

The role of colour coding of educational materials when studying grammatical categories of the Ukrainian language by foreign students

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Funding information

None.

Abstract

The paper considers the practical experience of creating educational visual materials on the Ukrainian language as a foreign language using innovative technologies, namely, the specifics of the role and place of colour and colour symbols as a code sign during the assimilation of new educational information. This study employed the following theoretical methods—analysis, systematisation and generalisation of modern research; empirical methods—experimental work; statistical methods—qualitative and quantitative processing of the results of empirical research; systematisation and correlation of the results of empirical research in accordance with the values of the case paradigm of the Ukrainian language. It was established that colour can affect not only a person's emotions and behaviour, but also cognitive processes, thinking and memory. Upon recollecting information, a person reproduces events and focuses on everything associated with them. Within the framework of this study, the authors have identified the role of the influence of colour on the activation and mobilisation of students' attention and memory, found ways to learn grammatical categories of the Ukrainian language using a generalising colour table. The authors proved that studying

grammatical categories of the Ukrainian language using the colour coding method improves awareness and reproduction of educational information.

KEYWORDS

colour coding method, colour symbolism, grammatical forms, nonverbal learning tools, Ukrainian as a foreign language

Context and implications

Rationale for this study

The process of Eurointegration in Ukraine has an impact on all spheres of life, in particular on the educational system, where significant changes related to the optimisation of technologies, forms and means of teaching, improving the ways of motivating the assimilation of the necessary information are taking place. The quality of international students teaching and its effectiveness need to be improved. The solution to the problem of the effectiveness of the educational materials lies in the harmonious combination of structured content and cognitively oriented design. This paper considers the practical experience of creating educational materials on the Ukrainian language as a foreign language using innovative technologies such as the specifics of the role and place of colour and colour symbols as a code sign in the assimilation of new educational information.

Why the new findings matter

In the study, it was found that colour can affect cognitive processes, thinking and memory of a person, and the role of the colour influence on the activation and mobilisation of students' attention and memory was revealed. The results of the research prove that the study of grammatical categories of the Ukrainian language using the colour coding method improves the comprehension and reproduction of teaching information.

Implications for educational researchers and policymakers

The grammatical table created by the authors contains the most difficult grammatical material for assimilation; it takes into account the basic psychological regularities of visual perception of information, colour influence on the human subconscious and is based on the principle of material accessibility, which manifests itself in the presence of symbols and words that are understandable for the speakers of different languages. Using the developed table, the conjugation of nouns, as well as adjectives and endings of pronouns and ordinal numbers can be studied. Educators should take into account that professional selection of colours significantly increases cognitive and motivational characteristics and decreases the level of negative psychoemotional states.

INTRODUCTION

With the beginning of the integration of higher education in Ukraine into the European educational system, considerable changes are taking place in the process of teaching academic disciplines. Technology, forms and means of teaching are being optimised, and ways to motivate the assimilation of necessary information are being improved (Gilyazeva et al., 2020). In this regard, it is important to improve the quality of education of international students. The paradigm of language education of foreigners in Ukraine is based on the 'Concept of language training of foreigners in Ukrainian universities' (Ushakova et al., 2011), which is based on the main provisions of the Constitution of Ukraine, the laws of Ukraine 'On Education', and the State National Programme 'Education: Ukraine of the 21st Century'.

Specific features of the methodology of teaching Ukrainian as a foreign language are that language as a subject becomes a means of mastering professional disciplines and obtaining professional education, getting acquainted with a new environment, culture, traditions. Theoretical analysis of Ukrainian and foreign scientific literature shows that the problem of teaching the Ukrainian language for foreign students is interdisciplinary and is presented in research in such areas as pedagogy, psychology, psycholinguistics, philosophy, and so on. Recently, much attention has been paid to psycholinguistic methods and methods of teaching foreign languages (Korda, 2020; Kovaleva et al., 2020). The solution to the problem of the effectiveness of educational materials lies in a harmonious combination of structured content and cognitively oriented design. This aspect is broad and includes all areas of influence on the user's perception of information: shape, location, colour, and so on. In the authors' opinion, it is the diversity of colours that constitutes a qualitative indicator of educational materials, which affects cognitive abilities of the brain.

