

Original scientific article

**ART EDUCATION AND AESTHETIC ASSESSMENT OF
INDIVIDUAL SERIAL REPRODUCTIONS OF VISUAL STIMULI**

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Abstract. *The purpose of this study was to examine the differences between psychology students (N=270) and art students (N=90) in aesthetic evaluations of visual stimuli. The stimuli were obtained by using Bartlett's method of individual serial reproduction of geometric, realistic and abstract drawings with additional instruction to increase originality. The assessments were performed on the following Semantic Differential Scales: arousal potential (AP), primordial content (PC), liking scale (DL) and artistic value scale (AV). Psychology students and art students do not differ in overall AP scores, but there is a statistically significant interaction of education type and type of stimuli. Psychology students give statistically higher average AP assessments to reproductions of realistic and abstract stimuli, and art students to geometric stimuli. Psychology students like the drawings obtained by "individual" reproduction more (DL) and give them a higher artistic value (AV) than the art students. This finding is in line with earlier research that respondents without art education have milder criteria, that is, art students are more strict evaluators. The findings are in line with Kozbelt's data that subjects without artistic education value more, and are therefore more interested in technical skill and realism, while "artists" primarily value originality (Kozbelt 2006). It can be concluded that respondents without art education and respondents with art education show similar trends in evaluating serial reproductions, but that they apply different aesthetic criteria and evaluation principles.*

Key words: *Bartlett serial reproduction, arousal potential, primordial content, aesthetic assessments*

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INTRODUCTION

The method of serial reproduction is a procedure in which the subjects reproduce certain content, so that the first subject in the sequence copies the original, the second makes a copy based on its copy, the third copies based on the copy of the predecessor, and so on until the last one. The first significant empirical research of serial reproduction was done by Bartlett (Bartlett 1932/1995) studying transformations on memorized material using texts and images. The reproductions, despite the subject's efforts to reproduce as accurately as possible, contained significant changes. The three most common types of reproductive changes, according to Bartlett, are:

1. simplification or simplification of content;
2. rationalization *ie.* replacing the unknown and foreign with the familiar and close;
3. emphasis or dominance of certain parts from the original content.

Bartlett's findings are known, above all, in social psychology. Experiments of serial reproduction find their application, not only in social psychology, but also in other fields such as the study of culture (Mesoudi 2005, 2007; Mesoudi & Whiten 2004), psychology of art (Milićević 2011, 2019, 2024; etc.), as well as in art itself (Adamowicz 2005; Garoian 2016; etc).

The findings of Ward (Ward 1949) are very interesting and surprising in this area. Using serial reproduction experiments, for example the early British coins, in laboratory conditions, he obtained transformations very similar to real changes that occurred throughout history. The design of the ancient original coin, after several reproductions, resembled the Gallic coinage of a later period, eventually taking the form of the early British coinage. Cumulative transformations during copying corresponded to actual historical changes! A similar process that has been going on for centuries throughout human history took place in the laboratory, in a short time,

Martindale (1990) finds confirmation of the theory of aesthetic evolution in Ward's research. The changes that occur in serial reproduction experiments correspond to actual stylistic changes throughout the history of art. He concludes that the method of serial reproduction is a direct path towards the experimental study of art history.

In his theory of aesthetic evolution, Martindale explains stylistic changes during the history of art by the dynamics of changing levels of arousal potential and primordial content. Arousal potential is most often measured by semantic differential scales taken from Daniel Berlyne (adjectives: simple-complex, weak-strong and passive-active). Using the example of different styles in different arts, during long historical periods, Martindale empirically confirms that over time artists have gradually increased the arousal potential of their works in relation to their earlier works and the works of their predecessors. These changes can be described mathematically by suitable regression equations, *i.e.* trends (Martindale 1990).

Primordial content is the second factor by which Martindale explains stylistic changes and their direction, and most often determines it by the scales of semantic differential (real-unreal, earthly-non-earthly, natural-unnatural, etc.). This dimension concerns originality. A similar concept is mentioned by other authors.

Ernst Kris (1953) distinguishes two processes in the development of creative ideas. The first is inspiration which includes regression and the second is a state of elaboration. Freud (1900) talks about the secondary and primary process of cognition. The secondary process is logical, reality-oriented. The primary process of cognition is irrational, freely associative. It is a thought close to fantasy, daydreaming, dreams, but sometimes also a thought close to

madness. Jung uses the terms *logos* and *eros*, while Nietzsche distinguishes Apollonian and Dionysian thought (Martindale 1990).

