

The Relationship between Types of Intelligence and Study Profile Options



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ABSTRACT

Intelligence is a domain that has always interested people throughout history. Psychologists have become aware of the fact that real progress may be achieved only through collaboration, by unifying existing results and conclusions about the nature, function and modes of expression of intelligent behaviour. The ideal expression of such a synthesis would be a combination of the research findings of Sternberg and Gardner. To achieve effective results, each approach should diversify and refine its methodology and tools. This paper highlights the existence of a relationship between the predominant type of intelligence and the choice of the study profile, an aspect that may be taken into account in career guidance and counselling. Based on applying a battery of tests that measure verbal and logical-mathematical intelligence to a number of 86 subjects, students in the first year at the Faculty of Letters and Faculty of Sciences, the study highlights the fact that subjects have maintained their profile in the transition from high-school to university studies and there are significant differences in terms of the average logical-mathematical intelligence levels between the students from the real and those from the human profile. There are relevant differences between the mean of logical-mathematical intelligence levels of the subjects from the real profile and of those from the human profile, which confirms that at the students from the real profile the logical-mathematical intelligence is predominant. In terms of verbal intelligence, there are no relevant differences between the subjects from the real and those from the human profile, but for the entire research group there are significant correlations between verbal intelligence and the word scrambling test results.

Keywords: Experiment, Verbal intelligence, Logical-mathematical intelligence, Real profile, Human profile.

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1. INTRODUCTION

1.1. Problem Statement

At the beginning of the 19th century, English psychologist Charles Spearman distinguished among the set of human skills a G (general) factor involved in performing all types of activity, and numerous S (special) factors corresponding, operationally, only to the concrete circumstances of the activity (artistic,

sporting, scientific, etc.). The general factor was agreed to be of the intellectual order, as understanding and solving problems is absolutely necessary in any activity. Therefore, the G factor was mistaken for intelligence.

American psychologist Thurstone established several intelligence factors, namely: (deductive and inductive) reasoning, memory, numerical ability, perceptual speed, spatial ability, word fluency, verbal comprehension. There are many factors of intelligence but because these intertwine and even intermingle, the presence of a G factor has not been invalidated. It is useless to raise the issue of the structure of intelligence, or according to the latest formulations, the problem of cognitive style.

The psychology of thinking operates with various differences between analytic and synthetic, pragmatic and theoretical, reproductive and productive, crystallized and fluid, convergent and divergent etc. In connection with brain lateralization, given the fact that the left hemisphere is specialized in the verbal and semantic order whereas the right hemisphere performs functions of handling spatial relationships and configuration of images, there have emerged variants of intelligence with a dominant logical-semantic or spatial-imaging dimension ([Popescu – Neveanu and Zlate, 1998](#)).

These variants of intelligence are often correlated with the theme of differences by gender which has been addressed in many cognitive domains, arguing that women have better verbal skills than men who possess spatial and mathematical skills. There is a difference between men and women regarding how the two brain hemispheres contribute to mental functions. Thus, a bilateral representation of verbal functions is observed more frequently in women than in men, which seems to provide an explanation also for spatial functions. Also, there was observed a greater tendency towards structural asymmetry in men than in women, but this does not seem to reflect a marked difference between men and women. Another possibility is that the same type of brain organization is present in both sexes, but the two sexes do not use the same strategy in how they approach tests.

1.2. Problem relevance

There have been conducted experiments with the aim of increasing the participation of girls in Math activity. Researchers have created workshops of Mathematics centred on stereotypes and the conclusion was that teachers could influence students' attitudes towards Mathematics and Science.

Upon high-school graduation, in Romania, 30% of girls and 50% of boys choose to study at faculties of Mathematics and Sciences. In 1980, only 25% of the titles of Doctor in Science and Engineering were awarded to girls ([Golu and Golu, 2003](#)).

In his research, Romanian psychologist Andrei Cosmovici identified the G factor as shared by various abilities. Given the instrumental structure of intelligence, specific to individual personality, we must show that life experience and especially school and vocational experience highlights it, enabling its assessment. Empirically, intelligence can be measured as learning performance, ease and depth of understanding, and the difficulty and novelty of the problems that the subject is able to solve ([Lupu, 2008](#)).

