

## **Chapter 3. Efficacy of the Thinking Approach to Language Teaching**

In this chapter we would like to present data from the empirical study into the efficacy of the Thinking Approach (TA) to language teaching and learning. We will begin with presenting the background and the methodology of the research and then continue by providing detailed data on the results we obtained. Findings will be presented separately for language and inventive thinking skills.

### **3.1. Research Methodology**

#### **3.1.1. Background**

The study on the efficacy of the use of teaching inventive thinking in a foreign language classroom was started by the author in 1999 when he was working as a teacher of English in a secondary school in Latvia. The main purpose of the study was to assist in the development of an approach to teaching inventive thinking within a foreign language instruction. As the teacher was the primary instrument of data collection and the purpose was mainly discovery and exploration, the study was qualitative in nature (Johnson & Onwuegbuzie 2004:18). This is also supported by the fact that the main tools used by the researcher were observation and content analysis of students' works. By 2003 the main features of the teaching methods became clear and it was decided to extend the methods used in the study. The author agrees with the opinion that quantitative methods can be helpful in a qualitative study (Westerman 2006; Yanchar 2006), therefore an experimental test and a questionnaire collecting quantitative data were added to the repertoire of tools in 2003. From that year, we also started collecting data on control groups. However, our research still remains enriching rather than theory building (Stiles 2006:258). Since 2003 up to date, we have been using a large repertoire of qualitative and quantitative tools to both develop the teaching method and study its efficacy. Thus, we believe that our research can be defined as a one of a mixed methods design (Johnson & Onwuegbuzie 2004:17).

In this chapter we report on the part of the research conducted during the academic year 2004-2005. In that period our study had a more quantitative focus as, after several years of dealing with primarily qualitative data, the researcher felt the need to compliment it with quantitative data, especially given that it was the

time when the second research site appeared (see section 3.1.3 below). Although there were many issues interfering with the quasi-experimental design we adopted (these will be described in detailed further on in this chapter), the data collected during that year helped us a lot in understanding the process of teaching inventive thinking within a foreign language instruction. Moreover, one could treat the data we obtained as an example of what Yanchar refers to as an alternative measurement, as a student's questionnaire or test score has always been "an interpretive account of his or her action and experience at a given time rather than an invariant index of a static ability" (Yanchar 2006:222). We find this point very important from the ethical point of view as well. From the very beginning, students participating in the intervention are told that the programme is aimed to help them develop inventive thinking skills along with language skills and the tests administered in the course of study should be primarily seen as tools to help them understand if and to what extent they make progress. The results of the tests are always discussed with learners and feedback is provided.

The aim of the given study is to find out to what extent the use of the Thinking Approach (TA) to language teaching developed by the author (Sokol, Galpern, Lasevich, & Dobrovolska, 2002) (Sokol, 2002-2003) (Sokol, 2005)<sup>75</sup> contributes to the development of students' language and inventive thinking skills. We are primarily interested in three questions:

1. Do students working with the TA demonstrate an increase in their inventive thinking skills?
2. Do students working with the TA demonstrate an increase in their language skills?
3. Do students working with the TA believe that the programme helps them improve their inventive thinking and language skills?

Thus, we are concerned with four variables: the TA to language teaching which is an independent variable in this study, and three dependent variables: inventive thinking proficiency, language proficiency and students' beliefs about their progress.

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<sup>75</sup> See chapter 2 of the present thesis for the most up-to-date information about the TA.

We understand the TA as an approach to language teaching aimed at an integrated development of language and inventive thinking skills as it is presented in Chapter 2 of the present thesis.

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<sup>76</sup>. OTSM-TRIZ is the underlying theory in our understanding of inventive thinking<sup>77</sup>. See section 1.5.3 for more details.

Language proficiency is an ability to use a language effectively<sup>78</sup> in all possible communicative situations.

Students' beliefs are defined as their perception and acceptance of the aims of the programme and an opinion about own progress in the area of inventive thinking.

The given study is an example of a mixed method design (Johnson & Onwuegbuzie, 2004:17) as both quantitative and qualitative instruments were employed.

### **3.1.2. Setting**

The study is conducted in two secondary schools in Latvia. The schools were chosen as at present these are the only two schools in the country where groups of upper-secondary school students study English with the Thinking Approach (TA) programme. In both schools, students start working with the TA in form 10, thus having had certain experience with more traditional programmes before (see below).

The TA was first introduced in School No. 1 in 2003 by the head English teacher after finishing a TA training conducted by the author. Starting from September

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<sup>76</sup> In the context of this study we adopt the understanding of a non-typical problem as the one for which no solution exists or is not known to the problem-solver.

<sup>77</sup> We believe however that OTSM alone is not enough for effective inventive thinking. In order to successfully solve a problem it is necessary to have both the knowledge of the field(s) where the problem arose and be aware of specific models or tools characteristic of the given field (Khomenko 2004).

<sup>78</sup> "Effective" use of language means that a person is able to use a language for reaching a wide range of various communicative aims.

2003, first two groups of 10 formers started working with the TA programme (the same teacher, 72 hours of training completed by the beginning of intervention). Since then, continuous support for the teacher has been provided both electronically and in the course of regular monthly one day workshops for TA teachers.

Elements of the TA started being introduced by the author of the thesis in School No.2 in 1997 and students began working with the TA programme starting from year 2000<sup>79</sup>. Since then various data have been collected on the efficacy of the programme as a part of the classroom research.

As the study is conducted in naturalistic settings, the primary concern of both teachers has always been with the actual content of teaching rather than data collection for academic purposes. This factor, as well as the lack of experience in research design, explains the fact that initially collected data are often fragmentary and it is difficult to use it for academic purposes. On other hand, the naturalistic setting adds to the value of the present study as it stands out from “much of the research on the efficacy of teaching thinking <that> has been conducted under optimal learning conditions”. (Carol McGuinness, 1999:1)

Most of the data reported in the given thesis was collected between May 2004 and May 2005. At the same time, we would like to note that we have been involved in collecting and analysing various qualitative and quantitative data dealing with the efficacy of the TA since 1999. Thus the present study may be considered to belong to the group of longitudinal ones and as Wilson (Wilson, 2000:37) points out “longitudinal studies of the efficacy of teaching thinking are significantly absent”.

### **3.1.3. Participants**

#### *School No. 1.*

The first school is a prestigious Russian medium school located in a second largest town of the country. Students come from different socio-economic

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<sup>79</sup> We distinguish between the time when the TA became the basis of the English curriculum (a full programme) and the time when it was used as an addition to a more traditional curriculum (elements).

backgrounds ranging from low to high. In terms of academic achievement, students' performance in upper-secondary level is above average in the country. There is one form for each year at the upper-secondary level. All students from forms 10 and 11 (17-18 years old) took part in the study (N=54). Practically all students have studied English as the first foreign language<sup>80</sup> since the first form<sup>81</sup>.

Both forms have English lessons five times a week. They are divided into two groups (N=14, N=14 in form 10 and N=14 and N=12 in form 11). Groups are not homogeneous in terms of language proficiency but students' levels are comparable (SD=6.8; SD=8.6; SD=8.0; SD=6.4 at the maximum number of points equalling 75)<sup>82</sup>.

The groups in form 11 started working with the TA in September 2003, thus they had already done a year's work with the programme by the time when the data for the given report started to be collected. The groups from form 10 starting working with the programme in September 2004.

#### *School No. 2.*

The second school is a school with a core curriculum in human sciences located in the capital city. The school is one of the three schools in the country where German is studied as the first foreign language, thus students come to school from different parts of the city. Social economic background of students is different and ranges from low to high. In terms of academic achievement the school is higher than average but considerably lower than School 1, especially in sciences.

There is one parallel of forms 11 and students are divided into two groups. One group (N=12) started working with the TA programme in September 2003. The second group (N=15) taught by another teacher works with the so-called traditional programme and is used as a control group in the study. A limiting factor is that the groups have a different number of contact hours per week, 5 hours in the TA

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<sup>80</sup> As the study was conducted in the Russian medium school, English is a second foreign language per se. The first foreign language students are exposed to is Latvian which is the official state language and thus can be called a second rather than a foreign language.

<sup>81</sup> A few students joined the school at a later stage and thus may have started learning English later than the first form.

<sup>82</sup> Data comes from the language progress test administered in September 2004

group and 3 hours in the control group<sup>83</sup>. There are two parallel forms 10 in the school. They are not divided into groups when learning English. Form 1 students (N=18) learn English with the TA programme (started in September 2004) and form 2 students (N=18) with the so-called traditional programme. The same limiting factor exists in terms of the number of contact hours per week – 5 in TA groups and 3 in comparison groups.

Students in School 2 start learning English as a second foreign language<sup>84</sup> in form 8. However, a number of students started learning English earlier either in other schools (in case they joined School No. 2 at a later stage) or attending a language school or taking private lessons. This fact probably explains very diverse language levels in the groups. (SD=15.9 in form 10, and SD=14.0 in form 11 at the maximum number of points equalling 75).

### **3.1.4. Data collection tools**

#### **3.1.4.1. Inventive thinking test**

##### 3.1.4.1.1. DEVELOPMENT OF THINKING TESTS

To the best of our knowledge there are no specific assessment tools developed to evaluate students' achievements in terms of inventive thinking skills as conceptualised in the context of this study (see Chapter 1 of the present thesis). At the same time, we have come to the conclusion that the tools used for assessment of creativity, critical thinking or intelligence are not applicable in our context as their primary concern is usually with a different set of skills<sup>85</sup>. Due to this reason thinking tests were developed by the author and then validated by a group of language teachers and OTSM-TRIZ experts. Examples of both tests are given in Appendix 3.1.

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<sup>83</sup> We are well aware that the difference in contact hours may have seriously affected the results of our findings. However, due to the naturalistic setting of our research, it was impossible to change this parameter. Therefore, our main conclusions in the given chapter will be based on observing progress within groups. Comparison of results between groups will be presented, however it should be treated with due caution.

<sup>84</sup> As School No.2 is also a Russian medium school, English is in fact a third foreign language – see footnote number 2.

<sup>85</sup> See, for example, our brief analysis of thinking skills tested in the Cambridge Thinking Skills exam presented in Chapter 1, section 1.4.2.1.

#### 3.1.4.1.2. VALIDATION OF THINKING TESTS

The Delphi Report (Facione, 1990) proposes the following criteria for evaluating an assessment strategy or instrument for purposes of critical thinking: content validity, construct validity, reliability and fairness. The same criteria were used when validating inventive thinking tasks for the purposes of the present research.

##### Content validity.

The tests were aimed to assess the following three major inventive thinking skills and their corresponding sub-skills<sup>86</sup> (see Appendix 1.1 for a full list of inventive thinking skills):

- describe elements by defining parameters and their values;
  - describe parameters and their values as elements that have their own parameters and their values.
  - describe immaterial elements by means of lists of parameters and their values.
  - define the function of an element as a change of one value under a specific parameter.
- describe elements as systems that have their sub-systems and are themselves parts of different super-systems
  - describe an element as a collection of other elements.
  - describe an element as a part of larger set of elements.
  - describe an element as a part of the hierarchy of different other elements.
- describe situations recognizing and distinguishing the influence of objective and subjective factors
  - distinguish between objective and subjective factors when building models of elements.
  - define those objective factors that determine the peculiarities of a given situation.
  - establish connections between the objective factors determining peculiarities of a given situation and the subjective factors that call for its change.
- transform the description of a problem situation in view of emerging contradictions (test 2 only)
  - combine the opposites.
  - define undesirable consequences of positive necessary results and positive consequences of negative undesirable results.
  - describe the underlying cause of a problem as a contradiction.
  - see a contradiction as an obstacle on the way from the resources of initial situation to the ideal final solution.
  - intensify contradiction in order to reduce the space of possible solutions.

The tables below demonstrate the place of skills in both tests.

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<sup>86</sup> Here and elsewhere in the text, we do not use the word “ability” in our definitions as we speak of both skills and dispositions (see Chapter 1 for details) and therefore a formulation that starts with a verb appears to be more relevant in our context

**Table 3.1.1.** Inventive thinking skills in September 2004 test.

<b>Assessment Parameter<sup>87</sup></b>	<b>Inventive Thinking Skills</b>
Number of features mentioned	<ul style="list-style-type: none"> <li>• describe elements by defining parameters and their values;                             <ul style="list-style-type: none"> <li>○ describe parameters and their values as elements that have their own parameters and their values.</li> <li>○ describe immaterial elements by means of lists of parameters and their values.</li> </ul> </li> <li>• describe elements as systems that have their sub-systems and are themselves parts of different super-systems                             <ul style="list-style-type: none"> <li>○ describe an element as a collection of other elements.</li> <li>○ describe an element as a part of larger set of elements.</li> </ul> </li> </ul>
Variety of features mentioned	
Ability to take account of a specific context of one's school	<ul style="list-style-type: none"> <li>• describe elements as systems that have their sub-systems and are themselves parts of different super-systems                             <ul style="list-style-type: none"> <li>○ describe an element as a part of larger set of elements.</li> <li>○ describe an element as a part of the hierarchy of different other elements.</li> </ul> </li> </ul>
Explanation why particular features / groups of features are important.	<ul style="list-style-type: none"> <li>• describe elements by defining parameters and their values;                             <ul style="list-style-type: none"> <li>○ define the function of an element as a change of one value under a specific parameter.</li> </ul> </li> <li>• describe situations recognizing and distinguishing the influence of objective and subjective factors                             <ul style="list-style-type: none"> <li>○ distinguish between objective and subjective factors when building models of elements.</li> <li>○ define those objective factors that determine the peculiarities of a given situation.</li> <li>○ establish connections between the objective factors determining peculiarities of a given situation and the subjective factors that call for its change.</li> </ul> </li> </ul>
Way of presenting ideas	<ul style="list-style-type: none"> <li>• describe elements by defining parameters and their values;                             <ul style="list-style-type: none"> <li>○ describe parameters and their values as elements that have their own parameters and their values.</li> <li>○ describe immaterial elements by means of lists of parameters and their values.</li> <li>○ define the function of an element as a change of one value under a specific parameter.</li> </ul> </li> <li>• describe elements as systems that have their sub-systems and are themselves parts of different super-systems                             <ul style="list-style-type: none"> <li>○ describe an element as a collection of other elements.</li> <li>○ describe an element as a part of larger set of elements.</li> <li>○ describe an element as a part of the hierarchy of different other elements.</li> </ul> </li> </ul>

**Table 3.1.2.** Inventive thinking skills in May 2005 test.

<b>Assessment Parameter</b>	<b>Inventive Thinking Skills</b>
Quality of classification	<ul style="list-style-type: none"> <li>• describe elements by defining parameters and their values;                             <ul style="list-style-type: none"> <li>○ describe parameters and their values as elements that</li> </ul> </li> </ul>

<sup>87</sup> See Appendix 3.1. for the marking scales for both tests.

