

Critical and Creative Thinking in the Professional Preparation of Social Pedagogues

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Grant: GA č. IGA/67/FHS/11/A. Zlín : FHS UTB

Name of the Grant: Critical and Creative Thinking in the Professional Preparation of Social Pedagogues

Subject: AN - Psychology

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Abstract The paper acquaints the reader with the status of critical and creative thinking in tertiary education, particularly in the professional preparation of social pedagogues. The authors present the reader with the results of a grant project which focused on examining the level of critical and creative thinking in students of social pedagogy. The paper is complemented by research examining the personality factors of an individual and their relation to the level of critical and creative thinking.

Keywords critical thinking, creative thinking, ways of educationing, key competencies, personality factors, personality psychology, cognitive competencies, personal competencies.

1. INTRODUCTION

Critical and creative thinking is a part of our everyday life. They increase our personal and professional commitment and help us solve problems that emerge in front of us. The question is can our students think critically and creatively? Does the personality of an individual influence their potential for critical and creative thinking? These issues are discussed in the within our paper: Critical and creative thinking in the professional preparation of future social pedagogues. However, to provide a meaningful introduction we offer an insight into the area explored within this issue.

Personality and personality factors are issues dealt with by personality psychology in our environment. The study of personality is closely linked to philosophy and therefore its foundations can be found in ancient times. It was the ancient Greeks and Romans who thought about the spiritual aspect of a human and the status of soul in a physical body of a human being. The whole psychology of personality is permeated by philosophical questions of human individuality and individual's worth. Plato laid the first psychological theory of personality, diving personality into reason, spirit and appetite. However, let us move forward, in the period of religious boom which was important for the development of psychology and personality psychology. It was religion indeed which addressed people and prompted them to look inside and evaluate their inwardness. Throughout history the study of man and his/her personality is documented. The most important and primary

studies that were undertaken in this area was, for example, Galton's research who drew inspiration from Darwin and measured individual differences in physical characteristics and mental faculties (vividness of mental imagery). Another important research was an empirical study of Spearman, who created tests of intellectual abilities and coined the theory of general intelligence. Freud, Jung, Erikson, Maslow, Skinner, Adler and others belong among other eminent representatives. Current names of personality psychology are P. Říčan, M. Nakonečný, V. Smékal or K. Balcar.

As was done for personality psychology, here is a brief introduction to critical and creative thinking. The first mention of critical and creative thinking can be traced back thousands of years ago and during the development of human society these concepts regularly emerge though not in the exact terminology as used today. Should we think about it, a certain method of critical thinking can already be seen in the teaching a famous ancient philosopher and thinker, Socrates, who taught his students through dialogue. Later in history, critical and creative thinking appeared in the works of T. Aquinas (*Summa Theologica*), F. Bacon (*The Advancement of Learning*), Descartes (*Rules for the Direction of the Mind*), T. Moore (*Utopia*), etc. However, for the purposes of this paper we will rather focus on today's significant representatives, who do not mention critical and creative thinking between the lines and without clear terminology, but whose work is an important source of inspiration for many of us. Critical and creative thinking is dealt with by numerous authors and we can also find several programmes that develop and support these competencies in an individual. The following belong among the most influential in the area: K. Hrbáčková (metacognitive processes), I. Turek (key competencies, critical thinking), and L. Ďuriča J.Štefanoviča (education towards creativity at universities), M. Jurčová (creative climate, creative personality, creativity and the creative process), M. Königová (creative and system thinking), J. Hlavsa (psychological foundations of the theory of creativity), Z. Kolláriková (education towards critical thinking), J. Mareš (learning styles of pupils and students), V. Švec (key competencies in teaching and training) or M. Zelina and M. Zelinová (creative development in children and youth) and others.

The above listed authors deal with the development of critical and creative thinking in the environment of Czech and Slovak schools from both the theoretical and the experimental point of view. Due to

this fact, it can be said that the application of critical and creative thinking is not only fashionable, but there are clear tendencies to integrate into the current education system.

Let us now proceed to a comprehensive overview of our work. At the beginning of the research there were many questions we asked ourselves and which will now be listed here to offer a functional introduction. Do personality factors, the level of critical thinking and the potential for creative thinking (hereinafter referred to as key competencies) vary depending on the length of university studies of an individual? How do these core competencies change? Is there a positive relationship among these key competencies? Is there a difference between the key competencies of students beginning a secondary school and students who graduating from a MA program? If so, what difference is it? Supports method of teaching at the university to develop critical and creative thinking? Does the way of teaching at universities support the development of the individual personality factors? Does the level of critical thinking and the potential for creative thinking depend on individual's self-confidence? Is original thinking dependent on the individual's potential for creative thinking?

Majority of these questions will be answered by our paper in the form of statistical hypothesis testing as shown in the design of the project and also by means of our own evaluation of the completed project.

Subsequently, we will discuss the objectives that were set at the beginning of the project. Their specific characteristic is reported below. The main objective of our research, as the questions suggest, is to determine whether the way of teaching at universities affects cognitive and personal key competencies of an individual. This objective was achieved by carrying out research using psychodiagnostic tests, i.e. Watson-Glaser test of critical thinking assessment, Urban's figural test of creative thinking and Gordon's personality profile-inventory. These tests were published in the Czech Republic under the copyright of Psychodiagnostika, a. s. Brno.

Definitions of basic concepts

Critical thinking is "a phenomenon which is closely linked to attitudes, knowledge and competence. Such a unit includes: 1) attitudes to identifying information, which include the ability to realise the existence of problems and the acceptance of the general need to prove the truth; 2) knowledge about the types of valid syllogisms, abstractions and generalisations, in which the severity or the accuracy of different types of evidence is logically determined; 3) the ability to apply and use these attitudes and knowledge." (Watson Glaser, p. 24, 2000)

Creative thinking is "the ability to create new and unusual product of a carefully perceived or specified problem, based on sensitive perception of the broadest context and other acquired information through an analysis, flexible processing, unusual associations, synthesis, structuring and assembling data, elements and structures we elaborate new solution, expressed as a product that is ultimately perceived as meaningful through communication with others." (Urban, p. 8, 1990)

The term **method of teaching** at a university is understood as: "teaching styles, forms and teaching methods, objectives and functions of education, educational environment, teacher's personality."

