largely in the United States, there is an A and AS Level Thinking Skills exam administered by the University of Cambridge International Examinations where critical thinking takes a major role(*Thinking Skills. GCE Advanced Subsidiary Level and GCE Advanced Level 9694. 2007 Syllabus. www.cie.org.uk*). We believe that assessment is a good indicator of what a course is really about as it is not a secret to any educator that most teaching is done for assessment purposes.

If we undertake a short analysis of the Cambridge Exam, we will see that its scope is much narrower than any of the lists of skills considered above. Let us start with the first part dedicated to problem solving.

> For the examination students need to be able to apply simple mathematics to new situations in order to demonstrate an ability to manipulate numerical and graphical data. They will need to be able to extract and use relevant data and find methods of using information in order to come to conclusions. (*Thinking Skills. GCE Advanced Subsidiary Level and GCE Advanced Level 9694. 2007 Syllabus. www.cie.org.uk*)(p.1)
>
> <…> The Problem Solving element of this subject is about using logical methods of handling numerical, graphical and pictorial data. Problem solving skills are not only desirable but essential to lawyers, sociologists, geographers, historians and those in many other professions. They have to understand and use numerical information, to analyse it and to draw conclusions from it. (p.1)

Agreeing that problem solving skills are desirable for representatives of a large number of different fields, the definition of problem solving appears rather limited. Modern lawyers, sociologists, geographers, etc. need much more than just “logical methods for handling numerical, logical and pictorial data”. The definition of problem solving in the given syllabus is more the one of mathematics for everyday life than problem solving.

There are four papers offered in the exam. Problems offered to students in Paper 1 are very simple as they are based on few choices only. As mentioned earlier, it looks more like mathematics for everyday life than problem solving. In real problem solving people are expected to invent something – then the problem is solved. In the given tasks, students are not expected to invent anything unless we assume they have no knowledge of mathematics, which is not the case with upper-secondary students for whom this exam is meant. We believe these tasks would be much more of problem solving ones if students did NOT know the mathematics they are expected to apply to them. It also appears that one can train learners to do such tasks without much improving their general thinking skills. Critical thinking tasks in the paper are centred around working with arguments. These are useful skills, but definitely not the only ones when speaking of thinking.

Paper 2 is not really different from Paper 1. It is just another format which is more difficult for students. Paper 3 is supposed to be advanced. The question we have though is whether it is advanced in terms of thinking skills or advanced because more knowledge is required to cope with tasks. Problem solving is understood here as mathematics applied to real life. Such tasks are very good for teaching mathematics well, but they are not enough for teaching (and testing) problem solving. It has to be mentioned that some questions in the critical thinking part would be more advanced if they required the use of several skills simultaneously.

Paper 4 is about building models of situations – obviously a very important part for successful problem solving. However, we would like to mention once again that models are not necessarily mathematical. A small variety of problems considered in this test appears to be quite a serious drawback.

1.3.2.2. Aim and theoretical basis

Most probably various critical thinking courses will have different aims depending on whose model of critical thinking is followed by the authors. One possible way of defining aims would be looking at most popular definitions of critical thinking and

trying to see what kinds of aims may hide behind this or that conceptualisation of critical thinking.[7]

Robert Ennis (R. Ennis, 1997c) defines critical thinking as "reasonable reflective thinking that is focused on deciding what to believe or do" . Sharon Bailin (Bailin, 1998:3) says that critical thinking should be conceptualized in terms of things necessary for making reasoned judgements. Richard Paul (Scriven & Paul, undated) says that 'critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.'

Ennis's definition will provide us with a very general aim that might sound as follows: educate a learner who is able to think reasonably and reflectively and as a result make decisions on what to believe or do. A part about reasonable thinking would probably be the aim if formulated by Bailin's followers while Paul's approach would be generally the same but giving a more explicit understanding of "reasonable and reflective".

As well as with other approaches described in this chapter, constructivism is the educational theory that lies at the basis of critical thinking. At the same time, it is necessary to note that due to a large number of various kinds of critical thinking currently taught around the world, the degree of constructivism in this or that approach may differ.[8] Yet, if it is teaching for critical thinking rather than teaching critical thinking, it is a constructivism approach that is essential for successful learning.

[7] It is important to note that we do not aim at producing a comprehensive analysis of possible aims. As there exists a large number of various definitions of critical thinking (cf. for example Lipman 2003:56-58 who gives 31 different definitions of critical thinking coming from different sources), our assumptions are bound to be fragmentary. At the same time, we believe that an analysis based on a number of widely recognised definitions can be enough for our purpose of considering critical thinking in the context of the driving problem of education.