Number and variety of problems	<ul style="list-style-type: none"> <li>○ have their own parameters and their values.</li> <li>○ describe immaterial elements by means of lists of parameters and their values.</li> <li>○ define the function of an element as a change of one value under a specific parameter.</li> <li>● describe elements by defining parameters and their values;             <ul style="list-style-type: none"> <li>○ describe parameters and their values as elements that have their own parameters and their values.</li> <li>○ describe immaterial elements by means of lists of parameters and their values.</li> </ul> </li> <li>● describe elements as systems that have their sub-systems and are themselves parts of different super-systems             <ul style="list-style-type: none"> <li>○ describe an element as a collection of other elements.</li> <li>○ describe an element as a part of larger set of elements.</li> </ul> </li> <li>● transform the description of a problem situation in view of emerging contradictions             <ul style="list-style-type: none"> <li>○ combine the opposites.</li> <li>○ define undesirable consequences of positive necessary results and positive consequences of negative undesirable results.</li> <li>○ describe the underlying cause of a problem as a contradiction.</li> </ul> </li> </ul>
Quality of formulations	<ul style="list-style-type: none"> <li>● transform the description of a problem situation in view of emerging contradictions             <ul style="list-style-type: none"> <li>○ combine the opposites.</li> <li>○ define undesirable consequences of positive necessary results and positive consequences of negative undesirable results.</li> <li>○ describe the underlying cause of a problem as a contradiction.</li> <li>○ see a contradiction as an obstacle on the way from the resources of initial situation to the ideal final solution.</li> <li>○ intensify contradiction in order to reduce the space of possible solutions.</li> </ul> </li> </ul>
Motivation of choice	<ul style="list-style-type: none"> <li>● describe situations recognizing and distinguishing the influence of objective and subjective factors             <ul style="list-style-type: none"> <li>○ distinguish between objective and subjective factors when building models of elements.</li> <li>○ define those objective factors that determine the peculiarities of a given situation.</li> <li>○ establish connections between the objective factors determining peculiarities of a given situation and the subjective factors that call for its change.</li> </ul> </li> </ul>
Presentation of ideas	<ul style="list-style-type: none"> <li>● describe elements by defining parameters and their values;             <ul style="list-style-type: none"> <li>○ describe parameters and their values as elements that have their own parameters and their values.</li> <li>○ describe immaterial elements by means of lists of parameters and their values.</li> <li>○ define the function of an element as a change of one value under a specific parameter.</li> </ul> </li> <li>● describe elements as systems that have their sub-systems and are themselves parts of different super-systems             <ul style="list-style-type: none"> <li>○ describe an element as a collection of other elements.</li> <li>○ describe an element as a part of larger set of elements.</li> <li>○ describe an element as a part of the hierarchy of different other elements.</li> </ul> </li> </ul>

Tables 3.1.1. and 3.1.2. demonstrate that in addition to a detailed conceptualisation of inventive thinking skills presented in Chapter 1, we had a

clear understanding of those inventive thinking skills targeted by the assessment strategy we had chosen. Another factor involved in content validity, however, is ensuring that answers are not the result of mere memorization and rote learning. As none of the groups participating in the study was exposed to given types of task in the course of learning, nor the themes of school improvement or further learning were covered in the programmes, we believe that there are no reasons to expect the effect of memorization or rote learning on test results.

Facione (Facione, 1990) also mentions dispositions as an important factor of a critical thinking assessment. We consider that dispositions are also important for the assessment of inventive thinking skills. At the same time we agree with Ennis (R. Ennis, 1997b) that if one explicitly tests for dispositions, “people can often feign the appearance of a disposition without really having it”. This is the reason for not informing students about testing for dispositions in any of the thinking tasks we offered to them.

#### Construct validity.

According to Loevinger (Loevinger 1957) quoted in (Cohen, Manion, & Morrison, 2003) construct validity is the queen of the types of validity. Our analysis of Sep. 2004 and May 2005 inventive thinking test papers conducted in summer 2005 demonstrates that students who applied the inventive thinking skills listed in tables 3.1.1 and 3.1.2 scored higher in the tests and generally produced much better answers than students who merely answered on the basis of their previous experience or subjective beliefs (see table 3.1.3 below for the results of correlation between the scores on separate assessment parameters and total scores). As relationships between scores for certain parts of the test and total scores appear significant in the absolute majority of cases ( $r > 0.7$ ) for both experimental and control groups, we may assume that a high achievement in each part of the test is a result of good inventive thinking skills while a poor achievement is a result of weak inventive thinking skills.

**Table 3.1.3.** Correlation between total scores on the test and scores on separate assessment parameters.

<b>September 2004 Test. All groups. (N=103)</b>		<b>May 2005 Test. All groups. (N=103)</b>	
<i>Evaluation Parameters</i>	<i>Total Score</i>	<i>Evaluation Parameters</i>	<i>Total Score</i>
Number of Features	r=0.58	Classification	r=0.80
Variety of Features	r= 0.67	Number and variety of problems	r=0.92
Context	r=0.80	Formulation of problems	r=0.84
Motivation	r=0.82	Motivation	r=0.90
Presentation	r=0.77	Presentation	r=0.87

### Reliability.

One of important indicators of reliability is consistency in evaluation conducted by different markers. Unfortunately, both tests were marked by the author only and further research is necessary to check whether such consistency exists.

One may also assume that writing a thinking test in a foreign language could affect the reliability of our findings. While such a possibility theoretically exists, we found no significant correlation between language and thinking tests scores (r=0.46 in September 2004 Test and r=0.42 in May 2005 Test), nor students' own assessments of their progress in language and thinking seriously correlated (r=0.51).

We believe that the tasks offered in the thinking test are not culturally biased and are equally suitable for students, at least in western European context.

### Fairness.

Both thinking tasks were constructed to ensure that all students are in a similar situation in terms of factual knowledge required for performing the task and no groups of students are in a disadvantageous position. In September 2004 Test we assume that all students have similar knowledge of their own school<sup>88</sup> and in

<sup>88</sup> Several students may be in a disadvantageous position here in case they have just joined the school and are not aware of the context, however as only two of our subjects fall into this group we assume that it could not make a significant impact on test results.

May 2005 Test we expect students to have comparable knowledge about possibilities for further education.

#### 3.1.4.1.3. ADMINISTRATION AND MARKING OF THE TESTS

Both inventive thinking tests were administered simultaneously to all the groups in September 2004 (during the first week of the school year) and May 2005 (two weeks before the end of the school year). Students were not informed about the test format before the pre-test and were told that the test format would be approximately the same before the post-test. The time given for both tests was forty minutes. Students were not given any clarification apart from language assistance in understanding the actual task wording and evaluation guidelines. Students were allowed to ask language questions or use a dictionary.

The tests were marked by the author following the marking scale presented in Appendix 3.1.

#### **3.1.4.2. Language proficiency test**

##### 3.1.4.2.1. CHOICE OF LANGUAGE TESTS

Unlike with inventive thinking tests, there are a number of various English language proficiency tests available on the market, e.g. Cambridge ESOL exams, IELTS, TOEFL, etc. Although the above exams demonstrate a number of considerable differences and are usually used in various contexts, we believe that practically any of them could be used for the purposes of the given research – to provide both students and researchers with a reliable account of students' language progress over a period of learning. Thus, at the stage of choosing the test our main concern was not so much the content of the test itself but such factors as availability of test papers, recognition of the test in the local context<sup>89</sup>, and the ease of administration. As a result, we opted for the First Certificate in English Test (FCE) offered by the University of Cambridge ESOL examinations. FCE past papers and various practice books are widely available, test papers, especially the objective papers (reading, use of English and listening) are easy to

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<sup>89</sup> Here we mean not so much a formal recognition of test results but a general acceptance of the test by students and teachers. This factor was important as groups participating in the study have to take a test three times during the academic year and spend the total of six academic hours on writing the test. It was essential for us that both learners and their teachers see this time as a good investment into learning rather than a mere loss.

administer and, probably most importantly, a secondary school leaving exam in English in Latvia is quite similar to the FCE exam. On the other hand, the length of the original FCE exam (about 5 hours) was far too long for the context of a secondary school, therefore a decision was made to adjust the exam to a time span of 90 minutes. This was done by reducing the number of papers to three (reading, listening and use of English) and selecting only several tasks from each paper. A more detailed information on the chosen parts of the test is presented in the next section.

#### 3.1.4.2.2. VALIDATION OF LANGUAGE TESTS

FCE is an example of an internationally recognised language exam which is taken by more than 270, 000 people each year in more than 100 countries.(FCE Exam 2005*First Certificate in English Exam*) A special Research and Validation Group was created in 1989. The group is responsible for ensuring that all Cambridge assessment products meet the following essential qualities:

- *Validity* - the extent to which test scores can be considered a true reflection of underlying ability
- *Reliability* - the extent to which test results are consistent and accurate, and therefore dependable
- *Impact* - the effect which a test has on candidates and other users, including society more broadly
- *Practicality* - the extent to which a test is practicable in terms of the resources needed.

(Cambridge ESOL Exams. Research Overview 2005*Cambridge ESOL Exams. Research overview*)

From the above four components we are primarily interested in the first two in the context of the given research, namely validity and reliability.

Hardly any assessment instrument can boast absolute validity as real life is always much more complex than a part a test can mirror. At the same time we would like to note that a wide recognition of the FCE exam in both state, public and private sectors around the world (Cambridge ESOL Exams. Recognition 2005*Recognition of Cambridge ESOL Exams*) can be considered a proof of quite a high validity in comparison with various assessment products available on the market.

The reliability indicator of the FCE exam is usually referred to as the composite reliability and is reported to have consistently been in the range of 0.92 since June

2000. (Geranpayeh, 2004). Each separate paper demonstrates quite high reliability figures as well: 0.84 on average in 2002/2003 in the Reading and Listening papers and 0.91 in the Use of English paper. (Geranpayeh, 2004). Apparently, the reliability will decrease as the number of test items is reduced (which was the case in the context of the given research), however the consistency of test results demonstrated by students taking the tests over past five years allows us to assume that the tests are reliable<sup>90</sup>.

The adjusted version of the FCE test used in our research is presented in the table 3.1.4.:

**Table 3.1.4.** The adjusted version of the FCE test used in the research.

Papers	Tasks	Items
Paper 1. Reading	Task 1. Multiple matching. <i>Main focus</i> : main points. A text preceded by multiple-matching questions.	7
	Task 2. Multiple choice. <i>Main focus</i> : detail, opinion, gist, deducing meaning. A text followed by four-option multiple-choice questions.	7
Paper 2. Listening	Task 1. Multiple choice. Understanding gist, main points, detail, function, location, roles and relationships, mood, attitude, intention, feeling or opinion.	8
	Task 2. Sentence completion, note completion or blank filling. Understanding gist, main points, detail or specific information, or deducing meaning	10
Paper 3. Use of English.	Task 1. Multiple-choice cloze. <i>Focus</i> : Vocabulary. A modified cloze text containing 15 gaps and followed by 15 four-option multiple-choice questions.	15
	Task 2. 'Key' word transformations. <i>Focus</i> : Grammar and vocabulary. Discrete questions with a leading sentence and a gapped response to complete using a given word.	10
	Task 3. Error correction. <i>Focus</i> : Grammar. A text containing errors. Some lines of the text are correct, other lines contain an extra and unnecessary word which must be identified.	15

#### 3.1.4.2.3. ADMINISTRATION AND MARKING OF THE TESTS

The language tests were given to students two times: during the first week of September 2004 and in the middle of May 2005. Students were given 30 minutes for Papers 1 and 3 and 25 minutes for Paper 2. The papers were marked by the

<sup>90</sup> A research into reliability of the adjusted versions of the FCE test remained beyond the scope of the given thesis.

three teachers involved in the research (a TA teacher from School 1, a TA teacher from School 2 and a non-TA teacher from School 2) according to the keys provided with Test Papers. A correct answer in each item was awarded one point apart from Tasks 1 and 2 in the Reading Paper where two points were given for a correct answer and Task 2 in the Use of English Paper where either 1 or 2 points were given.<sup>91</sup> The final score in each paper was adjusted to give a mark out of 25 to give an equal importance to all the three papers. Thus, the maximum total mark for the adjusted version of the language test is 75.

#### 3.1.4.3. Questionnaire

There is really only one question that  
can assess a learner: *Do you feel you have improved?*  
(Baxter, 1997)

Questionnaires were given to all TA groups taking part in the study. As well as inventive thinking and language tests, questionnaires were offered two times: in September 2004 and May 2005<sup>92</sup>. Examples of questionnaires are given in Appendix 3.2. When administering a questionnaire we wanted to see students' beliefs about their learning (both in terms of language and inventive thinking skills) and whether they change in the course of learning. More specific research questions under the thinking part of questionnaire are listed below:

- Students' evaluation of the process of learning (enjoyment)
- Students' evaluation of the learning materials (enjoyment)
- Students' evaluation of the learning materials (usefulness for thinking skills)
- Students' evaluation of the learning materials (usefulness for language skills)
- Students' satisfaction with the programme used for teaching English
- Students' evaluation of improvement in their self-study skills
- Students' evaluation of thinking skills transfer
- Students' evaluation of language skills transfer
- Students' attitude to problem-solving as such
- Students' attitude to learning
- Students' evaluation of their progress in thinking during the year
- Students' evaluation of their progress in thinking in comparison with the previous year

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<sup>91</sup> This marking procedure is identical with the one adopted for marking the full version of the FCE exam.

<sup>92</sup> Forms 11 filled in the questionnaire at the end of the previous year of learning (ie May 2004) and it as decided to use those results rather than offering the same questionnaire in September 2004.

As you can see from the samples, all questionnaires consist of ranking scale questions and one open question where students are invited to write a follow-up letter to their teacher. All questionnaires were designed by the author and piloted with two English teachers and several students not taking part in the study.