The term **personality factors** of an individual mean: dominance, responsibility, emotional stability, sociability, self-confidence,

prudence, original thinking, personal relations and vigor. (Gordon, 1999)

Personality psychology "describes how people differ from each other and at the same time resemble each other in their consciousness and behaviour and explains why it is so via the analysis of internal and external conditions, causes and objectives. Psychology of personality thus provides an individual with a tool to describe and interpret given activities, social behaviour and internal mental and spiritual life of an individual and also allows us to understand a particular individual." (Smékal, p. 12, 2004)

Key competencies are skills which may be "used in most professions, allow an individual to do a variety of professional work positions and functions, perform various professions, and which are suitable for solving a wide range of mostly unforeseen problems that will enable the individual to cope with rapid changes in work, in personal and social life." (Turek, p. 5, 2008)

In addition, the **key competencies** are to be divided into: informational, learning, cognitive (critical and creative thinking), interpersonal, communicational and personal. Numerous types of division are available in specialised literature, however the above has been selected to enable efficient key competence types identification.

Tab. 1: Characteristic of personality factors of an individual (Gordon, 1999)

Scale	High score	Low score
Superiority (A)	<ul style="list-style-type: none"> - have a verbal superiority - take an active role in the group - tend to make independent decision - are self-confidence in relation to others. 	<ul style="list-style-type: none"> - a passive role in the group - lack of confidence - tend to depend on councils - submissive in decision making
Responsibility (R)	<ul style="list-style-type: none"> - individuals are able to persevere in any assigned work - are persistent and decisive - it is possible to rely on them 	<ul style="list-style-type: none"> - are unable to focus on one task - tend to be fickle and irresponsible
Emocional stability (E)	<ul style="list-style-type: none"> - balanced individuals, emotionally stable - are relatively independent on fear, anxiety and nervous tension 	<ul style="list-style-type: none"> - excessive anxiety, hypersensitivity, nervousness, low frustration tolerance - poor emotional adjustment
Sociability (S)	<ul style="list-style-type: none"> - individuals prefer company and work with others - are gregarious and sociable 	<ul style="list-style-type: none"> - lack of sociability - general limitations of social relationships - in extreme cases avoidance of social contacts

Self-confidence (SE) - is a summary of the four above listed personality factors of an individual, i.e. superiority, responsibility, emotional stability and sociability		- anxiety, - unreliability - uptight - lack of confidence
Cautiousness (C)	- individuals carefully consider things before they decide - do not like changes - do not like to take the risk	- are impulsive - respond based on momentary idea - make quick and rash decisions - are fond of changes and look for excitement
Original thinking (O)	- individuals working on complex problems - are intellectually curious - like questions and discussions that provoke thought - like to think of new ideas	- do not like to work on complex and complicated problems - do not care about expanding knowledge - not interested in discussing questions that require thinking
Personal relations (P)	- individuals trust other people - tolerant, patient and understanding	- lack of trust - do not rely on others - individuals tend to be critical of others - what others do disgusts and irritates them
Vigor (V)	- spirited and energetic individuals - like to work at fast pace - like to move, they are able to do more than an average person	- individuals with low vitality and energy - prefer slower pace and tend to tire quickly - are below average in their performance and productivity

The above listed are just basic definitions of terms which we operate with throughout the article. There are many different definitions in the specialised literature. However to describe our understanding of the terms, the definitions above were adopted.

Research objectives

The main objective of this research was to determine whether the way of teaching at a university (namely at Faculty of Humanities at Tomas Bata University in Zlín) supports development of critical thinking and potential for creative thinking in university students (i.e. students of social pedagogy) and whether the length of study changes personality factors of an individual.

Partial research objectives were:

- determine the level of critical thinking in the research sample
- identify potential for creative thinking in the research sample
- determine the mutual relation between critical thinking and potential for creative thinking
- determine the relation between the length of study and the level of critical thinking
- determine the relation between the length of study and the level of potential for creative thinking
- determine the level of personality factors in students
- identify the mutual relations between personality factors, the level of critical thinking and the level of potential for creative thinking

Areas of research investigation

- a) the level of critical thinking (sub-component of the area: judgment, recognition of assumptions, deduction, interpretation, evaluation of arguments)
- b) the level of potential for creative thinking
- c) personality factors of students (sub-components: superiority, responsibility, emotional stability, sociability, self-confidence, vigor, original thinking, personal relationships, prudence).

Hypotheses

The following hypotheses were divided into individual groups due to their large number. They examine the relations between the research areas and their sub-components.

Group 1 hypotheses: Hypotheses examining relations between the length of university studies and the areas of research:

H_{1.1}: The level of critical thinking is dependent on the length of study at university.

H_{1.2}: Potential for creative thinking is dependent on the length of study at university.

H_{1.3}: Personality factors of an individual change positively with the increasing length of studies at university.

Group 2 hypotheses: Hypotheses examining statistically significant association between the research areas:

H_{2.1}: The results of Watson - Glaser critical thinking assessment test - groups A and B are in a statistically significant relation.

H_{2.2}: The results of Urban's figural test of creative thinking - groups A and B are in a statistically significant relation.

H_{2.3}: The results of Godron's personality profile inventory - groups A and B in a statistically significant relation.

Group 3 hypotheses: Hypotheses examining relations between different areas of research:

H_{3.1}: There is a positive correlation between the level of critical thinking and the level of potential for creative thinking.