The relevance of this study lies in the need to supplement the available theoretical constructions with associative areas, where colour is used not only as a symbol, but also as a sign, which is equipped with a certain meaning and becomes a form of information transmission. Given the above, the authors believe that it is worth identifying the associative areas of colour coding of the same type of information objects to stimulate cognitive processes during the activation of the student's mental activity.

The purpose of this study is to generalise practical experience in creating visual materials that systematise the process of studying the grammar of the Ukrainian language (as a foreign language) at the initial stage using innovative technologies, identifying the specifics of the influence of colour on the psychoemotional condition and mental processes of students during learning. Achieving the purpose involves solving the following research tasks: to summarise the achievements of Ukrainian and foreign researchers on the use of non-verbal learning tools; to determine the role and place of colour and colour symbolism as a cognitive tool in the assimilation of new educational information; to compile an experimental base for practical research; and to describe and analyse the results obtained. The subject of this study is colour as a symbol and sign which is equipped with a certain meaning, becoming a means of transmitting and storing information. The subject also includes grammatical categories of the Ukrainian language—the case paradigm of nouns, adjectives, possessive pronouns, ordinal numerals, gender categories and numbers.

LITERATURE REVIEW

A considerable number of articles analyse and investigate the innovative methods of education. Bezpalko (2003) studied innovative methods in the context of socio-pedagogical work. Zhuravlyova and Lopina (2018) paid attention to the case method. They highlighted a number of advantages of electronic database introduction, including improving the quality

of education, the possibility to use a personality-oriented approach and adaptability of educational material. Due to the fact that such a database is located on the Internet, it is available to students anywhere and anytime. It is important that the case method can be combined with different methods, resources, forms of learning and pedagogical technologies. Dychkivska (2015) emphasises that innovativeness is not a purpose of pedagogical activity but a tool and while implementing an innovative method, its effectiveness and resources spent should be taken into account. The scientist considers experiment as the main innovative pedagogical activity that helps to check the effectiveness of various pedagogical influences. Innovative pedagogical activity should be carried out using a personal approach, have a creative, research and experimental nature and strong motivation. Zavarueva (2019) considered language club as an effective form of learning and identified several forms of such classes, including debates and discussions, speeches in various formats, watching videos and so forth.

Many researchers at different times were interested in the problems of highlighting various aspects of the relationship between colour and the human psyche, including Lusher (2007) who created a test that made it possible to measure subjective states using colours and whose views were supported by Li et al., (2020), Sobchik (2016), Leontiev and Ryabova (1972) who studied psycholinguistic aspects of teaching Russian to foreigners and Alder (2001) who investigated creative problem solving with the use of modern psychotechnology. Freeling and Auer (1973) determined the relationship between the mental state of a person and their reaction to colours. In their study, working with colours is shown as one of the ways to increase work capacity and associate the activity with certain emotions. Nikolaenko (2005) studied the psychology of creativity and the language of symbols supporting the view that personality characteristics affect the evaluation of works of art. Yanyshyn (2006) investigated the semiotic aspect of colour. Bazyma (2005) studied the symbolism of colours in various religions and cultures of different peoples. An important part of the study is investigation of the impact of colour on a person from the point of view of psychology and psychophysiology, where the scientist examined in detail the impact of colour on the thinking process. Cases, where colour exposure promotes or interferes with problem-solving, have been explained. Yavich (2013) developed a methodology for creating a textbook taking into account the theory of colours and gave a characteristic of colours and of the influence of their combinations on the perception of educational material.

