THE INFORMATION LITERACY AND VERBAL CREATIVITY OF TRAINEE TEACHERS OF TECHNOLOGIES

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Abstract

The paper explores the information literacy and verbal creativity of female trainee teachers of Technologies (3rd year students) in Lithuania. Their information literacy was determined applying Mažeikienė et al.'s (2008) test for identifying information literacy, and verbal creativity was analyzed by means of Torrance's technique of personal creativity diagnostics (a verbal expression questionnaire). The paper analyzes the relation between the informants' information literacy and verbal creativity.

Keywords: Information literacy, verbal creativity, creative fluency, creative flexibility, trainee teachers of Technologies.

Introduction

For the last three decades UNESCO has been trying to promote the development of media and information literacy (http://unesco.lt/komunikacija-ir-informacija/mediju-ir-informacinis-rastingumas). Information literacy is the result of media education (the process of teaching and learning) and they key to life-long learning. The open-minded, educated and constantly learning information society which manages information is inevitably using information and communication technologies not only in their working environment, but also in different spheres of social, cultural, economic and political life. It is conditioned by the continuous reception, acquisition and transfer of knowledge with a special emphasis on the novelty and otherness of the present situation, the influence on human consciousness which is reflected in educational issues (Daujotytė-Pakerienė, 2001;Raeis, Bahrami, Yousefi, 2013; http://unesco.lt/komunikacija-ir-informacija/mediju-ir-informacinis-rastingumas).

Modern students are a generation which is being brought up by different technologies, including the information technologies, and any activity of theirs is related to technologies (Engestrom, 2001; Fischer, 2005; Jenkins, 2006; Cross-Bystrom, 2010; Rosen et al., 2013). Educators aim not only to manage information efficiently themselves, to innovatively improve the programmes of education and implement them, but also to encourage the growing generation to use information constructively, assess it critically, integrate into their possessed knowledge, ethically use it and create it by themselves (Daujotytė-Pakerienė, 2001; LaPorte, 2008).

The goal of any country is to train the future specialists so that they are able to answer the needs of the EU and global market in order to improve the economic competitiveness of the country. A necessary precondition for the implementation of this goal is perfect information literacy (PolerKovacic, ZgrabljicRotar, Erjavec, 2012), hence, researchers all over the world conduct studies aiming to reveal the students' (Ladbrook, Prober, 2011; Maitaouthong, Tuamsuk, Techamanee, 2011; PolerKovacic, ZgrabljicRotar, Erjavec, 2012; Raeis, Bahrami, Yousefi, 2013) and teachers' (Korobili, Malliari, Daniilidou, Christodoulou, 2011) skills of information literacy.

The international research and theoretical analysis determined that the use of digital technologies directly affects students' lifestyles, conception and choices. The students who

use information technologies have a wider approach to the analyzed issues, they have better skills of information literacy, and they are able to think critically (Ladbrook, Prober, 2011). However, the results of some other studies show that teachers are not inclined to apply information skills in their professional activity and thus restrict their trainees' attitude to information (Korobili, Malliari, Daniilidou, Christodoulou, 2011).

Researchers conceive the certain influence of information literacy on the quality of activity and thus try to create effective techniques for integrating information literacy into bachelor degree studies (Maitaouthong, Tuamsuk, Techamanee, 2011). The 21st century society faces the space and time of other possibilities, thus, the goal is to make the consumer become the creator of information. Every creator is expected to produce unique works, or, in other words, they have to be original (Daujotytė-Pakerienė, 2001; LaPorte, 2008).

Originality is frequently directly related to creativity Becker-Textor, 2001; Rowlands, 2011; Bhasin, 2011). Creativity expands the limits of cognition as well as production of scientific information and its development. In the era of information products, information literacy enables every individual not only to be inquisitive and look for information, but also to search for the target truth which helps to make individual decisions. The aforementioned processes are connected not only with personal or professional development and self-realization, but also with survival, adaptation, and competitiveness in the market. When solving the issue of survival in the era of information products, of key importance is creativity not only at universities, but in all institutions of education. Moreover, the ability to manage information is the reason to be proud of oneself and be confident of one's powers. Information management and confidence also affect creativity and its expression (Hensley, Arp, Woodard, Beth, 2004; Raeis, Bahrami, Yousefi, 2013). Hence, constructive and productive activity of a modern person requires two interrelated components – creativity and information literacy.