Martindale believes that there is a continuum that goes from conceptual thought on the one side to primordial (primordial) thought on the opposite side. Our awareness constantly varies along the primordial-conceptual axis. Whenever there are differences, the thought is conceptual, and with similarities, the thought is more primordial. Primordial thought is non-directive and freely associative, thus increasing the probability of combining new elements. Deeper regression leads to more freely associative thought, and thus combinations of more remote mental elements increase originality. The artist strives to increase the primordial content, *i.e.* originality, which raises the level of arousal. It goes to a maximum, after which there is a "loosening" of stylistic rules, *i.e.* style changes. Arousal has been steadily increasing throughout history. The primordial content also increases but up to a certain limit. When it reaches its peak, and artists in this field exhaust all possibilities, it gradually declines with the introduction of a new style. Stylistic changes and primordial content are in opposite phases. When one increases, the other decreases and vice versa (Ibid).

In existing classic group serial reproduction experiments, subjects aim at making exact copies. Artists in their work do not try to copy, but create original works of art. Martindale therefore gave the subjects a modified instruction to make their reproduced drawing a little more original than the previous one. This kind of instruction reflects what happened throughout the history of art. Every artist was forced to make his next work at least a little more original in order to interest the audience and not succumb to habituation (Martindale 1990, Milićević 2011).

These findings raise new questions and open up new possibilities: Can serial reproduction experiments of this type, in addition to the field of art history, also be applied to the investigation of the origin of an individual work of art? Can serial reproduction experiments simulate the creation, *i.e.* genesis of a work of art?

The cumulative changes that occur in Bartlett's classic group serial reproduction from one subject to another are not characteristic of the individual process of creative creation. In artistic creation and the search for the final artistic solution, the individual makes changes by himself, until the final version of his work. For this reason, in addition to "group" serial reproduction experiments with instructions to increase originality, "individual" serial reproduction experiments are also used in order to simulate the process of the genesis of a work of art as faithfully as possible (Milićević 2011, 2019).

Milićević and Pejić (2007) in the experiment of classic group serial reproduction on a non-artistic population, use a modified instruction – that each subsequent reproduction should be slightly embellished compared to the previous one. The obtained reproductions were then evaluated by the students on different scales of the semantic differential type. Scales of harmony, ornamentation and distance were used (Pejić and Milićević 2007), as well as scales of arousal potential and primordial content (Martindale 1990). The results indicate that Martindale's dimensions of arousal potential and primordial content show a trend that is in line with the expectations of the theory of aesthetic evolution. Arousal potential increases during the process of reproduction. This is true for simple geometric and realistic stimuli, while the opposite trend is observed for abstract drawings.

In this experiment, aesthetic evaluations of reproductions were made by psychology students without art education. Martindale also used "naïve" subjects, believing that they best simulate the aesthetic taste of the audience, as well as a simulation of what happened throughout the history of art.

The question arises whether the evaluations of respondents without an artistic education differ from the evaluations of respondents with an artistic education? Are "art students" stricter evaluators and judges? Does their aesthetic experience differ from the aesthetic experience of "non-artists"? Some studies using fMRI show that completely different cognitive centers are activated in artists rather than in non-artists (Miall & Tchalenko 2001; Tchalenko & Miall 2009). The same task was given to an artist and a non-artist, whereby both respondents, lying in the scanner-tube, crossed out the given forms (portrait, photo of a face and an abstract form). Differences in fMRI obtained in individual phases of drawing faces and abstract patterns were not observed. But that is why there are significant differences in the fMRI of artistic subjects and subjects without artistic skill. With non-artists, the increase in brain activity was pronounced in the areas of the so-called visual cortex. This means that with an ordinary subject, all activities take place in the visual-motor relationship. In the painter's brain, the activity in the frontal part is increased, i.e. in the zones responsible for the processes of higher mental activities. This means that an artistic act implies the activation of networks of abstract mental representations located in the cognitive zones of the brain. The layman, unlike the artist, relies on a visual representation by tracing the offered model. It seems that the artist, unlike the non-artist, does not cross out, but "thinks" the picture!