[8] Even working with materials that pre-suppose a constructivist approach, the teacher may often keep very close to the traditional teacher-centred model of teaching. This can often be seen in language classrooms when the teacher exemplifies a classical authoritative pedagogy using a "communicative" course book.

1.3.2.3. Conclusions

We believe that there is a difference between critical thinking courses as taught at least by those authors whom we quoted at the beginning of this section and the courses aimed at helping students successfully pass such critical thinking exams as Cambridge International Exam. In the former case we deal with a systematic development of various thinking skills and dispositions and, more importantly, also development of certain values[9]. In the latter case, however, we have hardly more than quite a narrow focused instruction which can be useful for a very limited spectrum of what refers to effective thinking.

At the same time it is necessary to note that with all their attractiveness even critical thinking approaches presented by such masters as Paul, Ennis and Facione do not resolve the underlying problem of modern education. Instruments of critical thinking work best when applied to dealing with today's knowledge. They can be extremely useful for analysis, evaluation, interpretation of this knowledge, making inferences and explaining but they have not been created for dealing with situations when no knowledge is available. Critical thinking is a tool for today and to a lesser degree a tool for tomorrow. Its focus is not so much on solving problems as finding a place in the ocean of solutions, as Ennis puts it 'deciding what to believe or do'. (see also (N. N. Khomenko, 2005))

1.3.3. Philosophy for Children

1.3.3.1. General description

One may look upon Philosophy for Children as one of critical thinking programmes, yet we would like to consider it separately due to several reasons. First, critical thinking is only a part of the programme according to its author Matthew Lipman (Lipman, 2003) and, second, the materials used in the programme definitely stand out from what is more conventionally used in critical thinking programmes.

[9] For example, Paul's division of critical thinking into weak and strong (referred to in Moseley, Baumfield et al. 2004:31) is based on the values aspect – it is values and beliefs of strong critical thinkers we speak about. Bailin's (Bailin 1998:2) conceptualisation of critical thinking as an essentially normative concept is also about values of what people see and accept as good thinking.

Lipman describes a list of deficiencies of critical thinking programmes that, according to him, "doomed it from the start" (Lipman, 2003:5-6). Philosophy for Children is offered as an alternative educational approach to improvement of thinking in schools. Its curriculum "is composed of novels for the students and manuals for the teachers. The novels are age-differentiated, and they aim to stimulate in children patterns of questioning and discussion that are first modelled by the fictional characters in the novels and subsequently continued, by internalization and appropriation, by the live children in the classroom, as they talk about what they have learned." (Lipman, 2003:156) Children are learning to become the community of inquiry which is seen as the only fully appropriate pedagogy for improvement of thinking. (Lipman, 2003:5) "The community of inquiry wants to build a system of thought." (Lipman, 2003:103)

According to Lipman, there are three most important dimensions of thinking to be cultivated: critical, creative and caring. Unfortunately, consideration of the last two dimensions appears to be much less detailed in comparison with the first one. We see it as an advantage of Philosophy for Children that a constructive component is discussed (creative thinking) and the value component is given attention (caring thinking), but these dimensions are apparently presented less instrumentally than critical thinking. Although the treatment of critical dimension is quite detailed, certain issues remain vague. On the one hand, Lipman conceives of critical thinking as a kind of protective thinking:

> <…> the role of critical thinking is defensive: to protect us from being coerced or brainwashed into believing what others want us to believe without our having an opportunity to inquire for ourselves.
> (Lipman, 2003:47)

> Critical thinking can provide a degree of protection against the less subtle forms of brainwashing.
> (Lipman, 2003:209)

On the other hand, making good judgements is seen as one of the indicators of students' progress. We see this as potentially contradictory things, as it is not always a problem of 'being brainwashed' that prevents one from making a good judgement, but rather an inability to resolve the contradictions faced in a specific situation. Thus, one will need not so much protection but support for moving forward.

In Lipman's novels, fictional characters serve as role models to children. Children are expected to gradually internalize the behaviour of the characters (Lipman, 2003:102) and then demonstrate a similar behaviour in the classroom.

1.3.3.2. Aim and theoretical basis

Philosophy for Children is aimed to develop three dimensions of thinking: critical, creative and caring which collectively produce multi-dimensional thinking. (Lipman, 2003:197) The ultimate aim of the programme is to provide education for "an inquiry-driven society". (Lipman, 2003:204) Thus, the aim of the programme may be formulated as follows: educate a learner who is able and wishes to think in a multi-dimensional way and is a part of "an inquiry driven society".

It is not surprising that Philosophy for Children is also based on the constructivist tradition in education. At the same time, Lipman's constructivism is much closer to the Russian school of psychology and it shares many commonalities with such an approach as Developing Education (Davydov, 1996) which is largely based on the Vygotskian Cultural-Historical theory (Vygotsky, 1982). At the same time, it is necessary to note that a number of important differences exist between the two approaches, such as different conceptualization of thinking, various objects of study, models of educational process, etc. (see (Margolis, 1996) for more details).