Group 4 hypotheses: Hypotheses examining relations between different research areas and their sub-components:

H_{4.1}: Original thinking in the student's personality profile is dependent on the level of potential for creative thinking.

H_{4.2}: The level of critical thinking is dependent on individual's self-confidence.

H_{4.3}: The level of potential for creative thinking is dependent on individual's self-confidence.

A question may rise as to why these relations are explored, especially within Group 4. We believe that university should develop an individual not only on the theoretical and practical level but should also focus on one's personal disposition and its development to enhance personal and professional commitment of the individual. Based on this assumption, personality factors can be classified as key competencies of an individual of 21st century,

namely personal competencies. This is how we also observe relations between other key competencies, in our case cognitive competencies.

Personal competencies should not be forgotten in the process of development of a competent individual. These competencies involve individual's self-confidence, self-esteem, motivation and commitment. Therefore, Gordon's personality profile inventory has been chosen because in our opinion it provides a comprehensive overview of personal competencies of an individual. However, it is an overview provided by individuals themselves based on their sole discretion. Therefore, certain subjective limitations of the research can be assumed. Now it is our task to determine individual relations and influences between the key competencies listed above.

Research methods and techniques

The data were collected on the basis of **psycho-diagnostic tests**, namely:

- *Watson - Glaser test of critical thinking evaluation (T-185)* which examines the level of analytical thinking in probands. This kind of thinking is examined based on five sub-tests: reasoning, recognising assumptions, deduction, interpretation and evaluation of arguments. These sub-tests are intended to measure different but interrelated aspects of critical thinking. The probands were asked to read statements that were stratified into different sub-tests and evaluate their appropriateness or validity. The test statements were prepared on the basis of current information that is freely available in newspapers, magazines or other media and that we encounter every day. The authors of this test are Goodwin Watson and Edwin M. Glaser and the test was published in the Czech environment in 2000 by Psychodiagnostika, a.s. Brno.
- *The Urban figural test of creative thinking (T-253)* - this test is used as a screening tool that provides an overview of creative potential of an individual. Unlike other tests exploring creative thinking, it takes the qualitative features of creative performances into account. The test consists of two variants A and B. The probands were given both variants and were asked, based on their own opinion, complete given fragments: a semi-circle, dot, right angle, wave, dashed horizontal line and a small "u" out of frame. The result drawings are then assessed based on 14 criteria, which include: application of the elements given, the inclusion of new elements, thematic and graphic links of fragments, abstraction, fiction and symbolism or non-conventional material handling, etc. As the name suggests the authors are K.K. Urban in cooperation with H.G. Jellenem. A Slovak version was prepared by T.Kováč and was issued by Psychodiagnostika, a.s. in 2002.
- *Gordon's personality profile (T-26)* - this test was created, as evident from the title, by Leonard V. Gordon and in our environment it was issued Psychodiagnostika, a.s. Brno. The test consists of 38 files and each file is composed of four statements. The test examines personality factors of an individual. The students were to evaluate which of the four statements in each file characterises them most and least. When evaluating, the test is divided into two parts, namely the study of a personality profile of an individual and their inventory. The personality profile examines the following personality factors: superiority, responsibility, emotional stability and sociability of the individual. An associated factor, i.e. self-confidence, is calculated as a sum of all these factors. Inventory of an individual examines individual's cautiousness, their original thinking, personal relations and vigor. Gordon's personality profile test is used in many fields especially in professional leadership, counselling, teaching and training sessions in management or research.

The research sample

Data collection took place at Tomas Bata University in Zlín, Faculty of Humanities, in the field of study Social pedagogy. Specifically, **the research sample** was divided into two research groups. The first group (referred to as group A) were students of social pedagogy in the 1st year of a Bachelor degree course, full-time form. This group consisted of 54 respondents for Urban's figural test of creative thinking and Watson-Glaser test of critical thinking assessment. 47 respondents were presented with Gordon's inventory and personality profile. The second group (group B) were students of Social pedagogy in the 2nd year of a Master's degree course, full-time form. This group was represented by 45 students and was identical for all three tests presented. However the number decreased by 4 respondents when given the Gordon's personality profile test and inventory.

Number of probands:

Tab. 2: Number of probands in the research study

Group	T-253 (number of probands)	T-185 (number of probands)	T-26 (number of probands)
Group A	54	54	47
Group B	45	45	41
Total	99	99	88

Implementation of the research study took place at Tomas Bata University in Zlín, Faculty of Humanities, in the field of Social Pedagogy, from 1.11.2011 to 6.12.2011.

2. INTERPRETATION OF RESEARCH RESULTS

Group 1 hypotheses: Hypotheses examining relations between the length of study at university and the research areas

H_{1.1}: *The level of critical thinking is dependent on the length of study at university.*

Tab. 3: Correlation matrix for hypothesis H_{1.1}

Variable	Correlation matrix (level of critical thinking) Marked correlations are significant at value P 0,05. N = 45			
	Average	Mixed deviation	The level of critical thinking, group A	The level of critical thinking, group B
The level of critical thinking, group A	45,910	6,810	1,000	-0,005
The level of critical thinking, group B	44,689	6,750	-0,005	1,000

From the above table we can observe a negative correlation coefficient, which takes the value of -0.005065. Based on the observed correlation coefficient, is it possible to state that the length

of study reduces the level of critical thinking. However, the correlation coefficient reaches very low values and therefore such correlation is of a very low dependence which is not statistically significant due to the relation $p = 0.973658 > 0.05000$. Therefore hypothesis $H_{1,1}$ was rejected.

Student's t-test, a test measuring the difference in the average of the data obtained is provided to calculate the concrete difference between the levels of critical thinking of a group A and B.

H_0 : The average level of critical thinking is the same for both groups A and B.

H_A : The average level of critical thinking is different in groups A and B.