Some findings show that the evaluations of artistic paintings differ between artists and non-artists (Kozbelt 2006; Weisberg 2004), but that the trends of evaluation of works from different periods of art are similar in both samples (Milićević 2005-2011). Kozbelt experimentally confirmed that art students are better able to perceive fluctuations in quality during the development of a painting. Respondents without artistic education value more, and are more interested in technical skill and realism, while "artists" primarily value originality. It seems that respondents with artistic education give lower, i.e. more strict assessments (Pejić 2003; Pejić & Milićević 2007b; Milićević 2011).

Milićević (2011) conducted the series of serial reproduction experiments on a sample of psychology students and a sample of art students. Received stimuli, i.e. reproductions will be used in the research that follows. The main research question was: are there any differences in aesthetic evaluations of visual stimuli obtained through serial reproduction between subjects without art education and subjects with art education?

METHOD

The experiment was carried out in several stages. In this paper, two phases will be presented. The first phase refers to the creation of stimuli by the method of individual serial reproduction. The second phase refers to the aesthetic assessment of the received stimuli by psychology students and art students.

Stimuli. In the first part of the research, three students of the Faculty of Arts in Niš from the Department of Painting reproduced 3 stimuli each (one each from the geometric, realistic and abstract groups) in 10 phases, using the "individual" serial reproduction method with the instruction to increase originality (Fig.1). Thus, in addition to the initial 9, another 90 new stimuli were obtained for the needs of further research (3x3x10). A single chain of serial reproduction was used in the creation of the stimulus. Certain content has been exposed, i.e. one of the three groups of drawings, so that the subject copied the original content, then the same subject made a copy based on his/her previous copy, and so on until the last drawing - the tenth in the series. At the same time, the subject was given a special piece of instruction at each stage to make his/her reproduction "a shade more original".

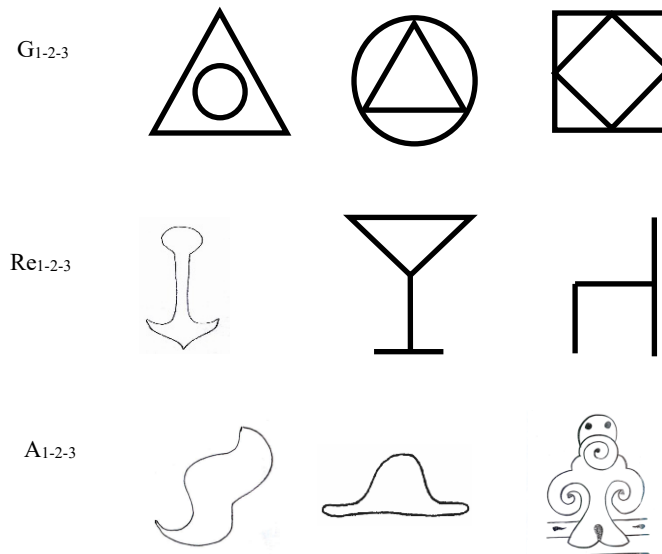


Fig. 1 Initial stimuli used in serial reproduction experiments: geometric (G_{1-2-3}), realistic (Re_{1-2-3}) and abstract (A_{1-2-3})

Sample. Students from the Department of Psychology of the Faculty of Philosophy in Niš participated in the research ($N_1=270$), out of which 13.7% were male and 86.3% female. The respondents had no previous art education. The second group of respondents with artistic education consisted of students of the Faculty of Arts in Niš ($N_2=90$) (Department of Painting 43% and Department of Applied Art 57%). 56.7% of respondents were female and 43.3% were male.

Instruments. A seven-point scale of the semantic differential type was used for the aesthetic assessment of stimuli:

- arousal potential (AP) (simple-complex, weak-strong and passive-active)
- primordial content (PS) (real-unreal, earthly-supernatural and natural-unnatural),
- scale for assessing liking (DL) (dislike - like) i
- scale of artistic value (AV) (artistically worthless - artistically valuable).

Procedure. The subjects had the task of evaluating the displayed stimuli on each of 30 seven-point scales, from -3 to +3 (-3 indicated the minimum and +3 the maximum presence of that feature). At the end of evaluating each stimulus, they had to write down what they thought the drawing represented.