1.3.3.3. Conclusions

Apparently, constructive (creative thinking) and value (caring thinking) dimensions are important in the context of the underlying problem of education. At the same time, it appears that the focus in the programme is more on 'protective' tools rather than 'constructing' tools, as critical component seems to prevail over the other two. This is also reflected in the role given to the formal logic in the process of development of thinking skills.

Another issue we are concerned with is the following: for the Philosophy for Children to contribute to the resolution of the underlying problem, we need learning materials where characters face and resolve future problems rather than the present ones. Unless this is done, we cannot approach the task of educating a manager of future problems – the role which is already recognised as needed for

the modern inquiry. Apparently, materials dealing with future are much more difficult to prepare.

1.3.4. Root of problem: missing theory

The purpose of this chapter is not to criticise current approaches to teaching thinking. We sincerely believe that many of them are good approaches and they do contribute to improving students' thinking skills. The problem we see is that many of these approaches are merely not meant to solve the underlying problem of education. One of the reasons for such a situation is the lack of an appropriate theory for powerful thinking behind currently available approaches to teaching thinking. The existence of a problem is in fact mentioned by a number of authors. (Jonathan Baron, 1993:191) (C. McGuinness & Nisbet, 1991:176) (Moseley et al., 2004:24)

What kind of theory do we need if we are concerned with the resolution of the underlying problem of modern education? In order to answer this question we have to decide what we see as the content of teaching which resolves the underlying problem of education. Apparently, it can no longer be teaching of facts. Teaching ways of experts' thinking within a domain – an aim for some of thinking approaches – is better, but we are back to our problem: the number of domains is growing very fast and eventually we face the problem analogous to teaching of facts. A possible answer would be teaching interdisciplinary ways of experts' thinking. Here we speak not so much of traditional thinking skills which lie across domains, such as analysing, summarising, etc but rather models of presenting knowledge which do not depend on content area. It is these general models that must become a substitute to factual syllabi we have everywhere around us[10]. We agree with Nesterenko (Nesterenko, 2005a) however, that general models are not enough. Nesterenko (ibid.) proposes that the new curricula is based on three pivots. Apart from models for description of knowledge, one needs to be aware of strategies, or to put it better, technologies for modifying knowledge or even generation of new knowledge. And the first two will be really valuable only in case they bring about a change in the values aspect – a thinking approach should

[10] Such an approach could mean that there is no time left for dealing with models of dealing with knowledge that are specific of a certain domain. However, we agree with Nesterenko (Nesterenko 2005) that this contradiction can be resolved by learning specific models within general models.

always lead to changes in the way we think and conceptualise the world around us.

Thus, we have at least three requirements to the new theory:

1. It should provide us with models for knowledge management which are domain independent
2. It should provide us with technologies for generation of new knowledge (ie problem solving) which allow to arrive at new solutions irrespective of domain
3. It should provide us with the description of the world view and a life strategy of a personality which accepts and practises the types of thinking described under 1 and 2.

Let us see to what extent the theories of thinking behind the approaches we have described meet the above criteria.

To the best of our knowledge, the authors of TfU approach do not explicitly mention any thinking theory that underlies their framework. Judging by the people involved in the project however, one may assume that it is either Gardner's theory of multiple intelligences (Gardner, 1993) or Perkins et al's (D. N. Perkins et al., 1993) dispositional theory of thinking that is seen as a basis. The former can hardly be called a theory of thinking in the sense of making it clear what constitutes the basis of effective thinking. Gardner's theory is rather a pedagogical theory that calls attention of educators to aspects of intelligence traditionally ignored in the classroom. The latter theory appears more relevant in the context of the underlying problem of education as it does give account of what needs to be mastered. At the same time, it is not clear how separate dispositions work in a system and provide the learner with models for description of knowledge, tools for generating new knowledge and the value system that helps learners unite the first two into a consistent model of seeing the world.

The thinking theory underlying critical thinking approaches is formal and informal logic. Unlike the dispositional theory of thinking, logical theory provides learners

with much better proceduralized models and tools that can be applied to various tasks across disciplines. The question that remains arguable though is to what extent models and tools developed in the framework of logic are relevant to the description of present and generation of new knowledge in the modern world. In our opinion, the requirements listed on the previous page demand that a person sees the world in all its complexities, conceptualising it as networks of contradictions[11] that permanently evolve in time. Unfortunately, mechanisms of formal and informal logic are built neither for working with contradictions nor for dealing with dynamic models.

