

The Influence of Intersubject Connection on Student's Learning Performance in Art Education

Miroslav Huzjak

Faculty of Teacher Education, University of Zagreb

Abstract

Teachers mostly implement the intersubject connection (correlation) in art education through visual motifs, not through insights into art phenomena. This leads to poor cognitive, psychomotor and affective results of teaching, and it is not in line with the fulfilment of the objectives in the art activities. There is no transfer of knowledge, instead there is the conviction that art is not about knowledge, that one needs only "to feel". Therefore, the main objectives of this study are to determine the effects of inter-curricular connection on the individual student's holistic visual development (cognitive, affective and psychomotor) while teaching art education. Furthermore, another objective is to establish the influence of intersubject connection on students' motivation while teaching art education. And finally, the aim was to formulate the guidelines for teacher training in the planning of intersubject connection, and to make a model of performance in correlative connection for teachers' practices. The study was conducted on a sample of over 400 students in the first, fifth and eighth grade of primary education, in four schools. It was found that students who were involved in the process of teaching with intersubject connection partially achieved a better understanding of art and other terms than the control group (significant difference was not found in one week in the first and fifth grade). The students of the experimental group achieved significantly better transfer of knowledge, motivation level, the sensitivity for the art materials and procedures, the degree of originality and individuality, and the degree of critical and aesthetic evaluation.

Key words: artistic expression; artistic knowledge and skill; correlation in teaching; knowledge transfer; visual (fine) art education.

Introduction

Intersubject connection (correlation, cross-curricular connections) is an integral didactical approach where knowledge, contents and learning skills are connected. It

represents a means for in-depth understanding of concepts through interdisciplinary connections of various subject areas. Intersubject connections enable problem-based learning where “the teacher directs students to fully act, as well as to connect artistic concepts to the concept of other subject areas and vice-versa (transfer and experiential learning)” (Tacol, 2003, p. 53). “Intersubject connections determine common purposes of different subject areas. They include the processes of the pupil’s integrated insight into the learning reality through transfer of learning skills and knowledge. The common denominator or the red thread connecting individual subjects is the transfer of learning strategies, data, concepts, rules, thinking skills, emotions, viewpoints, communication etc.” (Siherl-Kafol, 2008, p. 113). If the pupil receives unconnected art knowledge, that knowledge does not internalize easily and is easy to forget, and therefore it is necessary to establish and perform the transfer of knowledge – the transfer of learning effect from one subject area to another.

In the learning process of visual (fine) art education, support is given to special qualities of integrated learning, which emphasises aptness and greater efficiency when compared to traditional learning, followed by stronger motivation of students, use of more complex thinking processes and higher level of independence. Integrated learning includes various disciplines simultaneously; according to Wood (2005), its purpose is to present the world to students integrally. That method of learning formed the concept of interdisciplinarity, which led to the development of intersubject connections in visual art as well. At the level of goals of upbringing, integrated learning has a positive effect on the pupils’ incentive, independence, their self-confidence, persistence, concentration on the art assignment, intrinsic motivation, cooperative skills, empathy, and acceptance of diversity (Čudina-Obradović, 2009). In his Taxonomy, Bloom (1970) presented *synthesis* next to the last level, and for the last and the highest level he chose *evaluation*. Anderson and Krathwohl (2001), in their revision and adaptation of knowledge classification, regarded synthesis as a new creative contribution and, therefore, changed places of synthesis and evaluation. According to them, synthesis is on the highest level of different types of knowledge, and it is a creative insight into the process of thinking. In that way, creativity is accepted as the key role in achieving the primary goal of the learning process, and therefore, such theories revalue the significance of art subjects in the syllabus.

The teacher should use the method of intersubject connections only when there is a meaningful reason for it. Otherwise, intersubject connections will be conducted in the wrong way, which might cause more damage than benefits to the students. “In the process of creating the syllabus, that is, creating art assignments for pupils, the teacher should ensure that, due to the correlation with the concepts of other subject areas, (s)he retains integrity and purity of the visual art subject, so as not to cause possible connection of concepts of some subject areas to turn into mere confirmation of the level of treating those concepts as a form of art expression. This type of approach only determines the concepts from other subject areas, and leads students to non-creative

and stereotypical artistic expression” (Tacol, 2003, p. 8). Artistic work of pupils while teaching them visual art, therefore, should not be reduced to the level of *illustrating* certain contents, adopted from different subject areas. It is possible to avoid this by using didactical model of *structural intersubject connections (structural correlations)*, based on the concepts of structuralism.

Structuralism is a mode of thinking and a method of analysis which was developed in linguistics and its creator was a Swiss linguist Ferdinand de Saussure (2000). Structuralism deals with the structure, that is, order, principle, higher order (Balsey, 2003), which Saussure called *syntagms*, unlike the basic elements of a certain area which he calls *paradigms*. Paradigms are specific to every individual discipline and cannot be compared, but syntagms which arrange paradigms can be identical in different areas. Consequently, it is said that paradigms are disciplinary, and syntagms interdisciplinary (Bačić, 1980, 2004).

Correlation is a particular type of translation. Translation from one language into another must fulfil two conditions: it must be *reversible* (capable of being reversed) and must provide an *equivalent* (equal in value) (Eco, 2004, 2006). If we proclaim a line as a paradigm of artistic language, it is impossible to find its equivalent in any other language. Therefore, on the paradigmatic level, the translation is not feasible since it does not have the equivalence. The translation is possible on the syntagmatic level, since *rhythm*, as the concept of artistic language, is the equivalent to *rhythm* as the concept of musical language. With regards to the category of reversibility, it should be possible for certain meaning translated into another language to be translated back into the original language so that it does not significantly change the original meaning. If we transform music into a work of art, the reversion to music will no longer be possible, since that process is irreversible. It is possible to retain reversibility at the expressive and stylistic level of meaning, but not at the verbal level of meaning. Therefore, it is absurd to correlate motifs/themes of a certain art work with each other. It is necessary to correlate, create intersubject connections between *syntagms* (Huzjak, 2001, 2004, 2006, 2007). An average viewer will, due to the lack of professional knowledge, search for a motif in a work of art. For instance, in music, instead of searching for a figurative motif, (s)he will search for words (lyrics) which are identified with the sense of musical piece itself (Schönberg, 2009); the music without lyrics will be ‘too boring to listen’. Only theoretical education will enable an individual to aesthetically evaluate works of art, that is, to objectify the taste (Dahlhaus, 2003). It is not possible to translate from one language into another (for example, from musical to artistic language), unless one has wide knowledge of both languages. Otherwise, damage is done to one or both languages, pupils acquire a wrong view of life, and art education is reduced to mere illustration.