To evaluate the above hypotheses Student t – test was selected. The levels of t was calculated at 0.806090 at the level of significance of 0.05 and degrees of freedom 97 ($t_{0,05}(97) = 1,984 \rightarrow t_{0,05}(97) > t$). Based on this relation the null hypothesis was confirmed, i.e. that there are no statistically significant differences between the average values of critical thinking of groups A and B.

$H_{1,2}$: Potential for creative thinking is dependent on the length of study at university.

Tab. 4: Correlation matrix for hypothesis $H_{1,2}$

Variable	Correlation matrix (level of potential for creative thinking)			
	Average	Mixed deviation	Potential for creative thinking, group A	Potential for creative thinking, group B
Potential for creative thinking, group A	28,045	6,702	1,000	-0,1648
Potential for creative thinking, group B	33,077	8,001	- 0,1648	1,000

The correlation coefficient reached $r = - 0.164754$. The correlation can again be described as very weak and based on calculating the value of $p = 0.275 > 0.0500$ such correlation is again seen as statistically insignificant. Therefore hypothesis $H_{1,2}$, which referred to the relation between the length of study and potential for creative thinking, was rejected.

Student T - test:

H_0 : The average level of potential for creative thinking is the same in both groups A and B.

H_A : The average level of potential for creative thinking is different in groups A and B.

To evaluate the above hypotheses Student t – test was selected. The level of t was calculated at 2.535 with significance level at 0.05 and degrees of freedom of 97 ($t_{0,05}(97) = 1,984 \rightarrow t_{0,05}(97) < t = 2,535$). Due to this relation, the null hypothesis was rejected, i.e. that there are no statistically significant differences between the average values of the potential for creative thinking in the groups A and B.

We therefore confirmed the alternative hypothesis, that there is a statistically significant difference between the average levels of potential for creative thinking in the groups A and B.

$H_{1,3}$: Personality factors of an individual change positively with the increasing length of studies at university.

Due to a wide range of personality factors examined here, the following tables were created to provide an overview of the relation between the length of study and particular personality factors of an individual.

Table 5. examines individual personality profile and Table 6. provides an overview of the inventory of an individual.

Tab. 5: Table of personality factors in relation to the length of study at a university

Group A		Superiority group A		Responsibility group A		Emotional stability group A		Sociability group A		Self-confidence group A	
Group B		R	p	r	p	r	p	r	p	r	p
		Superiority group B	r	-0,197	0	0	0	0	0	0	0
	p	0	0,223	0	0	0	0	0	0	0	0
Responsibility group B	r	0	0	0,013	0	0	0	0	0	0	0
	p	0	0	0	0,938	0	0	0	0	0	0
Emotional stability group B	r	0	0	0	0	0,047	0	0	0	0	0
	p	0	0	0	0	0	0,774	0	0	0	0
Sociability group B	r	0	0	0	0	0	0	0,046	0	0	0
	p	0	0	0	0	0	0	0	0,779	0	0
Self-confidence group B	r	0	0	0	0	0	0	0	0	-0,189	0
	p	0	0	0	0	0	0	0	0	0	0,241

Tab. 6: Table of the inventory of an individual in relation to the length of study at university

Group A		Cautiousness group A		Original thinking group A		Personal relationships group A		Vigor group A	
Group B		r	p	r	p	r	p	r	p
		Cautiousness group B	r	0,073	0	0	0	0	0
	p	0	0,655	0	0	0	0	0	0
Original thinking group B	r	0	0	-0,096	0	0	0	0	0
	p	0	0	0	0,557	0	0	0	0
Personal relationships group B	r	0	0	0	0	-0,251	0	0	0
	p	0	0	0	0	0	0,119	0	0
Vigor group B	r	0	0	0	0	0	0	0,051	0
	p	0	0	0	0	0	0	0	0,757

Tab. 7: Approximate interpretation of the correlation coefficient values (Chráska, p 105, 2007)

Correlation coefficient	Interpretation
$r = 1$	exact dependence (functional relation)
$1,00 > r \geq 0,90$	very high dependence
$0,90 > r \geq 0,70$	high dependence
$0,70 > r \geq 0,40$	medium (large) dependence
$0,40 > r \geq 0,20$	low dependence
$0,20 > r \geq 0,00$	very low dependence
$r = 0$	exact dependence

An approximate value interpretation of the correlation coefficient is offered below for concretisation of the results listed in Table 5 and

6. The correlations are significant at the level of $p < 0.0500$. It can be easily observed that the calculated correlations r show generally very weak and statistically insignificant relation, because the level of p was not lower than the value 0.05. Therefore hypothesis $H_{1,3}$, which showed a positive change in personality factors of the individual during their university studies, was rejected.

For further calculations, we provide Student T-test which assesses statistically significant differences between the average number of points in the individual personality factors. The results are given in a Table No. 8. At the beginning of testing, the null and the alternative hypotheses were set.

H_0 : There is no difference in the average number of points in the individual personality factors between the groups A and B.

H_A : There is a difference in the average number of points in the individual personality factors between the groups A and B

Tab. 8: Student T-test for evaluation of average values in Gordon's personality profile.

Scale	Value t	H_0	H_A
Superiority	1,097	✓*	✗**
Responsibility	3,260	✗	✓
Emotional stability	3,147	✗	✓
Sociability	0,153	✓	✗
Self-confidence	2,392	✗	✓
Cautiousness	2,368	✗	✓
Original thinking	1,653	✓	✗
Personal relationships	2,920	✗	✓
Vigor	2,569	✗	✓

* hypothesis was confirmed

** hypothesis was rejected

Confirmation or rejection of the hypotheses was established on the basis of the observed relation, whether the value of t is smaller or greater than the critical value of the test criteria. The null hypothesis is confirmed when the value of $t < t_{0,05}(40) = 2.021$. The alternative hypothesis is confirmed if $t > t_{0,05}(40) = 2.021$. As you can see from the table above, there are statistically significant differences in the average number of points achieved in the following personality factors of the respondents surveyed: responsibility, emotional stability, self-confidence, personal relationships and vigor. In contrast, in the remaining personality factors, superiority, sociability and original thinking there were no significant differences between the average points achieved in groups A and B.