As Philosophy for Children is an example of a critical thinking approach, one may consider logic as the underlying thinking theory as well. Another option would be to say what Lipman did himself and state that his approach is grounded in the philosophical tradition. Philosophy will give us a much broader context and will provide us with models for dealing with both contradictions (eg dialectical logic) and dynamic character of phenomena in the world around us. At the same time, models offered by philosophy are often difficult to conceptualise as tools in the sense that they could be used as a system and provide us with a pragmatic problem solving outcome. If so, the value of philosophy as the key discipline for a manager of future problems diminishes, although it obviously remains one of the disciplines that helps him/her move in the right direction.

1.4. The General Theory of Powerful Thinking as an alternative theory for teaching thinking

1.4.1. General information

The history of the General Theory of Powerful Thinking (OTSM) (N. Khomenko, 1997-2000, 2004; N. N. Khomenko, in preparation) goes back to the end of 1940s when the Soviet engineer Genrich Altshuller started working on what later became known as the Theory of Inventive Problems Solving (TRIZ) (Altshuller, 1979, 1986b; Altshuller & Shapiro, 1956). Genrich Altshuller believed that going through trials and errors method was an extremely inefficient way of problem solving. He

[11] There are five types of contradictions distinguished in OTSM (Khomenko 2004). According to the general definition, a contradiction is a situation when two opposite demands are set to one element, for example a learning task should be individual and collective at the same time.

wanted to create a theory of innovation which was to resolve the following problem: how can one arrive at high quality solutions of technical problems avoiding generating a large number of ideas and then spending time on their evaluation. (N. N. Khomenko, 2005). By the end of the 1980s the theory was created and it was time for making the next step. However, even before that Altshuller started speaking about the need for a general theory for problem solving which he named OTSM (Altshuller, 1986a; Altshuller & Filkovsky, 1975). Starting from the 1990s Nikolai Khomenko has been the principle researcher in the field of OTSM. (Cavallucci & Khomenko, 2006; Cavallucci, Khomenko, & Morel, 2005; N. Khomenko, Eltzer, Cavallucci, & Lutz, 2004; N. Khomenko, Eltzer, Cavallucci, Lutz, & Caillaud, 2004; N. Khomenko & Kucharavy, 2002; N. Khomenko, Leluch, & Sidorchuk, 2003; N. N. Khomenko, 2005; N. N. Khomenko, Eltzer, Caillaud, Cavallucci, & Lutz, 2005; N. N. Khomenko, Eltzer, Cavallucci, Lutz, & Caillaud, 2006). Let us see what OTSM offers us in terms of the three requirements outlined above.

1.4.2. Models

The major source of OTSM models is TRIZ. We can speak about such models as contradiction, ideal final result, multi-screen system of powerful thinking and many others. At the same time, it is necessary to note that classical TRIZ models often appear different in OTSM if one goes beyond first glance acquaintance. For example, OTSM speaks about five types of contradictions in comparison with the three offered by classical TRIZ, the multi-screen model, often referred to as a full scheme model in OTSM, includes a number of additional axes apart from the traditional ones (time, hierarchy and anti-system), the notion of function is different from the one in classical TRIZ, etc. Moreover, OTSM offers a number of new models the roots of which are not necessarily in TRIZ. The most famous example would be the Element – Name of Feature – Value of Feature (ENV) model and the Fractal Model of the Problem Solving Process. The main reason for the difference is that OTSM models are meant to be more domain independent (including application to problems in the fields of humanities and social studies) while TRIZ models are primarily meant for technical problems[12]. Nesterenko (Nesterenko,

[12] Unlike a number of TRIZ researchers we believe that TRIZ models do work beyond engineering, what we are saying here is that they were not meant to work there and, therefore, it is often quite difficult to apply them.

2005a) offers a classification of OTSM models which consists of three groups: description of objects "without aim", description of objects in the context of aims, and description of problems in objects.