To love music means to understand musical ideas (Dalhaus, 2003), and the taste depends on the level of education (Fidler, 1980; Solar, 2004). By learning and practicing how to apply concepts from the field of art, the pupil perceives the principles and

regularities of creative work; how artwork itself is compositionally formed. Klee and other Bauhaus authors have used curves to track the music tones and their counterpoint relations (Düchting, 2002). It is necessary to create the network of concepts, to connect an image, sound, movement and lyrics. In other words, while teaching, it is necessary to apply interdisciplinarity, teaching about common (unique) principles. "Emotional belief develops as a result of cognitive processing of information and vice-versa. Everything is connected at a higher level of abstraction; and abstracting itself is the moment when the opinion is created" (Arnheim, 1985, p. 46). Intersubject connections in the curriculum of visual arts in the primary schools in the Republic of Croatia are not precisely defined, which is the reason why it is rather inexpertly performed in practice. The consequence of the lack of connection among the contents of the subjects is the lack of transfer of knowledge among those subject contents, the lack of understanding and memorising art concepts, stereotypical artistic expression of the pupils and lack of creativity, as well as the lack of skills to critically value and aesthetically evaluate both their own works of art and artwork in general. The starting point for the connection (integration) of subject contents is a didactical model of structural intersubject connections (structural correlation), based on common concepts and relations.

Research Objective and Hypotheses

Research Objective

We were interested in the basic starting points and the implementation of intersubject connections in visual arts. In our research, we have tested whether it is possible, through structural intersubject connections based on joining artistic concepts, their connections and also contents of other subjects, to achieve higher level of pupils' motivation for the subject of visual arts, creativity and innovativeness of artistic expression in solving problems, acquiring knowledge and understanding artistic concepts. Furthermore, on the basis of the aforementioned, we also wanted to establish the possibility for pupils to successfully work with art materials and methods, as well as show the ability to critically and aesthetically evaluate their own artwork and artwork in general.

Hypotheses:

The general hypothesis:

Through intersubject connections, during the process of teaching visual art, a better integral (holistic) education of pupils is achieved – in cognitive, emotional and psychomotor fields.

Specific hypotheses:

H1 The pupils who will be involved in the process of learning by means of intersubject connections will achieve a better memory of artistic and other concepts.

- H2 The pupils who will be involved in the process of learning by means of intersubject connections will achieve a better transfer of knowledge between curricular subjects.
- H3 The pupils who will be involved in the process of learning by means of intersubject connections will demonstrate a higher motivation for the artistic activity.
- H4 The pupils who will be involved in the process of learning by means of intersubject connections will demonstrate a wider knowledge of special qualities of artistic materials and methods of working with them, as well as connection of materials and artistic concepts, and will demonstrate more sensitivity regarding art material.
- H5 The pupils who will be involved in the process of learning by means of intersubject connections will demonstrate stronger individuality and originality, and will avoid visual stereotypes while expressing themselves artistically.
- H6 The pupils who will be involved in the process of learning by means of intersubject connections will demonstrate a greater ability to critically and aesthetically evaluate their own artwork and artwork in general.

Research Methodology

The Sample of Respondents

The research included 403 pupils enrolled in the first, fifth and eighth grade at four chosen primary schools from Zagreb and its surroundings in the Republic of Croatia, as well as eight primary school class teachers and six subject teachers who teach visual arts. Not all pupils were present in every class, or they have not done some tests or a part of some test, which is why the SPSS program did not include them in the calculation. That is the reason why, in the analyses, their total number is, as a rule, smaller than 403 and it fluctuates.

Table 1
The sample of respondents

	Experimental group N (%)	Control group N (%)	The whole sample
Gender			
Male	98 (50.8%)	100 (50.5%)	204
Female	95 (49.2%)	104 (49.5%)	199
Grade			
1st	63 (32.6%)	69 (32.9%)	132 (32.8%)
5th	53 (27.5%)	70 (33.3%)	123 (30.5%)
8th	77 (39.9%)	71 (33.8%)	148 (36.7%)
Schools			
School A	112 (58%)		
School B	81 (42%)		
School C		133 (63.3%)	
School D		77 (36.7%)	

Type of Research, Research Method, Technique and Instruments

The type of research is quantitative and the research method is causal, experimental. The research techniques included conducting a survey, evaluation and testing of knowledge.

Research Instruments

The following instruments were developed for data collection procedure:

- a test for determining the transfer of knowledge of artistic and other concepts;
- a test for determining the memory and understanding of artistic and other concepts;
- a survey questionnaire for determining the possibility of critical evaluation, and a questionnaire for determining aesthetical evaluation of their own and other works of art;
- a five-level evaluation scale for the level of knowledge of art materials and for mastering the procedure of performing the art technique, connecting art materials and artistic concepts, and for determining sensitivity to art materials;
- a five-level perceptual scale for determining the level of motivation for art;
- a five-level evaluation scale for determining individuality and originality in pupils' artistic expression.

The questionnaire yields to the following principles: 1) For the test of the transfer of knowledge, the questions were based on a comparison of concepts from different areas, or concepts that share a common structure. For example, the task was to explain what is common in the rhythmical roof of a Japanese pagoda and rhythm in the poem. 2) On the test of understanding artistic and other concepts, each test measured the knowledge of one artistic term (for example, plane, relief, rhythm, symmetry...). For example, the task was to write what kind of composition is used in the painting. 3) For a survey questionnaire of critical evaluation and a questionnaire for determining aesthetical sensitivity, the pupils used a Likert type scale to write the level of their agreement with the statements related to the art students' works.

Each pupil was processed by the set of measuring instruments in the survey. The tests, survey questionnaires and evaluation scales were prepared by the author of the research. The level of the tests' validity was confirmed by factor analysis. The level of the test reliability was calculated by using the Cronbach α coefficients, which vary, but they are mostly satisfactory.

Table 2

Cronbach α coefficients for the tests for 1st graders

	1st grade				
	1st week α	2nd week α	3rd week α	4th week α	5th week α
Test for understanding artistic concepts	.66	–	.52	.19	.29
Test for the transfer of knowledge	.45	–	.33	.64	.31
Questionnaire of critical evaluation	.34	.35	.72	.83	.71
Questionnaire of aesthetic sensitivity	.68	.53	.47	.33	.51

Table 3
Cronbach α coefficients for the tests for 5th graders

	5th grade				
	1st week α	2nd week α	3rd week α	4th week α	5th week α
Test for understanding artistic concepts	.23	-	.44	.33	.07
Test for the transfer of knowledge	.40	-	.28	.62	.49
Questionnaire of critical evaluation	.77	.86	.74	.79	.66
Questionnaire of aesthetic sensitivity	.58	.74	.54	.67	.81

Table 4
Cronbach α coefficients for the tests for 8th graders

	8th grade				
	1st week α	2nd week α	3rd week α	4th week α	5th week α
Test for understanding artistic concepts	.28	-	.20	.46	.24
Test for the transfer of knowledge	.68	-	.42	.22	.59
Questionnaire of critical evaluation	.68	.87	.84	.82	.72
Questionnaire of aesthetic sensitivity	.48	.58	.58	.52	.71