2. Group 2 hypotheses: Hypotheses examining statistically significant relation between areas of the research

$H_{2,1}$: There is a statistically significant relation in the results of Watson - Glaser critical thinking assessment test between the groups A and B.

Tab. 9: Contingency table for hypothesis $H_{2,1}$

group	Contingency table (level of critical thinking). Frequency of marked cells > 10			
	level 1	level 2	level 3	row total
A	41	6	7	54
B	30	14	1	45
all groups	71	20	8	99

1 = deep below the average level

2 = below average levels

3 = average level

Tab. 10: Summary table for hypothesis $H_{2,1}$

group	Summary tab.: Expected frequencies. Frequency of marked cells > 10 Pearson's chi-square.: 8,65769, df = 2			
	level 1	level 2	level 3	row total
A	38,727	10,909	4,363	54
B	31,272	9,091	3,636	45
All groups	71	20	8	99

df = degrees of freedom

1 = deep below the average level

2 = below average levels

3 = average level

H_0 : There is no statistically significant relation between the frequencies of the results of Watson - Glaser evaluation of critical thinking test in groups A and B.

H_A : There is a statistically significant relation between the frequencies of the results of Watson - Glaser evaluation of critical thinking test in groups A and B.

The contingency table above shows that the results between groups A and B or of a statistically significant relation. This confirms the following calculated relation: $\chi^2_{0,05}(2) = 5,991 < \chi^2 = 8,65759$.

Contingency coefficient C which takes values $C = 0.2839$ was calculated for accurate statistical processing. This coefficient takes values ranging from 0 to +1 and the higher the coefficient, the greater the dependence between research phenomena. It can be concluded, based on the calculated coefficient of contingency, that there is low dependency amongst phenomena in the contingency table.

$H_{2,2}$: There is a statistically significant relation in the results of the Urban's figural test of creative thinking between the groups A and B.

Tab. 11: Contingency table for hypothesis $H_{2.2}$

group	Contingency table (potential for creative thinking). The frequency of marked cells > 10			
	level 1	level 2	level 3	row totals
A	45	7	2	54
B	29	8	8	45
all groups	74	15	10	99

Level 1 = deep below the average level

Level 2 = below average levels

Level 3 = average level of

Tab. 12: Summary table for hypothesis $H_{2.2}$

group	Summary tab.: Expected frequencies Frequency of marked cells > 10 Pearson's chi-quotient.: 6,36051, df = 2			
	level 1	level 2	level 3	row total
A	40,363	8,181	5,454	54
B	33,636	6,818	4,545	45
all groups	74	15	10	99

df = degrees of freedom

1 = deep below the average level

2 = below average levels

3 = average level

H_0 : There is no statistically significant relation between the result frequencies of Urban's creative thinking figural test in groups A and B.

H_A : There is a statistically significant relation between the result frequencies of Urban's creative thinking figural test in groups A and B.

The contingency tables demonstrate the relation between the results of Urban's figural test of creative thinking. The χ^2 value was calculated at $\chi^2 = 6,36051 > \chi^2_{0,05}(2)$. We therefore reject the null hypothesis and accept the alternative hypothesis, i.e. that the obtained results are of statistically significant relation.

The contingency coefficient C takes values $C = 0.246$ which means that is not a high degree of dependence between the variables in the contingency table.

$H_{2.3}$: There is a statistically significant relation between the results of Gordon's personality profile and inventory in groups A and B.

Tab. 13: Contingency table for hypothesis $H_{2.3}$

Range	Group	Observed frequencies LS*	Observed frequencies HS**	Pearson's chi-quotient	Degrees of freedom	p
Superiority	A	33	14	0,094	1	0,759
	B	30	11			
Responsibility	A	23	24	6,891	1	0,009
	B	9	32			
Emotional stability	A	37	10	5,167	1	0,023
	B	23	18			
Sociability	A	27	20	0,326	1	0,568
	B	26	15			

Self-confidence	A	32	15	0,863	1	0,353
	B	24	17			
Cautiousness	A	31	16	1,09	1	0,297
	B	22	18			
Original thinking	A	36	11	0,137	1	0,711
	B	30	11			
Personal relationships	A	39	8	1,244	1	0,265
	B	30	11			
Vigor	A	34	13	11,34	1	0,0008
	B	15	26			

* LS = low score

** HS = high score

A statistically significant relation between the results of Gordon's personality profile and inventory between group A and B was not detected. A significant relationship was found in individual tests, i.e. in the following factors: responsibility, emotional stability and vigor, however due to the fact the hypothesis was rejected in the remaining factors, we must reject hypothesis $H_{2.3}$ as such.

A scale was created to assess low and high scores achieved in various personality factors. To achieve this, the rating scale is to be found below.

Tab. 14: Standards for assessing the level of a personality profile and inventory:

Scale	High score	Low score
Superiority	22 - 36	0 - 21
Responsibility	22 - 36	0 - 21
Emotional stability	22 - 36	0 - 21
Sociability	22 - 36	0 - 21
Self-confidence	87 - 144	0 - 86
Cautiousness	24 - 40	0 - 23
Original thinking	24 - 40	0 - 23
Personal relationships	21 - 40	0 - 20
Vigor	21 - 40	0 - 20

Group 3 hypotheses: Hypotheses examining relations between the individual areas of research

$H_{3.1}$: There is a positive relation between the level of critical thinking and the level of potential for creative thinking.

