



THE COGNITIVE ASPECT OF INTERACTIVE LEARNING AND TEACHING IN VISUAL ARTS EDUCATION

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Abstract/Izvleček The task of contemporary visual arts education is to enable quality interaction among all subjects of the teaching process, through which the students are encouraged to think, imagine, and develop higher-order cognitive activities. The objective of this empirical research study was to verify the differences in the results of students in the control and experimental groups (n=285) regarding their knowledge and understanding of visual arts content. Analysis of the results shows that the students in EG showed significantly better results compared to the students in CG, which means that the interactive model of learning and teaching positively influenced the students' understanding of visual arts content.

Kognitivni vidik interaktivnega učenja in poučevanja pri pouku likovne umetnosti

Naloga sodobnega pouka likovne umetnosti je omogočiti kakovostno interakcijo med vsemi udeleženci učnega procesa, s pomočjo katere učence spodbujamo k razmišljanju, domišljiji, ustvarjanju novih idej in razvoju kognitivnih dejavnosti višjega reda. Cilj izvedene empirične raziskave je bil preveriti in analizirati razlike v rezultatih učencev v kontrolni (KS) in eksperimentalni skupini (ES) (n = 285) glede znanja in razumevanja vsebin pri pouku likovne umetnosti. Analiza rezultatov je pokazala, da so učenci v ES pokazali bistveno boljše rezultate v primerjavi z učenci v KS, kar pomeni, da je interaktivni model učenja in poučevanja pozitivno vplival na razumevanje vsebine pouka likovne umetnosti pri učencih.

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Introduction

Modern pedagogical theories (constructivism, cognitive theories) define learning as a personal creative process that involves the active changing and transformation of facts, an individual's interpretation and organization of knowledge, and its use in everyday life. On the other hand, teaching is defined as a process of appropriate support for learning (Senge, 2000; Plut Pregelj, 2008). These definitions manifest a change in the school paradigm and a shift in the educational process from a transmission approach towards a transformational approach to learning and teaching. The transmission approach to learning and teaching is determined by the students' adoption of ready-made constructs of organized knowledge in a manner involving passive acceptance of the facts offered by their teacher. The transformational approach to learning and teaching is defined as an approach in which the teacher encourages the students' active participation through inquiry-centered learning (stimulating interaction, conversation, discussion, research, and problem-solving of visual arts tasks), through which students achieve their complete development (Mezirow (Ed.), 2000; Taylor, 2017; Paek, 2019). Changing the paradigm from behaviorism to cognitivism has had a considerable effect in the field of art, as previously the artistic fields were classified in the affective domain because they were not considered cognitive. This change marked the beginning of an understanding of art as a cognitive activity. Guilford (1968) and other creativity theorists place the classification of creative factors in the field of mental activity. Theories of perception, as well as contemporary theories of the symbolic characteristics of visual language, have been emphasizing the role of intellectual processes in understanding the visual symbols in artworks as well as "reading" them. This fact also emphasizes the importance of cognitive activities for both artistic expression and artistic reception in visual arts classes. Contemporary art education is based on developing pupils' productive, artistic-creative skills and their receptive abilities. The latter include art appreciation, where pupils are introduced to the acts of perceiving and receiving, thus evaluating and internalizing works of art (Duh, 2016). It can be concluded that cognitive development is necessary for the development of visual arts skills and that the development of various cognitive activities should be encouraged through visual arts classes. Learning new things is easier if pupils' knowledge is more structured, since this helps the learner add new information to the existing system and to use knowledge. Therefore, pupils need to

acquire cognitive learning strategies, i.e., how to organize and acknowledge already obtained knowledge (Arov, & Jørg, 2017).