1.4.3. Technologies

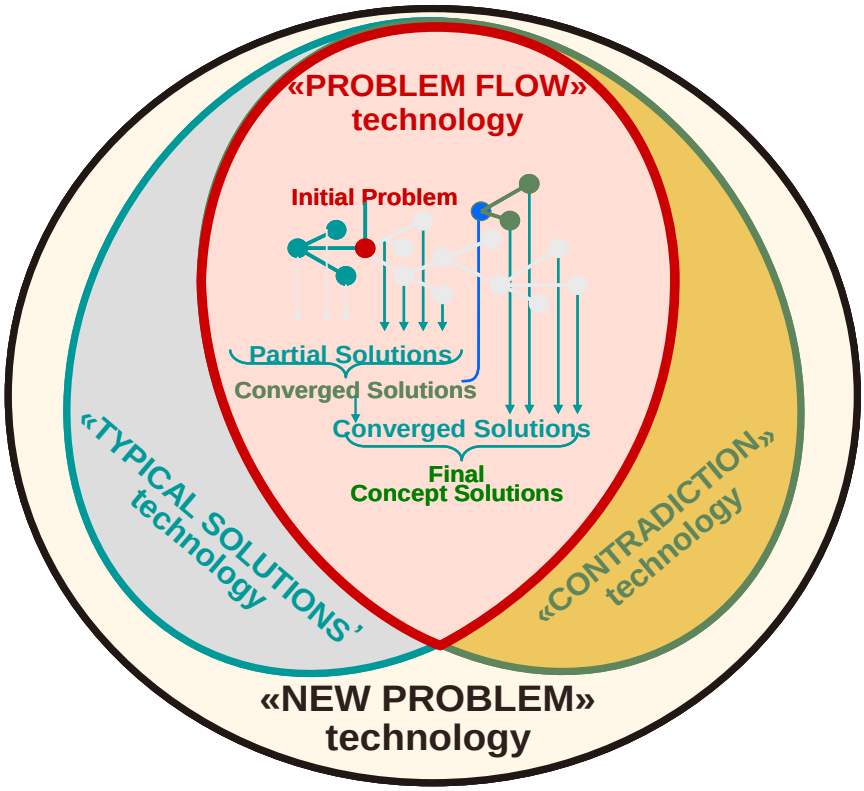
Classical TRIZ offers two main technologies to problem solving: standards for technical problems solving (Altshuller, 1988) for the so-called typical problems and the algorithm of inventive problems solving (ARIZ) for non-typical problems[13] (Altshuller, 1986b). Both of the tools underwent a long evolution before becoming really powerful instruments for problem solving (see, for example (Altshuller, 1986a)). However, as we mentioned above, tools of classical TRIZ are primarily meant for solving technical problems – the same is true about technologies[14]. The four technologies of OTSM appeared as a result of working with large numbers of non-technical problems and, as well as separate models, are meant to be domain independent. Presently OTSM includes the following technologies: The New Problem Technology, The Typical Solutions Technology, The Contradiction Technology, and The Problem Flow Technology. Each technology is meant to perform a separate role, i.e. the Typical Solution Technology is applied when the problem can be described by if <description of the problem> then <description of solution> model; the Contradiction Technology is applied when the problem is non-standard (cannot be described by if – then model, i.e. its solution is not known or merely not available to the problem solver) and thus requires models allowing to resolve separate contradictions; The Problem Flow Technology is meant for coping with complexes of contradictions characteristic of problem networks rather than one separate problem; and the New Problem Technology is applied when no knowledge about the problem is available yet, in other words one does not really know what kind of problem(s) he/she is going to face and it is necessary to transform a vague situation into a working definition of a problem. (N. N. Khomenko, 2005:23) At the same time it is necessary to note that an OTSM professional normally applies the technologies in an integrated way rather than linearly in the real problem solving process.

[13] Different versions of ARIZ were developed by Altshuller starting from 1950s. The last version developed by him is ARIZ-85c which is considered the classical text of ARIZ as used today.

[14] It is necessary to note that this fact does not mean that TRIZ tools cannot be successfully applied to non-engineering problems, it is just that they were not initially developed for these purposes and, therefore, require more care and precision.

Figure 1.4.1. presents how the technologies relate to each other.

Fig. 1.4.1. OTSM Technologies. (N. N. Khomenko, 2005)



1.4.4. Life strategy

Life strategy of a personality refers to the value dimension. We believe that when one becomes a powerful problem solver in the real sense of this expression, one merely cannot apply the skills to evil purposes. The life vector of such a person is described in one of the branches of TRIZ known as the Theory of Creative Personality Development (TRTL). (Altshuller & Vertkin, 1994) Creative Personality as outlined in TRTL is characterised by six main qualities:

- having a new or unachieved ultimate *Goal* (or a *System of Goals*) which is worthy and valuable to the community;
- having a *Program of Activities* (or several programs) aimed to achieve the set goal and control the process of its execution;
- desire and *Concrete Results* in carrying the heavy workload necessary to go according to plan;
- ability to solve problems encountered on the way to the *Goal*;
- ability to defend one's own ideas, bear public unacknowledgement and incomprehension, ability "to stand punishment" and keep loyal to the *Goal*;

- *Commensurability of Achievements* (or their dimension) with the set *Goal*.