There arises the question of why is grouping of students based on skills so frequent? Proponents argue that this enables a better response to individual differences, adjusting the pace, methods and materials to each group level. In secondary schools, grouping by skills is reflected in the curriculum that differs across profiles (Theoretical high-school: real profile: Mathematics-Informatics specialization and Natural Sciences specialization; human profile: Philology specialization, Social Sciences specialization; Vocational high-school: Profiles: 1. Sports; 2. Theology; 3. Visual Arts/Architecture; 4. Music; 5.

Choreography; 6. Drama; 7. Philology (Waldorf); 8. Pedagogy; Technological high-school with: I. Services branch. Domains: 1. Economy; 2. Tourism and food; 3. Trade. II. Technical branch. Domains: 1. Media Production; 2. Printing Techniques; 3. Mechanics; 4. Electronics, Automation; 5. Electricity; 6. Electromechanics; 7. Construction, installation and public works; 8. Building materials; 9. Industrial chemicals; 10. Textile and leather industry; 11. Manufacture of wood products. III. Natural resources and environment protection branch. Domains: 1. Environment protection; 2. Food Industry; 3. Agriculture; 4. Industrial Chemistry).

Intelligence is one of the concepts that unites domains such as Psychology, Logic, Mathematics, Linguistics, Neurology, Cybernetics, resulting in the domain of the Cognitive Sciences. This integrates research on all human cognitions, from perception and representation to memory, thinking, creativity and skills (Lupu, 2014).

1.3. Background of the Concept of Intelligence

Etymologically, the word 'intelligence' is derived from the Latin *intelligere* or *interlegere*, meaning 'to organize', 'to relate'. The term suggests that intelligence exceeds thought, the latter being limited to establishing relations between the essential characteristics of objects and phenomena, and not relations between relations.

More broadly, intelligence is a set of functions that enable the body to adapt to the environment through acquisitions and original re-enactment of behaviours. In a narrower sense, it is synonymous with the ability to learn, operate with abstractions and solve problems. It is a quality of all mental activities, ensuring adaptability to new situations quickly and efficiently (Popescu – Neveanu and Zlate, 1998).

Whereas the first researchers believed that intelligence is a unitary or general trait, R. Cattell classified intelligence into fluid and crystallized abilities to differentiate between the general raw ability and intelligence polished by culture and school. He believed that fluid intelligence manifests in spatial, non-verbal and performance tests, for example sorting arrays and building cubes, whereas crystallized intelligence is displayed in tests of verbal knowledge, vocabulary and Math problems that require the direct application of previously learned knowledge. As the research evolved and the domain developed, there were proposed other types of intelligence – such as verbal, mathematical, spatial and perceptual.

Researchers have extended the theory of multiple skills to original ideas, proposing models that describe intelligence as comprising a variety of aspects or parts: the structure of the intellect proposed by Guilford; Sternberg's triarchic theory of intelligence; Gardner's theory of multiple intelligences (Dumitriu, 2010).

Guilford believes that intelligence depends on mental operations and their products. He developed a model of the structure of the intellect, describing specific intelligence (versus general intelligence) as the intersection of five cognitive operations (convergent thinking, divergent thinking, evaluation, memory and cognition) with four contents of thought (figural, symbolic, semantic and behavioural) and six products (units, classes, relations, systems, transformations, and implications) (Guilford, 1967).

Robert (1988) another supporter of the theory of multiple abilities, proposes a triarchic theory of intelligence, with three dimensions: processing components; the link between intelligence and environment; a mechanism for modifying intelligence through experience, each of them combining with the other two in producing intelligent behaviour (Bernstein et al., 2002).

Contextual intelligence is the individual's ability to adapt to the environment and/or culture: an intelligent person is an individual who manages to survive in a given situation that is often hostile. Fundamentally linked to motivation, to exploiting the living context, this type of intelligence depends heavily on the culture in which it appears and the memory in which it is fixed.