The General Programmes of Technologies for Basic Education in Lithuania (2008) state that Technological Education consists of learners' creative and productive activity, for the implementation of which information literacy and creativity are especially important. Good skills of information literacy help to distinguish between learning about the influence of the media, education technologies and educational media, and at the same time they can help to assimilate these spheres and become a creator of information. The result of this process is the creator of information. According to Pearson and Young (2002), modern society is directly dependent on technologies, which it at the same time creates; therefore, every person has to be familiar with technologies. The fast development of technologies and information alongside with the scientific progress require new patterns of thinking, knowledge and skills (Birmontienė, Tamutienė, 2001) which all rely on creativity. Creativity enables a person to interpret, assimilate new information with the old one, flexibly use the possessed knowledge, accurately apply the abilities in order to cognize, employ and create technologies Meyer, 2012).

The curricula of the 21st century include various abilities; nevertheless, creativity is incorporated into all education documents as one of the most important skills of survival (Jaquith, 2011). Creativity and creation have always raised a lot of questions and discussions (Guilford, 1950; Belcher, Davis, 1971; Torrance, 1971; 1974; 1977; 1987; Barron, 1988; 2004; Gardner, 1993; Gage, Berliner, 1994; Burleson, 2005;Olatoye, Oyundoyin, 2007), but the present-day attention to creativity is raising even more topical questions (Jaquith, 2011;Kozik, Handlovska, 2011; Díaz, 2011; Rowlands, 2011), especially in teacher training which is directly related to the world of tomorrow. Promotion of creativity expression is one of the major objectives of today's education (Meyer, 2012). These investigations and discussions justify the significance of Technology teachers' information literacy management and creativity expression as well as enable to conduct a qualitative research on the trainee

Technology teachers' information literacy, creativity and the interrelation of these two components.

Main Text

The research problem is the information literacy and verbal creativity of female trainee teachers (3rd year students) of Technologies as well as their interrelation.

The object of the research is trainee Technology teachers' information literacy and verbal creativity.

The goal of the research is to investigate the information literacy and verbal creativity of trainee teachers of Technologies and to reveal their interrelation.

The methods used: scientific literature and documents review and a qualitative analysis, based on Mažeikienė et al.'s (2008) test and Torrance's methodological recommendations.

Research questions:

What is the verbal creativity of the 3rd year students of Technology Education?

What is the information literacy of the 3rd year students of Technology Education?

Is the information literacy of trainee Technology teachers related to their verbal creativity?

Research Instrument

Research methodology

The Methodology for a Diagnostic Analysis of Verbal Creativity

assessment of creativity involves a number of criteria such as novelty, relevance, effectiveness, usefulness, and surprise (Boden, 2004; Cropley, 1999; Plucker, Beghetto, & Dow, 2004; Sternberg &Lubart, 1996,). Research on the assessment of creativity has been criticized for not having adequate criterion measures as well as for relying on subjective judgments and for using creativity tests that have theoretically too general or unimportant items to measure such a complex construct (Sak&Ayas).

The instrument for the analysis of trainee Technology teachers' verbal creativity (in verbal expression) was composed on the basis of Torrance's test technique (TTCT). The study also used Torrance's (1995) and Kim's (2006) works.

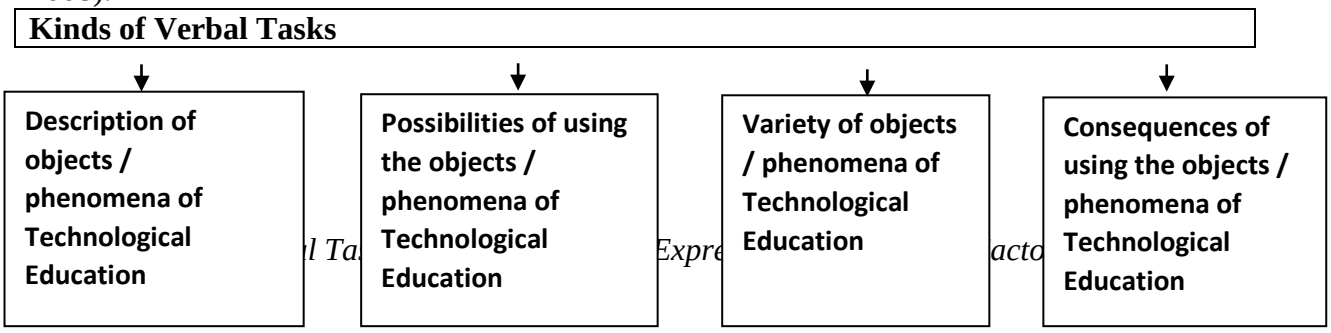
The first feature of the expression of creativity – **fluency** – is diagnosed by adding up the total sum of the informant's answers. The expression of creativity on the basis of fluency is measured by amplitude, quantity. The more the answers the higher level of creativity is achieved on the basis of the fluency criterion. In the calculation of the expression of creativity on the basis of points for the fluency criterion, every answer is assessed with 1 point.