#### **3.1.4.4. Interview**

##### 3.1.4.4.1. RESEARCH QUESTIONS IN THE INTERVIEW

In order to increase the reliability of data collected as a result of administering a questionnaire, it was decided to conduct interviews with each student working with the TA programme. As well as the questionnaire, interviews had a dual purpose dealing with both students' opinion on their improvement in language and inventive thinking in the course of working with the TA programme. Below you may see a list of research questions the interview sought to answer:

- Students' opinion about the TA based language course in comparison with other language courses;
- Students' evaluation of their progress in English when working with the TA programme in comparison with the progress in other languages during the same period of time;
- Students' evaluation of their progress in inventive thinking during the period of working with the TA programme.
- Students' evaluation of their progress in learner autonomy during the period of working with the TA programme.

##### 3.1.4.4.2. VALIDATION OF INTERVIEWS

Many researchers mention problems related to the validity of interview as a research instrument (Cohen et al., 2003:120). The problem is even greater in the case of naturalistic settings (Burden & Nichols, 2000:303) and the given study is apparently an example of one. On the other hand, agreeing that validity and reliability may often be problematic in interviews, we still believe that this technique can be useful, especially for collection of additional data to be used in research. As a result of literature analysis (Cohen et al., 2003) and consideration of a particular context of the given research, the following sources of bias were identified before conducting the interview:

- the attitudes, opinions, and expectations of interviewers;
- a tendency for interviewers to seek answers that support their preconceived notions;
- misperception on the part of interviewers of what the respondent is saying;
- misunderstandings on the part of the respondent of what is being asked;
- selective or interpreted recording of data;
- a tendency for students not to give honest answer in fear of possible consequences.

Kitwood (Kitwood 1977) quoted in (Cohen et al., 2003:124) argues that increased reliability in interviews is only possible at the cost of reduced validity. Agreeing with Kitwood that respondents need to feel at ease in some points of the interview (for increasing validity) we believe that it does not exclude a possibility to have structured parts of the interview for the purposes of increasing its reliability. Exactly this scheme was chosen for the given interview where students were asked an open question (and the interviewer tried to help them 'feel at ease') which was followed by a series of structured smaller questions to obtain more specific data which is easy to code (see Appendix 3.3. for an example of interview questions). Other measures employed to reduce the bias were as follows:

- interviewers met for a two hour session where the process of conducting interviews was discussed and the issue of possible bias connected with the interviewer discussed. It was decided that interviewers would keep as close as possible to the prepared text of questions and their order and all prompting questions should be avoided unless respondents fail to give any answer to the question at all;
- marking scale for the interview was developed before the interviews;
- it was decided to give students a choice of language for the interview: English or their mother tongue (Russian in case of both schools);
- interviews were recorded and the interviewers met and discussed the data as well as interviewed each other.

### 3.1.4.4.3. ADMINISTRATION AND ANALYSIS OF INTERVIEWS

Interviews were conducted by the two teachers – each teacher interviewing their groups. All students were interviewed individually during April – May 2005. The average length of the interviews equalled 15 minutes. All interviews were recorded and then analysed by the author. Data were categorised into two groups: numerical and textual. Tables 3.1.5 and 3.1.6. present the categories of data in both groups.

**Table 3.1.5.** Interview - numerical data.

<b>Question</b>	<b>Possible answers</b>
Wish to learn other languages with the TA programme	Yes No Undecided
Wish to learn other subjects with the TA programme	Yes No Undecided
Evaluation of the TA programme for teaching English	From 1 to 5
Evaluation of language progress during the time of working with the TA programme	From 1 to 5
Progress in reading	
Progress in writing	
Progress in listening	
Progress in speaking	
Progress in English in comparison with another language	From 1 to 5
Changes in problem solving	Yes No
Evaluation of changes in the approach to problems	From 1 to 5
Changes in the way students think	Yes No Undecided
Changes in problem solving when working with grammar	Yes No
Changes in problem solving when working with independent projects	Yes No
Changes in approach to independent learning	Yes No
Changes in planning skills	Yes No
Changes in self-assessment skills	Yes No
Evaluation of changes in the approach to independent learning	From 1 to 5
Ability to learn a new language without a teacher	Yes No Undecided
Changes in the attitude to the TA programme	Yes No
Evaluation of the TA programme at the beginning of studies	From 1 to 5
Evaluation of the TA programme at the present moment	From 1 to 5

**Table 3.1.6.** Interview - textual data.

<b>Question</b>	<b>Students' answers</b>
Features of the TA based teaching	Student centred Focus on thinking skills Absence books
Comparison of a TA based course in English with 'traditional' other language courses	New and different from other subjects English is taught more effectively English is taught more traditionally My role in English is more active Teacher's role in English is more of a helper Focus on thinking skills in English
Comparison of learning materials in a TA based English course and 'traditional' course in other language	Absence of course books in English Materials in other language courses are more standard We have a possibility of choice of materials in English
Comparison of learning tasks in a TA based English course and 'traditional' course in other language	A higher variety of tasks in a TA course More standard tasks in other language courses TA tasks require a deeper approach TA tasks require more thinking Tasks are the same
Comparison of students' role in a TA based English lesson and 'traditional' lesson in other language	More active role in English Same role
Opinion about TA as a method for learning languages	Positive Neutral Negative Difficult at first
What makes TA course different from other language courses?	Focus on learner autonomy Focus on thinking skills
Wish to study other subjects according to TA principles	Yes, but not exact subjects Yes, if I am serious about the subject No, it will be too much load for me No, it will be too difficult
Wish to study other language with the TA programme	Yes, if I am not a beginner No, it will take a lot of time
Opinion about changes in language skills while working with the TA	Skills improved Doubt whether skills improved
Changes in problem solving skills	Use of models More serious approach to problems No fear of problems New point of view about problems
Specific things in the programme that improved problem solving skills	Models Practice
Opinion about changes in the approach to independent learning	Improvement Improvement + transfer to other domains explicitly mentioned Still face problems Don't like it Don't do it
Opinion on changes in planning skills	Transfer of skills to other domains Still problems with planning
Causes of changes in the attitude to the TA programme over time	Understanding of the programme and requirements My progress
Time of changes in attitude towards the TA programme	Semester 1 Semester 2 Semester 3

Semester 4  
Semester 5  
Step by step

It is necessary to note that the number of subjects answering questions may be significantly different, especially for the questions in Table 3.1.6. This is explained by the fact that Table 3.1.5. summarises the structured part of the interview (variants of answers were given to respondents – closed questions) and an opinion of practically all subjects was recorded<sup>93</sup> while Table 3.1.6 presents answers to open questions where respondent were free to decide if they wished to give a comment or not.

## 3.2. Findings: language

### 3.2.1. Language proficiency test

#### 3.2.1.1. SUMMARY OF RESULTS

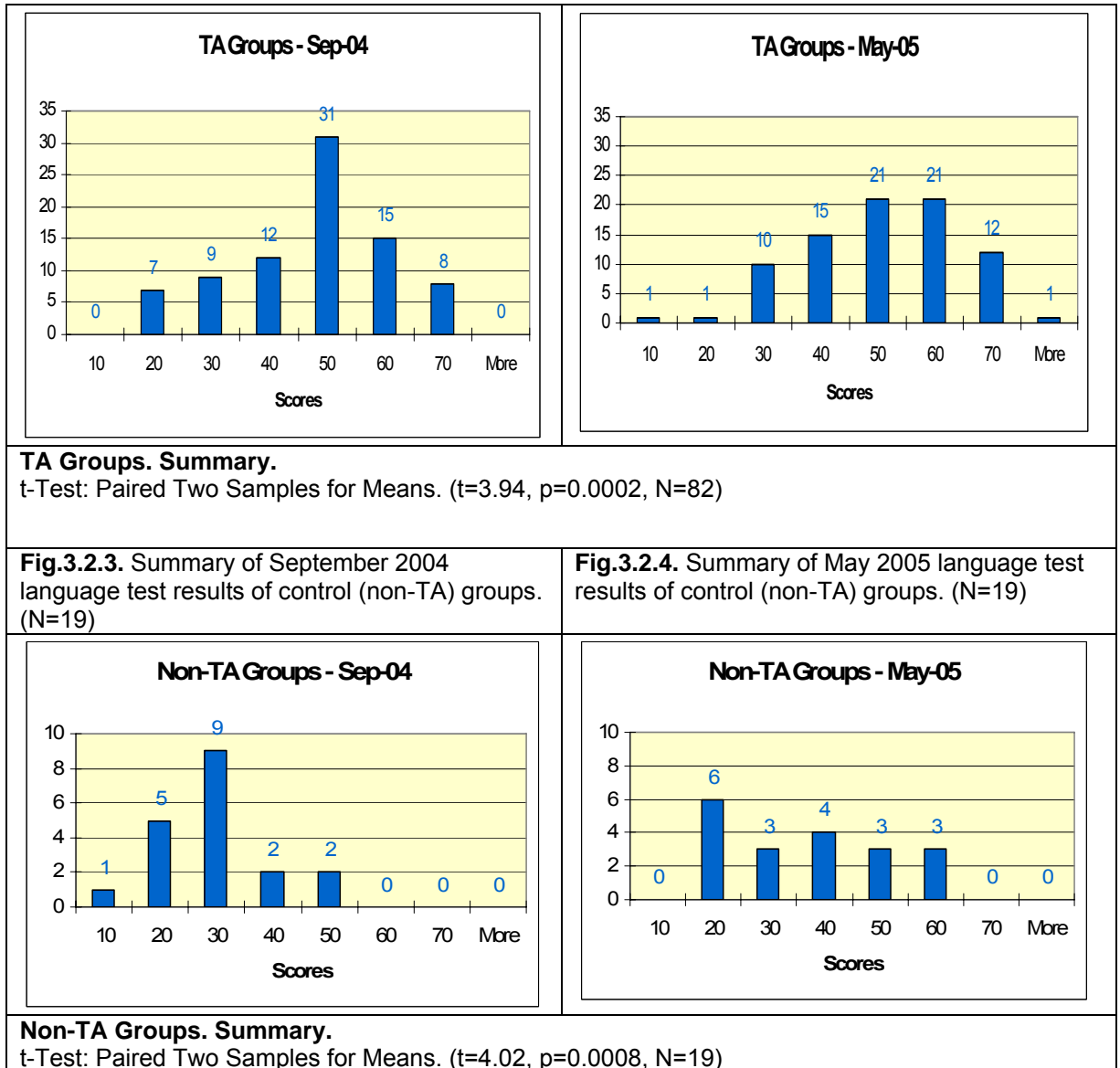
Test results were analysed statistically employing a t-test for paired two samples for evaluation of changes within separate groups of students and TA and comparison populations as a whole, and a t-test for two independent samples for comparison of control and experimental groups.

The table below presents a general summary of t-test results and histograms of test results for experimental and control groups.

**Table 3.2.1.** General summary of t-test results of language proficiency test for experimental and comparison groups.

<p><b>General summary.</b> t-Test: Experimental vs. Control Groups. Two-Sample Assuming Unequal Variances. (<math>t=-2.026</math>, <math>p=0.053</math>, <math>N=101</math>).</p>	
<p><b>Fig.3.2.1.</b> Summary of September 2004 language test results of experimental (TA) groups. (N=82)</p>	<p><b>Fig.3.2.2.</b> Summary of May 2005 language test results of experimental (TA) groups. (N=82)</p>

<sup>93</sup> When analysing interviews we found out that several subjects missed one or two questions. Most probably this happened due to inattentiveness of the interviewers.



3.2.1.2. INTERPRETATION OF RESULTS

While both experimental and control groups significantly improved their language skills during the academic year (see Table 3.2.1.), we have observed no significant differences between language test results when comparing the performance of experimental and control groups against each other. In this section, we would like to provide more contextual data on language test results and discuss those factors that could have affected the reliability of our findings<sup>94</sup>.

The first factor is the difference in samples between the experimental and control groups. Although the number of students in TA groups was initially higher ( $N=82$ )

<sup>94</sup> Certain factors related to limitations in the design of the present study will be discussed in Section 3.3.1.2. below.

than in non-TA groups (N=35), it is necessary to note that while 100% of TA students took the language test, only 54% of non-TA students did so. While some students missed the test due to objective reasons, it is quite evident that many of them just chose not to write it<sup>95</sup>. Moreover, the majority of those who missed the test were weaker students whose poor performance would significantly decrease the total of the group.

The second factor we would like to mention is the difference in how the test was written. While students from TA groups were sitting alone and communication with each other was close to impossible, non-TA students could often consult each other while taking the test<sup>96</sup>.

The last factor we would like to mention is familiarity with types of tasks in the test. While none of test tasks was the focus of work in the classroom in TA groups<sup>97</sup>, non-TA groups occasionally come across FCE types of tasks in the course books they use for studying English.

Apparently, the above three factors may have seriously undermined the reliability of results in non-TA groups and, thus, the reliability of the t-test comparing the performance of TA and non-TA groups against each other. However, even when assuming that all of the above factors did affect the results of the language test, students from TA groups did *not* perform significantly worse than non-TA students. At the same time, it is necessary to note that no factors significantly undermine the results of language tests in TA groups. As the data show considerable improvement of skills across groups (see Table 3.2.1.), we may conclude that students benefited from the TA programme in terms of language skills.

### **3.2.2. Questionnaire**

#### 3.2.2.1. SUMMARY OF RESULTS.

**Table 3.2.2.** Mean scores of experimental (TA) groups in the language part of the questionnaire conducted in May 2005. (maximum is 5)

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<sup>95</sup> This assumption was confirmed by several students from non-TA groups in a conversation with the author.

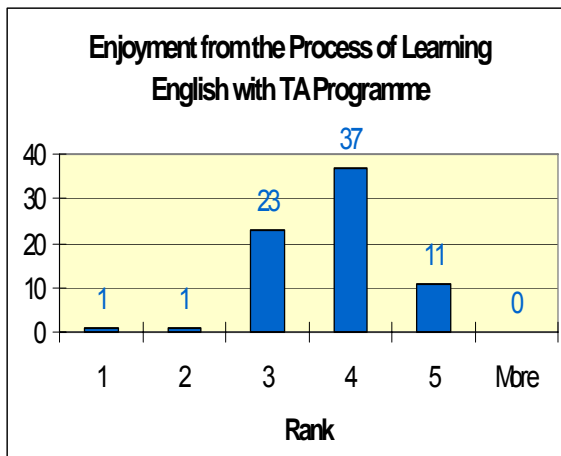
<sup>96</sup> Data comes from conversations with students after the test.

<sup>97</sup> Apart from test analysis and self-study work of learners.