Psychology students ($N = 270$) evaluated a total of 99 stimuli (9 initial and 90 stimuli obtained by individual serial reproduction). Due to the smaller number of respondents in the sample and the limited possibility of applying the entire set of stimuli, students with artistic education, i.e. students of the Faculty of Arts ($N = 90$) evaluated 33 stimuli, namely 3 initial stimuli (geometric, realistic and abstract) and their reproductions (3 x 10) obtained in the experiment of "individual" serial reproduction with the instruction of "increasing originality". Three initial stimuli-drawings were used: 1) G_1 . geometric drawing of a triangle with a circle in the middle; 2) Re_1 realistic "anchor" drawing from Bartlett's series (Bartlett 1916, 1932/1995) and 3) A^1 first abstract drawing, as well as 10 individual serial reproductions each (30 in total).

The examination was conducted in groups of 10-12 subjects. Stimuli were displayed using an LCD projector. In parallel with the video projection, reproductions of the original were also shown, so that each respondent could take a close look at the drawing on paper. The stimulus reproduction time was not limited. Projection of the next stimulus was performed only when the last respondent in the group had finished the assessment.

The obtained aesthetic evaluations were analyzed according to all dimensions, as well as their trend during the reproductions of each of the three types of initial stimuli. What we were most interested in this paper were the differences and similarities in the assessments of respondents from the "non-artistic" and "artistic" population.

RESULTS

In the tables that follow (tables 1-4) there are overviews of the arithmetic means of the assessments by all the above mentioned dimensions of "individual" reproductions of certain types of stimuli and standard deviations for students of Psychology and students of the Faculty of Arts. T-test of independent samples was also performed for reproductions of all three types of stimuli (geometric, realistic and abstract).

An analysis of variance (ANOVA) was performed, where the factors were: type of education (psychology students - students of the Faculty of Arts) and type of stimulus (geometric, realistic abstract) and the dependent variable: assessments on each of the individual aesthetic dimensions: arousal potential, primordial content, dislike - like scale, artistic value scale (AP, PC, DL and AV).

In the assessment of arousal potential (AP), the analysis of variance shows a statistically significant separate influence of the type of stimulus, $F(1, 3954) = 7.17$, $p < .001$, but not a statistically significant separate influence of the type of education. This means that psychology students and art faculty students do not differ in overall assessments of arousal potential. However, a statistically significant interaction between the type of education and the type of stimulus was identified, $F(2, 3954) = 12.02$, $p < .001$.

Psychology students have statistically higher average estimates of the AP dimension when reproducing realistic, $t(1318) = 2.48$, $p < .01$ and abstract stimuli, $t(1318) = 2.14$, $p < .05$. But that's why art students give higher estimates of arousal potential to geometric stimuli, $t(1318) = -2.00$, $p < .05$ (table 1). Between the samples there are differences in arousal assessments for all three types of stimuli, but since these differences are in different directions, there are no statistically significant differences when it comes to all assessments together.

Table 1 Differences in arousal potential (AP) of "individual" serial reproductions of geometric (G), realistic (Re) and abstract stimuli (A) between psychology students and art students

		AP - assessments									
Stimuli		Psychology students			Art students						
Type	Phase	M_1	SD_1	n_1	M_2	SD_2	n_2	M_1-M_2	t -test	df	p
G	Total 0-10	0.27	1.44	990	0.45	1.41	330	-0.18	-2.00	1318	$p < .05^*$
Re	Total 0-10	0.48	1.50	990	0.27	1.33	330	0.22	2.48	1318	$p < .01^{**}$
A	Total 0-10	0.67	1.30	990	0.49	1.40	330	0.18	2.14	1318	$p < .05^*$

In the assessment of primordial content (PC), the analysis of variance shows a statistically significant separate influence of the type of stimulus, $F(1, 3954) = 36.95, p < .001$, but not a statistically significant separate influence of the type of education. This means that psychology students and art students do not differ in overall assessments of primordial content. However, there is a statistically significant interaction between the type of education and the type of stimulus, $F(2, 3954) = 8.66, p < .001$.

Psychology students have a statistically higher average estimates of the PC dimension when playing abstract stimuli, $t(1318) = 3.72, p < .01$. However, art students gave higher ratings of primordial content to reproductions of realistic stimuli, $t(1318) = -2.24, p < .05$. There are no differences between the samples in the evaluations of the primordial content of reproductions of geometric stimuli (Table 2).