Procedure

In two schools the survey was conducted with the experimental groups (EG), and in another two it was conducted with the control groups (CG). We obtained the results by doing a pedagogical experiment. During the first week, the teachers conducted the initial testing in both groups by using the same art assignment from the field of drawing, and after the class a test for determining the level of knowledge of artistic concepts, a test for determining the transfer of knowledge, a survey questionnaire for determining the possibility of critical evaluation, and a questionnaire for determining the possibility of aesthetical evaluation of pupils' and other works of art were administered. The teachers rated the level of motivation for the pupils' activity in art in the tables. After the class, a committee of three members was set up – two class teachers, and one visual arts teacher - a specialized teacher. The committee, while reviewing pupils' works, assigned points to each individual work (that is, to every pupil) for the level of sensitivity for the usage of art materials, as well as points for the level of individuality and originality. In that way, each individual pupil, out of 403 pupils in the survey, was evaluated by means of a battery of six measuring instruments.

In the following weeks, the EG followed a special experimental programme, including intersubject connections (structural correlation), and the process of learning in the CG was 'standard' – without intersubject connections, or connecting only on the basis of art motifs/themes. Both verbal and written instructions were given to the teachers in the EG, and Power Point presentations with intersubject contents were made. The experiment took place during regular classes of visual arts. During the second week, the pupils did their art assignments, and after the class they filled the questionnaires for the purpose of determining the possibility of critical and aesthetical

evaluation, through the course of which they rated one of pupils' works which was created at that class and was put on the board. After the classes, the teachers rated the motivation and the committee rated the sensitivity to art materials, originality and individuality. The tests of the knowledge transfer process and the tests of artistic concepts which they were learning in that class, were not filled in immediately, but after one week – the aim was to measure to which extent the pupils memorised the learned concepts. This type of survey was also carried out in the third and fourth week of the research. In the fifth week the pupils did not get an art assignment, but they only filled in the tests and questionnaires related to the concepts they learned during the previous week.

Concepts that were processed during the research and their correlation with other subjects:

1st grade: revision (rhythm) of shapes; Music education – revision of tones, Nature and society – revision (rhythm) of the four seasons, Physical and health education – rhythmic structures of movement

1st grade: surface; Mathematics – a geometric figure (a circle, a triangle, a rectangle, a square);

1st grade: geometric solids and non-geometric shapes; Mathematics – objects in space;

5th grade: rhythm; Croatian language – rhythmic structure (meter) of a verse, Music education – rhythm in music, Physical and health education – rhythm in dance;

5th grade: balance – symmetry; Mathematics – axisymmetric figures;

5th grade: ratio and proportions; Mathematics – ratio and proportions;

8th grade: relief; Geography – relief, Earth structure;

8th grade: rhythm; Croatian language – rhythm in poetry, Physical and health education – rhythm in dance;

8th grade: symmetry, reflection, translation and rotation; Mathematics – symmetry (reflection, translation and rotation), Biology – the body symmetry.

Test of Knowledge Transfer

1. Circle the answer: which musical rhythm corresponds to the rhythm of the columns?



- a)
- b)
- c)
- d)
- e)

2. Write on the lines: explain the connection between this image and rhyme in this song.



O lijepa, o draga,
O slatka slobodo,
Dar u kom sva blaga
Višnji nam Bog je d'o.

3. Draw in the fields: how would you draw the rhythm of the rhymes (made it visible) using geometric shapes?

Tiho kos u grmu spava / A još tiše raste trava
Tiho tamni bor šumori / A još tiše trešnja zori.

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4. Circle the answer: how would you name the rhythm shown on this sculpture?



- a) a a b b b) a b a b
c) a b b a d) a b c b
e) a a a a

5. Write on the line three rhythmic repetitions around you, in the classroom.

Figure 1. Example of The Test of Knowledge Transfer, 8th grade

Table 5

An example of the five-level evaluation scale for evaluating sensitivity to art materials

levels	clay - criteria
5 th Highly sensitive	<ul style="list-style-type: none"> - the pupil always achieves optimum clay moisture, all the shapes are compact, they do not disintegrate - the pupil examines a variety of surfaces independently, (s)he uses impressing and scratching in order to create different textures - the pupil independently researches various clay modelling and texturing tools - the pupil presents the motif with a large number of details, both spatially and stably
4 th sensitive	<ul style="list-style-type: none"> - the pupil often achieves optimum clay moisture, all the shapes hold together - with little help from the teacher, the pupil examines the variety of surfaces, and uses impressing and scratching in order to create different textures -with little help from the teacher, (s)he examines the practicability of some clay modelling and texturing tools -the pupil presents the motif with many details, both spatially and stably
3 rd Partially (slightly) sensitive	<ul style="list-style-type: none"> - the pupil achieves an average clay moisture, all the shapes mostly hold together, some parts fall off - only with the help from the teacher, (s)he examines a variety of surfaces, sometimes (s)he uses impressing and scratching in order to create different textures - with occasional instructions from the teacher, (s)he examines the practicability of some clay modelling and texturing tools - the pupil presents the motif with an average number of details, both spatially and stably

2 nd Not sensitive	<ul style="list-style-type: none">– the pupil does not achieve sufficient clay moisture, the shapes hardly hold together, parts fall off– with frequent suggestions given by the teacher, (s)he achieves an under-average variety of surfaces, (s)he rarely uses impressing and scratching in order to create different textures– also, with frequent instructions given by the teacher, (s)he mainly does not examine the practicability of some modelling and texturing tools– the pupil presents the motif by using small number of details, some parts are flat and often lodged (torn down)
1 st Highly insensitive	<ul style="list-style-type: none">– the pupil does not achieve optimum clay moisture, the clay is too dry or sticky, the shapes disintegrate– there are no signs of surface articulation– the pupil does not research the practicability of some clay modelling and texturing tools– the pupil presents the motif by using a minimum number of details, the shapes are flat and lodged (torn down)

Results

All the tests, questionnaires and evaluation scales were calculated on the level of the first, the fifth and eighth grade, and on the level of the total sum of all three grades. Due to the lack of space, only tables showing the total sum (all grades) will be presented here, and separate grades will be interpreted in the text.

Test of Understanding the Concepts

The total sample (N=381 pupils) was divided into the experimental group (n=183) and the control group (n=198).

The data for the test of understanding the concepts were processed by using t-test for independent samples (EG and CG). The results in the sample of the first graders demonstrate that during the first ($t(118.20) = 0.85; p > .05$) and fourth week ($t(98.06) = 1.17; p > .05$) a statistically significant difference between the EG and CG was not obtained. During the third week, there was a significant difference between them ($t(123) = 5.20; p < .01$), which indicated that the CG was more successful. A statistically significant difference ($t(128.70) = 3.84; p < .01$) was also found during the fifth week, indicating that the EG was more successful.