Cognitive development in the context of contemporary visual arts pedagogy theories

Efland (2002) cites Gardner and Eisner as the first theorists to point out in the 1980s the peculiarities of cognitive processes specific and unique to artistic thinking and creation, and which, as such, contribute to an individual's complete cognitive development. In his theory of multiple intelligences, Gardner (1993) states that every intelligent activity in itself involves multiple types of intelligence. Speaking in the context of visual arts, visual expression, for example, involves spatial intelligence. However, it may also include logical-mathematical intelligence if it is a representation of a linear perspective, or physical-kinesthetic intelligence if it is a three-dimensional design in sculptural material (Simmons, 2001). By criticizing the focus on verbal and mathematical systems of symbols in school curricula (and neglecting the artistic ones), Gardner (1993) also argues that a broader representation of various intelligence or symbol systems would extend the range of cognitive abilities, bringing balance to the curriculum. On the other hand, Eisner (1982, 2002) argues that the mind develops multiple forms of representation through experiences acquired through the senses, which can be based on visual perception, auditory and/or tactile sources. If it were possible to convey everything that people want to express in one or two forms, others would be unnecessary or redundant. Thus, each of the arts offers unique ways of presenting ideas and feelings. The presence of multiple areas of art in the school system can therefore be justified in terms of the cognitive skills they nurture. Art education is therefore a subject where pupils continuously express themselves creatively and also develop the ability to receive and perceive works of art (Duh, & Herzog, 2016). The richer range of experiences within individual school subjects creates the preconditions for shaping a wide range of cognitive potentials that students will be able to develop.

Today's postmodern society places increased demands on individuals for developing complex cognitive abilities, including those nurtured through various artistic forms. Efland (2002) cites four features provided by the arts, which can facilitate everyday life in today's circumstances. Those are as follows:

- the cognitive flexibility argument, which takes into account the complex and ill-structured character of learning, where judgements are made unguided by rules or generalisations that cover multiple cases, and this includes most situations in life;
- the integration of knowledge argument, where the interpretation of artworks draws strength from knowledge in collateral domains, enabling the learner to understand the context of the work;
- the imagination argument where imagination is identified as a pervasive structuring activity using metaphor and narrative to establish new meanings and achieve coherent, patterned, and unified representations; imagination is essential to our rational capacity to find significant connections, draw inferences, and solve problems;
- the aesthetic argument, which establishes the point that perceptually vivid aesthetic encounters in the arts have educational value.

Students' cognitive development within visual arts education

Students' cognitive development presupposes the activation of their cognitive abilities, by which they discover the reality around them. The development of the students' cognitive abilities is manifested in the reproduction or recognition of knowledge, and the development of intellectual capacities and skills that enable students to use that knowledge. Different thoughts are formed in the brain of an individual based on emotional experiences. By thinking about what we see, hear, or experience with other senses, we renew images, sounds, and feelings within ourselves and process them according to our own experiences and previous constructs. In the context of visual arts, the development of cognitive abilities implies an increasing perception and appreciation of space and objects in it, its visual characteristics, and relations between visual elements. Butina (1997) considers artistic thinking a special form of productive thinking that leads to an artistic experience, i.e., artistic production. This means that artistic thinking is an integral part of artistic expression, which gives it a creative characteristic. Thinking is a process that happens over time, but cognition is the result of that process. Visual

content is designed with the help of visual thinking, which enables the choice of the manner of artistic formulation and expression of an idea (Muhovič, 1992).

The complex character of visual arts classes influences the development of numerous cognitive functions and abilities through the process of visual cognition, visual thinking, processing collected data of visual and non-visual content, transformation of input through practical activity, and the assessment of one's own and other's artistic/visual messages i.e. visual literacy (Hardiman, 2019; Morris, Lummis, & Lock, 2018). Acquiring the knowledge of artistic concepts and visual language is one of the basic goals of teaching visual arts education in primary school. The teacher thus plays an important role in the process of the students' acquisition and understanding of visual arts knowledge. In order to properly stimulate cognitive development among students, the teacher should respect their developmental levels and adapt the teaching process to the cognition levels of a particular age group. The terms used in the syllabus should be used in teaching; a rich vocabulary should be used to refer to the visual arts content and to accustom students in this way to the specifics of visual arts language, i.e., talking about visual arts. The teacher should also seek appropriate teaching methods to guide students to understand the content material and draw their own conclusions. Teaching should be based on the problem-solving approach to learning and teaching, whereby the visual problem is indirectly revealed, and the teacher instructs the students through conversation to think about it, understand it, and seek possible solutions through visual expression based on new knowledge. The aim of visual arts education is for students to achieve in-depth processing of information, which ensures long-term memory and the capacity for knowledge application, as opposed to the surface capture of content that will remain only in short-term memory. Applied knowledge is characterized by mastering cognitive skills, learning strategies, research procedures, and problem solving.