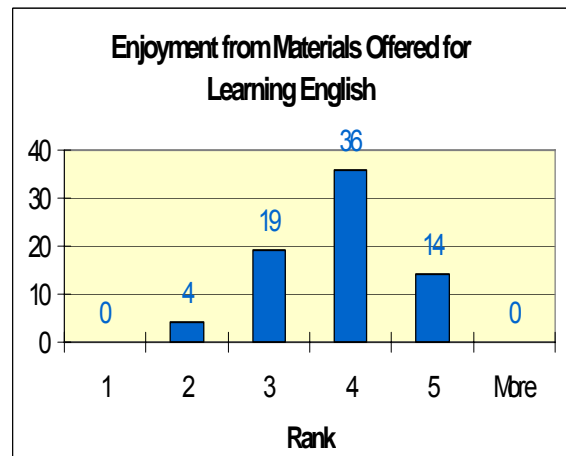
Question <sup>98</sup>	Mean score
1. To what extent have you <i>enjoyed</i> the process of learning English this term?	3.77
2. To what extent have you <i>enjoyed</i> the materials offered for learning English this term?	3.82
3. To what extent were the materials offered to you this term <i>useful</i> for the development of your language skills?	3.85
7. To what extent are you satisfied with your progress in English during this year in comparison with your progress in other languages?	3.54
8. To what extent do you think you have improved your self-study skills as a result of your English lessons during this year?	3.30
10. Learning happens everywhere, not just at school. To what extent do you <i>enjoy</i> learning?	3.87
13. To what extent do you believe you improved your language skills as a result of English lessons in forms 8 and 9?	2.85
14. To what extent do you believe you have improved your language skills as a result of English lessons in forms 10 and 11?	3.78

The histograms below present the distribution of students' answers to the above questions.

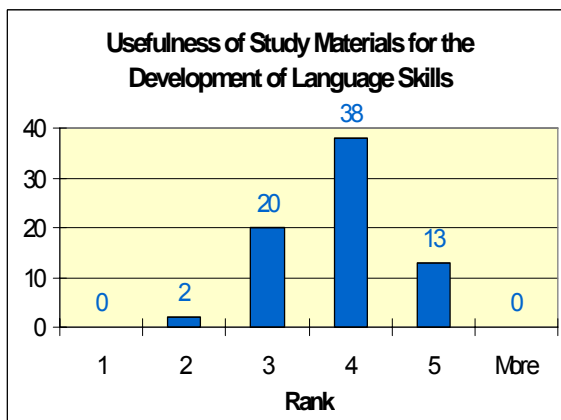
**Fig.3.2.5.** Enjoyment from learning English with TA programme.



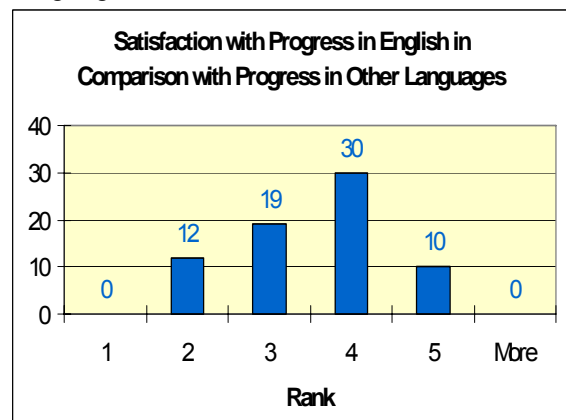
**Fig.3.2.6.** Enjoyment from materials offered for learning English.



**Fig.3.2.7.** Usefulness of Study Materials for the Development of Language Skills.



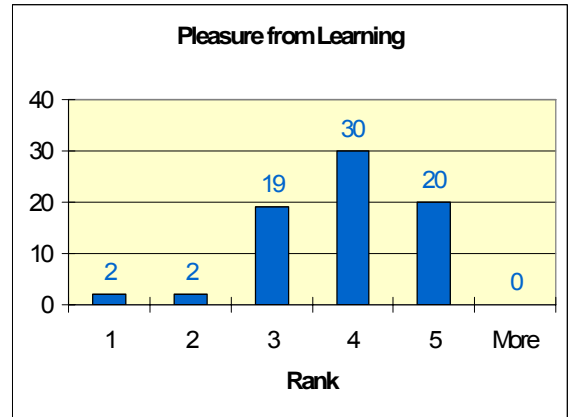
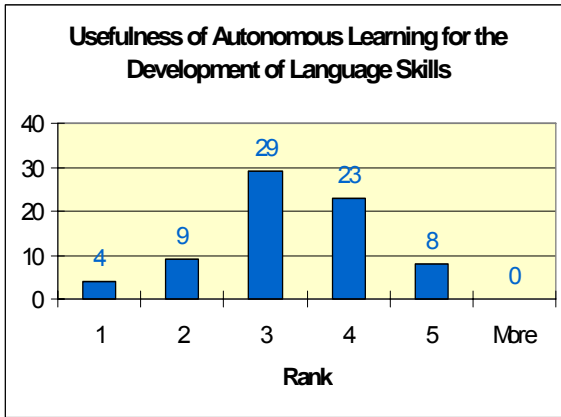
**Fig.3.2.8.** Satisfaction with Progress in English in Comparison with Progress in Other Languages.



**Fig.3.2.9.** Usefulness of Autonomous Learning for the Development of Language Skills

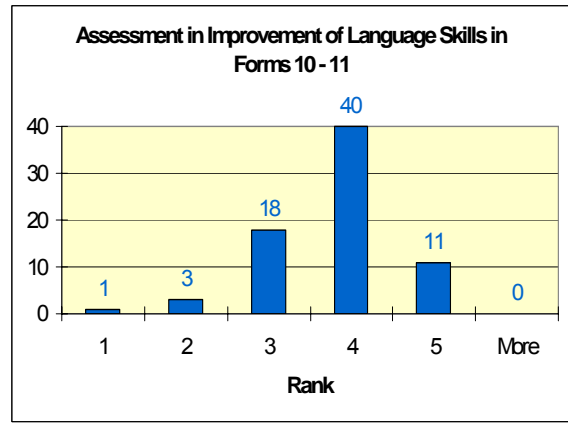
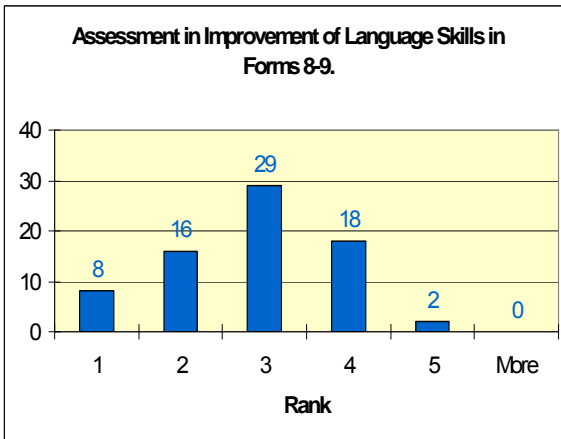
**Fig.3.2.10.** Pleasure from Learning.

<sup>98</sup> Numbers of questions coincide with those in the original questionnaire presented in Appendix 3.2. Here we present only those questions which deal with the theme of language skills.



**Fig.3.2.11.** Improvement of Language Skills in Forms 8-9.

**Fig.3.2.12.** Improvement of language skills in forms 10-11.



### 3.2.2.2. INTERPRETATION OF RESULTS

Students' answers to the language part of the questionnaire can be divided into two groups: those dealing with self-assessment of improvement in language skills and those indicating students' attitude to various aspects of learning. Let us consider these two groups in turn.

51 students (or 70 per cent) indicated that they had considerably improved their language skills during the period of working with the TA programme (marks 4 and 5) while only 4 students (5 per cent) mentioned that the progress had been not high enough (Fig. 3.2.12). When evaluating their progress in English in comparison with progress in other foreign languages, 40 students (56 per cent) indicated that they had made a greater progress in English in comparison with 12 (17 per cent) who believed they had progressed less than in other languages.

Moreover, 10 students (14 per cent) pointed out that they had made a much higher progress in English (Fig. 3.2.8). 31 students (or 42 per cent) believe that autonomous learning, which is an important part of the TA programme (see Chapter 2), helped them improve their language skills. It is necessary to note though that 29 students (40 per cent) are not sure how helpful is autonomous learning and 13 (18 per cent) believed it was not helpful for them (Fig. 3.2.9). When comparing students' evaluation of their progress in English in forms 8-9 (before the TA programme) and forms 10-11 (with the TA programme), we found out that students' self-assessment of progress when working with the TA programme is considerably higher ( $t=8.42$ ,  $p=2.51E-12$ ,  $N=73$ ). It is also interesting to note that students' evaluation of their progress in English before the exposure to the TA programme changes as a result of working with the programme. For example, TA students were asked to evaluate their progress in English in forms 8-9 (before the TA programme was introduced) two times: during the first week of learning with the TA programme and after the year of learning. Students evaluated their progress in forms 8-9 considerably lower during the second evaluation ( $t=-2.1$ ,  $p=0.041$ ,  $N=39$ ).

As previously mentioned, we believe that students' attitude to learning is a very important factor for evaluation of a learning progress. In this connection, we would like to note that practically no students indicated a negative attitude to either working with the TA programme (only 2 students or 3 per cent indicated that they had not enjoyed this kind of learning – Fig.3.2.5.) or materials offered for learning (only 4 students or 5 per cent indicated that they had not enjoyed – Fig. 3.2.6.). At the same time, 48 students (or 66 per cent – Fig. 3.2.5.) mentioned that they had enjoyed the TA kind of learning and 50 students (or 68 per cent - Fig. 3.2.6.) indicated that they had enjoyed the materials. In relation to materials, it is also important to note that over two thirds of students mentioned that they had also been very useful for learning (Fig. 3.2.7.) We would also like to note that over two thirds of TA students (Fig.3.2.10) indicated that they enjoy learning while only 4 students (5 per cent) mentioned that they did not like it. In our opinion, this figure is worthy of attention at the time when many upper-secondary school learners are reported to be rather demotivated.

### 3.2.3. Interview

#### 3.2.3.1. SUMMARY OF RESULTS.

As mentioned in section 3.1.4.4. above the interview included two types of questions: open and closed ones. Tables 3.2.3. and 3.2.4. present students' answers to both groups of questions.

**Table 3.2.3.** Students' answers to closed interview questions dealing with language and learning skills.

Question	Possible answers	Number	Percentage
Changes in approach to independent learning	Yes	76	97%
	No	2	3%
Changes in planning skills	Yes	58	73%
	No	21	27%
Changes in self-assessment skills	Yes	38	48%
	No	41	52%
Ability to learn a new language without a teacher	Yes	35	45%
	No	36	46%
	Undecided	7	9%
		<b>Mean</b>	
Evaluation of progress in English	From 1 to 5	3.4	
Evaluation of progress in reading	From 1 to 5	3.5	
Evaluation of progress in writing	From 1 to 5	3.3	
Evaluation of progress in listening	From 1 to 5	3.5	
Evaluation of progress in speaking	From 1 to 5	3.4	
Changes in the approach to independent learning	From 1 to 5	3.6	

**Table 3.2.4.** Students' answers to closed questions of the interview dealing with the theme of language skills.

Question	Students' answers <sup>99</sup>	Number	% <sup>100 101</sup>
Comparison of a TA course in English and a "traditional" course in a foreign language	English is taught more effectively	9	11%
	English is taught less traditionally	14	17%
	My role in English is more active	4	5%
	The teacher's role in English is more of a helper	14	17%
	TA focuses on thinking skills	11	14%
Comparison of learning tasks in TA and "traditional" courses	More variety in TA tasks	12	15%
	TA tasks are not standard	4	5%
	TA tasks require deeper approach	16	20%
	TA tasks develop thinking skills	15	19%
	Tasks are the same	24	30%
Opinion about the change of language skills when working with TA	Language skills improved	66	84%
	I doubt that my language skills improved	5	6%
Opinion about the change in	Improvement in independent learning	42	53%

<sup>99</sup> The list of categories for students answers was made after the interview and includes only those students mentioned more often. Some students may have provided an answer different from the one in the list while others may not have answered the question at all.

<sup>100</sup> As students were free to provide several answers, data does not necessarily add up to 100%

<sup>101</sup> Percentage is calculated from the total number of students taking part in the interview rather than those who provided an answer to the question.

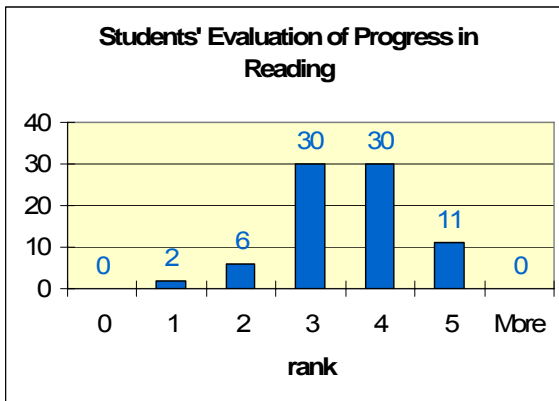
approach to independent learning	There's a transfer of acquired learning skills to other subjects and fields	3	4%
	There are still problems with autonomous learning	4	5%

3.2.3.2. INTERPRETATION OF RESULTS

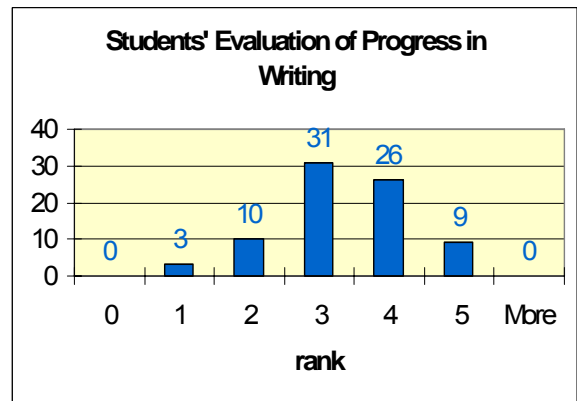
The interview questions dealing with the theme of language skills can be divided into three groups: students' self-assessment of progress in various aspects of language, students' evaluation of their approach to learner autonomy and a comparison between TA and "traditional" language courses. Let us consider all these groups in turn.

Figures 3.2.13 – 3.2.16 below present histograms of students' self-assessment on different aspects of language. As we can see, an absolute majority of students evaluate their progress in each skills higher than average.