The results of the fifth graders demonstrate that during the first week, in the process of the initial testing, there was a significant difference between the EG and CG ($t(117) = 2.47; p < .05$), and that the EG was more successful. During the third week ($t(82.4) = 3.63; p < .01$), and the fourth week ($t(116) = 8.66; p < .01$), there was a significant difference between the EG and CG, in favour of the EG, who achieved better results in both weeks. During the fifth week there was no significant difference between the EG and CG ($t(121) = -.15$).

The results in the sample of the eighth graders demonstrate that during the initial week ($t(137) = -.74; p > .05$) a statistically significant difference was not obtained. During the third week ($t(128) = 4.38; p < .01$), the fourth week ($t(133) = 4.01; p < .01$)

and the fifth week ($t(136.2) = 3.52; p < .01$) there were significant differences between the EG and CG, indicating that the EG was more successful in all three weeks.

Table 6

The results of the conducted t-test of understanding the concepts (1st+5th+8th grade together)

		N	M	SD	t-test	df	p
1 st week	Experimental	187	5.27	2.02	.81	385	.421
	Control	200	5.11	1.96			
3 rd week	Experimental	171	4.14	1.78	2.76	330.72	.006
	Control	194	3.66	1.47			
4 th week	Experimental	185	3.49	1.59	3.79	373.39	.001
	Control	194	2.83	1.84			
5 th week	Experimental	190	3.18	1.03	3.23	392	.001
	Control	204	2.83	1.11			

The results obtained from the total sample of pupils of the first, the fifth and the eighth grade taken together, demonstrate that during the initial week ($t(385)=.81; p > .05$) a significant difference between the EG and CG was not obtained. During the third week ($t(330.72)=2.76; p < .01$), the fourth week ($t(373.39)=3.79; p < .01$) and the fifth week ($t(392)=3.23; p < .01$), there was a significant difference between the EG and CG, with the EG being more successful on the test of understanding the concepts in all three weeks.

Test of Knowledge Transfer

The total sample (N=380 pupils) was divided into the experimental group (n=182) and the control group (n=198).

The data for the *test of knowledge transfer* were processed by using t-test for independent samples (EG and CG). The results in the sample of first graders demonstrate that during the first ($t(127)=1.17; p > .05$) and the third week ($t(123)=1.26; p > .05$) a statistically significant difference between the EG and CG was not obtained. In the fourth week ($t(122.67)=5.86; p < .01$) and the fifth week ($t(107.41) = 7.35; p < .01$) there was a significant difference between the EG and CG, with the CG being more successful.

The fifth graders' results demonstrate that, during the first week, ($t(117)=1.99; p < .05$) a statistically significant difference between the EG and CG was obtained. In the fourth week ($t(115)=8.13; p < .01$), a statistically significant difference was also obtained, with the pupils who were taught by using the model of intersubject connections being more successful in understanding the artistic concepts. During the third week ($t(108.67)=1.13; p > .05$) and the fifth week ($t(115.20) = -1.83; p > .05$), there was no significant difference between the EG and CG.

The results obtained in the sample of the eighth graders demonstrate that, during all the weeks of the research, a statistically significant difference between the EG and CG was noted. In the first week ($t(123.14)=-5.38; p < .01$) the pupils of the CG achieved better test results (M=2.88). In the third week ($t(128)=5.50; p < .01$), in the

fourth week ($t(129.87)=3.33$; $p<.01$) and in the fifth week ($t(127.64)=6.73$; $p<.01$), there was a statistically significant difference between the EG and CG, with the group which was taught by means of the model of intersubject connections achieving better results than the CG.

Table 7

The results of the conducted t-test of knowledge transfer (1st+5th+8th grade together)

		N	M	SD	t-test	df	p
1 st week	Experimental	187	2.89	2.03	-1.06	385	.289
	Control	200	3.11	1.99			
3 rd week	Experimental	171	3.18	1.57	4.39	322.87	.001
	Control	194	2.52	1.24			
4 th week	Experimental	185	4.91	3.15	4.39	369.19	.001
	Control	193	3.55	2.86			
5 th week	Experimental	186	3.68	1.80	6.41	388	.001
	Control	204	2.56	1.63			

The results obtained from the total sample of pupils of the first, the fifth and the eighth grade together, demonstrate that during the initial research there was no statistically significant difference between the EG and CG, and during all other weeks of the research, a significant difference was noted. In the first week ($t(385)=-1.06$; $p>.05$) the CG achieved better results on the knowledge transfer test ($M=3.11$). In the third week ($t(322.87)=4.39$; $p<.01$), in the fourth week ($t(369.19)=4.39$; $p<.01$) and in the fifth week ($t(388)=6.41$; $p<.01$), a significant difference was observed, indicating that process, during all three weeks, the group that was taught by means of the model of intersubject connections produced better results than the control group.

Motivation for the Artistic Activity

The total sample ($N=318$ pupils) was divided into the experimental group ($n=152$) and the control group ($n=166$).

A complex variance analysis (complex ANOVA) was carried out in order to determine differences between EG and CG in their motivation for artistic activity, on the basis of the teachers' assessment. In the fifth week, pupils did not do an art assignment and therefore their motivation was not measured.

The results of the complex analysis in the first grade demonstrated a statistically significant interaction effect for the group of pupils (EG and CG) and for the measuring point (1st – 4th week). The analysis of the sample effects demonstrated that there was a significant difference between the EG and CG ($p<.01$) in the first and the third teaching week. In the second and fourth week there was no significant difference.

The results obtained for the fifth grade demonstrated a significant interaction effect for the group of pupils, the measuring point and the treatment. The analysis of simple effects demonstrated that there was a significant difference between the EG and CG ($p<.01$) in each teaching week, except in the first, initial week ($p>.05$).

The results for the eighth grade also demonstrated a significant interaction effect for the group of pupils, the measuring point and the treatment. The analysis demonstrated that there was a significant difference between the EG and CG ($p < .01$) in the first, the second and the fourth teaching week. A significant difference was not observed in the third week ($p > .05$).