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Opportunities to foster cognitive development through an interactive approach to learning and teaching in visual arts education

In visual arts classes, students learn in parallel through theory and practice, while actively constructing knowledge about the world and themselves. Teaching should be focused on stimulating learning through cognitive activities such as self-observation, classification, analysis, synthesis, comparison, generalization, inductive and deductive reasoning, analogy creation, and evaluation, as the highest goal for the cognitive domain, which includes the student's ability to evaluate artworks (ideas, procedures and processes) in accordance with specific goals, and to identify values and attitudes; evaluation includes all the levels mentioned above, conscious judgments and critical thinking of students.

In visual arts education, it is very important that there be appropriate interaction and cooperation between all subjects in the teaching process. It is most successfully achieved through an interactive approach to learning and teaching, in which the emphasis is placed on better communication among all subjects of the educational process and on the use of teaching strategies that provide greater student activity, such as learning through problem solving, active learning, experiential learning, learning through play, and group work (Tomljenović, 2015). Through these activities and the application of appropriate teaching methods, students are encouraged to think, compare, ask questions, imagine, create new ideas, develop artistic sensibility, and to develop higher-order cognitive activities such as analysis, synthesis, evaluation, and critical thinking. The use of art material and techniques increases the students' thinking, understanding, experience, and application of theoretical settings through artistic expression, which renders visual arts education an important area for simultaneous and complementary cognitive, affective, and psychomotor development.

The interpretive activity in constructing new knowledge is particularly present in visual arts education. It is important that the teacher does not have prejudices about one appropriate way of solving visual arts problems, but instead develops a sensitivity to student solutions, remaining open to new and different ideas, and through interaction with students and by asking them appropriate questions, seeks to understand the reasoning behind each student's perception. This can help in gaining insight into the students' mode and style of cognition, cognitive abilities,

attitudes and beliefs, as well as areas that still need to be developed. Knowing this is the basis for further selection and preparation of the teaching process and visual tasks. Since students create their own cognitive constructs, the teacher has the role of an indirect leader, coordinator, and one who directs students towards independent individual conclusions. The teacher should also provide the necessary sources of information and other materials that will help the students in building their own knowledge based on their own thinking, i.e., the transformation of their representations from one form to another. When gaining new knowledge in visual arts classes, it should be taken into account that the construction of knowledge occurs by linking new concepts to old structures if a connection is established between these. Therefore, students should be encouraged to engage in communication in which, based on their experience, they will come up with new ideas and, with the help of the teacher, draw new conclusions. This way of gaining knowledge is tied to Piaget's idea of resolving a cognitive conflict and to Vygotsky's theory of the zone of proximal development (Esola, & Nelson, 2019). Problem-based visual arts tasks provoke a cognitive conflict that triggers changes in the students' thinking and leads them to seek solutions independently and creatively.