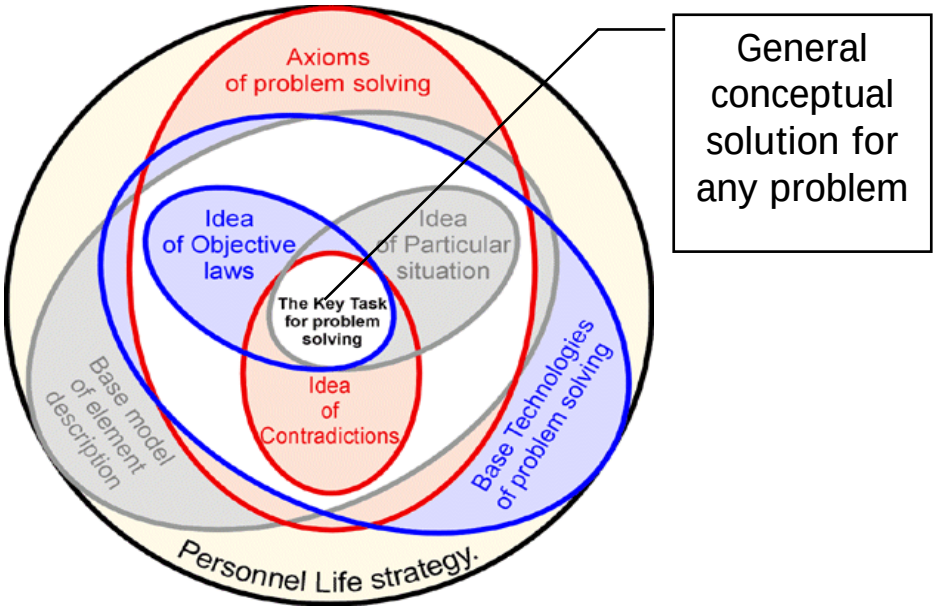
(Altshuller & Vertkin, 1994:127)

The model of a life strategy of such a person was proposed by Althsuller and Vertkin (Altshuller and Vertkin ibid.) and described as an example of a chess game where a creative personality is playing against external circumstances.

1.4.5. Summary

The general structure of OTSM is presented in Figure 1.4.2. below.

Fig. 1.4.2 Structure of OTSM (N. Khomenko, 2004)



As you can see the model includes such parts as the key task for problem solving and axioms of problem solving in addition to the areas discussed above. If the definition of the former is presented in the figure above, the latter requires an additional explanation. The purpose of OTSM axioms is twofold: on the one hand, they define the scope of the science, on the other hand, they are the most general problem solving tools one can employ. There are three groups of axioms:

(1) main axiom of OTSM or the axiom of description
(2) axioms of world vision or the description of the world from the OTSM point of view;
(3) axioms of the thinking process or main points in the description of the thinking process from the point of view of OTSM

(N. N. Khomenko, in preparation)

So, what is OTSM and how can it help us in teaching thinking?

According to Khomenko (N. Khomenko, 2004) it is:

- THEORY about complex and interdisciplinary problem solving.
- SYSTEM of META KNOWLEDGE AND META MODELS.[15]
- SCIENTIFIC METHODOLOGY for solving non-typical problems.
- SYSTEM OF INTELLECTUAL TECHNOLOGIES that use problem solving for forecasting, bypassing competitors' and protecting own patents, company management, etc.
- INTERDISCIPLINARY LANGUAGE for cooperation and better communication between people of different professions.

We would also add that it is a set of beliefs and a system of values. Thus, OTSM meets all the three requirements we formulated for the theory for teaching thinking:

(1) it provides us with domain independent models for knowledge management;
(2) it provides us with technologies for generation of new knowledge ;
(3) it provides us with the description of the world view and a life strategy of a powerful thinker.

1.5. Model of Education based on the General Theory of Powerful Thinking

1.5.1. Resolution of the driving problem

The driving problem of modern education formulated earlier says that teachers must prepare students to the life neither they nor students know anything of. In Nesterenko's (Nesterenko, 2005a) formulation this contradiction looks as follows: "The content of education has to be defined in advance in order to teach effectively and it cannot be defined in advance as we do not know what a person will need tomorrow. "

The approach of OTSM based education to the resolution of the above contradiction is through modelling features characteristic to all education, i.e. students are learning models, or rather meta models. Specific subject matter content is studied within meta-models, they become pivotal elements for

[15] OTSM does not exclude or diminish the role of professional knowledge – it is extremely important and essential for solving problems.

organization of content. Nesterenko (ibid.) says that there are three things a student must learn:

- deal with new information
- develop new tools for dealing with the world
- acquire new values

These three vectors define the thinking curriculum of OTSM approach: students are learning FACTS (models of objects and processes), TOOLS (models of transformation and strategies) and VALUES (models of seeing models). (Nesterenko ibid.) The aim of OTSM education is the development of the world view centred on a problem. The problem as such is the central value in this system and is seen as the source for personal development and changing the world. (Nesterenko ibid.)