Empirical intelligence indicates how our own past experiences underlie our current behaviour. Also called experiential, this form of intelligence is the ability to make a routine out of something newly acquired. Driving a car illustrates how our learning progress makes us faster, more skilled in processing information and developing responses.

Analytical (or componential) intelligence corresponds to the classical notion of intelligence measured by IQ tests, being highlighted at children with good school results. As early as 1977, Sternberg identified three types of cognitive mechanisms: performance components, metacomponents and components for accumulating knowledge (Neculau and Şchiopu, 1997).

Thorndike proposed the distinction between at least three types of intelligence: abstract or conceptual intelligence characterized by the ability to use verbal and symbolic material; practical intelligence, based on the tangible when handling objects; social intelligence that involves understanding people and managing relationships well.

Gardner proposes multiple intelligences derived from the diversity of abilities found in the modern technological society. Today's world is full of people who have high verbal or logical intelligence, but who excel in other areas as well, such as the spatial (artists and architects) or interpersonal (effective counsellors or empathetic teachers) domains.

To study intelligence, Gardner focused on how people learn and used a system of symbols, namely: language, mathematics and music. The question that arose was whether all these systems require the same skills and processes, the same intelligence. To answer, Gardner researched not only intelligence test scores but also the experimental processing of data, how children develop, exceptional skills of children, remarkable adults, biological research, values and traditions of different cultures (Gardner, 2003).

According to Gardner's research, all people possess a number of intellectual or "intelligent" prototypes, each of them encompassing problem-solving skills. Although intelligences usually interact, they can operate with some independence, individuals being able to develop their other intelligences later. The main types of intelligence that Gardner proposes are: linguistic intelligence (sensitivity to the meaning and order of words and the various uses of language), logical-mathematical intelligence (the ability to operate with long chains of reasoning and recognition of patterns and relationships), visual-spatial intelligence (the ability to perceive the visual world accurately, to recreate, transform or modify aspects of the world on the basis of someone's perceptions), musical intelligence (sensitivity to rhythm, melody and harmony), bodily-kinaesthetic intelligence (the ability to use one's body and handle objects), intrapersonal intelligence (accessing and understanding one's own emotions, self-awareness), interpersonal intelligence (the ability to understand others and show empathy) (Golu and Golu, 2003).

While all people possess these types of intelligence, individuals differ genetically and empirically in terms of the profile of intellectual strengths and weaknesses. This psychological theory yields no direct educational implications but if individuals differ in terms of intellectual profile, then this aspect should be taken into account in organizing the educational system.

Given the instrumental structure of intelligence, specific to each individual personality, our aim is to show that life experience and especially school and professional experience highlight and make it

assessable. Empirically, intelligence can be measured as learning performance, the ease and depth of understanding and the difficulty and novelty of the problems that the subject is able to solve.

In April 2003, at a meeting conducted by the American Educational Research Association in Chicago, Gardner presented the paper "Multiple Intelligences After Twenty Years" in which he concluded that there was clear evidence of the existence of naturalistic intelligence and suggestive evidence for a possible existential intelligence (the intelligence of big questions). He also explored in more detail the relationship between intelligence – as bio-psychological potentiality and different areas and disciplines that exist in different cultures and civilizations. What we know and how we analyse the world could be, to some extent, a reflection of human intelligence. He introduced three uses of the term "intelligence": a) a property of all human beings (we all possess these intelligences); b) a dimension in which human beings differ (even monozygotic twins do not have the same profile of intelligence); c) the manner in which an individual performs a task to achieve a goal (Lupu, 2014).

The topic of multiple intelligences remains open, as Gardner himself said in his paper, with efforts being required to propose new intelligences. Thus, to complement the explosion of interest in emotional intelligence, efforts were made to describe spiritual intelligence and sexual intelligence, there being also proposed the existence of digital intelligence.