In contemporary visual arts education, problem-solving strategies are used as a model for acquiring new visual knowledge and skills and using these in everyday life. According to Guilford (1968), creative thinking and problem solving are the same phenomenon. Both situations cause a cognitive conflict in an individual that can be resolved by using the old learning strategies in a new way, or by finding and using new strategies that lead to a satisfactory solution. In visual arts education, the purpose, goals, and tasks of problem solving are inseparably linked to the creative dimension of personality, so that solving them activates, in addition to cognitive skills, social, motivational, emotional, intuitive abilities, i.e., the entire conative area, including psychomotor abilities (Karlavaris, & Berce Golob, 1991). When discussing ways to provide the conditions for understanding what and how children learn in the arts, Eisner (2002) emphasizes precisely the visual arts problem, i.e., the situation in which students' existing conceptual and technical repertoires are insufficient to address what they confront; thus, they are encouraged to think about how to deal with the problem in new ways.

Methodology

Research problem and aims

In the Croatian school practice, especially at the level of homeroom teaching, visual arts education is still considered as a process aimed at developing expression, emotions and motor skills, without proper emphasis on the cognitive aspect of students' development (Tomljenović, & Novaković, 2014). The student's artistic activity is mainly directed towards the realization of the artistic motif using the given art techniques, but without the understanding and realization of other goals of visual arts classes, despite the guidelines for contemporary concepts in the Visual Arts Curriculum prescribed by the Croatian National Educational Standard (hereinafter: CNES). This attitude is also characteristic of teaching other arts, which are generally considered to be concrete and emotional, but not abstract or mental activities, in which the hands act rather than the head, and as more closely related to play than to work, practice, and benefit. However, the teaching tasks that art education places at the forefront – noticing subtle, qualitative artistic-aesthetic relationships, imagining possibilities, identifying elements of the visual language and their relationships, interpreting the metaphorical meanings of artworks, generating new and unusual ideas, taking advantage of unforeseen opportunities while working – require complex cognitive operations. Moreover, the contemporary conceptual teaching of visual arts offers numerous opportunities for the development of various cognitive activities.

The research described in this paper is part of a broader study conducted to improve the quality of visual arts education; this study focused on evaluating the impact of an optimized, interactive model of learning and teaching in visual arts on students' knowledge and understanding of visual content, abilities, and skills in the use of visual materials and techniques, as well as creativity in solving art tasks. This paper describes part of the research related to examining the effect of the application of an interactive model in visual arts on the acquisition by students of knowledge and understanding of visual content at the elementary school grade level. This part of the research aimed to develop a model of learning and teaching visual arts that will ensure the acquisition of greater knowledge and a better understanding of the visual content prescribed by CNES.

With regards to the research aims, the following hypothesis was formed:

H: Students in the experimental group will demonstrate greater knowledge and understanding of visual content than students in the control group.

Research Sample

Table 1: Number and distribution of students per grade

	Group	N	f	f%
Second grade	CG	71	143	50.2
	EG	72		
Forth grade	CG	68	142	49.8
	EG	74		
Total			285	100

The sample of participants in the pedagogical experiment included 285 second- and fourth-grade students from four elementary schools in Rijeka (Table 1).

Data Collection Procedure

The research was based on quantitative research paradigms, using a pedagogical experiment. In this paper, the results obtained by tests of knowledge are described and related to the verification of knowledge and understanding of the processed art content. The experiment was conducted in parallel groups (control and experimental groups), within which the effect of the implementation of the experimental teaching model was tested. The research included 16 second- and fourth-grade homeroom classes (students aged around 8 and 10 years); eight classes (four second-grade and four fourth-grade classes) represented the control group, and the other eight (four second-grade and four fourth-grade classes) constituted the experimental group.

When selecting a sample, the attempt was made to include classes which had the most similar characteristics (material and technical conditions of work; number, gender, and school achievement of the students). The classes were not physically contiguous; the sample consisted of 285 students (139 in the control group and 146 in the experimental group) and 16 homeroom teachers (eight in the control group and eight in the experimental group). The research was conducted as a painting

activity and included the implementation of five teaching units (one for verifying the initial state) carried out in the control and experimental groups.