1.5.2. Syllabus design: inventive thinking skills and dispositions

For syllabus design it appears reasonable to present OTSM curriculum as a list of inventive thinking skills and dispositions (N. Khomenko & Sokol, 2000) (see also Appendix 1.1 for an updated list)[16]. In the Delphi Report, Facione states the experts articulated the ideal, meaning that no person is adept in all the skills listed. The list is a kind of ideal which can serve as a rich and worthy goal. (Facione, 1990:3) The purpose of the given list is similar. Although it may be far from ideal in terms of representation of what is meant under OTSM in the educational context, the list also aims to set the standard of what is to be taught in OTSM based education.

Lists of skills and dispositions are widely spread in the field of teaching thinking. (Paul et al., 1990) (D. N. Perkins et al., 1993:7-8) (Costa, 2001) (R. H. Ennis, 2002) and others. Thus, it appears reasonable to justify why we propose one more list.

Inventive thinking in the context of OTSM-TRIZ is seen as a problem solving activity. It is possible to classify a person's thinking as an example of an effective inventive thinking if a person is able to solve problems. A problem is understood

[16] It is necessary to note that OTSM skills and dispositions and inventive thinking skills and dispositions are used interchangeably here.

as a contradiction between our wishes and objective laws of systems evolution which are manifested in peculiarities of a specific situation. Moreover, the subject of OTSM-TRIZ is new problems, i.e. problem for which a solution is not known yet. When resolving a problem, an OTSM-TRIZ expert does not merely generate ideas. This person permanently narrows the solution search space by applying various tools of OTSM-TRIZ. Thus, we see OTSM-TRIZ skills as skills that help us reduce the solution search space of new problems and eventually bring the problem-solver to a situation when only several variants remain possible.

When taking a closer look at the lists, several other groups of differences can be mentioned. We will consider these in the next section.

1.5.3. Distinctive features of the proposed system of inventive thinking skills and dispositions

1.5.3.1. Underlying basis for lists of skills and dispositions

Most available lists on the market are either eclectic (try to include everything possible) or based on a combination of formal and informal logics. The drawback of the former is the lack of the system effect. The whole must have a new function which is not characteristic of any part. To take a classical example, a car is always more than just a collection of all its parts. It is doubtful that eclectic lists have such a function as the approach to constructing them was probably bottom up rather than top down (i.e. from the theory). As an example, we can mention a list proposed by Costa (Costa, 2001) or Perkins and his colleagues (D. N. Perkins et al., 1993)

In the latter case, we can speak about the system effect – for example, lists of critical thinking skills are often a system – however, their purpose is not effective problem solving. The main focus of critical thinking skills appears to be analysis rather than synthesis, which is quite evident from the list presented in the Delphi Report. Ennis's list would be another example to the point. In this respect, critical thinking skills lists are complementary to OTSM skills lists. The reason for this may probably lie in the fact that the purpose of critical thinking is defensive, as Lipman (Lipman, 2003:47) puts it "to protect us from being coerced or brainwashed into believing what others want us to believe" while OTSM and TRIZ are initially aimed

at synthesis, these are constructive approaches, although they may be used for "defensive" purposes as well.

1.5.3.2. Instrumentality

To be applicable in the context of problem solving, it should be clear how to apply skills. They should not be declarative entities, but proceduralized guidelines. Unfortunately, some of the well-known lists do not meet this requirement. As an example, we can mention a list of mental habits by Costa (Costa, 2001). Although the author mentions that a habit of mind includes capabilities, it is not clear which ones are required to exercise this or that habit of mind. Mental habit No.4 is to think flexibly, mental habit No. 7 is asking questions and posing problems. Agreeing that thinking flexibly, asking good questions and posing problems are important for effective thinking, it is necessary to note that statements per se are no more than declarations. To learn to think flexibly or to pose problems, one need to develop a set of various thinking skills. If we refer to the list of OTSM-TRIZ skills, Group 1 (12 skills) deals with flexible thinking and Group 3 (16 skills), as well as a number of skills from Groups 2 and 4 refer to posing problems.

In the dispositional theory of thinking (D. N. Perkins et al., 1993) flexible thinking is mentioned again as one of the key abilities. (The disposition to be broad and adventurous). Some other abilities mentioned by authors include: the ability to apply and exemplify ideas, to make analogies and comparisons, to identify and classify details; the ability to make and execute plans and forecast possible outcomes, etc. Speaking about comparisons and classifications, we can mention Group 2 of OTSM-TRIZ skills (15 skills) which deal with the above purpose. As to forecasting, it is doubtful that anyone would argue the complexity of this skill, as forecasting in its true sense hardly exists in any of the fields. OTSM-TRIZ skills, as a whole system, can be used as a basis for forecasting, however other tools, and thus skills, will be required.