Considerable research in teaching Ukrainian as a foreign language is reflected in the studies of the Goroshko (2001), Dzyubenko et al. (2009), Pasov (2010), Ushakova (2014), Dychkivska (2015), Zavarueva (2019) and others. Ushakova (2014) compared traditions and innovations in teaching language to foreign students. Zavarueva (2019) believed that the successful organisation of extracurricular work has a positive impact on studying and ensures an effective educational process. The grammatical and textual materials for teaching foreign students are developed by Azarova et al. (2004). Analysing the studies of the above researchers, the authors of the present study conclude that high-quality training of foreign students is impossible without the use of modern innovative educational technologies.

There are several channels of information perception: visual, auditory and kinesthetic. Most people perceive and remember visual information best, otherwise the perception will not be of high quality for them. Evidently, human visual memory systems are of fundamental importance for human cognition since they are closely related to general cognitive properties (Li et al., 2020). It is well known that the colour perception of the world is the oldest reality of human existence. The study of the influence of colour on human mental processes opens the way to the development of hidden capabilities of the human brain. A lot of research has already been done in this area and it has been proven that colour, its perception and use are essential for successful learning. According to Bazyma (2005):

Colour influence on the human mental apparatus affects not only their emotions and behaviour but also cognitive processes, primarily thinking. This refers not to the informational, but to the energy side of colour influence, and thus not to the content of the mental process, but to its dynamic and energetic characteristics. From this standpoint, thinking comes both before the subject of thinking and before the external observer, not as a sequence of purposeful associations, judgments, conclusions, etc., but as a certain kind of mental tension which resolves in case of finding a solution with a relief that satisfies the subject.

One of the ways of thinking is to subconsciously reproduce the experience (sounds, sensations, emotions). Recollecting certain information, a person reproduces events and focuses on everything relating to them. The vast majority of visual memory research focuses on remembering simple stimuli, such as colours, oriented lines, new shapes, all stimuli for which participants have no prior knowledge or expectations (Brady et al., 2016). Therefore, during the learning process, it is important to manage the listener's attention and consider the factors that may be its stimuli: contrast, diversity of colours, sound—that is, everything that causes emotions. If one associates an emotion with a certain concept, phenomenon or object, it will evoke encoded information in memory and encourage action each time. According to researchers, the colours of the 'active side' improve mental activity and increase its productivity. These colours include bright and light shades. The scientists Bazhin and Etkind (1985) conducted a study and identified that, apart from the emotional component of basic colours, there are also emotional associations with learning activities, a person's attitude to certain phenomena.

MATERIALS AND METHODS

This study employed such theoretical methods as analysis, systematisation and generalisation of modern research. Empirical methods are represented by experimental work. Statistical methods included qualitative and quantitative processing of the results of empirical research as well as systematisation and correlation of the results of empirical research in accordance with the values of the case paradigm of the Ukrainian language. The above methods facilitate the establishment of mechanisms for activating thought processes and creating associative connections in a person's mind when learning foreign languages. It allows track monitoring the growth dynamics of respondents' positive results.

To explore the perception of a particular colour in combination with grammatical images, the authors tried to conduct an association experiment (Kozlyakovsky, 2005). For three years, a survey was being conducted among 100 foreign students of various faculties of the Dnipro National University of Railway Transport named after Academician V. Lazaryan to identify the connection of case paradigm values with the most common colour profiles of intellectual emotions, which would effectively influence the process of creating visual materials. Notably, quantitative indicators are not the main purpose of this study and the authors do not claim their exhaustiveness and finality considering that special research requires special methods and more material.

The study was conducted in several stages. The first stage was selecting a colour palette. The second one was determining the attractiveness of colours. The third one was determining the relationship between colour and grammatical category.

At the first stage, the authors decided on the colour palette and chose not only the main colours, but also their combinations (red, yellow, green, blue, purple, pink, brown, sand, grey). This choice is motivated by the fact that when the selected colours are evenly arranged, they balance each other (red excites, green calms, etc.). At the second stage of the study, a free association experiment was applied. For this, informants were offered a

set of cards with selected colours. The informant had to choose an attractive colour without hesitation, that is, it was important to identify the first reaction. This stage was developed according to the principle of M. Lusher's Test (Lusher, 2007). In aggregate, the main 'cold', 'warm' and several mixed colours gained the advantage among the selected colours. Thus, the colours that made up the list of stimuli are as follows: red, yellow, green, blue, purple, pink, brown.