For the purpose of verifying the variables, two different ways of performing the teaching process were included in the study. The first one used an optimized, interactive model of learning and teaching via modern teaching strategies and methods. Another way of teaching was implemented through the use of established approaches to learning and teaching according to the teachers' usual operating mode. Teachers in EG received additional training on the interactive approach to learning and teaching and were provided with specially designed instructional guidelines from the trained research leader for the implementation of each teaching unit. Teaching units containing the following visual problems were implemented in

- the second grade: 1. Light and dark colors; 2. Warm and cold colors; 3. Color tones (chromatic and achromatic colors); 4. Pure and mixed colors;
- the fourth grade: 1. Rhythm of warm and cold colors; 2. Color texture; 3. Color degradation; 4. Color harmony.

Teaching units were selected from the National Curriculum for Primary Schools (*Nastavni plan i program za osnovnu školu, 2006*) for the second and fourth grades of primary school, Visual Arts subject, area of painting.

For the purposes of the study, an instrument was designed that included tests of knowledge and understanding of visual concepts and content for second- and fourth-grade students. Knowledge tests were conducted in CG and EG at the beginning and the end of the pedagogical experiment. They included questions that tested the general visual knowledge in the area of painting prescribed by the Curriculum for the second and fourth grade. Objectivity and validity were calculated for the knowledge test. Statistical analysis of the tests was performed separately for the second and fourth grades. Taking the test took 10-20 minutes. Student testing was conducted by teachers who would normally teach in the classrooms that participated in the study. The tests were based on closed-ended questions that related to knowledge of the visual language, art materials, techniques, and motifs. At the beginning of the school year, as had been expected, some visual concepts were unknown to the students. The testing at the beginning and the end of the pedagogical experiment aimed to determine the difference in the students' level of knowledge and understanding of visual arts concepts and content at the beginning and the end

of the school year, i.e., to determine which group would achieve better results at the end of the school year compared to the initial state.

Basic descriptive statistics and inference statistics were used for the purpose of the study. The following statistics were used to process the results of knowledge tests of second- and fourth-grade students: descriptive statistics, the Kolmogorov-Smirnov (K-S) test to check the normality of the distribution of the results, and the non-parametric Mann-Whitney U test to compare the differences between the two groups (CG and EG). The collected data were analyzed with the statistical analysis software Statistica, Version 8.0, StatSoft, Inc.

Results and Interpretation

The knowledge test for second-grade students

Table 2: Results of Mann-Whitney's U test in CG and EG after performing initial and final knowledge tests in the second grades

	Mann-Whitney U test	Wilcoxon W	Z	p	CG Median	EG Median
Initial	2501.500	5129.500	-.222	.824	13.0000	13.0000
Final	695.500	3251.500	-7.579	.000	16.0000	19.0000

Using the Mann-Whitney U test to compare the significance of the difference between the two independent groups of scores revealed that the difference in the achievement between the control and experimental group was not statistically significant ($Z = -.222$; $p > 0.05$) (Table 2). Based on the statistical analysis, it can be seen that the students in CG and EG had the same baseline on the first test at the beginning of the school year (before conducting the pedagogical experiment). The students in EG scored an average of 13.01 points on the initial test at the beginning of the school year, and the students in CG scored 13.16 points. In the final test, the students in EG achieved an average of 18.38 points, and the students in CG scored 15.66 points. The difference in success on the final test between the students in EG and CG, calculated using Mann-Whitney's U test, is statistically significant ($Z = -7.579$; $p < 0.01$) (Table 2).

The differences in the final test compared to the initial test are significantly greater in EG than in CG. The differences in the result in CG also go in the direction of result improvement; however, they are less pronounced than in EG. The most significant progress in CG was achieved in matters related to the classification of primary and secondary colors as well as warm and cold colors. The least progress was made in CG regarding issues related to recognizing the type of motif in the paintings. The greatest advances in EG were made in matters related to the recognition of light and dark colors, the recognition of painting techniques, and the recognition of the type of motif in the paintings. The least progress was observed in the recognition of warm colors and painting techniques of tempera and watercolors.