Table 8

The results of the complex ANOVA for the level of pupils' motivation (1st+5th+8th grade)

Main effects	F-proportion	df/error df	p
Measuring point	7.52	3/314	.001
Interaction	38.44	3/314	.001
Treatment	22.29	1/316	.001

Table 9

Descriptive statistics and the results of the analysis of simple effects for the level of pupils' motivation (1st+5th+8th grade)

Measuring point	Group	N	M	SD	p
1 st week	Experimental group	152	4.06	1.02	.001
	Control group	166	4.43	.77	
2 nd week	Experimental group	152	4.24	.85	.001
	Control group	166	3.78	1.04	
3 rd week	Experimental group	152	4.38	.97	.001
	Control group	166	3.77	.97	
4 th week	Experimental group	152	4.54	.67	.001
	Control group	166	3.93	.98	

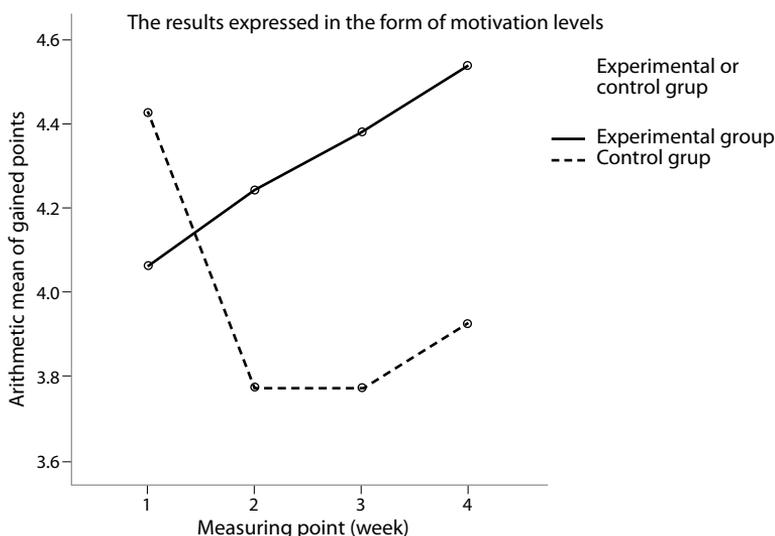


Figure 2. The results expressed as pupils' motivation levels

The results obtained from the 1st, the 5th and the 8th grade taken together, demonstrated a statistically significant interaction effect for the group of pupils and the measuring point. The analysis of simple effects (*Pairwise comparison*) demonstrated that the EG and CG differ ($p < .01$) significantly in every teaching week. From the presented graph (Figure 2), it is obvious that the level of motivation for the pupils' who were taught by using the model of intersubject connections, demonstrates an increasing trend over time. The motivation level of the CG decreased after the first measuring point, but it showed a slight increase in the last week.

Sensitivity to Art Materials and Techniques

The total sample (N=318 pupils) was divided into the experimental group (n=152) and the control group (n=166).

A complex variance analysis (complex ANOVA) was carried out. In the fifth week pupils did not do an art assignment and therefore their sensitivity to art materials and techniques was not measured.

The results of the complex variance analysis for the first grade demonstrated a statistically significant interaction effect for the group of pupils (EG and CG) and the treatment (a total ratio between arithmetic means of gained points). The analysis of simple effects demonstrated that there was no significant difference between the EG and CG ($p > .05$) in the initial, first teaching week. In all three weeks of the research, the EG and CG differed significantly ($p < .01$), with the EG demonstrating an average sensitivity to art materials and techniques.

The results for the fifth grade demonstrated a statistically significant interaction effect for the group of pupils, the measuring point and the treatment. The analysis indicated that the EG and CG did not differ significantly ($p > .05$) in the first teaching week. During the following three weeks of the research, the EG and CG differed significantly ($p < .01$), with the EG demonstrating higher sensitivity to art materials and techniques.

The results of the sample of the eighth grade demonstrated a statistically significant interaction effect for the group of pupils, the measuring point and the treatment. The analysis indicated that there was a significant difference between the EG and CG ($p > .05$) in the initial teaching week. In the following three weeks of the research, there was a significant difference between the EG and CG ($p < .01$), with the EG showing higher sensitivity to art materials and techniques.

Table 10
The results of the complex ANOVA for the level of sensitivity for art materials and techniques (1st+5th+8th grade)

Main effects	F-proportion	df/error df	p
Measuring point	.64	3/314	.592
Interaction	34.21	3/314	.001
Treatment	54.85	1/316	.001

Table 11

Descriptive statistics and the results of the simple effects analysis for the level of sensitivity to art materials and techniques (1st+5th+8th grade)

Measuring point	Group	N	M	SD	p
1 st week	Experimental group	152	3.47	1.04	.054
	Control group	166	3.70	1.03	
2 nd week	Experimental group	152	4.07	.86	.001
	Control group	166	3.24	.94	
3 rd week	Experimental group	152	4.11	.85	.001
	Control group	166	3.07	1.04	
4 th week	Experimental group	152	3.80	.84	.001
	Control group	166	3.39	.99	

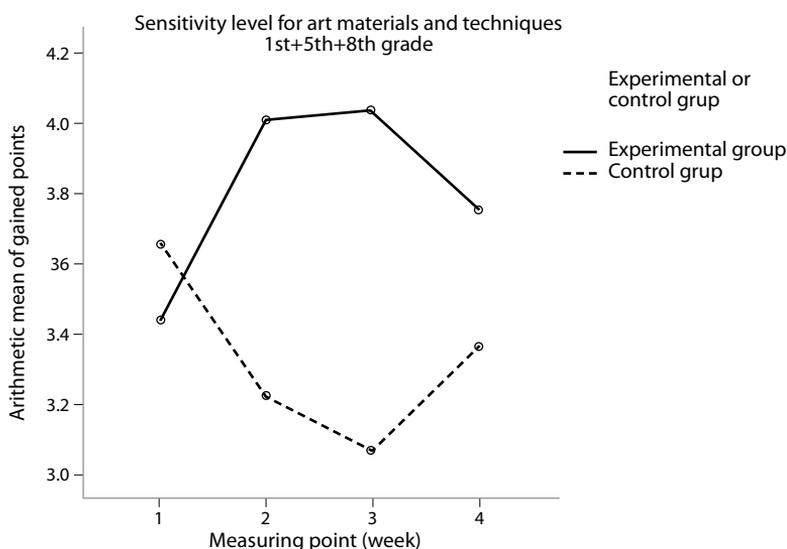


Figure 3. The level of sensitivity to art materials and techniques, all grades taken together

The results for all grades taken together demonstrated a statistically significant interaction effect for the group of pupils and for the treatment. The analysis demonstrated that there is no significant difference between the EG and CG ($p > .05$) in the first teaching week. In the following three weeks of the research, the EG and CG differed significantly ($p < .01$), and the EG showed a higher average sensitivity to art materials and techniques. From the presented graph (Figure 3), it is obvious that the level of pupils' sensitivity to art materials and techniques in the initial week was higher in the control group than in the experimental group and, subsequently, it demonstrated a decreasing tendency during the research, and again a slight increase. The sensitivity level varied in the groups that were taught by means of a model of intersubject connections, then it sharply increased during the second week and it continued to rise in the third week, but it steadily went down in the fourth week; nevertheless, it remained above the average of the control group in all measuring points.

Individuality and Originality

The total sample (N=319 pupils) was divided into the experimental group (n=152) and the control group (n=167).