At the third stage, a list of association images was compiled which were linked to the meanings of cases. Separate forms indicated the names and numbers of the case paradigm and related semantic interpretations (their understanding was clarified with students in advance). The method of conducting this stage was as follows: the respondent received colour cards and a form and, without hesitation, had to link the selected seven colour codes with the association of semantic interpretations of grammatical categories. A sample form is presented in Table 1.

RESULTS AND DISCUSSION

According to the experiment, the following results were obtained: (1) the most attractive colour images for visual perception 'colour—reaction speed' were identified; (2) the nature of the connection 'colour—grammatical category' was determined. It was established that 70% of respondents, in one sequence or another, correlated nominative case with red, pink and yellow; genitive—blue, pink, green; dative—green, blue, purple; accusative—yellow, blue, green; ablative—blue, orange, brown; locative—blue, purple, green; vocative—red, yellow, green. Thus, the systematisation of the resulting array of associations represents the constructed association areas and allows structuring and fixing colour images (codes) in the mind of a person with associated grammatical categories. To avoid fatigue from diversity of colours, the colours were arranged in the table so as to balance each other (Figure 1). 'Cold' colours reduce the effectiveness of the mental activity, and 'warm' colours of the 'active side' improve mental activity and increase productivity. As a result, the table gets a neutral colour, which positively affects the activation of mental processes in general. As a result of using this technique, the educational material was understood several times faster.

Given the above, it is advisable to use both individual natural colours and their combinations when creating visual materials. It was empirically proved that visual material, regardless of age characteristics, is understood much better than other means of presenting information. According to Pasov (1977), 'even abstract ideas are easily and definitively attached to the visual image'.

The information that the teacher provides to students can be presented in various forms (oral messages, textbook, audio and video materials, diagrams, tables, etc.). Notably, a modern student wants to get information with the least mental cost. The development of

TABLE 1 Respondents' form for identifying the relationship between colour and case

Case number and name	Semantic interpretation
No. 1 Nominative	Name of the subject; stability, foundation
No. 2 Genitive	Pertinence, circumstantial meanings; objections
No. 3 Dative	Addressee of the action; action, direction
No. 4 Accusative	Object, direction of movement; action, interest
No. 5 Ablative	Tool, profession, conjunctiveness of action; energy, sign of action
No. 6 Locative	Place of action, time; transition from action to stability
No. 7 Vocative	Terms of address; stability

РІД ЧИСЛО ВІДМІНОК									
ІМЕННИК 名词 NOUN NOM					ПРИКМЕТНИК 形容词 (+数词, 代词) ADJECTIF ADJECTIVE				

table relevant when studying new material and irreplaceable when summarising what has been learnt, and in the process of a student's independent work.

The inflectional structure of the Ukrainian language causes certain difficulties for foreigners in the context of studying cases. Based on the already existing experience of creating generalising grammatical tables (Chernosvitova, 2004), the authors have tried to combine the case forms of nouns, adjectives, possessive pronouns and ordinal numerals. An important rule for agreeing words in a phrase and sentence in gender, numbers and cases is successfully demonstrated in the table where these parts of speech are in the same plane and clearly indicate the interdependence of different parts of speech. The proposed table also demonstrates the methods of creating masculine, feminine, neuter, and plural forms, and explains the principles of changing hard/soft vowels upon the formation of new case forms.

Notably, the proposed table can be used at the very beginning in the introductory course, where the phonetic composition of the Ukrainian language is studied. Vowel letters are presented from the standpoint of hardness and softness of flexions and it is suggested to remember them as 'letters-friends': а, е, и, у, о ≠ я, є, і, ю, ї. In the table, case flexions are indicated in capital letters and as a variant of the main hard flexions, soft flexions are indicated in lowercase letters, which students should pay attention to.