Analysis of the results shows that the interactive model of learning and teaching in this pedagogical experiment had an impact on achieving better results in the knowledge and understanding of visual concepts and content by the students in EG. In general, it is possible to observe considerable improvement within the experimental group and a slight improvement within the control group.

The knowledge test for fourth-grade students

Table 3: Results of the Mann-Whitney U Test in CG and EG after performing the initial and final tests in the fourth grades

	Mann-Whitney U test	Wilcoxon W	Z	p	CG Median	EG Median
Initial	2401.000	5102.000	-.338	.736	13.0000	12.0000
Final	810.500	3156.500	-7.039	.000	14.0000	16.0000

Using the Mann-Whitney U test, it was found that the difference in achievement between the control and experimental groups in the initial state was not statistically significant ($Z = -, 338; p > 0.05$) (Table 3). Based on the statistical analysis, as with the second-grade students, it can be observed that the students in CG and EG had the same baseline on the first test at the beginning of the school year (before conducting the pedagogical experiment).

The comparison of CG and EG shows that the students in the experimental group averaged 12.10 points on the initial test at the beginning of the school year, while students in the control group scored 12.12 points. On the final test, students in the experimental group achieved an average of 16.32 points, and students in the control group 13.88 points. The difference in success on the final test between the students in CG and EG, calculated using the Mann-Whitney U test, is statistically significant ($Z = -7.039$; $p < 0.01$) (Table 3).

The differences on the final test compared to the initial test are significantly greater in EG than in CG. The differences in CG also go in the direction of result improvement, albeit less pronounced than in EG. The greatest advance in CG is evident in matters related to the classification of primary and secondary colors as well as warm and cool colors. The least progress in CG is evident in matters related to the recognition of motifs in the pictures. The major advances in EG are present in matters related to the recognition of achromatic and chromatic colors and the contrast of light and dark colors. The weakest progress in EG is evident in recognizing dynamic and moderate rhythm and contrast of warm and cold colors.

It can be concluded that there were statistically significant differences in the final state between EG and CG in the area of knowledge and understanding of visual material, which means that the students in EG showed better understanding and knowledge of visual terms and concepts than the students in CG.

Given the results in the final state between EG and CG in the second and fourth grades, it can also be concluded that the research hypothesis has been confirmed.

There is an assumption that the more pronounced success of the optimized model of teaching in EG, compared to results for the established approach to teaching in CG, is a consequence of designing visual arts tasks to stimulate communication between students and teachers and thus to yield better understanding and knowledge of visual content by students. By applying subject-specific (visual arts) teaching methods, the material was presented in accordance with specific visual arts problems in the field of painting, which means that students became acquainted with the teaching content in a more appropriate, comprehensive, and interesting way. The teaching approach was tailored to different cognitive types, learning styles, and student ages, as the teaching materials were presented in a way that included a variety

of sensory experiences, teaching aids, inductive and deductive reasoning, as well as more or less structured teaching situations. In EG, the teaching units were conducted on the basis of well-established teaching preparations, with particular emphasis on how teaching materials were presented, and the use of appropriate teaching methods in order to include all students' learning styles and to stimulate student motivation, interest, and active interaction with the teacher and each other. The teachers received explanation on the importance of communicating with students and ways of asking appropriate questions, as well as the significance of stimulating active conversation as a basis for better adoption of visual concepts and developing critical and creative thinking and expression. EG teachers were particularly drawn to the need to use various teaching aids; for this reason, a PP presentation was prepared for each unit by the research leader, as well as various reproductions of artworks and other teaching aids.

As mentioned before, during the implementation of the experimental model of teaching, special attention was paid to active teacher-student interaction, during which the teachers presented the visual content in a planned and thoughtful way. They used meaningful questions related to the teaching material as a means to direct students toward recognition, identification, and interpretation of visual phenomena. The teachers had an active conversation with the students about the aesthetic and visual components of the artworks and encouraged them to make connections between the visual content and situations in everyday life. The questions also motivated the students to relate new visual knowledge to already adopted ideas and to elaborate their own conclusions with the aim of verbalizing their thoughts and ideas, encouraging self-expression to improve their thinking and production of ideas as well as developing self-confidence and critical thinking.