A complex variance analysis (a complex ANOVA) was used. In the fifth week the pupils did not do an art assignment. Therefore, neither a level of individuality nor a level of originality were measured.

The results obtained in the first grade demonstrated a statistically significant interaction effect for the group of pupils, the measuring point and the treatment ($p < .01$). The analysis demonstrated a significant difference between the EG and CG ($p < .05$) in the first, the second and the third teaching week. In the initial week the CG demonstrated a higher level of originality, and the EG demonstrated greater originality in the second, third and fourth week. In the fourth week of the research, significant difference between the EG and CG ($p > .05$) was not noted.

The results obtained in the fifth grade demonstrated no statistically significant interaction effect for the group of pupils, but there was a statistically significant interaction effect for the measuring point and the treatment. However, the significance level for the interaction was marginal at .06. Therefore, we can conclude that no significance was proven to exist, but an inclination persisted on the level of simple effects analysis due to the fact that the EG and CG differed significantly ($p < .01$) in all four weeks.

The results obtained in the eighth grade demonstrate no statistically significant interaction effect for the group of pupils, while significant interaction effect was shown for the measuring point and the treatment. There were no differences between the EG and CG in the initial week (the control group was slightly ahead). Nevertheless, a significant difference arose in the following three weeks of the research, with the EG showing a greater average originality and individuality.

Table 12

The results of the complex ANOVA for the level of individuality and originality (1st+5th+8th grade)

Main effects	F-proportion	df/error df	p
Measuring Point	.821	3/315	.483
Interaction	32.23	3/315	.001
Treatment	87.17	1/317	.001

Table 13

Descriptive statistics and the results of the simple effect analysis for the level of individuality and originality (1st+5th+8th grade)

Measuring point	Group	N	M	SD	p
1 st week	Experimental group	152	3.72	1.16	.772
	Control group	167	3.76	1.10	
2 nd week	Experimental group	152	4.31	.92	.001
	Control group	167	3.16	1.01	
3 rd week	Experimental group	152	4.27	.88	.001
	Control group	167	3.14	1.21	
4 th week	Experimental group	152	4.11	.95	.001
	Control group	167	3.52	1.11	

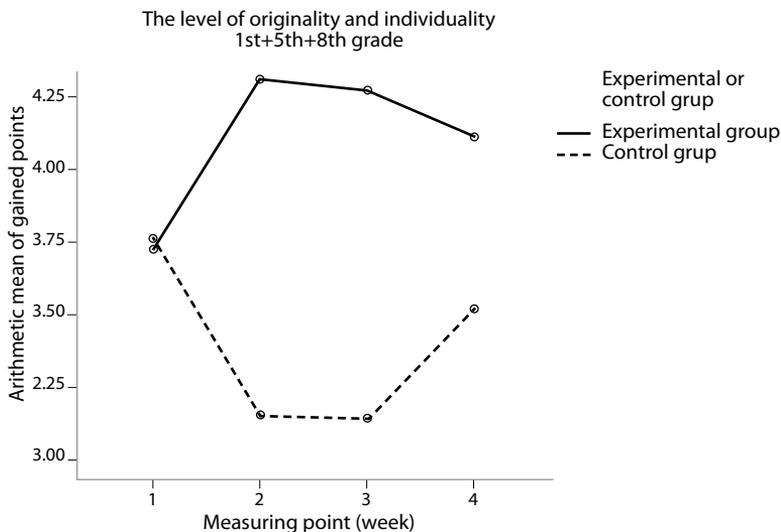


Figure 4. The level of originality and individuality, all grades taken together

The results for all grades taken together demonstrated a statistically significant interaction effect for the group of pupils and for the treatment. There was no significant difference between the EG and CG ($p > .05$) in the initial teaching week. During all three weeks of the research the EG and CG differed significantly ($p < .01$), and the EG demonstrated greater average originality and individuality. From the given graph (Figure 4) it is obvious that the level of originality and individuality was equal in the initial week, and then, during the research, it increased for the experimental group and decreased for the control group. Average originality and individuality was significantly greater in the EG than in the CG.

Critical and Aesthetical Evaluation of Pupils' Own and Other Works of Art

The total sample ($N=376$ pupils) was divided into the experimental group ($n=181$) and the control group ($n=195$).

The data for *the survey questionnaire for determining the possibility of critical and aesthetical evaluation of pupils' own artwork and other works of art* was processed by means of a t-test for independent samples (EG and CG).

The results obtained for the *critical evaluation* for the first grade demonstrate that, in the first week ($p > .05$), a statistically significant difference between the EG and CG was not obtained. In the second week ($p < .05$), in the third week ($p < .01$), in the fourth week ($p < .01$) and in the fifth week ($p < .01$), there was a significant difference between the EG and CG, and the CG was more successful in the critical evaluation questionnaire.

The results obtained for the *aesthetical evaluation* done on the sample of pupils of the first grade demonstrate that, during the initial week ($p < .05$), a statistically significant difference between the EG and CG was obtained in favour of the EG. In the second

week ($p > .05$), in the third week ($p > .05$), in the fourth week ($p > .05$) and in the fifth week ($p > .05$), a statistically significant difference between the EG and CG was not obtained.

The results obtained for the critical evaluation in the fifth grade demonstrate that during the first week ($p < .01$), during the second week ($p < .01$), during the third week ($p < .01$), during the fourth week ($p < .01$) and during the fifth week ($p < .01$), a statistically significant difference was noted, with the CG being more successful.

The results obtained for the aesthetical evaluation in the fifth grade demonstrate that in the first week ($p > .05$), in the second week ($p > .05$), in the fourth week ($p > .05$) and in the fifth week ($p > .05$), a statistically significant difference was not obtained. A significant difference was noted in the third week ($p < .01$).

The results obtained for the critical evaluation in the eighth grade demonstrate that in the first week ($p < .01$), in the second week ($p < .01$), in the third week ($p < .01$), in the fourth week ($p < .01$) and in the fifth week ($p < .01$), a statistically significant difference was noted, with the CG being more successful in the questionnaire.

The results obtained for the aesthetical evaluation in the eighth grade demonstrate that in the initial week ($p < .05$), in the second week ($p < .01$), in the third week ($p < .01$), in the fourth week ($p < .01$) and in the fifth week ($p < .05$), a statistically significant difference between the EG and CG was obtained, and it was in favour of the EG.