See also Smith's criticism of many critical thinking lists in terms of their instrumentality or procedural content as he calls it (G. Smith, 2002b:668). Ennis's list of critical thinking skills (R. H. Ennis, 2002) or the list presented in the Delphi Report (Facione, 1990) should be mentioned as good exceptions here.

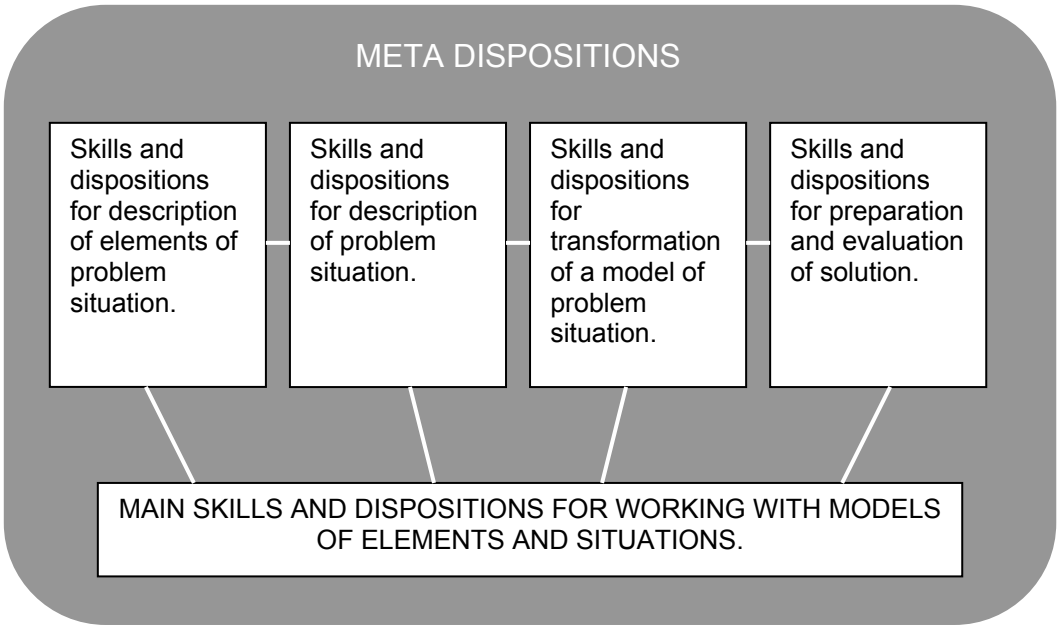
1.5.3.3. Dispositional element

Most researchers agree that skills by themselves are not enough – in order to think effectively one must have dispositions for effective thinking. Dispositions required for this purpose vary according to different authors. Agreeing that dispositions are important, we propose another list, as dispositions necessary for inventive thinking as understood in the context of the present work must be closely connected with OTSM. We have also added a group of meta dispositions, or dispositions about the life of a person who applies inventive thinking regularly and effectively. This group appears to be important as any teaching of thinking must be ultimately aimed at the development of a certain type of personality. The personality we aim to develop when teaching OTSM would be better conceived taking this group of dispositions into account.

1.5.3.4. Structure of inventive thinking

We define inventive thinking proficiency as an ability to effectively solve non-typical (creative) problems in various domains avoiding a large number of trials and errors. OTSM-TRIZ is the underlying theory in our understanding of inventive thinking. Fig. 1.5.1 presents the structure of inventive thinking as it is conceptualised in the context of OTSM-TRIZ.

Fig.1.5. 1. Structure of inventive thinking



The given figure shows the relationship between various structural units of inventive thinking. Appendix 1.1 presents them in a linear way and gives more specific information on each unit.

1.6. Summary

In this chapter we considered what could constitute the content of what is referred to as teaching thinking. We suggested that various thinking oriented products on the market should be analysed at three levels: programmes, approaches and theories. Apart from this, one should pay attention to the scope of problems a given product aims to solve. Ideally, it should help us with both what we referred to as the central problem of modern education and specific problems of a local context. We looked into three well-known approaches to teaching thinking: Teaching for Understanding, Critical Thinking and Philosophy for Children. As a result of analysis, we came to the conclusion that despite numerous positive features of the approaches, they all appear to have a major drawback: none of them is aimed to resolve the central problem of modern education. We suggested that a possible reason for such a situation is the lack of the underlying theory which could serve as a possible methodological basis for resolving the above problem. We proposed the General Theory of Powerful Thinking (OTSM) as a possible underlying theory for teaching thinking. We also briefly characterised an educational approach to teaching thinking which is based on the OTSM approach. Finally, we proposed the structure of inventive thinking as conceptualised in the proposed approach.

In the next chapter we will turn to the description of the pedagogical perspective on teaching thinking in the context of language education which is the main focus of the given research.