Using a variety of didactic aids, the teachers in EG created learning situations in which students could gain new experiences and develop cognitive skills in direct interaction with the learning material. In the teaching process, group work was also applied, during which the students solved art problems through creative play (puzzle-folding, color-matching of papers depending on the task, mosaic-stacking, word and image pairing, etc.). Through group work, students develop interaction with other students, share knowledge, feelings, and ideas, while developing the capacity for verbal and non-verbal communication, tolerance, and confidence.

Based on description of the activities carried out in EG, it can be concluded that the teaching of visual arts encompasses much more than mere visual expression. One of the basic goals of teaching visual arts is the development of creative imagination and fostering a number of skills that will help the student to solve problems creatively. The acquisition of knowledge relates not only to the knowledge of the visual arts content, but also to the knowledge of creativity, analysis, and visual communication (Turković, 2009), which implies the development of numerous and diverse cognitive functions. Thus, when we talk about the cognitive abilities that can be developed in visual arts classes, we should be aware that they refer, on the one hand, to activities in the field of reason, conceptualization, logic, and formal thought discourse and, on the other, to the realm of our equally worthy physical, perceptual, material, emotional, and imaginative nature (Turković, 2009). Guilford (1968) states that cognitive processes related to problem solving include convergent activity (analytical, logical thinking) and divergent activity (creative thinking). Activation of both types of thinking is crucial in effective problem solving, i.e., in the overall cognitive development of personality. The specificity of visual arts education, which combines the theoretical and practical/ creative part, provides optimal conditions for the development of both types of thinking. Chishti, and Jehangir (2014) find that early experiences with visual arts might have great influence on the attainment of cognitive abilities, such as creative thinking and problem solving. Visual arts education, as a domain for fostering divergent as well as convergent thinking, should promote problem-solving skills in students by having them observe visual elements and recognize the relation between them, understand the visual language through interactive conversation among all participants in the teaching process, and develop visual sensibility through artistic activities. The results of numerous studies also prove the importance of visual arts education in the development of higher-level thinking skills that are transferred to later life, as well as various cognitive skills, which lead to successful cognitive outcomes in other teaching areas and disciplines beyond the arts (Alter, 2009; Caiman, & Jakobson, 2019; Chishti, & Jehangir, 2014; Danesi, 2020; Eisner, 2002; Formichov, & Formichova, 2019; Ghanbari, 2015; Keinänen, Hetland, & Winner, 2000). However, research also shows that most primary school teachers still lack awareness of the need to develop certain cognitive abilities through arts, such as acquiring visual arts concepts and content, verbally expressing and interpreting knowledge and experiences in the field of art, or developing artistic and aesthetic attitudes (Tomljenović, & Novaković, 2014). Although most teachers consider this subject of great or very high importance in