Table 2 Differences in primordial content (PC) of "individual" serial reproductions of geometric (G), realistic (Re) and abstract stimuli (A) between psychology students and art students

Stimuli		PC assessments									
Type	Phase	Psychology students			Art students			M_1-M_2	t - test	df	p
		M_1	SD_1	n_1	M_2	SD_2	n_2				
G	Total 0-10	-0.22	1.53	990	-0.36	1.32	330	0.15	1.54	1318	<i>ns</i>
Re	Total 0-10	0.18	1.79	990	0.42	1.62	330	-0.24	-2.24	1318	$p < .05^*$
A	Total 0-10	0.00	1.68	990	-0.37	1.48	330	0.36	3.72	1318	$p < .01^{**}$

In the assessment of liking (DL), the analysis of variance shows a statistically significant separate influence of the type of education, $F(1, 3954) = 9.46, p < .01$, but not a statistically significant separate influence of the type of stimulus. A statistically significant interaction between these two factors (type of education x type of stimulus) was identified, $F(2, 3954) = 8.69, p < .001$.

Psychology students prefer reproductions of abstract stimuli, $t(1318) = 5.00, p < .01$ (Table 3).

Table 3 Differences in liking (DL) of "individual" serial reproductions of geometric (G), realistic (Re) and abstract stimuli (A) between psychology students and art students

Stimuli		DL - assessments									
type	phase	Psychology students			Art students			M_1-M_2	t - test	df	p
		M_1	SD_1	n_1	M_2	SD_2	n_2				
G	Total 0-10	-0.16	1.89	990	-0.07	1.84	330	-0.09	-0.77	1318	<i>ns</i>
Re	Total 0-10	-0.15	2.01	990	-0.28	1.85	330	0.13	1.09	1318	<i>ns</i>
A	Total 0-10	0.25	1.81	990	-0.35	1.93	330	0.60	5.00	1318	$p < .01^{**}$

When assessing the artistic value (UV) of reproduction drawings, the analysis of variance revealed a statistically significant separate influence of the type of education, $F(1, 3954) = 4.89$, $p < .05$, but not a statistically significant separate influence of the type of stimulus. A statistically significant interaction between these two factors (type of education x type of stimulus) was identified, $F(2, 3954) = 7.74$, $p < .001$.

Similarly as in terms of likability, psychology students give higher ratings of artistic value to abstract stimulus reproductions than art faculty students, $t(1318) = 4.46$, $p < .01$.

Table 4 Differences in assessments of artistic appreciation (AV) of "individual" serial reproductions of geometric (G), realistic (Re) and abstract stimuli (A) between psychology students and art students

Stimuli		AV - assessments									
Type	Phase	Psychology students			Art students			$M_1 - M_2$	t - test	df	p
		M_1	SD_1	n_1	M_2	SD_2	n_2				
G	Total 0-10	-0.17	1.73	990	-0.07	1.73	330	-0.10	-0.90	1318	<i>ns</i>
Re	Total 0-10	0.07	1.74	990	0.04	1.77	330	0.04	0.32	1318	<i>ns</i>
A	Total 0-10	0.20	1.70	990	-0.28	1.75	330	0.48	4.46	1318	$p < .01^{**}$

CONCLUSIONS

By analyzing the differences between the evaluations of the aesthetic dimensions of "individual" serial reproductions of all three types of stimuli (geometric, realistic and abstract), statistically significant differences were obtained in the evaluations of the likability dimension (DL) and artistic value (VA) of the reproduced stimuli. Psychology students, on average, give reproductions statistically higher marks when it comes to the above mentioned dimensions.

Psychology students rate the drawings obtained by individual reproduction as more symmetrical, precise and orderly (Harmony dimension) compared to art students. This especially applies to reproductions of realistic and abstract drawings. The finding corresponds to Kozbelt's data that respondents without artistic education value more, and are therefore more interested in technical skill and realism, while "artists" primarily value originality (Kozbelt 2006). It seems that even here, when evaluating "individual" reproductions, "non-artists" are more concerned with the technical skill of drawing and precision, and they rate these qualities with higher scores within the dimension of harmony (H).

Earlier findings also show that respondents without an art education are more inclined to give higher marks and that they are less strict in evaluating these qualities (Pejić 2003) compared to students with an art education.