Tab. 15: Correlation matrix for hypothesis H_{3,1}

Variable	Correlation matrix (critical thinking vs. potential for creative thinking) Marked correlations are significant at value $p < 0,05$. N = 98.			
	Average	Mixed deviation	Level of critical thinking	Level of potential for creative thinking
Level of critical thinking	45,194	6,448	1,000	0,0983
Level of potential for creative thinking	30,622	7,593	0,0983	1,000

This hypothesis was not confirmed, as the table shows, with the value of $p > 0.05$, $p = 0.362142$.

The correlation coefficient was calculated at $r = 0.098337$, indicating a very weak correlation between the related phenomena. As said the correlation is significant due to the relation $p > 0.05$. It can hence be concluded that there is no positive relationship between the level of potential for creative thinking and critical thinking levels in groups A and B.

This may be due to low levels of critical thinking and low levels of potential for creative thinking which the students achieved.

Group 4 hypotheses: Hypotheses examining relations between different areas of the research and their sub-components

H_{4,1}: *Original thinking in the student's personality profile is dependent on the level of their potential for creative thinking.*

Tab. 16: Correlation matrix for hypothesis H_{4,1}

Variable	Correlation matrix (potential for creative thinking vs original thinking) Marked correlations are significant at value $p < 0,05$. N = 84.			
	Average	Mixed deviation	Level of potential for creative thinking	Original thinking
Level of potential for creative thinking	16,286	5,412	1,000	0,3123
Original thinking	20,761	5,423	0,3123	1,000

The correlations are significant at the value of $p < 0.05$. Thus we can say, as is evident from the table, that there is a correlation between the level of potential for creative thinking and original thinking. However, this is a low dependence, since it only reaches 0.312, which is previously standardised by $0.40 > r \geq 0.20$ as low dependence. If we are to compare with previous information obtained from different areas of the research, we must point out that students gained a low score in both, Urban's figural test of creative thinking and personality factor of original thinking. This may be the reason why there is certain dependence between these phenomena, even though it is rated as low.

H_{4,2}: *The level of critical thinking is dependent on the individual's self-confidence.*

Tab. 17: Correlation matrix for hypothesis H_{4,2}

Variable	Correlation matrix (level of critical thinking vs self-confidence) Marked correlations are significant at value $p < 0,05$. N = 84.			
	Average	Mixed deviation	Level of critical thinking	Self-confidence
Level of critical thinking	44,557	6,477	1,000	-0,0048
Self-confidence	81,147	15,778	-0,0048	1,000

Table 17 describes a relation between the level of critical thinking and self-confidence of an individual. However such relation was not confirmed. The value of p did not reach a significance level below 0.05. Correlations are also very low, close to zero, which makes us reject hypothesis H_{4,2}, i.e. there is no relation between the levels of critical thinking and self-confidence of an individual.

H_{4,3}: *The level of potential for creative thinking is dependent on self-confidence of an individual.*

Tab. 18: Correlation matrix for hypothesis H_{4,3}

Variable	Correlation matrix (potential for creative thinking vs self-confidence) Marked correlations are significant at value $p < 0,05$. N = 84.			
	Average	Mixed deviation	Potential for creative thinking	Self-confidence
Potential for creative thinking	16,286	5,412	1,000	-0,2098
Self-confidence	81,488	15,972	-0,2098	1,000

The hypothesis H_{4,3}, which referred to the relation between the level of potential for creative thinking and self-confidence of the individual, was rejected on the basis of the observed correlation coefficient $r = 0.209$, where the significance value exceeded level 0.05.

3. SUMMARY

A grant project on Critical and creative thinking in the professional preparation of social pedagogues was conceived as a research survey in the area of cognitive competencies in university students, specifically examination of the level of critical thinking and potential for creative thinking. The research was done via psychodiagnostic tests. Furthermore, the research was complemented by a personality factor study specified earlier in the text. This research was aimed at exploring different relations between cognitive competencies of an individual and their personal competencies, examined by Gordon's personality profile and inventory. An account of our research activities and results achieved is provided below.

The following results have been obtained using statistical methods:

It has been observed that there is a weak, statistically insignificant dependence between the length of study and the level of critical and creative thinking. Therefore, the hypotheses $H_{1,1}$ and $H_{1,2}$ had to be rejected. It may be, in our opinion, due to the method of teaching used at universities which does not support either critical or creative thinking. The assumption is supported by students' report saying that they rarely discuss a problem in lectures, rarely implement the problem into practice at seminars, rarely solve problems in lecture and seminar critically; rarely analyse problems in seminars by situational analysis, rarely stage an act in order to illustrate a problem; rarely utilise information from different disciplines into complex knowledge and awareness. The students reported that rarely create projects to support creativity and almost never play creative games.

However, we believe that this may be corrected by innovations and restructuring of the teaching methods used at universities. It is where education should be focused not only on theoretical knowledge but should develop student's personality, their key competencies and cognitive processes.

As already mentioned earlier in the paper, the following tests were used: Glaser-Watson's test of assessing critical thinking was used to research the level of critical thinking and potential for creative thinking. Urban's figural personality test of creative thinking was also used. We find it important to provide a comprehensive evaluation of the leading studies carried out using the same psychodiagnostic tests.

Watson-Glaser's assessment of critical thinking has been used in many research investigations. The most prominent ones are:

- Smith's research in 1977, when Smith focused on the relation between the level of critical thinking and many factors which interact in the classroom → high level of critical thinking has a positive effect on students' participation in class, development and release of their abilities and interaction among students themselves.
- Robertson and Molloey found in 1982 that a high degree of critical thinking is related to a low level of neuroticism.
- Thompson and Smith (1982) claimed that high rates of deduction in the CTA test have a large influence on successful solving of statistical problems.

Likewise, Urban's figural test of creative thinking was an important test for many research surveys, such as creativity research in the Slovak Republic by Kováč, Mkhize's research in 1987 studied the influence of environment on Zulu nation's children's creative performances, Kraus and Hindemith-Yanar used the test in 1993 for measuring the potential for creative thinking in highly gifted children, etc.