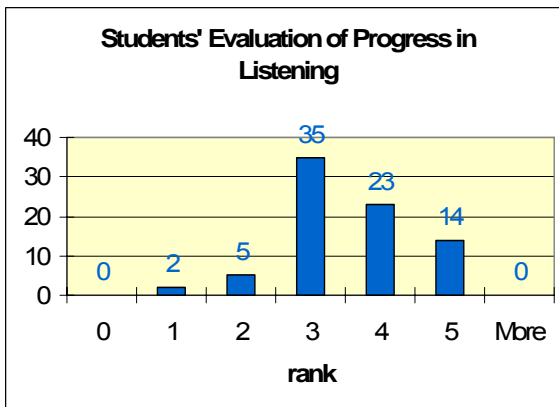
**Fig.3.2.13.** Students' evaluation of their progress in reading.



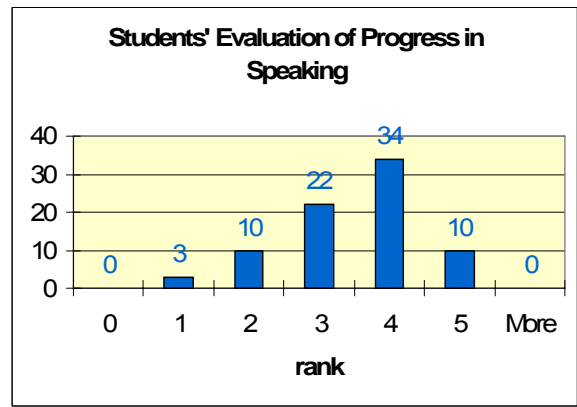
**Fig.3.2.14.** Students' evaluation of their progress in writing.



**Fig.3.2.15.** Students' evaluation of their progress in listening.

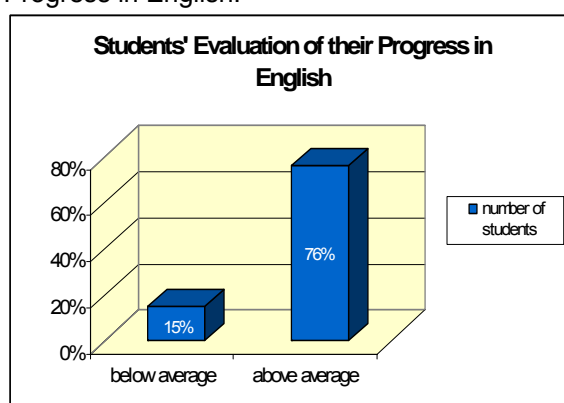


**Fig.3.2.16.** Students' evaluation of their progress in speaking.

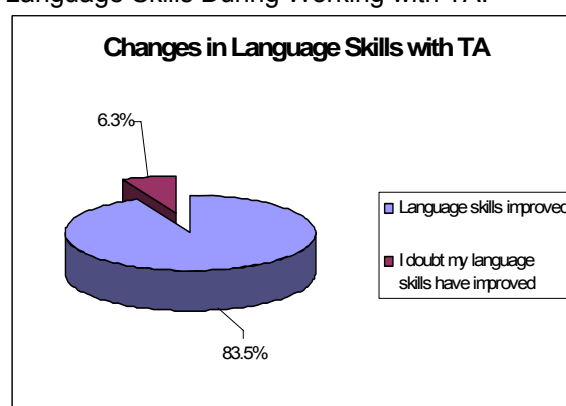


If we look at all aspects together, 12 students (15%) out of 79 taking part in the interview evaluate their progress as below average while 60 students (76% from the total number of those who took part in the interview) see their progress as being above average (Fig 3.2.17). Even a higher number of students (84% - Fig. 3.2.18) mention that they feel that their language skills have improved as a result of working with the TA.

**Fig.3.2.17.** Students' Evaluation of Their Progress in English.



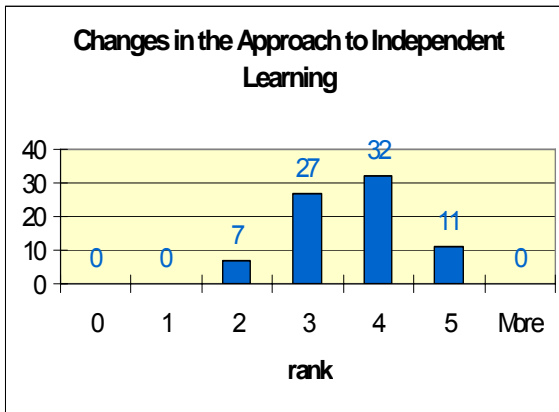
**Fig.3.2.18.** Students' Evaluation of a Change in Language Skills During Working with TA.



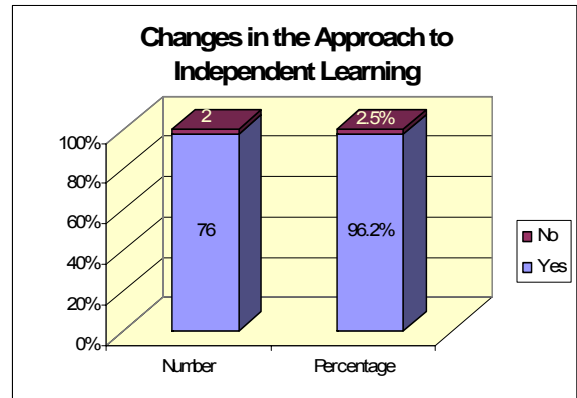
Thus, we may assume that a number of students, who marked that a change in their language skills had not been significant (below average), nevertheless feel that they have improved. We find this important and encouraging as upper-secondary school students in Latvia are generally quite critical about school and seldom evaluate what they have learnt at school higher than it actually was.

The development of skills for learner autonomy is one of the foci of the TA based learning and we were interested if students believe they are improving as independent learners. At first sight, our results appear quite encouraging: 97% of students mention that they have improved their learning skills (Fig. 3.2.20) and more than a half mark significant changes in their skills. (Fig. 3.2.19).

**Fig.3.2.19.** Students' evaluation of changes in their approach to independent learning.

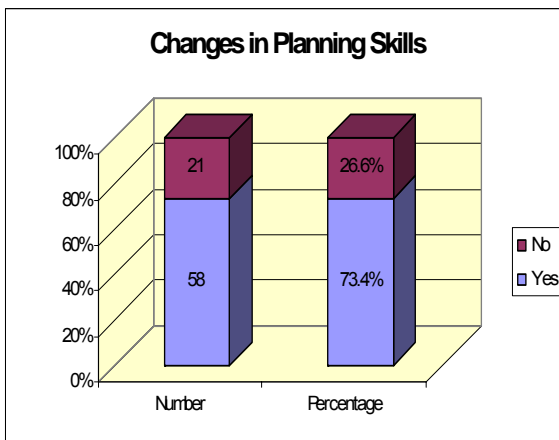


**Fig.3.2.20.** Changes in the Approach to Independent Learning.

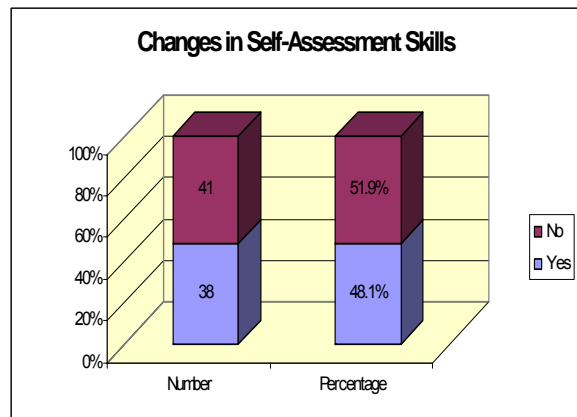


At the same time, when asked to evaluate progress in separate aspects of learner autonomy, students' answers were different. 73% of students mentioned changes in planning skills and only 48% marked that their self-assessment skills had improved. (Fig. 3.2.21 and 3.2.22.).

**Fig.3.2.21.** Students' Evaluation of Changes in Planning Skills.



**Fig.3.2.22.** Students' Evaluation of Changes in Self-Assessment Skills.

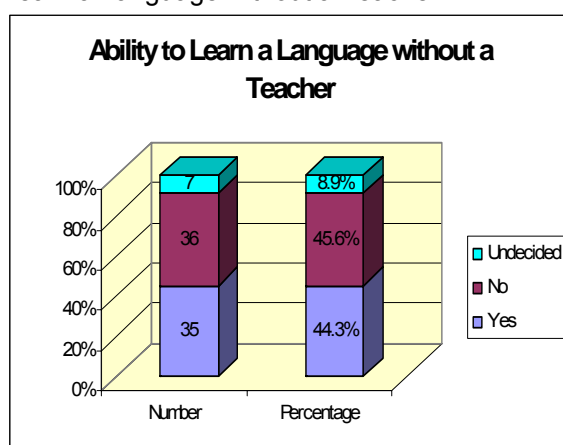


We believe that a possible reason for the seeming discrepancy may lie in the stage of skills development. At present, many students are undergoing the stage when they "feel" changes but are still unable to fully explain what exactly is changing. Thus, they believe that they have become better learners, however it is still unclear to them whether their planning or self-assessment skills have improved. Further research is necessary to validate this hypothesis.

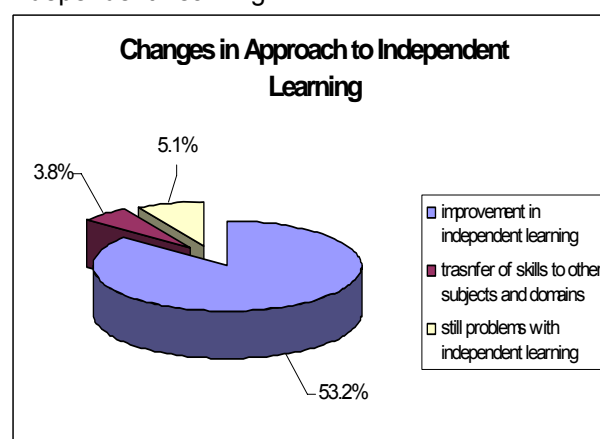
It also appears interesting that when asked whether they think they will be able to learn a language without the teacher (the highest stage of learner autonomy), students' answers divided as approximately 50:50 (see Fig. 3.2.23). On the one hand, this result may also confirm the hypothesis we expressed in the previous paragraph, on the other hand, however, we consider that 45% of students believing that they are ready for a full autonomy can be considered a good achievement.

We would also like to note that a number of students mentioned that they use the acquired skills in other domains (Fig.3.2.24). Although the percentage is still very small (3,8%), the fact of transfer by itself is very encouraging. We may also assume that the percentage could have been higher should the question been a closed one<sup>102</sup>.

**Fig.3.2. 23.** Students' Evaluation of Ability to Learn a Language without a Teacher.



**Fig.3.2.24.** Type of Changes in the Approach to Independent Learning.

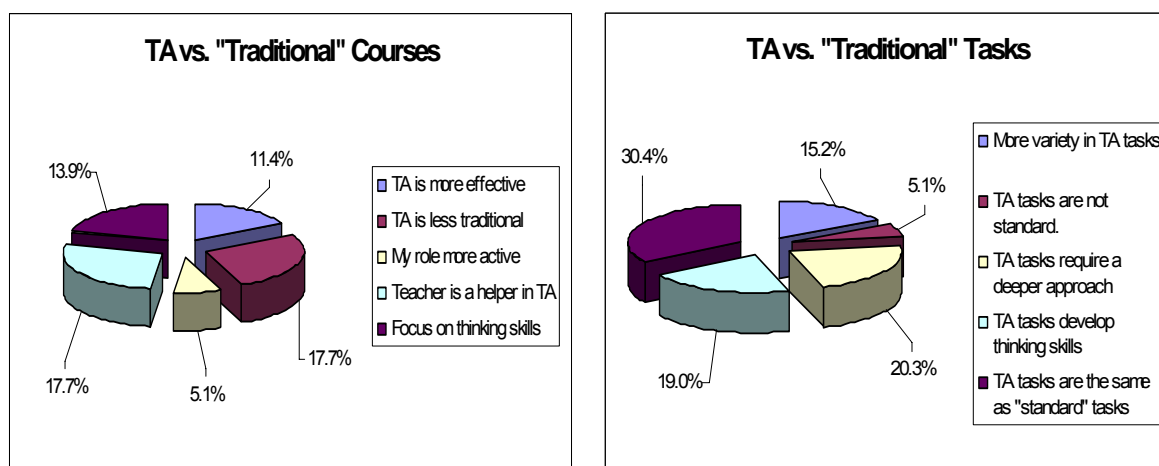


Figures 3.2.25 and 3.2.26 present some aspects of students' conceptualisation of the TA.

**Fig.3.2.25.** Comparison of TA with "Traditional" Courses in Foreign Language.

**Fig.3.2.26.** Comparison of TA Tasks with "Traditional" Tasks in Learning a Foreign Language.

<sup>102</sup> Students were not directly asked about the transfer of skills here, 3,8% of students mentioned it without being asked.



It appears interesting that two very important features of the TA, namely a focus on thinking skills and a different role of the teacher, appear to be quite clear to many students (see Fig. 3.2.25.)<sup>103</sup>. Students mark the novelty and effectiveness of TA (Fig.3.2.25) which also coincides with our own conceptualisation of the method. The most important conclusion we would like to draw here is that none of the features mentioned by students came as a surprise, moreover all of them are also seen by us as important characteristics of the adopted approach.

The data is less encouraging though when we come to tasks. 30 per cent of student do not see the difference between "traditional" and TA tasks (Fig. 3.2.26). This came as a surprise to us as, in our opinion, quite many differences exist between the approaches at the level of task. At least two possible factors may account for the above. On the one hand, we may assume that students do not see the difference between the TA tasks and more traditional tasks. On the other hand, however, a reason might be a different understanding of the question by students. Most differences between TA and more traditional tasks lie at the level of procedure, i.e. the HOW part of the task (see Chapter 2 for more details), while students may have not included this as a part of the task. We are well aware that both of the explanations are nothing more than our speculations and agree that further research is necessary to find an answer to the given question.

<sup>103</sup> Let us stress once again that these answers come from the open questions of the interview, thus the reliability of this data is quite high.