To answer the question "what is the best way to activate the types of intelligence in order to achieve specific pedagogical objectives?" research is needed on the ramifications of the multiple theory. One possible research line would consist in analysing how social activities and knowledge domains are regularly reconfigured. Every complex society has at least 100-200 different occupations and every university offers at least 50 different areas of study.

1.4. Research Hypotheses and Their Correspondence to the Research Design

- There are no significant differences between the students from the human and those from the real profile in terms of the predominant type of intelligence.
- There are significant differences between the students from the human and those from the real profile in terms of the predominant type of intelligence.
- At the students from the real profile, the logical–mathematical intelligence is the predominant type compared with the verbal intelligence.
- At the students from the human profile, the verbal intelligence is the predominant type compared with the logical–mathematical intelligence.

The students participating in this experiment are from the human profile and the real profile.

The independent variable: logical-mathematical intelligence versus verbal intelligence.

2. METHOD

2.1. Identify Subsections

The Bonnardel 53 test (B 53) comprises 65 problems in the form of a series of figures. The top 5 items are used as examples to instruct subjects on how to solve the problems and the principles underlying the solving of the problems included in the test. Each sample is composed of two groups of figures arranged horizontally. The first 3 figures from the left represent the "Series", the next 6 figures on the right the "Answer options".

The student must find the rule which underlies the construction of the series and choose the “correct answer” from the 6 “Answer options”, namely the figure that should logically continue the series. The subject notes on the answer sheet, for each problem, the number corresponding to the figure selected from the series of the 6 figures. In its construction, the focus was placed on the ability to seize the dynamic aspect of intelligence.

To be sensitive to different levels of school and professional training, the difficulty levels of the test items were gradated and test items arranged in order of increasing difficulty. Because the B. 53 test can be given wide applicability, we have reduced the examination and application time to 15 minutes (the test can also be applied with no time limit). Thus, B. 53 is an operational test that does not exhaust subjects. For the examiner, the task is easy as correction is performed with the help of a grid (Lupu, 2015).

The multiple intelligences test consists of 80 items where each item is a sentence expressing a mood, an activity, a problem. On a scale from 1 (strongly disagree) to 5 (strongly agree), the subject should express the extent to which the respective statement is true in relation to him/herself. The sentences are formulated based on the 8 intelligences that are finally ranked.

For this test, the intelligences were numbered as follows: 1. Verbal / Linguistic; 2. Mathematical / Logical; 3. Visual / Spatial; 4. Bodily kinaesthetic; 5. Rhythmic / Musical; 6. Interpersonal; 7. Intrapersonal; 8. Naturalistic.

Word scramble is a test where the subject has to unscramble a word and build as many new words as possible from the letters of the given word in 15 minutes. The new words must be written in three columns, one column for the first 5 minutes, the second column for the next 5 minutes and the third column for the last 5 minutes. Performance is defined by the number of new words.

The I2 test consists of 4 subtests, each with 10 problems to solve: - Opposite words: the subject must find the word that is the opposite to the one given; - Analogies: the subject must find the word that matches the one given; - Series of numbers: the subject must find a logical continuation of the given numbers; - Superfluous words: the subject must decide which word does not fit in a series of given words.

2.2. Participant (Subject) Characteristics

For this research there were tested 86 subjects, 42 boys and 44 girls. They are students in the first study year at the “Vasile Alecsandri” University of Bacău, 43 subjects at the real profile from the Faculty of Sciences and 43 subjects at the human profile from the Faculty of Letters.

In Table 1 and Table 2 we present the sample description for the real profile and the human profile. For the real profile, there were tested 43 subjects, namely 22 boys and 21 girls.

Table-1. Sample description for the real profile

Subject gender	Number of students	Percentage
Masculine	22	52,2%
Feminine	21	47,8%
Total	43	100%

For the human profile, there were tested 43 subjects, namely 21 boys and 22 girls.

Table-2. Sample description for the human profile

Subject gender	Number of students	Percentage
Masculine	21	47,8%
Feminine	22	52,2%
Total	43	100%

The subjects maintained their profile in the transition from high-school to university studies.