Another feature of the expression of creativity – **flexibility** – is perceived as the number of categories (classes). The expression of creativity on the basis of flexibility is measured by the variety of categories (classes) and their amplitude. All the answers of the respondents are grouped into categories (classes) according to their meaning. Irrespective of the number of answers in one category (class), when adding up the results, a category (class) is counted only once. The more variants of categories (classes) there are in the answers the higher level of creativity expression on the basis of the flexibility criterion. Every category (class) is assessed with 3 points.

One of the features of creativity, i.e. originality, is determined according to the number of unexpected, non-standard, unusual answers. An answer is considered to be original when it is unique, exclusive in the group of the informants. Every original answer is assessed with 5 points. Different groups provide different original variants of the answer.

The questionnaire for the analysis of creativity features consists of two parts: verbal (*TTCT – Verbal*) and nonverbal (*TTCT – Figural*). This paper presents the investigation of verbal creativity on the basis of only one – **verbal** – part of the questionnaire (Fig. 1). When the informants were completing the tasks in the **verbal part**, they had to **give answers in**

textual form. The verbal part of the questionnaire consists of four different tasks in which the research participants have to reveal the variety of objects / phenomena; describe objects / phenomena; foresee the possibilities of using the objects; foresee the possible consequences of using the objects. Every task has to be completed in 3 minutes. The tasks of the verbal part are composed on the basis of the curriculum of Technological Education which consists of four spheres: nutrition, textile, constructive materials, and electronics (General Programmes, 2008).



The Methodology for a Diagnostic Analysis of Information Literacy

The diagnostic analysis of information literacy was based on Mažeikienė et al.'s (2008) information literacy questionnaire which was adapted for Lithuania. The information literacy questionnaire consists of five groups of questions which correspond to the UNESCO conception of information literacy http://unesco.lt/komunikacija-ir-informacija/mediju-ir-informacinis-rastingumas): 1) perception of the goal and need for information; 2) determination of information search strategy and information acquisition; 3) information assessment, selection and management, integration of the selected information into the possessed system of knowledge and values; 4) information use and creation in order to achieve the target goal; 5) ethical and legal use of information (Fig 2)[39]. The complexity index (CI) of every group of questions was counted using the following formula:

$$CI = \frac{\sum N_1}{\sum N_2}$$

The higher the complexity index, the easier the questions in the analyzed group are.

The third and fourth year students of Technology Education, who took part in the study, answered 42 questions. Every question had four possible answers given and the students had to choose one correct option. The students' correct answers were analyzed according to the determined complexity index (CI).

[39] N_1 – the sum of the informants' points, N_2 – theoretically possible sum of points