The gender category of nouns and adjectives can also be learnt using a table. Each form is displayed in the corresponding cell and it is assigned not only a name, but also a symbol that anyone can understand. Then, a corresponding sample word is attached to each flexion of the initial form of masculine, feminine and neuter gender: *студент* (*student*), *учитель* (*teacher*), *музей* (*museum*); *книга* (*book*), *студентка* (*student*), *відповідь* (*answer*), *аудиторія* (*audience*); *вікно* (*window*), *місце* (*place*), *завдання* (*task*). The teacher uses this model to name any word, and students determine its form. Thus, students develop the skills of independence in work with the gender category.

In the future, the table can be used for studying the category of numbers. The corresponding column has a name—a symbol in the form of two little men and a word that names the corresponding concept. In masculine and feminine nouns, the flexions of the plural form coincide, and the neuter gender has a different flexion, denoted by a letter of the English alphabet 'n—neuter'. Thus, the table implements the principle of minimised representation of grammatical material of the pre-case period.

Mastering the main course aims to teach the student the most important models of colloquial speech based on the study of the case paradigm. The study of case forms and language constructions should be explained with the help of a table that is always in front of students during classes. Constant communication of students with the table is provided in the future according to the principle of visualisation of educational material, which contributes to a strong consolidation of the studied forms and models. The presentation of case forms in the main course takes place in a certain sequence that is determined by the methodology of teaching the Ukrainian language for foreign students. The authors of this study have also tried to follow this principle in their table.

After the initial form of the nominative case, the accusative case is studied. Here one should definitely draw the student's attention to the dichotomy of being and non-being (or animate—inanimate), which is indicated by a diagonal line in two squares (masculine gender and plural). A conditional image of a heart, a living symbol that visualises the question, has been added to the creature field (who?). It is known that the accusative case defines the object to which the action, time and place directly passes. Such additional values are mainly transmitted using prepositions and question words located in the middle and rightmost columns of the table—for example: where, when, and how long; to put under the table; to go to class; to work for a friend; looks like a brother; will be in a minute; we have been waiting for you in a year; the students rested for an hour.

Apart from the main case flexions, the dative and locative case also provide parallel forms. Masculine nouns in the dative singular have such flexions as *-ові, єві (-єві)* or *-у (ю)*. Masculine nouns in the locative case have such flexions as *-ові, -єві (-єві)* or *-у (-ю), -і (-ї)*. Flexions *-ові, -єві (-єві)* are more frequently used in nouns that are the names of creatures. Therefore, if two masculine nouns coincide in speech—the names of creatures in the dative and locative singular cases—they should be used with different flexions. In the locative case with a preposition *по*, parallel flexions *-у (ю)* and *-і (ї)* can be used: *по Дніпру—по Дніпрі (Dnipro)*, *по місту—по місті (city)*; only flexions *-і* are used to indicate the time: *по обіді (dinner)*, *по закінченні (end)*.

The next stage that may cause difficulties is the study of the plural category, in particular the form of the genitive and accusative cases of animate objects. The genitive and accusative cases in the table are combined into a common cell and filled in with the same colour. The fact is that the accusative case can have the plural form of the nominative case for inanimate objects and the genitive case form of the plural for animate objects. At the same time, it is necessary to explain to students that different forms of plural nouns in the genitive case are associated with the presence of variants of belonging to different categories of gender: *студент—студент-ів (student)*, *учитель—учител-ів (teacher)*, *музей—музе-їв (museum)*; *книга—книг (book)*, *студентка—студент-ок (student)*, *аудиторія—аудитор-ій (audience)*, *відповідь—відповід-ей (answer)*; *вікно—вікон (window)*, *місце—місць (place)*, *завдання—завдань (task)*. In the table, for convenience, such flexions are marked with the corresponding generally accepted symbols that denote the concept of a gender category (initial letters of the English alphabet—m., f., n.). In the vocative plural case, nouns have the same form as the nominative one: *студенти (students)*, *учителі (teachers)*, *товариші (friends)*.