Table 14

The results of the conducted t-test for critical and aesthetical evaluation (1st+5th+8th grade)

		N	M	SD	t-test	df	p
1 st week critical evaluation	Experimental	187	44.98	5.15	12.04	345.56	.001
	Control	199	36.94	7.79			
2 nd week critical evaluation	Experimental	179	25.08	3.60	17.15	328.41	.001
	Control	192	16.75	5.61			
3 rd week critical evaluation	Experimental	171	49.70	5.48	17.09	348.42	.001
	Control	194	37.86	7.68			
4 th week critical evaluation	Experimental	184	47.53	5.60	20.85	363.10	.001
	Control	194	33.79	7.16			
5 th week critical evaluation	Experimental	182	23.41	3.62	15.22	377	.001
	Control	197	17.15	4.33			
1 st week aesthetical evaluation	Experimental	187	1.74	1.33	2.76	384	.006
	Control	199	1.38	1.25			
2 nd week aesthetical evaluation	Experimental	179	1.33	.82	3.67	365.65	.001
	Control	192	1.02	.80			
3 rd week aesthetical evaluation	Experimental	172	2.69	1.40	5.25	342.80	.001
	Control	194	1.96	1.23			
4 th week aesthetical evaluation	Experimental	184	2.10	1.42	3.50	376	.001
	Control	194	1.61	1.30			
5 th week aesthetical evaluation	Experimental	182	.85	.89	3.13	352.89	.002
	Control	197	.58	.74			

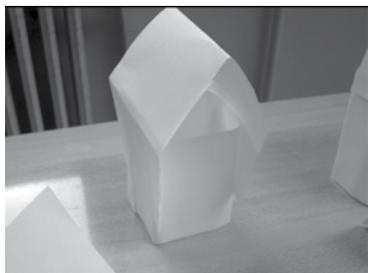
The results of the t-test for determining the possibility of critical evaluation, conducted on the sample of pupils of the 1st, 5th and 8th grade taken together, demonstrate that in the first week ($t(345.56) = 12.04$; $p < .01$), in the second week ($t(328) = 17.15$; $p < .01$), in the third week ($t(348.42) = 17.09$; $p < .01$), in the fourth week

($t(363.10) = 20.85$; $p < .01$) and in the fifth week ($t(377) = 15.22$; $p < .01$), a statistically significant difference between the EG and CG was noted, with the CG being more successful in the questionnaire on critical evaluation.

The results of the t-test for *determining the possibility of aesthetical evaluation*, conducted on the sample of pupils of 1st, 5th and 8th grade taken together, demonstrate that in the first week ($t(384) = 2.76$; $p < .01$), the second week ($t(365.65) = 3.67$; $p < .01$), the third week ($t(342.80) = 5.25$; $p < .01$), the fourth week ($t(376) = 3.50$; $p < .01$), and in the fifth week ($t(352.89) = 3.13$; $p < .01$), a statistically significant difference between the EG and CG was obtained and it was in favour of the EG. The results indicate that the hypothesis H6 on the level of all the results taken together was totally confirmed regarding determining the possibility of aesthetical evaluation, in which the EG was more successful than the CG.

The Analysis of the Results of the Compared Groups

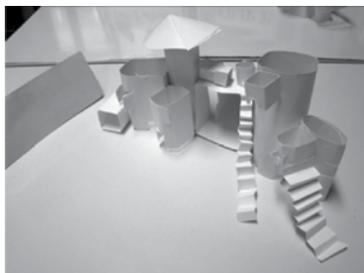
1st grade / Artistic concept: geometric solids / Motif: a house / Art material: paper



C1

1st grade, the control group

The pupil modelled a house following a template (a square + a triangle), only in space. There are no details. A paper folding technique was not explored. Not much effort was put into creating the geometric solids.



E1

1st grade, the experimental group

The motif of a house was created by using many details, including doors, windows and stairs. The paper was folded and joined in many ways and in different directions. The geometric solids are in different sizes, angular and spherical.

5th grade / Artistic concept: symmetry and asymmetry / Motif: a butterfly / Art material: pastel



C2

5th grade, the control group

A butterfly motif is presented as its stereotype, the wings in the shape of mirror letters, such as 'B', and with patterns of 'smiles' and 'hearts' on them. The symmetry is created by setting geometrical figures in a row. The pastel was pressed lightly; the colour is pale.

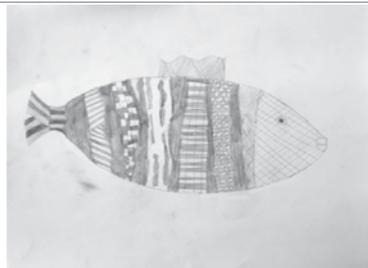


E2

5th grade, the experimental group

The upper wings are bigger, and the lower ones are smaller with the 'swallow tail' on the top. The geometrical figures that are mirrored are various and diagonal. The pastel is pressed hard, which makes colours strong and intense.

8th grade / Artistic concept: rhythm of shapes and tones / Motif: a fish / Art material: a pencil



C3

8th grade, the control group

The shape of the fish is uniform, with only one fin. The rhythm is created by setting verticals in a row. The pencil is pressed fewer times, and it produces a small number of tones and less smudging by using fingers.



E3

8th grade, the experimental group

The shape of the fish is irregular, unusual, with a lot of fins and details. The rhythms follow one another in different directions. A press of the pen creates various tones, from light to dark tones.

Discussion and Conclusions

The conducted research has certain methodological limitations. The test reliability varies. Cronbach α coefficients are considered reliable if $\alpha > .5$, and certain number of tests has a weak coefficient. Nevertheless, these results are considered to be satisfactory, taking into consideration that the tests are picture-based. The sample is not representative; the number of respondents is sufficient, but it did not cover all the cultural environments in the region. The type of schools included tutorial and non-tutorial schools, which can influence the level of competence of the teacher who conducts and evaluates research.

Research Results According to the Hypotheses

H1 The pupils involved in the process of learning by using intersubject connections will achieve better memory of artistic and other concepts.

The results obtained on the sample of pupils of the 1st grade demonstrate that the hypothesis was confirmed only in the last week of the research. The results obtained in the 5th grade confirm the hypothesis for two out of three weeks of the research. The results obtained in the 8th grade confirm the hypothesis entirely. The results obtained on the sample of all the pupils taken together demonstrate that the significance was noted during all the weeks of the research and, therefore, the hypothesis was confirmed entirely.

Having observed lower results of the testing in the 1st and the 5th grade, we can conclude that pupils in the early grades memorise artistic concepts with more difficulty, which is not unusual, since they are neither forced to memorise them nor their knowledge and memory gained at art classes is tested in either written or oral form. For the pupils in the 8th grade, the method of structural correlation created a significant difference between acquiring and memorising knowledge, probably due to a greater acquisition of concepts in other teaching subjects; during art classes, the concepts gained additional meaning and enabled pupils to memorise them more easily.

H2 The pupils involved in the process of learning by using intersubject connections will achieve a better transfer of knowledge from one taught subject to another.

The results obtained in the 1st grade confirm the hypothesis for two out of three weeks of the research. The results obtained in the 5th grade demonstrate that the hypothesis was confirmed during only one week of the research. The results obtained in the 8th grade demonstrate that there was a statistically significant difference between the EG and CG in all three weeks of the research. The results obtained from the total sample of pupils demonstrate that a significant difference between the EG and CG exists in all three weeks of the research, with the EG being more successful.