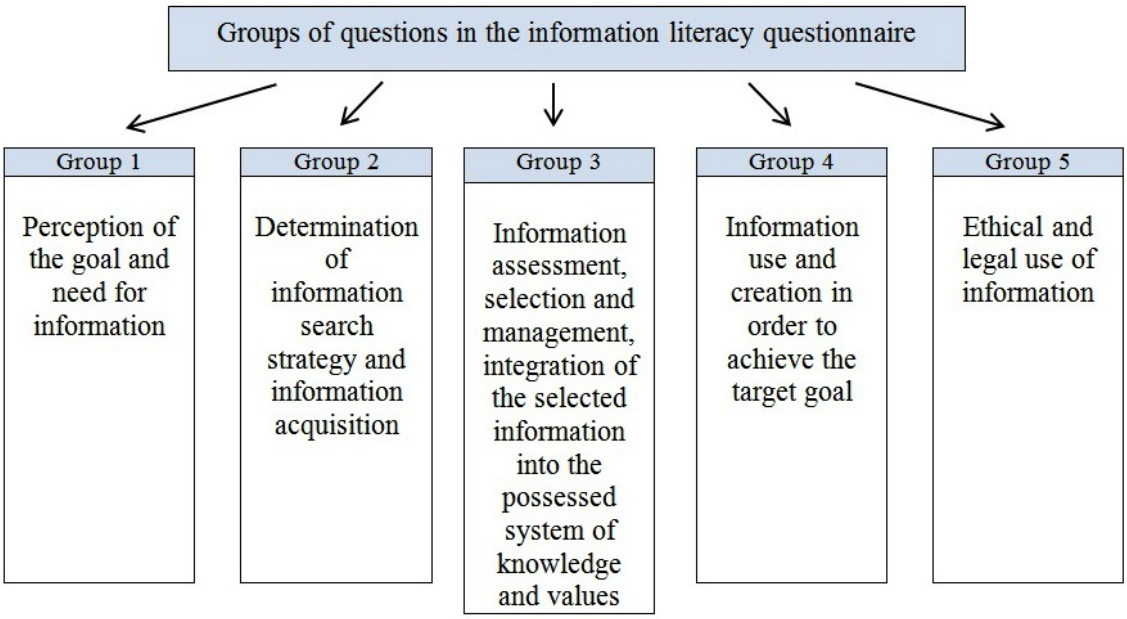


Fig.2. Groups of Questions in the Information Literacy Questionnaire

Characteristics of the Informants

The sample of a qualitative research is purposive and typically convenient (Patton, 2002). The informants of the research were the 3rd year female trainee teachers of Technology Education at Lithuanian University of Educational Sciences who were studying in the third and fourth years. The informants' educational and demographic characteristics were different (Table 1).

Table1. Educational and Demographic Characteristics of the Qualitative Research Participants

No	Nationality	Average grade of the last (4th) term	Age
Third year students			
1	Lithuanian	9.5	21
2	Lithuanian	10.0	21
3	Lithuanian	9.03	21
4	Lithuanian	10.0	21
5	Lithuanian	9.4	20
6	Lithuanian	9.0	21
7	Lithuanian	9.7	22

The research participants were all the 3rd year students in the programme of Technology Education. It has to be noted that in the third year this programme is studied only by female students. The curriculum of the study programme covers all the spheres of technologies: nutrition, textile, electronics, constructive materials and design. The average age of the informants is 20-22, and the average grades of the third year students vary (Table 1).

Research results

The Verbal Creativity of the 3rd Year Students of Technology Education

The highest scores for the expression of verbal creativity were determined in the respondents' answers to the first task of the research – description of Technological Education objects / phenomena on the basis o the fluency criterion (23; 21), and on the basis of the flexibility criterion (27), and on the basis of the originality criterion (95) (Table 2). The task which required the description of objects or phenomena by means of not only adjectives appeared to be the most favorable for the expression of the trainee Technology teachers' verbal creativity. The lowest score (5; 6) for the informants' creative fluency were determined

in the answers to the fourth task. It shows that the trainee Technology teachers have difficulty in foreseeing the quantity of the possible consequences of a given situation – the biggest number of the foreseen consequences of a given situation was 11, while the given objects were described in as many as 23 variants, and 16 different variants were presented for the definition of the application and variety of objects (Table 2).

Table 2. The Scores of 3rd Year Trainee Technology Teachers' Expression of Features of Verbal Creativity According to the Tasks

Information	Question 1. Description of objects/ phenomena	Question 2. Application	Question 3. Variety of objects/ phenomena	Question 4. Possible consequences	Total score for verbal fluency/flexibility/originality	Total score for verbal creativity	Average grade
FLUENCY							
1	17	7	**15**	6	45	217	9.5
2	**23**	12	**16**	**5**	**56**	**306**	**10**
3	**11**	**8**	**9**	**5**	**33**	**213**	**9.0**
4	21	9	**15**	**11**	**56**	275	**10**
5	**23**	11	11	**5**	50	232	9.4
6	19	13	13	6	51	242	**9.0**
7	17	**16**	**15**	9	**57**	**337**	9.7
Total	**131**	**76**	**94**	**47**	**348**	**1822**	**9.5**
FLEXIBILITY							
1	**15**	5	-	12	**32**	217	9.5
2	18	8	-	**9**	35	**306**	**10**
3	18	5	-	12	35	**213**	**9.0**
4	21	**4**	-	**9**	34	275	**10**
5	**27**	6	-	**9**	**42**	232	9.4
6	21	5	-	15	41	242	**9.0**
7	**15**	**9**	-	**21**	**45**	**337**	9.7
Total	**135**	**42**	**-**	**87**	**264**	**1822**	**9.5**
ORIGINALITY							
1	65	**5**	40	30	140	217	9.5
2	**95**	30	**65**	25	**215**	**306**	**10**
3	55	40	**15**	35	145	**213**	**9.0**
4	70	45	40	30	185	275	**10**
5	55	45	25	**15**	**120**	232	9.4
6	**40**	55	35	20	150	242	**9.0**
7	**85**	**65**	50	35	**235**	**337**	9.7
Total	**465**	**285**	**270**	**190**	**1190**	**1822**	**9.5**
Total	731	403	364	324			