The mirror image of the declension of nouns in the table is the declension of adjectives and the same case flexions of pronouns and ordinal numbers. According to their flexions, the teacher also fixes certain verbal forms or word samples of hard and soft flexions: *новий (new)*, *синій (blue)*. Further, their declension is studied using the case forms of nouns already known to students, for example: *Кого тут немає?—Тут немає м-лого нов-лого друг-ів (hard group) (Who isn't here?—My new friend isn't here)*; *Чого тут немає? Тут немає м-лого син-іього олівц-ів (soft group) (What isn't here?—My blue pencil isn't here)*. This is the way to not only study the adjective, but also the possessive pronoun.

According to the same principle, the teacher explains the declension of ordinal numbers, which change by gender, numbers and cases, as well as adjectives. Numerals with a flexion *-ий* change as adjectives of a hard group: *перший (перша, перше, перші) (the first)*, *другий (the second)*, *четвертий (the fourth)*, *дванадцятий (the twelfth)*, *п'ятдесятий (the fiftieth)*, *сотий (the hundredth)*, *тисячний (thousandth)*, *мільйонний (millionth)*; with a flexion *-ій* *третій (третя, третє, треті) (the third)* change as adjectives of the soft group.

Thus, students themselves can generalise that in the Ukrainian language, the question contains half of the correct answer. This is how grammatical patterns of the Ukrainian language are gradually outlined, which allows students to independently build speech constructions and see mistakes made without spending time waiting for the teacher's explanation.

CONCLUSION

Taking into account the above analysis, the authors conclude that studying grammatical categories using a combined table with the help of colour coding will contribute to better memorisation of educational material. Theoretical analysis of scientific research has shown that high-quality education is impossible without the use of modern innovative educational

technologies. Questions of the influence of colour on thought processes during the assimilation of new information require further research and systematisation. It was established that when developing visual educational materials, it is necessary to take into account the characteristic features of the influence of colour on the psychoemotional condition and cognitive abilities of the student. It was experimentally proved that colour coding of a combined table is an effective way for high-quality assimilation of grammatical categories of the Ukrainian language by foreign students. Professional selection of colours considerably increases cognitive and motivational characteristics and reduces the level of negative psychoemotional conditions. It was demonstrated that information that needs to be memorised should be highlighted in contrasting colours, taking into account the principle of balance to reduce fatigue from saturation and diversity of colours. The colours of the 'warm' and 'cold' spectrum balance each other, creating the effect of psychological comfort, which positively affects the entire learning process.

The features of the table developed in the course of the study were explained in detail, including the choice of activities where it can be used. The table contains conventional symbols that are understandable to representatives of different nationalities. The principle of educational material visualisation provides a solid consolidation of the studied forms and models, provided that students constantly use the table. With its help, students can gradually master the grammatical system of the Ukrainian language. A promising area of work is research aimed at comparative analysis of colour values, studying the content of individual colours to identify the features of their influence on thought processes during the educational process.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

ETHICAL APPROVAL

All procedures performed in studies involving human participants were in accordance with the 1964 Helsinki Declaration and its later amendments.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