The influence of intersubject connections was noted in all grades, but in this hypothesis, weaker results were calculated in the first and in the fifth grade, and the outstanding results were calculated in the eighth grade; this is probably due to the reasons mentioned in the previous hypothesis. The significance was noted in the total sample.

H3 The pupils who were involved in the process of teaching by using intersubject connections will demonstrate a higher motivation for artistic activity.

The results obtained in the 1st grade demonstrated a significant difference only during one week, and there was no difference in the other two weeks. The results obtained in the 5th grade demonstrated a significant difference between the EG and CG in all the weeks. The results obtained in the 8th grade demonstrated a significant difference in two out of three weeks. The results obtained for the 1st, the 5th and the 8th grade taken together demonstrated a significant difference between the EG and CG in all the weeks of the research.

The influence of the intersubject connections on the pupils' motivation for art was noted during the whole research, but it reached a significant level in the 1st grade only during one week, in the 5th grade during two weeks, and in the 8th grade in all three weeks. We assume that, as cognitive skills develop, the pupils' motivation also increases due to an "a-ha effect" which is created by common concepts which connect different teaching subjects.

H4 The pupils who were involved in the process of teaching by using intersubject connections will demonstrate better knowledge of special qualities of artistic materials and techniques for using them, connection between materials and artistic concepts, and they will show higher sensitivity to art materials.

The results obtained for each of the studied grades (1st, 5th and 8th) demonstrated a significant difference between the EG and CG in all three weeks of the research. The results obtained for all the grades taken together also demonstrated a significant difference between the EG and CG in all three weeks of the research, and the EG demonstrated a higher average sensitivity to art materials.

It is noted that the influence of the intersubject connections on the pupils' sensitivity to art materials and techniques for using them was at a significant level during the whole research in all grades. We conclude that the hypothesis is confirmed entirely, regardless of the pupils' age.

H5 The pupils who were involved in the process of learning by using intersubject connections will demonstrate greater individuality and originality, and will avoid visual patterns while expressing themselves artistically.

The results obtained in the 1st grade demonstrated a significant difference between the EG and CG in two weeks of the research, and there was no significant difference in one week. The results obtained in the 5th grade demonstrated that the difference in the interaction effect is marginal, even though there is a significant difference between the EG and CG in all four weeks of the research. The results obtained in the 8th grade demonstrated no significant interaction effect, even though the significance on the level of simple effects analysis appeared in all three weeks of the research. The results obtained for all grades taken together, demonstrated a statistically significant interaction effect, and the analysis indicated that the EG and CG differed in all weeks of the research, and the EG demonstrated greater originality and individuality.

It is noted that the influence of the intersubject connections on the originality and individuality of pupils existed during the whole research, but it reached a significant level only in some weeks, in some grades and in total results. Therefore, the hypothesis is only partially confirmed.

H6 The pupils who were involved in the process of learning by using intersubject connections will demonstrate greater ability to critically and aesthetically evaluate their own works of art and artworks in general.

The results obtained for the possibility of critical evaluation for the 1st grade demonstrate a significant difference between the EG and CG in all four weeks, while the results of the test on *aesthetical evaluation* demonstrate that a significant difference was not obtained during the research. The results obtained for the *possibility of critical evaluation* in the 5th grade demonstrate a significant difference between the EG and CG in all weeks, while the results obtained for *aesthetical evaluation* demonstrate that a significant difference was not obtained. The results obtained for the possibility of critical evaluation in the 8th grade demonstrate a statistically significant difference in all weeks, and also, the results obtained for *aesthetical evaluation* demonstrate a significant difference in all weeks, in favour of the EG. Therefore, the hypothesis is partially confirmed for the 1st and the 5th grade and entirely confirmed in the 8th grade. The results obtained for critical evaluation on the total sample of all the pupils taken together demonstrate that there is a significant difference in all weeks, and the same applies to the results of the *aesthetical evaluation*. Therefore, the part of the hypothesis referring to critical evaluation of an artwork is confirmed entirely. On the other hand, the part of the hypothesis referring to *aesthetical evaluation* is confirmed only partially; it is not confirmed in the first and in the fifth grade, and it is entirely confirmed in the eighth grade.

As in previous hypotheses, the success of the method of intersubject connections increases with the age of pupils, while it is much smaller during the early years of education (but it still exists). For both critical and *aesthetical evaluation*, it is necessary

to have cognitive skills which are more developed in later grades, while in early grades of education pupils are probably led by their own feelings and habits they acquired from the environment which shaped their personalities, such as parents, teachers, peers, mass media, etc.

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Miroslav Huzjak

Faculty of Teacher Education, University of Zagreb
Savska cesta 77, 10000 Zagreb, Croatia
miroslav.huzjak@ufzg.hr

Utjecaj međupredmetnog povezivanja na uspješnost učenika pri poučavanju likovne kulture

Sažetak

Međupredmetno povezivanje (korelaciju) u Likovnoj kulturi učitelji većinom izvode na temelju likovnog motiva, a ne na temelju spoznavanja likovnih pojmova. To dovodi do slabih kognitivnih, psihomotoričkih i afektivnih rezultata poučavanja, a nije ni u skladu s doseganjem ciljeva u likovnoj djelatnosti. Ne dolazi do prijenosa znanja, već se stječe uvjerenje da u umjetnosti nije dovoljno znanje, već da je potrebno samo „osjećati“. Stoga su glavni ciljevi ovog istraživanja: ustanoviti kakav je utjecaj međupredmetnog povezivanja na cjelovit likovni razvoj (kognitivni, afektivni i psihomotorički) pojedinog učenika pri poučavanju likovne kulture, kakav je utjecaj međupredmetnog povezivanja na motivaciju učenika pri poučavanju likovne kulture, oblikovati smjernice za izobrazbu učitelja o planiranju međupredmetnog povezivanja i izraditi model izvedbe korelativnog povezivanja za praksu učitelja. Istraživanje je provedeno na uzorku od 403 učenika, u prvim, petim i osmim razredima, u četiri škole. Ustanovilo se da su učenici koji su bili uključeni u proces poučavanja međupredmetnim povezivanjem postigli djelomično bolje razumijevanje likovnih i drugih pojmova od kontrolne grupe (značajne razlike nije bilo u jednom tjednu prvog i petog razreda). Učenici eksperimentalne grupe postigli su statistički značajno bolji transfer znanja, stupanj motivacije, osjetljivosti na likovne materijale i postupke, stupanj originalnosti i individualnosti i stupanj kritičkog vrednovanja i estetskog ocjenjivanja.

Ključne riječi: *korelacija u nastavi; likovna kultura; likovno izražavanje; likovno znanje i spretnost; transfer znanja.*