The 3rd year trainee Technology teachers who had the highest average grades (10; 9.7) also attained the highest scores for verbal fluency (57; 56) (Table 2). The possessed knowledge and experience facilitate a successful expression of verbal fluency.

The total verbal creativity is directly related to the expression of verbal creativity fluency: the informant whose total score for verbal creativity is the highest (337) also has the highest score for the general verbal fluency (57) and verbal fluency in the task on the application of objects (Question 2) (16). The informants, whose average term grades (10; 9.7) and the scores for verbal creativity are the highest in the group (337; 306; 275), also have the highest scores for verbal fluency in the task on the variety of objects / phenomena (16; 15) (Table 2).

The highest scores for the flexibility of verbal creativity (27) and the fluency of verbal creativity were determined in the task on the description of objects / phenomena (Question 1). The informant who possesses the highest score for verbal creativity also got the highest score for the flexibility of general verbal creativity (45) (Table 2).

The highest score for the expression of originality of verbal creativity was determined in the answers of the students who participated in the investigation of the first task – description of technological education objects / phenomena (95; 85) (Table 2). The smallest sum of scores for the originality of verbal creativity (190) was determined in the informants' answers about the possible consequences (Question 4). The completion of this task also requires analytical thinking, imagination and logical insight. Despite the complexity of the task, every informant's answers included unique possible consequences of the given situation. The analysis of the research data revealed that the informants who possess high average grades also get high scores for the expression of originality (Table 2).

Information Literacy of the 3rd Year Students of Technology Education

The 3rd year trainee Technology teachers were able to answer a half of the test questions on information literacy (51 %) and that shows fairly limited skills of information literacy. It was noted that the third year students who had the highest average grades (10) also got the highest CI points for information literacy (0.58 and 0.61) (Table 3). The research results demonstrated that only the achievements assessed by the highest term grades have influence on information literacy.

The informants' CI scores were determined in the group of questions in the questionnaire – a test on the ethical and legal application of information (CI – 0.68). The 3rd year trainee Technology teachers are best at the complex ethics of applying information, and worst at the acquisition of information (CI – 0.34).

The analysis of the 3rd year trainee Technology teachers' information literacy revealed a relation between the total CI score of information literacy and information acquisition (the 2nd group of questions in the information literacy questionnaire) and assessment skills (the 3rd group of questions in the information literacy questionnaire): the informants of an average total information literacy CI (CI – 0.5) found it difficult to determine the strategies of information search and availability (CI = 0.1 – 0.3) (Table 3); the informants whose total information literacy is higher than the average CI are more able to determine the strategies of information search (CI = 0.4 – 0.7), to assess and select the target information and integrate it into the possessed experience of information (CI = 0.7 – 0.8) (Table 3).

Table 3. The Information Literacy CI, Verbal Creativity and Term Achievement Scores of the 3rd Year Students of Technology Education

Informant	Year	1 Perception of the goal and need for information	2 Determination of information search strategy and information acquisition	3 Information assessment, selection and management, integration of the selected information into the possessed system of knowledge and values	4 Information use and creation in order to achieve the target goal	5 Ethical and legal use of information	Total CI average of correct answers	Average term grade	Total score for verbal creativity
1	III	0.6	0.3	**0.3**	0.57	**0.75**	0.5	9.5	217
2	III	**0.7**	0.4	**0.8**	**0.4**	**0.75**	**0.61**	**10**	**306**
3	III	0.5	0.4	0.7	0.57	**0.5**	0.53	9.0	**213**
4	III	**0.6**	0.4	0.7	**0.7**	**0.5**	**0.58**	**10**	275
5	III	0.4	**0.1**	0.5	**0.4**	**0.75**	0.43	9.4	232
6	III	**0.3**	**0.1**	**0.2**	0.57	**0.75**	**0.38**	9.0	242

7	III	0.4	**0.7**	0.7	0.57	**0.75**	**0.62**	9.7	**337**
Total		0.5	0.34	0.56	0.54	0.68	0.52	9.5	1822

The Relation between the Verbal Creativity and Information Literacy of the 3rd Year Students of Technology Education

The informants whose scores for the general verbal fluency (56; 57) and originality (185; 215; 235) were the highest in the group also had the highest average term grades (9.7; 10) and the general CI average fot the correct answers of information literacy (0.58; 0.61; 0.62) (Table 4).