primary school, most teachers also consider practical artistic activity as the most important part of visual arts teaching and thus affirm that understanding the importance and purpose of the subject is primarily related to the practical expression and development of manual skills (*ibid.*). This attitude is still deeply rooted in Croatian school practice at the primary school level. Tanay (2001) refers to the widespread view of the visual arts as a subject whose content cannot be learned but can only be mastered by exercise; Tanay sees the cause behind this attitude in the lack of expertise among classroom teachers, who believe that the teaching of visual arts is based on feelings and preference (talent) for the visual arts area. On the other hand, research results also show that the arts have not been taught adequately in pre-service teacher education courses and that (among other things) in-service teachers often have misconceptions about the purpose, tasks, and goals of visual arts teaching (Alter, Hayes, & O'Hara, 2009; Garvis, & Pendergast, 2012; Nilson, Fetherston, McMurray, & Fetherston, 2013); they might also feel insufficiently competent to teach visual arts (Garvis, 2009; Russell-Bowie, 2012; Tomljenović, & Novaković, 2019). Therefore, it is necessary to work continuously on updating study programs but also on the professional development of teachers in this area. The goal of lifelong teacher education is to change teachers' attitudes towards their role in the teaching process and to increase their awareness of their own responsibility for the quality of teaching, as well as their awareness of the need to change outdated approaches to learning and teaching in the direction of an (inter)active, dynamic, and professional approach to learning and teaching. The aim of visual arts education is to achieve in-depth processing of information by students, which ensures long-term memory and the application of knowledge, as opposed to the superficial capture of content that will remain in short-term memory. Applied knowledge is characterized by the mastery of cognitive skills, learning strategies, research procedures, and problem solving. Students also need to develop metacognitive knowledge – an awareness of their own ways of thinking and learning and of the potential need for changing them (Bakračević Vukman, 2004). In order for these goals to be achieved, it is imperative that teachers be aware of them; knowledge of the goals, purpose, and outcomes of learning and teaching in visual arts education is a basic starting point for the successful realization of visual arts classes.

Two important types of thinking are developed in contemporary visual arts education: creative and critical thinking. Both types of thinking are vital life skills that make it easier to solve the complex problems generated by the ambiguity and uncertainty of daily life. Numerous studies demonstrate a significant positive correlation between encouraging the development of critical and creative thinking skills on cognitive learning outcomes (Alter, 2009; Siburian, Corebima, & Saptasari, 2019; Lin, & Wu, 2016). Although creative thinking is more often associated with the subject Visual Arts, the development of critical thinking should not be neglected. The capacity for critical thinking is proving increasingly important in today's world, in which new information multiplies rapidly, as it enables the creation of one's own concepts, attitudes, and ideas. Therefore, the ability to develop critical thinking is considered an important pedagogical competence that needs to be developed in teachers (Nilson, Fetherston, McMurray & Fetherston, 2013). The development of creative and critical thinking should be at the center of the educational process, as well as one of the basic goals not only in visual arts education but in teaching generally.

Conclusions and Practical Implications

This study was conducted to examine the extent to which the contemporary, interactive model of fine arts teaching can influence the stimulation of various cognitive activities in students and thus the quality of learning and understanding of teaching content. An interactive approach to teaching and learning in visual arts emphasizes better communication among all subjects in the educational process and on the use of teaching strategies that provide greater student activity, such as problem-solving learning, learning through play, active learning and experiential learning. This approach also encourages students to participate more in conversations with teachers, to express their opinions and ideas more easily, enabling them thereby to understand the teaching content better and to experience greater activity and creativity in the teaching process. An interactive approach to learning and teaching is also based on actively encouraging the development of students' cognitive abilities through observing, formulating problems and solving problems, asking and answering questions, making new conclusions, as well as understanding and using terms/elements of a visual language in their verbal and artistic expression. A knowledge test was used to test the second- and fourth-grade students' knowledge and understanding of visual content in the field of painting. The statistical analysis

of the results showed that students in the final state of EG achieved statistically significantly higher scores than students in CG, in both the second and fourth grades. This means that an optimized interactive model of learning and teaching, based on a problem-solving approach to art tasks, adopting and understanding art concepts and content through an active and self-directed approach to learning, independent inference, creative play, affective experience, and motor activity, has resulted in a better knowledge of visual concepts and a deeper understanding of the teaching material among students in EG. The results of the study showed that students in EG were more involved in discussions with teachers, more easily expressed their opinions and ideas, and were more active during the teaching process, which allowed them to adapt better and understand the lesson content.

This study opens up opportunities for further research that could go in several directions. It would be interesting for visual arts-pedagogical practice to explore the effects of the interactive teaching model in other areas of visual expression (drawing, three-dimensional design or printing). We believe that the results of the research will help in raising awareness among classroom teachers about the need to change their teaching approach in order to consciously and professionally stimulate the development of important cognitive skills in students, especially creative and critical thinking.

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