According to the test manuals, Watson-Glaser test of critical thinking and Urban's figural test of creative thinking have not been used to examine the relation between critical and creative thinking. Based on the fact, we decided to investigate a positive relation and confirm it statistically. In context a positive relation is seen as a proportional relationship between the level of critical and creative thinking, i.e. with the increasing level of critical thinking, the level of potential for creative thinking also increases.

Due to low values which the probands scored in each test, the level growth of their positive relation could not be observed. Within the research, a positive relationship has not been confirmed and thus the

$H_{3,1}$ hypothesis has been rejected. This may be assigned to the following research restrictions: students achieved very low scores in both tests and majority of students scored deep below average.

To enable comprehensive evaluation of the data collected, the Student's t-test was used. The test was used to evaluate and compare the average values obtained in the research and was used in both, the Watson-Glaser test of critical thinking and Urban's figural test of creative thinking. It was found that the average level of critical thinking and the potential for creative thinking is the same in both groups A and B.

We also focused on examining the link between the results of groups A and B, again in both tests. Pearson's Chi-square test was used for a contingency table. It was found that in both tests, there is a correlation between the obtained data. Thus it can be said that the results of both groups, A and B, are almost identical.

The main and partial research objectives were established at the beginning of the research implementation as reported earlier in this paper. The research being over, we can conclude that the objectives were achieved. The main objective was to determine whether the manner of teaching at universities supports the development of critical thinking and the potential for creative thinking in university students. This objective was achieved, even though the hypotheses $H_{1,1}$ and $H_{1,2}$ were rejected and it was concluded that the level of critical and creative thinking is not dependent on the length of study. We argue that the situation should be different. During their university studies, students encounter situations in which they need to think analytically, conclude, solve problems and present their arguments and be able to defend them. Furthermore, students are to develop projects, seminar papers or manuals, which should not only be a mere copy of professional publications but should also bring own, original, creative design. Therefore, both critical and creative thinking in students of final years of the studies should be more developed than in the first year students. If it were so, it would mean a positive relation between the length of study and the level of critical and creative thinking. In our case, however, a negative relation was confirmed which suggests that students in the final year are comparable in many aspects to the students who only just entered a university.

The paradox in the results was finding that students in the second year of their Master's degree course, in full-time form, were to attend a subject Critical thinking and argumentation in their previous Bachelor degree course. This subject, however, was cancelled during re-accreditation. The situation above implies that it is important to not change the concept of subjects only but to change the way of teaching as well to support an individual's personality, to develop their cognitive and metacognitive processes and to enhance their professional commitment, through the development of key competencies that are necessary to perform the profession of a social pedagogue.

We also focused on examining personality factors of an individual. It has been stated above that we should develop student's critical and creative thinking which are considered to be key cognitive competencies of 21st century. The question is, should student's personal competencies not develop as well? Should they not learn how to cope with difficulties in a way that would make them sufficiently developed to manage to solve these difficulties? Such questions were asked in the introduction to this paper and now we summarise the results of which were collected in our research study and which were related to personality factors of an individual. We shall start with the first hypothesis regarding relation between the length of study and the level of individual personality factors. This hypothesis, as already stated and statistically proved, was rejected. It

was a hypothesis $H_{1,3}$ which predicted that the personality factors of an individual vary with the length of university studies. Many could argue that not only school but of course environment, genetic predisposition and other factors play a significant role, if not crucial, role in shaping the personality of an individual. However, we hypothesised that also university should develop personal skills of an individual and should thus lead the students to increase their competencies not only in professional but also personal life.

Hypothesis, $H_{2,3}$ aimed at statistically significant relations between certain factors in groups A and B. This hypothesis was also rejected, even though we could observe certain statistically significant relations between the following factors: responsibility, emotional stability and vigor of students.

As mentioned at the beginning of this paper, all hypotheses have been divided into specific research areas. Group 4 hypotheses are of especially significant importance to our research as they summarise the relation between critical and creative thinking and personality factors of an individual. Hypothesis $H_{4,1}$ aimed at a relation between the level of potential for creative thinking and original thinking of an individual. This hypothesis was confirmed via previous statistical evidence. It is possible to say that original thinking is dependent on the level of potential for creative thinking. Despite the fact that only low dependence was detected this phenomenon can still be observed. The research finding that both groups reached low score in the tests can help interpret the fact above. The following figures serve to illustrate the fact.