### 3.3. Findings: inventive thinking skills

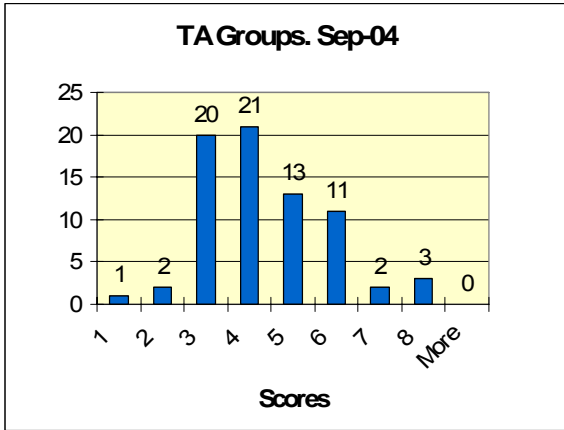
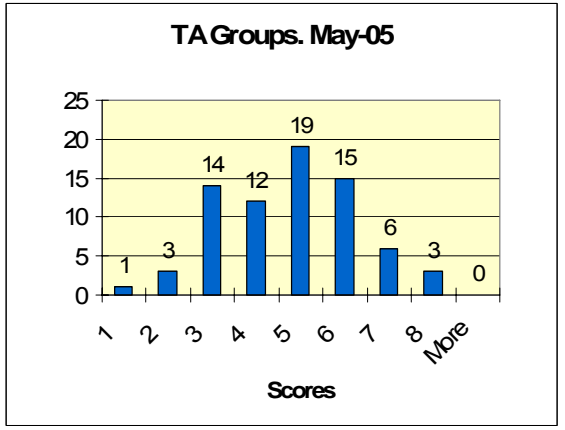
#### 3.3.1. Inventive thinking test

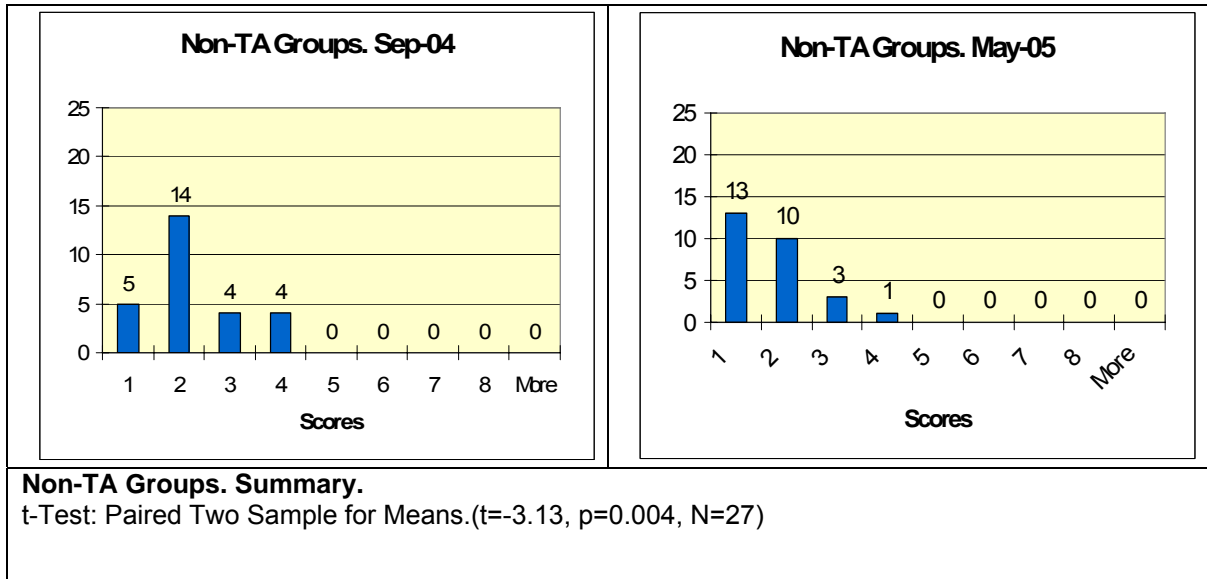
##### 3.3.1.1. SUMMARY OF RESULTS

Test results were analysed statistically employing a t-test for paired two samples for evaluation of changes within separate groups of students and TA and comparison populations as a whole, and a t-test for two independent samples for comparison of control and experimental groups.

The table below presents a general summary of t-test results and histograms of test results for experimental and comparison groups.

**Table 3.3.1.** General summary of t-test results for experimental and control groups.

<p><b>General summary.</b> t-Test: Experimental vs. Comparison Groups. Two-Sample Assuming Unequal Variances. (<math>t=3.32</math>, <math>p=0.001</math>, <math>N=100</math>).</p>																																									
<p><b>Fig.3.3.1.</b> Summary of September 2004 thinking test results of experimental (TA) groups. (N=73)</p>	<p><b>Fig.3.3.2.</b> Summary of May 2005 thinking test results of experimental (TA) groups. (N=73)</p>																																								
 <table border="1"> <caption>TA Groups. Sep-04</caption> <thead> <tr> <th>Score</th> <th>Frequency</th> </tr> </thead> <tbody> <tr><td>1</td><td>1</td></tr> <tr><td>2</td><td>2</td></tr> <tr><td>3</td><td>20</td></tr> <tr><td>4</td><td>21</td></tr> <tr><td>5</td><td>13</td></tr> <tr><td>6</td><td>11</td></tr> <tr><td>7</td><td>2</td></tr> <tr><td>8</td><td>3</td></tr> <tr><td>More</td><td>0</td></tr> </tbody> </table>	Score	Frequency	1	1	2	2	3	20	4	21	5	13	6	11	7	2	8	3	More	0	 <table border="1"> <caption>TA Groups. May-05</caption> <thead> <tr> <th>Score</th> <th>Frequency</th> </tr> </thead> <tbody> <tr><td>1</td><td>1</td></tr> <tr><td>2</td><td>3</td></tr> <tr><td>3</td><td>14</td></tr> <tr><td>4</td><td>12</td></tr> <tr><td>5</td><td>19</td></tr> <tr><td>6</td><td>15</td></tr> <tr><td>7</td><td>6</td></tr> <tr><td>8</td><td>3</td></tr> <tr><td>More</td><td>0</td></tr> </tbody> </table>	Score	Frequency	1	1	2	3	3	14	4	12	5	19	6	15	7	6	8	3	More	0
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<p><b>TA Groups. Summary.</b> t-Test: Paired Two Sample for Mean s. (<math>t=1.73</math>, <math>p=0.08</math>, <math>N=73</math>)</p>																																									
<p><b>Fig.3.3.3.</b> Summary of September 2004 thinking test results of control (non-TA) groups. (N=27 )</p>	<p><b>Fig.3.3.4.</b> Summary of May 2005 thinking test results of control (non-TA) groups. (N=27 )</p>																																								



In addition to the comparison of scores, the correlation analysis was conducted for comparing the relationship between scores in different rubrics of the test and the total score. The results of the analysis are presented in Table 3.1.3.

We also analysed the test papers on the subject of inventive thinking dispositions. We agree with Perkins, Jay and Tishman (D. N. Perkins et al., 1993:6) who define dispositions as ‘tendencies toward patterns of intellectual activity that condition and guide cognitive behaviour specifically.’ We also agree with Ennis (R. Ennis, 1997b) that dispositions are definitionally not a part of thinking skills. Inventive thinking dispositions are connected with associated abilities or skills, however manifestation of a disposition does not necessarily mean being skilful in application of this or that model. At the same time, dispositions are important to be an effective inventive thinker, therefore we were interested whether students subjected to experimental treatment demonstrate an increase in inventive thinking dispositions. In the context of the given research we consider that an inventive thinking disposition was manifested if a student explicitly employed one or several OTSM-TRIZ models when performing the task. The table below demonstrates numbers of students disposed to think inventively in each of the groups.

**Table 3.3.2.** The numbers of students demonstrating inventive thinking dispositions during September 2004 and May 2005 inventive thinking tests.

Group	Students demonstrating dispositions – Sep-04	Students demonstrating dispositions – May-05
-------	--	--

School 1. Form 10.	2 (7.7%)	13 (48.1%)
School 1. Form 11.	7 (26.9%)	12 (46.2%)
School 2. Form 10.	0 (0%)	3 (23.1%)
School 2. Form 11.	2 (20%)	6 (60%)
Control. Form 10.	0 (0%)	0 (0%)
Control. Form 11.	0 (0%)	0 (0%)

### 3.3.1.2. INTERPRETATION OF RESULTS

Although our results demonstrate that experimental groups performed much better on the inventive thinking tests ( $t=3.32$ ,  $p=0.001$ ), we believe a close look at the results is needed before any conclusion could be made.

Due to naturalistic conditions of this research, there is a strong limiting factor in the design of the study, i.e. a different number of contact hours per week in experimental and control groups. Although we believe that this factor did not make any significant influence on our findings, a further research with more comparable conditions for experimental and control groups are needed to prove this assumption. A number of other factors could also have influenced the outcome of the experiment. One of them is a different level in language competence between experimental and control groups. Although our data demonstrates no significant correlation between language and thinking test results ( $r=0.46$  for the September test and  $r=0.42$  for the May test)<sup>104</sup>, we agree that further investigations are necessary to be more confident about it. Another factor is students' attitude to tests as such. It is probable that experimental groups took the tests more seriously than control groups which could also affect the results. Notwithstanding all the above, we would like to note that the difference in performance between the experimental and control groups is quite impressive, therefore we believe that our findings deserve some consideration.

We also believe that due to the nature of our research, it is important to consider the changes within experimental groups as such. Comparing the four experimental groups, we see that both groups of 10 formers demonstrated significant changes in thinking skills ( $t=3.69$ ,  $p=0.001$  and  $t=3.59$ ,  $p=0.004$ ) while no significant changes have been observed among groups of 11 formers<sup>105</sup>.

<sup>104</sup> It is interesting that this result is very close to the one we obtained in correlation between students' self-assessment of their progress in language and inventive thinking ( $r=0.51$ )

<sup>105</sup> The group of 11 formers from School 2 demonstrated an increase significant at  $\alpha=0.1$  ( $t=1.86$ ,  $p=0.099$ )

Moreover, one group of 11 formers demonstrated a significantly worse performance on the May test. What are possible factors that could account for the above differences?

One possible explanation of the difference between performance in Form 10 and Form 11 groups may lie in the fact that the former started working with the TA programme in September 2004, i.e. at the same time when the pre-test was conducted, while the latter had already worked with the programme for one academic year in School 1 and half a year in School 2. We may suppose that progress in thinking skills is more dramatic during the first year of learning.

We believe that a special consideration should be given to changes in the performance of the group of 11 formers from School 1. What are possible explanations to the fact that the group which performed significantly better on the pre-test ( $M=5.29$  against  $M=3.06$ ,  $M=3.12$ ,  $M=3.73$  in the rest of the groups) not only demonstrated a decrease in results but was also outperformed by all other experimental groups?

In our opinion, a number of factors could account for this change. Most probably the situation we observed was a result of an interaction of various factors where each separate factor played a certain role in the overall system effect. Let us consider some possible factors more specifically.

Factor 1. Although September and May tests are comparable in terms of the way they were assessed, there are a number of differences between them considering the groups of inventive thinking skills required for successful performance of the task. The September test deals mainly with skills from Groups 2 and 3 (reference to the article / chapter) while the May test also requires skills from Group 4, namely those connected with the use of contradictions models from OTSM-TRIZ. It is important to note that OTSM-TRIZ models associated with the above groups of skills, and thus necessary for successful performance of a task, are different. If the September test mainly requires basic skills in application of the Element – Name of Feature – Value of Feature (ENV) model, the May test asks not only for more advanced skills associated with the ENV model, but also presupposes an ability to describe situation using the Multi-screen model (more advanced

application of the ENV Model)(N. Khomenko, 2004) and an ability to operate with contradictions. It may be assumed that basic skills associated with the use of ENV model are also developed in the course of learning many exact disciplines and students who perform better in those disciplines may also perform better on tasks associated with these skills. As Form 11 students from School 1 are better at exact subjects than the rest of students from experimental groups, it may account for a better performance in the September test. This factor may also account for the fact that students from control groups performed significantly worse during the May tests ( $t = -3,14$ ,  $p = 0.004$ ,  $N = 27$ )

Factor 2. It is also necessary to note that by September 2004 Form 11 from School 1 had had the longest exposure to the TA programme which could also affect their performance on the September test.

Factor 3. The analysis of the May papers shows that many Form 11 students from School 1 automatically took the task as being fully isomorphous to the task offered in the September test demonstrating quite an impressive use of the ENV model but failing to recognise the necessity to employ the model of contradiction. This factor may point out to both the lack of a disposition associated with the use of the contradiction model and / or a mere inattentiveness when dealing with a task.

Factor 4. One of the differences of the TA programme is a non-linear planning of a syllabus (see section 2.2.6 for more details). It means that students may deal with similar themes at different times and with a different depth. When analysing the results of the tests, the teacher from School 1 admitted that they hardly dealt with contradictions explicitly during the academic year 2004-2005.

Factor 5. Teacher effect. It has been widely noted that the role of the teacher is quite important in implementation of thinking programmes (Wiske, 1998:24) (Burden & Nichols, 2000:298) (D. N. Perkins, 2003:2) and others. As contradictions models may be considered more difficult to teach in comparison with the ENV model and the teacher in School 1 has less expertise in OTSM-TRIZ than the teacher in School 2, it could also account for differences in acquisition of skills and development of dispositions.

Let us stress once again that we consider that no single factor should be considered central in the explanation of the differences in results. We believe in the systemic effect of various variables, therefore all conclusions, including those we tentatively offer here, should be taken with caution. There is still very little research on effects of teaching OTSM-TRIZ in subject-matter courses and one should be careful not to jump to conclusions. On the other hand, we believe that our data could be valuable for further research on integration of OTSM-TRIZ in educational curricula. These data can also be interesting in the context of infusion thinking programmes (R. Ennis, 1997c:1) (Swartz, 2000) (Baumfield et al., 2004:30) as to the best of our knowledge the TA is one of the few thinking interventions in the area of foreign language education.

When turning to Inventive thinking dispositions, it is necessary to note that all TA groups demonstrated an increase in the number of students disposed to think inventively. The total increase with the experimental groups amounted to 35% (N=73). Although not all of these students were equally good in terms of inventive thinking skills and manifestation of a disposition does not necessarily mean that it was the best possible disposition in a particular situation (see above the discussion of possible reasons for weak performance of Form 11 students from School 1 in the May 2005 test), we consider that manifestation of a disposition when working on a task different from the ones students have practised during the school year allows us to assume a possibility of a far transfer (D. N. Perkins & Salomon, 1992:2) of inventive thinking dispositions. Furthermore, we would like to note that no student from control groups has demonstrated an inventive thinking disposition when working on a test task. Admitting that various factors could account for the given situation, two conclusions could still be made. First, inventive thinking dispositions do not develop by themselves. And, second, the TA programme could be considered a tool for the development of inventive thinking dispositions in the context of foreign language education.