2.3. Sampling Procedures

Figure 1 shows that the results have a normal distribution for verbal intelligence measured with the I2 Test. It was found that the vast majority of subjects (88%) respond well to the verbal intelligence test items, the subjects from the human profile having solved the I2 Test items to the same proportion (88%) as those from the real profile (88%).

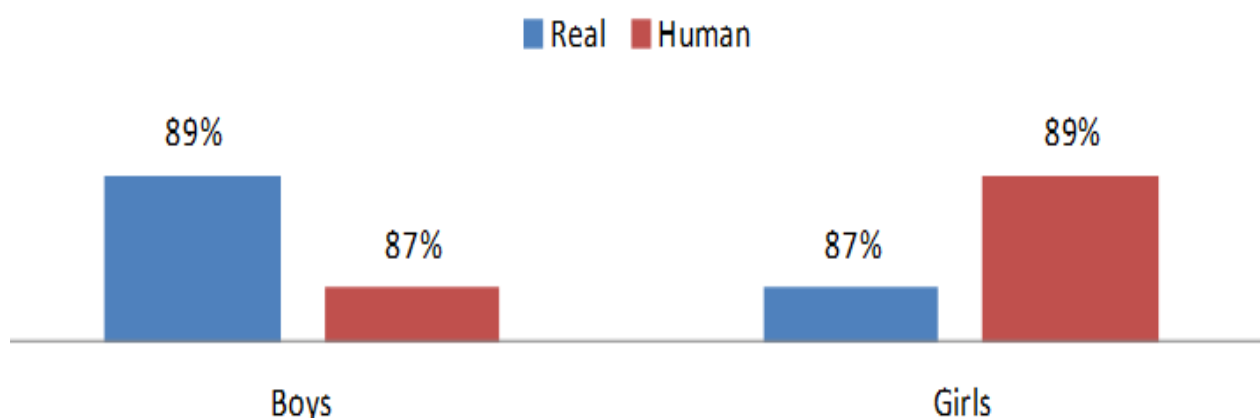
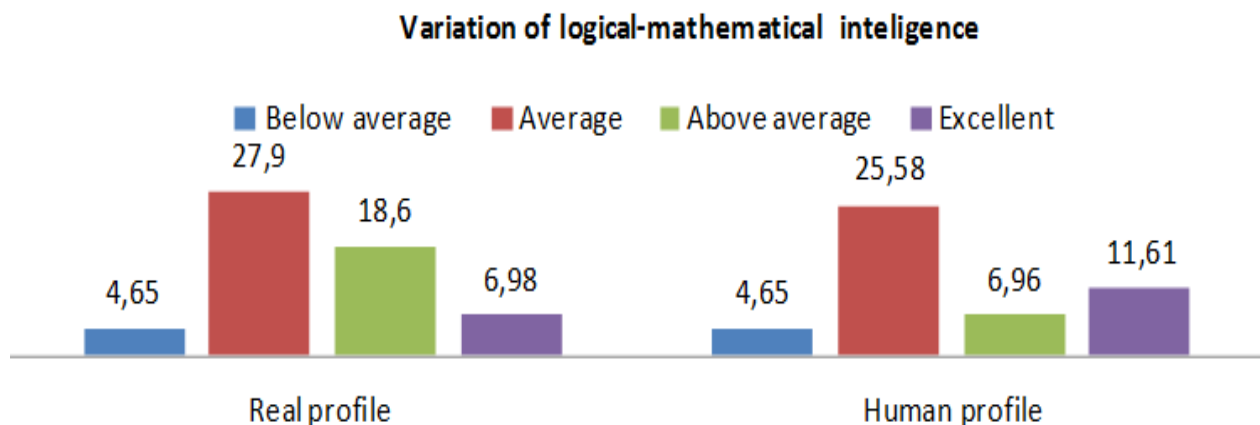
**Figure-1.** Representation of verbal intelligence according to the study profile

Figure 2 shows the distribution measured with the B53 test for logical-mathematical intelligence, according to the university study profile. The logical-mathematical intelligence distribution measured with the B53 test yielded an IQ mean of 115, with a standard deviation of 15.43, which confirms the theory of general intelligence.