No statistically significant differences between the samples were found in the estimation of the amount of arousal potential (AP) and primordial content (PC). Also, not even Kozbelt, in his dynamic analysis of Matisse's *Large Reclining Nude*, finds a difference between "artistic" and "non-artistic" samples in the evaluations of arousal potential and primordial content (Kozbelt 2006). Mattindale, on the other hand, presents a large amount of evidence that the

arousal potential increases with the artistic tradition during history. This hinted to the fact that something similar would happen in the area of the genesis of an individual work of art. This was partly proven in our research on the trends of these dimensions, which can be seen in the results of the regression analyzed in the previous part of the presentation. But, if the arousal potential is also taken as an identifying aspect of aesthetic judgments, one would expect differences in the evaluations of this dimension with artists and non-artists. This was not obtained in Kozbelt's (Kozbelt 2006) and our research.

Art students find drawings obtained by "individual" reproduction more appealing (DL) and artistically valuable (AV) than art students. And this finding is in line with earlier research that respondents without art education have milder criteria and they like drawings and paintings that have average values for artists (Pejić 2003; Milićević 2005). Also, the preference for decorated or redundant drawings increases the amount of attractive stimuli. Art faculty students, on the other hand, are stricter critics and value originality and creativity more than technical skill. However, it should be kept in mind that statistically significant differences were found only in assessments of likeability (DL) and artistic value (AV) of abstract stimuli. At first glance, this does not correspond to earlier findings that respondents without an art education prefer and value more artistically realistic drawings and works of art compared to abstract ones. However, if one looks at the qualitative analysis of the obtained reproductions of abstract stimuli, it can be seen that the reproductions of the simplified detail of Tabaković's drawing are realistic from the first to the last. This cannot be said for the reproductions of the first stimulus, and in the reproductions of the second we have forms that resemble single-celled organisms or spermatozoa, i.e. there are forms with a recognizable meaning. Perhaps the presence of realistic elements, which are normally preferred by psychology students, influenced the higher assessment of likeability and artistic value.

In the end, it can be concluded that the aesthetic evaluations of "individual" serial reproductions among psychology students and art faculty students differ, that is, that subjects without art education and subjects with art education apply different aesthetic criteria and evaluation principles.

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UMETNIČKO OBRAZOVANJE I ESTETSKE PROCENE INDIVIDUALNIH SERIJSKIH REPRODUKCIJA VIZUELNIH STIMULUSA

Cilj ovog istraživanja je da se ispituju razlike između studenata psihologije (N=270) i studenata umetnosti (N=90) u estetskim procenama vizuelnih stimulusa. Stimulusi su dobijeni metodom individualne serijske reprodukcije geometrijskih, realističkih i apstraktnih crteža sa instrukcijom povećanja originalnosti. Procenjivanje je vršeno na sledećim skalama semantičkog diferencijala: arausal potencijalu (AP), primordijalnom sadržaju (PC), skali dopadanja (DL) i skali umetničkog vrednovanja (AV). Studenti psihologije i studenti umetnosti se ne razlikuju u ukupnim procenama AP, ali postoji statistički značajna interakcija vrste obrazovanja i vrsta stimulusa. Studenti psihologije daju statistički više prosečne procene AP reprodukcijama realističkog, i apstraktnog stimulusa, a studenti umetnosti geometrijskim stimulusima. Studentima psihologije su crteži dobijeni "individualnom" reprodukcijom dopadljiviji (DL) i umetnički vredniji (AV) nego studentima Fakulteta umetnosti. Ovaj nalaz je u skladu sa ranijim istraživanjima da ispitanici bez umetničkog obrazovanja imaju blaže kriterijume, odnosno da su studenti umetnosti stroži procenjivači. Nalazi su u skladu i sa Kozbeltovim podacima da ispitanici bez umetničkog obrazovanja više cene, a samim tim se više i zanimaju za tehničku veštinu i realizam, dok "umetnici" primarno cene originalnost (Kozbelt 2006). Može se zaključiti da ispitanici bez likovnog obrazovanja i ispitanici sa likovnim obrazovanjem pokazuju sličan trend procena serijskih reprodukcija, ali da pri tome primenjuju različite estetske kriterijume i principe procenjivanja.

Ključne reči: *Bartletova serijska reprodukcija, arausal potencijal, primordijalni sadržaj, estetske procene*