REFERENCES

- Alder, G. (2001). *NLP: Modern psychotechnology. NLP for Managers: How to achieve excellence at work*. Peter.
- Azarova, L. E., Korzhenko, V. Y., & Korzhenko, Z. P. (2004). *Practical grammar of the Ukrainian language: For foreign students of the preparatory department*. VNTU.
- Bazhin, E. F., & Etkind, A. M. (1985). *Colour test of relations (CTS). Methodical recommendations*. <https://www.twirpx.com/file/2922969/>
- Bazyma, B. A. (2005). *Psychology of color: Theory and practice*. Rech.
- Bezpalko, O. V. (2003). *Social pedagogy in schemes and tables*. Training Center. Literature.
- Brady, T. F., Störmer, V. S., & Alvarez, G. A. (2016). *Working memories not fixed-capacity: More active storage capacity for real-world objects than for simple stimuli*. National Academy of Sciences of the United States of America.
- Chernosvitova, N. Z. (2004). *Educational grammar table: Cases*. Zlatoust.
- Dychkivska, I. M. (2015). *Innovative pedagogical technologies: Textbook*. Akadem Izdatelstvo.
- Dzyubenko, L. I., Dubichynsky, V. V., & Chezganovtain (2009). *The only typical curriculum in the Ukrainian language for foreign students of the main faculties of non-philological profile of higher educational institutions of Ukraine III-IV levels of accreditation*. KPU.
- Freeling, G., & Auer, K. (1973). *Man—Color—Space*. Stroyizdat.
- Gilyazeva, E., Evgrafova, O., Sharypova, N., & Akhunzianova, R. (2020). 'Flipped classroom' technology in teaching foreign languages. *Advances in Intelligent Systems and Computing*, 1114, 229–240.

- Goroshko, E. I. (2001). *Integrative model of free associative experiment*. http://library.kpi.kharkov.ua/files/new_postupleniya/gorint.pdf
- Korda, A. (2020). Thinking with pictures: Memory, imagination, and colour illustration in Victorian teaching and learning. *Paedagogica Historica*, 56(3), 269–292. <https://doi.org/10.1080/00309230.2018.1550520>
- Kovaleva, A. G., Anchugova, O. V., Zarifullina, D. P., Kurmanova, D. I., & Tkacheva, M. V. (2020). Information and communication technologies for analytics of individual tracking in foreign language teaching. *CEUR Workshop Proceedings*, 2562, 77–84.
- Kozlyakovskiy, P. A. (2005). *General psychology: Textbook*. Design Printing.
- Leontiev, A. A., & Ryabova, T. V. (1972). *Psycholinguistics and teaching Russian to foreigners*. Publishing House of Moscow University.
- Li, X., Xiong, Z., Theeuwes, J., & Wang, B. (2020). Visual memory benefits from prolonged encoding time regardless of stimulus type. *Journal of Experimental Psychology: Learning Memory and Cognition*, 46(10), 1998–2005.
- Lusher, M. (2007). *Luscher color test*. AST.
- Nikolaenko, N. N. (2005). *Psychology of creativity: A textbook*. Rech.
- Pasov, E. I. (1977). *Fundamentals of teaching foreign languages*. Russkiy Yazik.
- Pasov, E. I. (2010). *Fundamentals of communication theory and technology of foreign language education: A methodological guide for teachers of Russian as a foreign language*. Russian Language Courses.
- Sobchik, L. N. (2016). *Method of color choices – Modification of the eight-color Lusher test*. Rech.
- Ushakova, N. I. (2014). *Teaching the Russian language to foreign students: Theory and practice, traditions and innovations*. Kharkiv National University named by V. N. Karazin.
- Ushakova, N. I., Dubichynsky, V. V., & Trostynska, O. N. (2011). Concept of language training of foreigners in Ukrainian universities. *Language Teaching in Higher Educational Institutions*, 19, 136–146.
- Yanyshyn, P. V. (2006). *Psychosemantics of color*. Rech.
- Yavich, M. P. (2013). *Using the theory of colors when creating an electronic textbook. Modern research and innovation*. <http://web.snauka.ru/issues/2013/05/24076>
- Zavarueva, I. I. (2019). Language circle as a form of effective study of a foreign language. *National University 'Ostroh Academy'*, 5(74), 266–269.
- Zhuravlyova, L. V., & Lopina, N. A. (2018). Practically-oriented case-teaching methods in continuing medical education based on information web technologies. *Continuing Professional Education: Theory and Practice*, 3(4), 67–73.

How to cite this article: Zavarueva, I., Bondarenko, L., & Fedko, O. (2022). The role of colour coding of educational materials when studying grammatical categories of the Ukrainian language by foreign students. *Review of Education*, 10, e3312. <https://doi.org/10.1002/rev3.3312>