### **3.3.2. Questionnaire**

#### 3.3.2.1. SUMMARY OF RESULTS

**Table 3.3.3.** Mean scores of experimental (TA) groups in the inventive thinking part of the questionnaire conducted in May 2005. (maximum is 5)

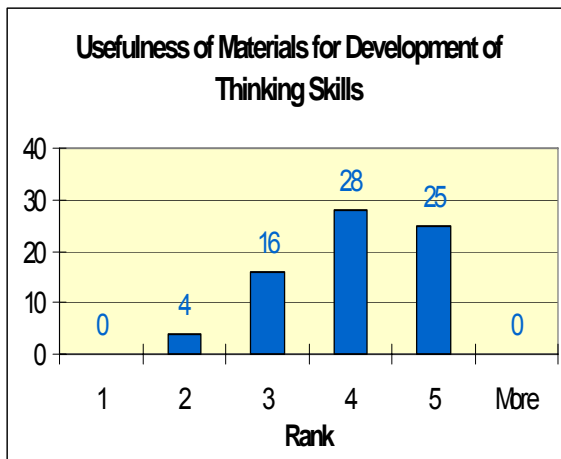
**Question**

**Mean score**

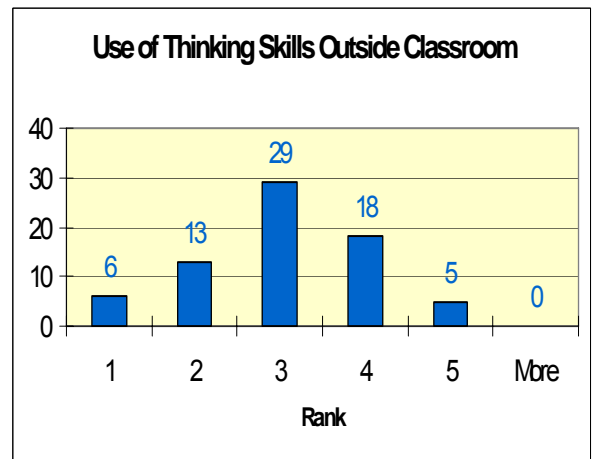
4. To what extent were the materials offered to you this term <i>useful</i> for the development of your thinking skills? <sup>106</sup>	4.01
5. To what extent do you use thinking skills mastered in your English lessons outside the classroom?	3.04
6. To what extent are you satisfied with the programme used for teaching English at school?	3.88
9. To what extent do you enjoy problem-solving in your every day life?	3.18
11. To what extent do you believe you improved your thinking skills as a result of English lessons in forms 8 and 9?	2.26
12. To what extent do you believe you have improved your thinking skills as a result of English lessons in forms 10 and 11?	3.74

The histograms below present the distribution of students' answers to the above questions.

**Fig.3.3.5.** Students' evaluation of usefulness of materials for the development of their inventive thinking skills.



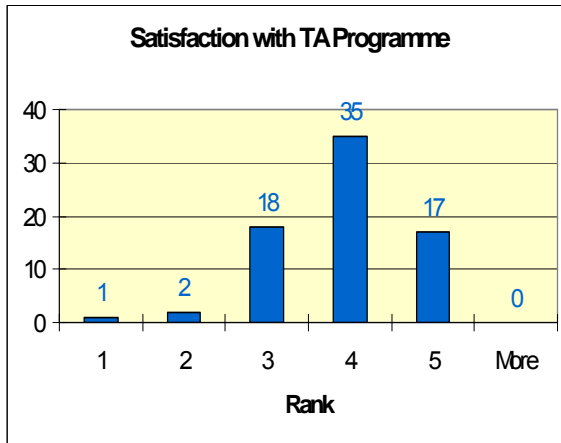
**Fig.3.3.6.** Students' evaluation of their use of inventive thinking skills outside the classroom.



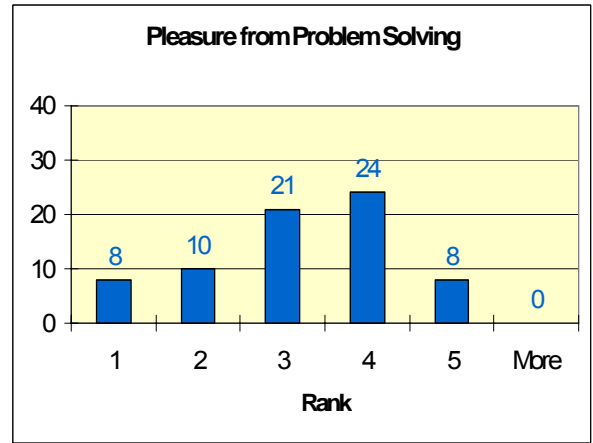
**Fig.3.3.7.** Students' evaluation of the TA programme.

**Fig.3.3.8.** Students' evaluation of the degree to which they enjoy problem solving.

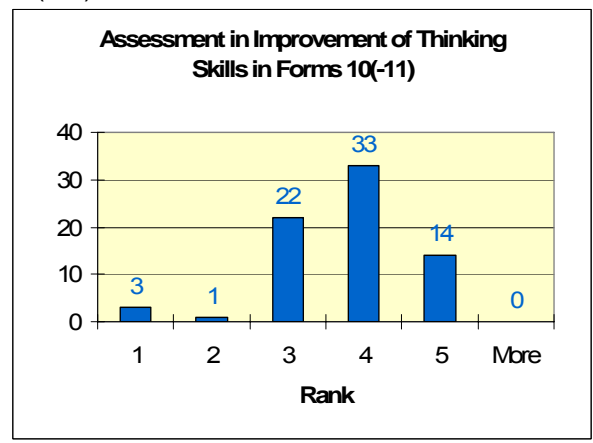
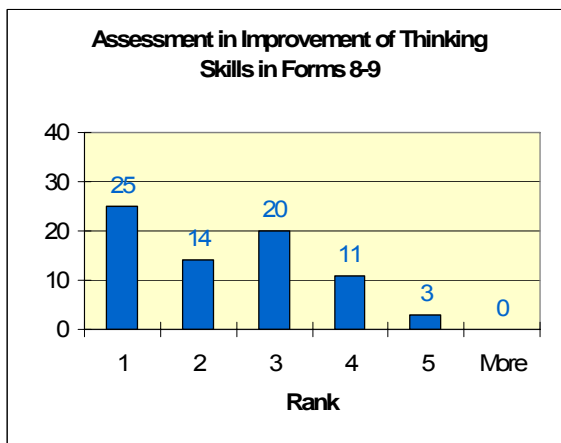
<sup>106</sup> Numbers of questions correspond to the actual numbers of questions in the questionnaire presented in Appendix 3.2.



**Fig.3.3.9.** Students' evaluation of their improvement in inventive thinking skills in forms 8-9.



**Fig.3.3.10.** Students' evaluation of their improvement in inventive thinking skills in forms 10(-11)



The data on students' evaluation of their improvement in inventive thinking skills presented in figures 9 and 10 demonstrates that there is a significant difference between the progress students observe ( $t=8.42$  ,  $p=2.51E-12$  ,  $N=73$ , two-tail)

Another interesting factor we noted is a significant change of students' evaluation of their progress in thinking skills during forms 8 and 9 that takes place between September and May questionnaire ( $t= -2.89$ ,  $p=0.006$  ,  $N=39$ , two-tail).

When conducting the correlation analysis of relationship between students' answers to different questions of the questionnaire, we found no significant relationship between any of the questions, Pearson Product Moment correlation ranging from 0.2 (usefulness of materials for the development of language skills and usefulness for the development of thinking skills) to 0.55 (improvement of language skills in forms 8-9 and improvement of thinking skills in forms 8-9)

### 3.3.2.2. INTERPRETATION OF RESULTS

The mean ranking of 4.01 (out of 5) demonstrates that the majority of TA students find the materials offered by the programme useful for the development of their inventive thinking skills and they are also satisfied with the programme as such (mean ranking 3.88). Less encouraging data was obtained on students' use of thinking skills outside the classroom (3.04) and their pleasure from problem solving (3.18).

It is generally agreed that transfer is ultimately the purpose of all learning (D. N. Perkins & Salomon, 1990), thus it is crucial whether students transfer the skills they acquired in one classroom to new contexts. We believe that students' own feelings about transfer are one of important indicators of whether transfer occurs. Although the mean ranking of 3.04 points out that a number of students report transfer of skills to new contexts<sup>107</sup>, we generally hope to reach a higher mean ranking among our subjects by the end of learning (May 2006 for Forms 11 and May 2007 for Forms 10).

One of the aims of OTSM-TRIZ education is the development of a personality for which problem as such lies in the centre of their world view. This personality sees problems as a source for both personal development and changing the world (Nesterenko, 2004). Enjoying problem solving is essential for approaching such an aim. Although the mean ranking of 3.18 points out that our students are hopefully moving in the right direction, we believe that changing students attitude to problems is one of the most challenging tasks as people are generally tuned rather negatively what concerns problems.

Both in September 2004 and May 2005 Form 10 students were asked to evaluate their progress in thinking skills during forms 8 and 9. We believe that a significant change in evaluation may be explained by the fact that students' conceptualisation of thinking skills is changing during the work with the TA programme<sup>108</sup>. It may be assumed that at the beginning of the treatment students perceive thinking skills as anything connected with the process of thinking. Taking into account that many

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<sup>107</sup> 18 students (25%) ranked 4 and 5 (7%) students ranked 5

<sup>108</sup> We believe that this change is not incidental as no significant differences were found in Form 11 students evaluation of their progress in thinking skills between May 2004 and May 2005 results.

people believe that practically anything that goes beyond a mere linguistic focus can be called a thinking skill (see for the discussion of misapplication of the term 'thinking skill' (G. Smith, 2002a:211), one may come to the conclusion that practically everything can be referred to as a thinking skill. In the course of working with the programme students come to conceptualise thinking skills differently, more and more as skills necessary for successful problem solving in various fields.

One of the common beliefs in the area of foreign language education is about thinking skills being automatically developed in the process of learning a foreign language. A possible reason for this misconception can lie in the long tradition of connections between language and thinking. Agreeing that connections exist, we would like to note that there are important differences between thinking as understood in a generally philosophical sense and inventive thinking skills as defined in this paper. Our data suggests that there is no significant relationship in students' progress in language and inventive thinking, neither according to test scores nor to students' own assessment of progress. Another thing to be mentioned here is that there is a general agreement that an *explicit* focus on thinking is necessary if one aims at bringing changes in students' thinking skills. (Jonathan Baron, 1993) (Facione, 1990:14-15) (Carol McGuinness, 1999:2) (D. N. Perkins et al., 1990:292) (Swartz, 2000)

It also seems interesting that hardly any relationship exists between students evaluation of their improvement in language and thinking skills and the overall evaluation of the efficiency of the programme ( $r=0.24$  and  $r=0.2$  respectively,  $N=73$ ). On the other hand, our data suggests that twice a stronger relationship exists between students' evaluation of their progress in independent learning and the overall evaluation of the programme, ( $r=0.41$ ) the latter also being not a significant relationship though. Thus, it may be assumed that students' evaluation of the programme is a complex process which cannot (and should not) be described in a linear way.

### 3.3.3. Interview

#### 3.3.3.1. SUMMARY OF RESULTS

The table below summarises students' answers to close questions of the interview related to the theme of thinking skills.

**Table 3.3.4.** Students' answers to close interview related to the theme of thinking skills.

Question	Possible answers	Number	Percentage
Wish to learn other languages with the TA programme	Yes	56	71%
	No	15	19%
	Undecided	8	10%
Wish to learn other subjects with the TA programme	Yes	35	44%
	No	22	28%
	Undecided	22	28%
Changes in problem solving	Yes	64	81%
	No	15	19%
Changes in the way students think	Yes	56	71%
	No	21	27%
	Undecided	2	3%
Changes in problem solving when working with grammar	Yes	65	82%
	No	14	18%
Changes in problem solving when working with independent projects	Yes	53	70%
	No	23	30%
Changes in the attitude to the TA programme	Yes	70	90%
	No	8	10%
		<b>Mean</b>	
Evaluation of the TA programme for teaching English	From 1 to 5		3.92
Evaluation of changes in the approach to problems	From 1 to 5		3.22
Evaluation of the TA programme at the beginning of studies	From 1 to 5		2.33
Evaluation of the TA programme at the present moment	From 1 to 5		4.04

**Table 3.3.5.** Summary of students' answers to open questions of the interview related to the theme of thinking skills<sup>109</sup>.

Question	Students' answers <sup>110</sup>	Number	% <sup>111 112</sup>
Features of the TA based teaching	Student centred	41	51.9%
	Focus on thinking skills	19	24.1%
	Absence books	13	16.5%
	New and different from other subjects	31	39.2%
Opinion about TA as a method for learning languages	Positive	47	59.5%
	Neutral	27	34.2%
	Negative	2	2.5%
	Difficult at first	7	8.9%

<sup>109</sup> We are not reporting those open questions where less than 50% of students provided their answers unless the data is seen as being important anyway, eg in question about changes in problem solving.

<sup>110</sup> The list of categories for students answers was made after the interview and includes only those students mentioned more often. Some students may have provided an answer different from the one in the list while others may not have answered the question at all.

<sup>111</sup> As students were free to provide several answers, data does not necessarily add up to 100%

<sup>112</sup> Percentage is calculated from the total number of students taking part in the interview rather than those who provided an answer to the question.

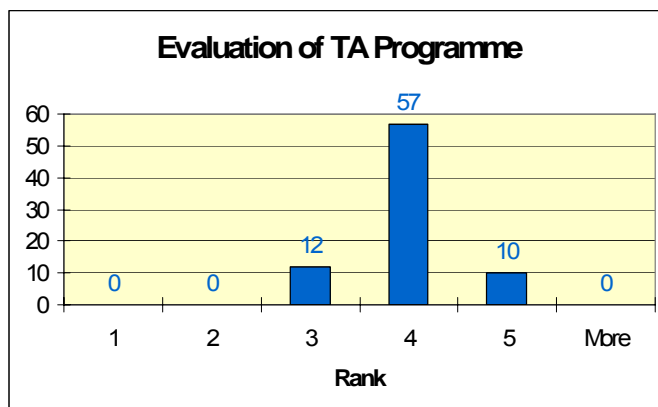
What makes TA course different from other language courses?	Focus on learner autonomy	40	50.6%
	Focus on thinking skills	22	27.8%
Changes in problem solving skills	Use of models	19	24.1%
	More serious approach to problems	12	15.2%
	No fear of problems	4	5.1%
	New point of view about problems	2	2.5%
Specific things in the programme that improved problem solving skills	Models	35	44.3%
	Practice	4	5.1%
Causes of changes in the attitude to the TA programme over time	Understanding of the programme and requirements	29	36.7%
	My progress	22	27.8%
Time of changes in attitude towards the TA programme	Semester 1	19	24.1%
	Semester 2	29	36.7%
	Semester 3	4	5.1%
	Semester 4	2	2.5%
	Step by step	8	10.1%

As well as with questionnaires, no significant correlations were found between students' answers to different interview questions.