The 3rd year trainee Technology teachers, whose points for the expression of verbal creativity are the lowest (120; 150), also got the lowest CI scores which do not exceed the average (0.5) information level (0.38 – 0.5) (Table 4).

One 3rd year student of Technology Education, whose expression of verbal creativity scored highest in the group (235), got a significantly higher CI score (CI – 0.7) in the group of determination of the strategy of information search and information acquisition (Table 3 and 4). A constructive search for information requires verbal creative originality which helps to create different strategies related to information acquisition.

Table 4. The 3rd Year Trainee Technology Teachers' Total Scores for the Expression of Verbal Creativity on the Basis of Creativity Criteria

Informant	Total verbal fluency	Total verbal flexibility	Total verbal originality	Total score for verbal creativity	Average grade	Total CI average for correct answers
1	45	**32**	140	217	9.5	0.5
2	**56**	35	**215**	**306**	**10**	**0.61**
3	**33**	35	145	**213**	**9.0**	0.53
4	**56**	34	185	275	**10**	**0.58**
5	50	42	**120**	232	9.4	0.43
6	51	41	150	242	**9.0**	**0.38**
7	**57**	**45**	**235**	**337**	9.7	**0.62**
Total	**348**	**264**	**1190**	**1822**	**9.5**	**0.52**

The skills of information assessment, selection, management and integration (the 3rd group of questions in the information literacy questionnaire) as viewed by the researchers as the most complicated ones. The research results show that the highest CI in the group of information assimilation skills was attained only by the informants whose total information literacy CI (0.58 – 0.61), verbal creativity score (185 - 235) and the average grade (9.7 - 10) were the highest in the group (Table 3 and 4). Information selection and integration into the possessed experience is a complicated holistic process which requires logical thinking, creative thinking and knowledge. The analysis of the research results conditions a "threshold" theory: the informants whose verbal creative originality is lower than 145 points have lower skills of information assessment and integration.

Conclusion

The 3rd year trainee Technology teachers, whose average term grades were the highest in the group (10; 9.7) also had the highest score for verbal fluency (57; 56) and verbal originality (235; 215; 185). The possessed knowledge and experience facilitate the successful expression of verbal fluency and verbal originality, yet, they are not a decisive factor of originality expression – high average term grades do not determine high scores for the

expression of creative originality. The informant who had the highest score for general verbal creativity also had the highest score for the flexibility of general verbal creativity (45). The tasks which require description of objects / phenomena are most favorable for the expression of fluency, flexibility and originality of the 3rd year students of Technology Education. Even though the task which required logical, analytical thinking and imagination did not reveal a high expression of the informants' creative originality, the statistic verbal creativity in this task was higher than the total statistic verbal creative originality of the informants.

Technology education 3rd year students were able to answer a half of the questions in the information literacy test. Only the informants with the highest average grade (10) got the highest scores of information literacy in the group. The informants are best at the complex ethics of using information, and worst at information acquisition (CI – 0.34). The informants who did not exceed the average (CI – 0.5) total information literacy CI had difficulty determining the strategies of information search and availability (CI = 0.1 – 0.3). The 3rd year trainee teachers of Technologies whose total information literacy is higher than the average were better at determining the strategies of information search (CI = 0.4 – 0.7), assessing and selecting the necessary information and integrating it into the possessed information experience (CI = 0.7 – 0.8).

The informants, whose scores for general verbal fluency (56; 57) and originality (185; 215; 235) were the highest in the group, also had the highest average term grade (9.7; 10) and the total CI average for the correct answers of information literacy (0.58; 0.61; 0.62). The research participants, whose score for verbal creative originality expression was the lowest, also got the lowest CI scores, which did not exceed the average (0.5) information level, for their information literacy skills. Constructive information search requires verbal creativity which facilitates the creation of different strategies of information acquisition. Information selection and integration into the possessed experience is a complex holistic process which requires logical thinking, creative thinking and knowledge. On the basis of the research results, there was a "threshold" theory formulated: the informants whose verbal creative originality is lower than 145 points have lower skills of information assessment and integration.

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