Figure. 1: The level of potential for creative thinking, group A and B

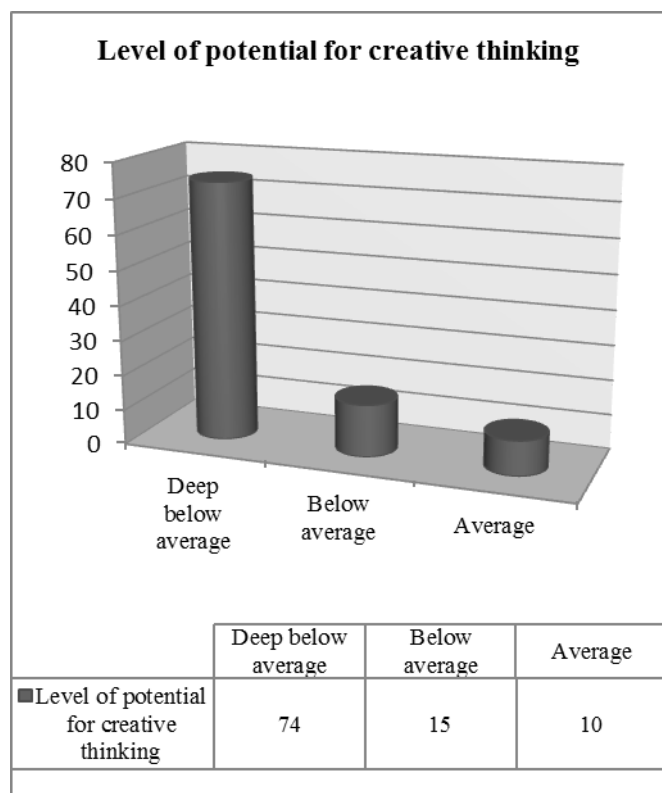
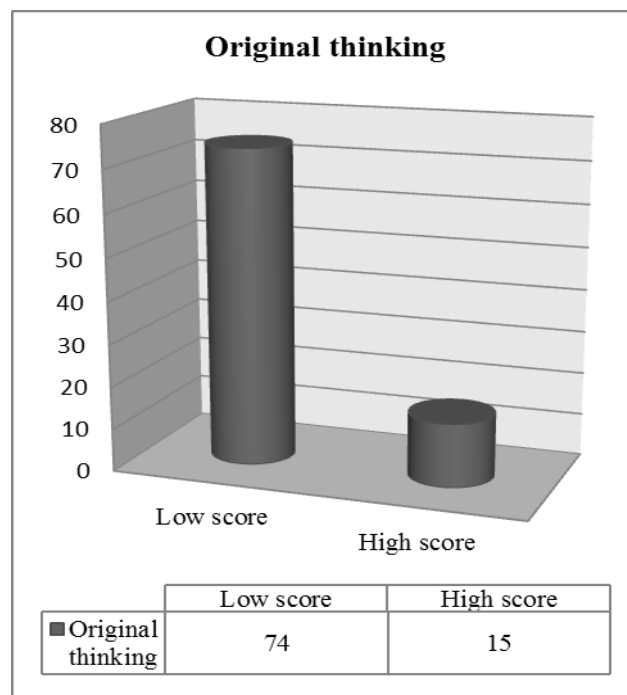


Figure. 2: The level of the personality factor of original thinking in groups A and B



The figures show how successful the students were in each test. One more research limitation should be mentioned here: a subjective evaluation of the level of original thinking. The students themselves reported so although this fact was also confirmed in Urban’s figural test of creative thinking where one of the evaluation factors was original thinking. None of the probands gained points in this category. Images that the students created, on the basis of administration, did not contain elements of originality.

Next hypothesis, $H_{4,2}$ assumed the relation between the level of critical thinking and self-confidence of an individual. This hypothesis was again rejected on the basis of a documented statistical survey. A personal factor of self-confidence was a summary of four individual personality factors, i.e.: superiority, responsibility, emotional stability and sociability. The relationship between the level of critical thinking and self-confidence was studied because of our assumption that an individual with a high degree of self-confidence also has a higher level of critical thinking and is therefore able to assume, speculate, interpret, deduce and evaluate arguments better. As we delved deeper into the topic of joining critical thinking, creative thinking and self-confidence, we had better specify self-confidence. From a pedagogical point of view, self-confidence is a part of self-concept and it can be characterised as an individual's positive attitude to oneself, which is associated with a favourable assessment of their own possibilities and their actual performance. Judging from the above definitions, we can already see a certain need for some critical thinking while shaping an individual's self-confidence. When shaping our self-concept, self-esteem and self-image, we should also take into account how we think of ourselves, how we interpret ourselves and how we accept arguments of others. Within our self-concept, we often ask ourselves who we are, what we want to be or what we should do. One should not only use critical thinking here but also creative thinking and by using own creative ideas and knowledge of ourselves we create our future.

Hypothesis about the relation between potential for creative thinking and self-confidence of an individual was next. The hypothesis in hand was rejected on the basis of reliable statistical methods. The

research constraint present in the case of both hypotheses $H_{4.2}$ and $H_{4.3}$ were the attainment of low score in the psycho-diagnostic tests: Watson-Glaser's test of critical thinking evaluation, Urban's figural test of creative thinking and personality profile and Gordon's inventory - personal factor self-confidence. The probands tested reached a very low score in these tests. This can be attributed to the difficulty of measuring the relation between the research areas. We assumed that with the increasing level of critical thinking, the level of creative thinking will increase and consequently individual's self-confidence will increase. However it was not possible to investigate because of the above-mentioned research limitations and the hypotheses had to be rejected.

CONCLUSION

We come to the end of our paper in the form of conclusion. Here we would like to summarise our entire project with a certain perspective and practical application in the future.

Looking at today's concept of tertiary education, it is clear that the main focus is on providing information from the theoretical point of view in order to remember the information and its subsequent application in "an exam". Unfortunately, this does not develop mental functioning of an individual and does not support development of his/her personality. Many requirements on the exercise of the profession are imposed on employees from the point of view of social pedagogy. This profession is essentially a profession in which living is earned by word and a fully developed personality of a social pedagogue is necessary.

In the beginning of this paper, several questions were asked, most of them answered in the paper. It was found that student's critical and creative thinking is not developed, not even after five years of study at university. We also found that students' personality factors do not change with the length of study at university. Perhaps you may feel that such statements do not provide much. However if you look closer, you will see a serious question that rises before us. What competencies do we develop in our students in the Czech tertiary education environment? How should we best develop them? What teaching methods should we apply to increase personal and professional commitment of students?

In our opinion, the right teaching methods that encourage students to develop their own mental functions could contribute to more effective teaching in tertiary education. In order to create a functional end, let us present what is understood as ways of teaching

The term teaching methods at university could be defined as: "teaching styles, forms and teaching methods, objectives and functions of education, educational environment and the personality of a teacher."

It is clear from the definition that we are interested in changes not only to the content or form, but we focus on a complex

approach to this change. How does teaching which supports key competencies influence us? And what would it be like?

The answer to this question is still open and it will be answered in our next research work, in which we want to focus on characteristics of such education and what are other relations between critical thinking, creative thinking and personality profile of an individual their intelligence structure.

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