### 3.3.3.2. INTERPRETATION OF RESULTS

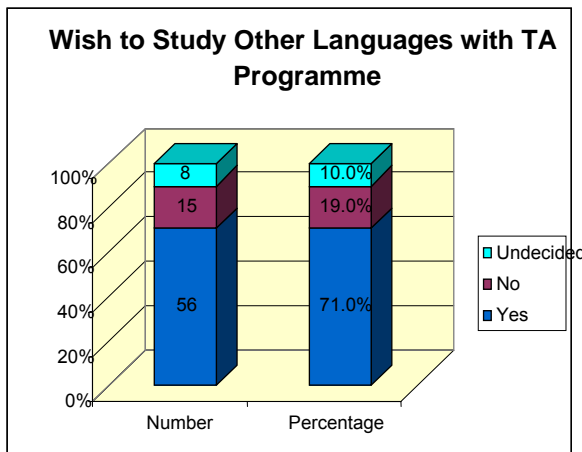
The mean ranking when evaluating the TA programme equals 3.92. The reliability of this number is supported by the fact that a similar result was observed in the questionnaires – (the mean ranking of 3.88) and the last question of the interview where students had to rank their present attitude to the TA programme (the mean ranking of 4.04). As it is seen from Figure 3.3.11. below, no student has given a ranking lower than 3 which allows us to conclude that subjects demonstrated a relatively high level of the programme acceptance.

**Fig.3.3.11.** Histogram of students' satisfaction with the TA programme in May 2005.

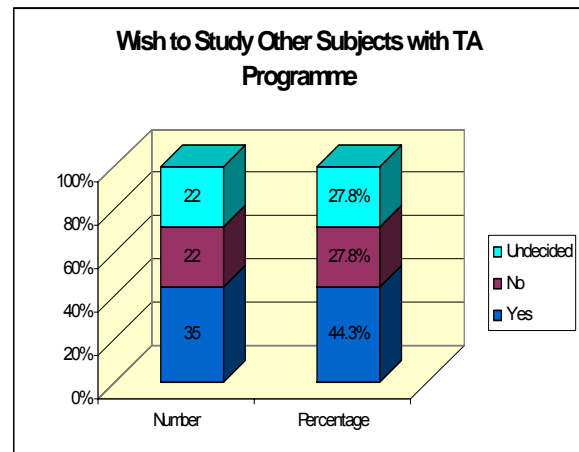


There are two more things to be mentioned in connection with the programme. The first one deals with students' perception of universality of the programme. As seen from the figure below, 71% of students reported a wish to learn other languages with the TA programme. 44% of respondents mention that they would be glad to study other subjects on the basis of the TA principles. In reference to other subjects, the majority of students who answered negatively pointed out that they could not imagine how similar principles could be followed in courses of exact sciences. As no attempts have been made to demonstrate how the TA principles, or rather principles of OTSM-TRIZ education can be implemented in other subjects, we may conclude that about 50% of students require additional guidance before they could make a decision about a possibility of transferring principles of OTSM-TRIZ education across domains and whether they could benefit from it. At the same time, already at this stage many students see a possibility of employing the programme for learning other subjects and potential benefits it could bring them.

**Fig. 3.3.12.** Students' wish to study other languages with the TA Programme.



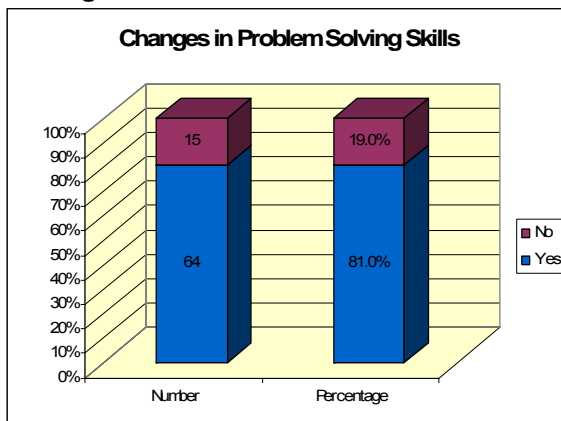
**Fig. 3.3.13.** Students wish to study other subjects with the TA programme.



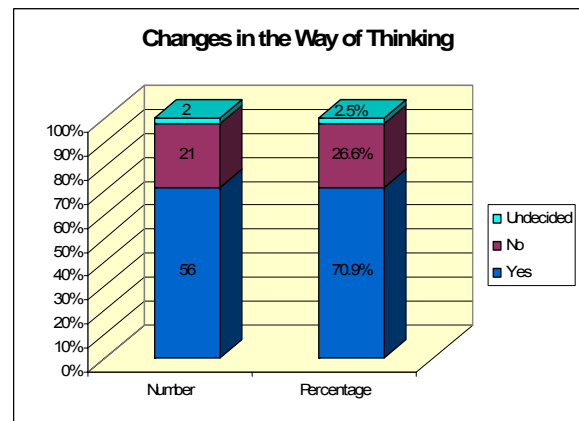
The second moment deals with a change of students' attitude to the TA programme with time. The initial reaction to the programme is not very positive (the mean ranking of 2.33), however a significant change in attitude was observed when comparing the September and May opinion about the programme. ( $t=14.4$   $p=2.04307E-23$   $N=79$ , two tail)

81% of students report changes in their problem solving skills<sup>113</sup>. It may be supposed that such a high number is explained by students' narrow conceptualisation of problem solving (i.e. only problems related to specific language problems). At first sight the fact that 82% of students report changes in grammar problem solving may support this idea. However 72% of students report changes in the way they think which can hardly be assumed to be understood by students in the narrow language context.

**Fig. 3.3.14. Changes in Students' Problem Solving Skills.**



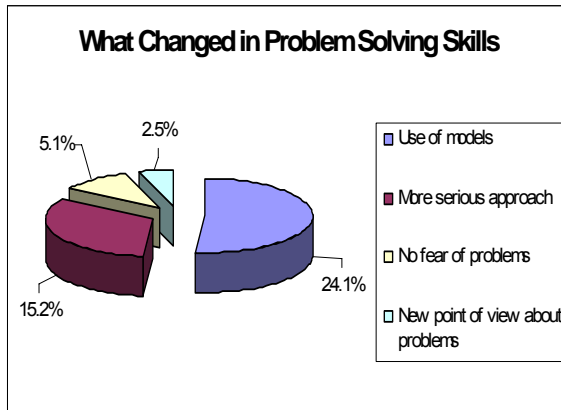
**Fig. 3.3.15. Changes in the Way of Thinking.**



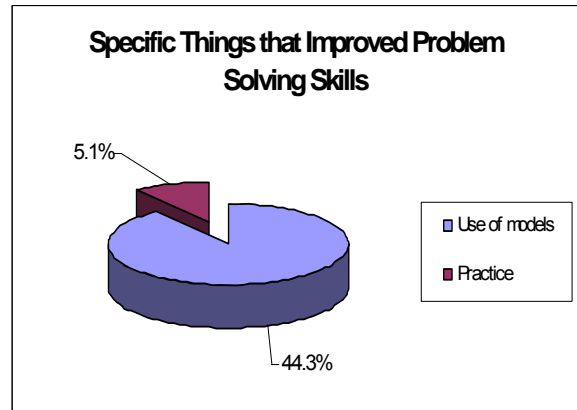
<sup>113</sup> As mentioned earlier, we use inventive thinking and problem solving skills interchangeably in the content of the present research.

We also find it important that about  $\frac{1}{4}$  of students choosing to comment on their answers on questions dealing with problem solving mention see OTSM-TRIZ models and report an interiorisation of models as thinking tools and 44.3% see models as specific things in the programme that improved their thinking skills (see figures 3.3.16 and 3.3.17 below)<sup>114</sup>.

**Fig. 3.3.16.** What Changed in Students' Problem Solving Skills.



**Fig. 3.3.17.** Specific Things that Improved Problem Solving Skills.

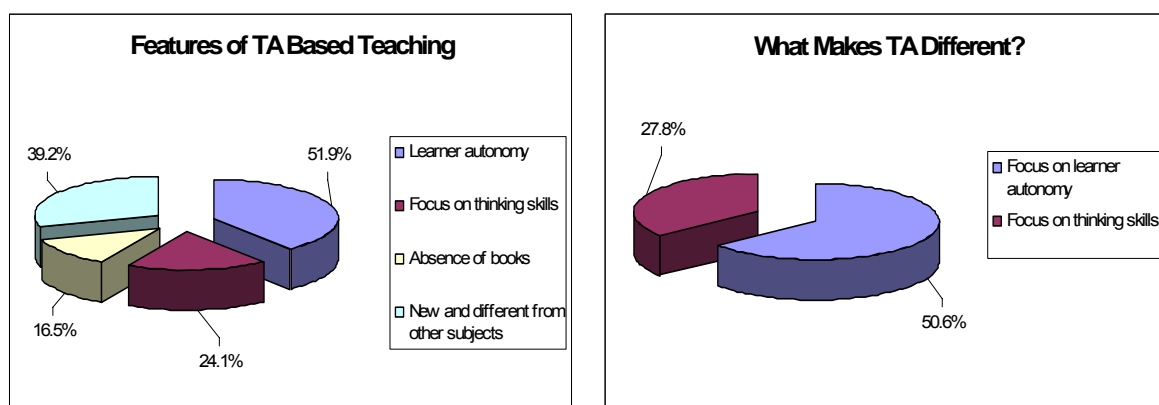


We may also assume that unlike us students do not perceive thinking and problem solving skills absolutely interchangeably as the mean ranking of improvement in problem solving skills equals 3.22 (interview) while the mean ranking in thinking skills is 3.74 (questionnaire), However this difference can also be explained by other factors.

One of the questions we were interested in before conducting a study is whether students perceive the TA programme as a tool for the development of their inventive thinking skills. The results of the study seem to suggest that the focus on thinking skills is clearly perceived by about 25% of students, however another 50% see the programme as a tool for the development of their learning skills (see Figures 3.3.18 and 3.3.19 below).

**Fig.3.3.18.** Features of the TA based teaching.      **Fig.3.3.19.** What makes the TA different?

<sup>114</sup> Please note that percentage is calculated from the total number of students taking part in the interview rather than those who answered the given questions.



In fact, one may assume that the actual number of students seeing the foci on thinking and learner autonomy is higher as comparison of answers in chart 18 and 19 may suggest that a number of students reporting the TA is 'new and different from other subjects' (39%) meant either focus on learner autonomy and / or thinking skills.

### 3.4. Summary

The aim of the present study is to find what to what extent the use of the Thinking Approach to language teaching contributes to the development of students' language and inventive thinking skills. This chapter presents the results we have obtained by summer 2005. Our purpose was to find out whether 1) students working with the TA programme demonstrate an increase in their inventive thinking skills, 2) students working with the TA programme demonstrate an increase in their language skills, and 3) students working with the TA programme believe that the programme helps them improve their inventive thinking and language skills.

We found out that students working with the TA programme demonstrate significantly better results in a thinking test in comparison with the control group ( $t=3.32$ ,  $p=0.001$ ). The reliability of this finding is limited though as students in the control group had a smaller number of contact hours per week (3 hours in control groups versus 5 hours in experimental groups).

Students working with the TA programme demonstrated a gain in thinking skills when comparing their performances in pre- and post-tests. The difference is significant only at alpha 10% ( $t=1.74$ ,  $p=0.086$ ). The control groups on the other

hand demonstrated a significant decrease in thinking skills ( $t=-3.14$ ,  $p=0.004$ ). We also found out that the TA groups of 10 formers performed better on thinking tests (both of them demonstrated a significant increase) in comparison with form 11 groups. The most surprising finding about results of the thinking test was a significantly worse performance of a group of 11 formers from school 1 which are assumingly the strongest group in terms of thinking skills. Possible reasons for such a situation were discussed in part of this article. We believe that further research is necessary to either validate or reject our assumptions and we plan to do it in the coming academic year.

We have found no significant differences between the language progress in experimental and control groups. The reliability of this data is undermined though as only 54% of students in control groups wrote the test and many weak students are reported to have missed it. On the other hand, we observed a significant progress in groups of TA students when comparing the results of pre- and post-tests. ( $t=3.94$ ,  $p=0.0002$ ,  $N=82$ )

Our findings suggest that the majority of students accept the programme and find it useful for the development of their inventive thinking skills (mean ranking 3.92 out of 5,  $N=79$ ). It is also necessary to note that the attitude to the programme dramatically changes with time, being not very high during the first month of learning (mean ranking of 2.33 out of 5,  $N=79$ ) and rising to 4.04 in the second semester of learning. Moreover, we found out that students' conceptualisation of thinking skills as such changes as a result of working with the TA programme. This fact is supported by a significant change in students' evaluation of their progress in thinking skills during forms 8 and 9 (before they started working with the TA programme) in September 2004 and May 2005. ( $t=14.4$ ,  $p=2.04307E-23$ ,  $N=79$ , two tail).

83.5% of students mention that they have improved their language skills in English when working with the TA programme, moreover 76% mention that they have made a considerable progress. We found significant difference between students' evaluation of their progress in English during forms 8-9 (before the exposure to the TA programme) and forms 10-11 (when working with the TA programme). ( $t=8.42$ ,

$p=2.51E-12$ ,  $N=73$ ). Absolute majority of students also pointed out that they were enjoying learning with the proposed programme.

Apart from the focus on inventive thinking and language skills, students perceive the TA programme as an effective tool for the development their skills for autonomous learning. Research evidence suggests that such programmes tend to be very effective. (Moseley et al., 2004:54)

In conclusion we would like to say that our data suggests that students in two secondary schools of Latvia were ready to accept the programme dealing with the development of inventive thinking skills in the area of foreign language instruction and believe that such a programme contributes to the development of their inventive thinking and language skills. At the same time we agree that further research is necessary to obtain more reliable data on the actual efficacy of the programme for the development of students' inventive thinking and language skills.