**Figure-2.** Representation of logical-mathematical intelligence according to the study profile

3. RESULTS

3.1. Recruitment

The distribution of the intelligence level by university study profile is as follows:

- For the real profile, 4.65% of the subjects have a below average intelligence level, 27.9% of the subjects have average intelligence, 18.6% of the subjects have above average intelligence and 6.98% excellent intelligence level. The total of subjects with above average intelligence is 25.58%.

- For the human profile, 4.65% of the subjects have a below average intelligence level, 25.58% of the subjects have average intelligence, 6.96% of the subjects have above average intelligence and 4.65% excellent intelligence level. The total of subjects with above average intelligence is 11.61%.

3.2. Statistics and Data Analysis

Regarding the intelligence measured with the word scrambling test, we have found that 23.25% of the subjects from the real profile have above average and very high levels of intelligence, whereas 25.58% of the subjects from the human profile have above average and very high levels of word scrambling scores. Figure 3 comprises a representation of intelligence measured with the word scrambling test.

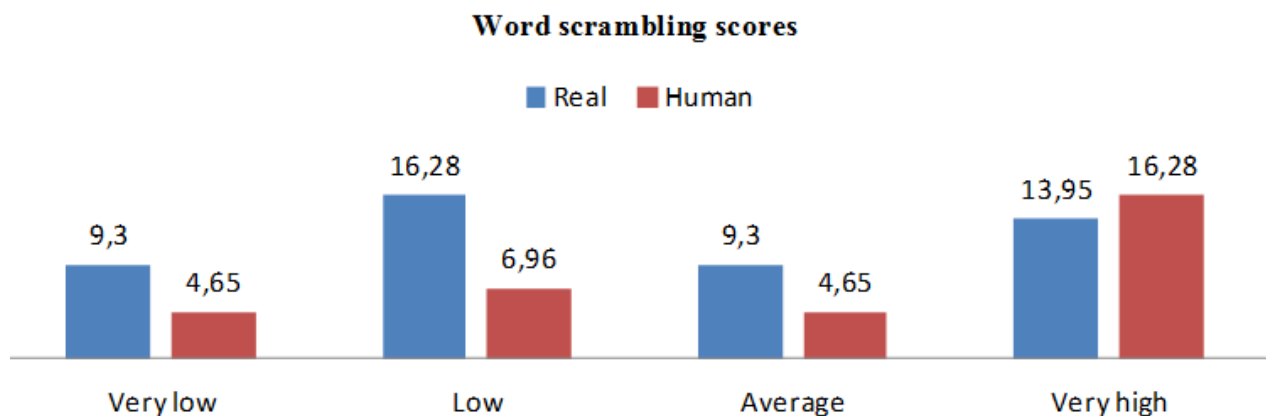


Figure-3. Representation of intelligence measured with the word scrambling test

Lupu (2014)

Following the application of these tests it was found that there are differences between the two groups in terms of types of intelligences:

1. There are significant differences between the mean of the logical-mathematical intelligence of the subjects from the real profile and of those from the human profile.
2. In terms of verbal intelligence, there are no significant differences between the real and the human group of subjects.
3. There are no significant differences in spatial intelligence between the real and the human group of subjects.
4. There are no significant differences in kinaesthetic intelligence between the real and the human groups of subjects.
5. There are no significant differences in musical intelligence between the real and the human groups of subjects.
6. There are no significant differences in interpersonal intelligence between the real and the human groups of subjects.
7. There are no significant differences in intrapersonal intelligence between the real and the human groups of subjects.

8. There are no significant differences in naturalistic intelligence between the real and the human groups of subjects.
9. There are no significant correlations between logical-mathematical intelligence and the results to B53.
10. There are no specific differences in terms of the level of logical-mathematical intelligence (measured with B53) between the subjects from the real profile and those from the human profile.
11. There are no specific differences in terms of the means from the word scrambling tests between the subjects from the real profile and those from the human profile.

4. CONCLUSIONS

The distribution of the intelligence level by university profile is as follows:

- for the real profile, 4.65% of the subjects have below average level of intelligence, 27.9% of the subjects have average intelligence, 18.6% of the subjects have above average intelligence and 6.98% excellent level of intelligence. The total of the subjects with above average intelligence is 25.58%.
- for the human profile, 4.65% of the subjects have below average level of intelligence, 25.58% of the subjects have average intelligence, 6.96% of the subjects have above average intelligence and 4.65% excellent level of intelligence. The total of the subjects with above average intelligence is 11.61%.

The subjects maintained the nature of their profile in the transition from high-school to academic studies, which shows that the decision regarding their study profile was taken at a much earlier stage. There are relevant differences between the mean of logical-mathematical intelligence levels of the subjects from the real profile and of those from the human profile, which confirms that at the students from the real profile the logical-mathematical intelligence is predominant.

In terms of verbal intelligence, there are no relevant differences between the real and human subjects, but for the entire research group there are significant correlations between verbal intelligence and the word scrambling test. This may be due to the I2 test that does not have a too fine capacity of discrimination, not corresponding to the subjects' age. Consequently, in the next paragraph we shall present the limitations of our research ([Lupu, 2014](#)).

Thus, based on our results, we may argue that those who possess a high level of logical-mathematical intelligence may choose easily to attend either of the two profiles (human / real), being able to successfully meet the requirements of both areas. This is possible because logical-mathematical intelligence implies both specific characteristics (abstract thinking - the ability to seize abstract relations) and characteristics shared with those of verbal intelligence (thinking in images - the capacity to represent and seize spatial relationships, creativity - frequency of associations flexibility, composing situations) ([Lupu \(2015\)](#)).

5. RESEARCH LIMITATIONS

1. The type of intelligence is an essential factor but not the only one involved in choosing one's professional profile. Factors that exert their influence:
 - the influence of the family environment (respecting the wishes of parents);
 - the demands of present day society (e.g. a student who has graduated from a high-school with a human profile will choose to attend a real-profile faculty, considering that this will provide more opportunities in finding a job);
 - personality factors (extraversion, self-control, sociability, emotionality);
 - the overstraining of students in the real profile high-school causes them to choose a human profile faculty.

2. Another limitation is the insufficient number of subjects that may render some data irrelevant and inconclusive.
3. The division of subjects by gender is not proportional, therefore a meaningful comparison cannot be performed.
4. The low scores in some tests could be explained by the subjects' misunderstanding of the instructor's briefing.
5. Regarding word scrambling: there are subjects whose mother tongue is different from Romanian, therefore have difficulties in performing the task.
6. The time limit required by certain tests may inhibit subjects in terms of answering speed, hence their IQ level based on the test will be lower than the real one. Thus, impulsive subjects may rush to deliver answers, whereas the reflective ones will put a lot of time and effort in analysing and deciding upon the answer (Neculau and Şchiopu, 1997).

Reflective students take more time to answer, the impulsive ones takes risks and make more mistakes. The impulsive students perform better in games of speed where the target has a lower level of information.

7. Some of the tests used did not measure exactly what we wanted: the I2 test is irrelevant, being inappropriate to the age of the subjects, its results could not be classified.
8. In the multiple intelligences test, the items fail to discriminate accurately between types of intelligence and the subjects' profile.

6. SUGGESTIONS

We intend to improve our research by increasing the research sample and using other tests to measure logical-mathematical and verbal intelligence, and even adding another variable: emotional intelligence. An example of a battery of tests suitable for our purpose may be: Amthauer's test; the I. 1 intelligence test (J. M. Lohn and I. M. Nestor); the I. 4 test (G. K. Benet, Harold S. Seahore, Alexander G. Wesman). This is a psychological instrument that measures the general skill level and contains themes which measure both the verbal and non-verbal component of intelligence as a general capacity. The test comprises 5 themes that capture some features of the development of general intelligence and the efficiency of the mental verbal and non-verbal operational level, as shown in the table below. The test may be applied collectively.

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