



# International Journal of Educational Methodology

Volume 11, Issue 1, 1 - 15.

ISSN: 2469-9632

<http://www.ijem.com/>

## Exploring Pre-Service Teachers' Perceptions of Sustainability in Visual Arts Education

Robert Potočnik<sup>\*</sup> 

University of Ljubljana, SLOVENIA

Iztok Devetak 

University of Ljubljana, SLOVENIA

Luka Ribič 

University of Ljubljana, SLOVENIA

Received: September 1, 2024 ▪ Revised: October 12, 2024 ▪ Accepted: November 29, 2024

**Abstract:** The concept of sustainability in visual arts education is a relatively new way of looking at content. Therefore, it is important that the contents of sustainability are systematically integrated into the educational process at all levels of education. In this research, special attention was paid to the specifics of understanding the complexity of the term "sustainability" of pre-service teachers who come from a different educational background and who will also carry out visual arts activities with different aged students in their future work. A free association method with online interviews and artwork analysis was used in this study, with 5 female pre-service teachers from four different European countries. The study revealed that pre-service teachers recognize examples of good practice in architecture, the cultural landscape, and various other visual arts messages - they know what good sustainable practice in the environment and the arts is and what is not. However, they show less understanding of the specifics of materials as carriers of material cultural heritage or of the artworks themselves, as well as of contemporary artistic practices that emphasize themes related to sustainable issues or development. It can be concluded that further interdisciplinary approaches should be used in reaching sustainability goals in visual arts education and wider.

**Keywords:** Contemporary art, cultural heritage, foreign students, interdisciplinary approach, sustainable development, visual arts classes.

**To cite this article:** Potočnik, R., Devetak, I., & Ribič, L. (2025). Exploring pre-service teachers' perceptions of sustainability in visual arts education. *International Journal of Educational Methodology*, 11(1), 1-15. <https://doi.org/10.12973/ijem.11.1.1>

### Introduction

Sustainability is a concept that has come to the fore a lot in recent decades (Vogt & Weber, 2019), but we can say that the concept is not new or that our ancestors already knew it (Potočnik, 2018a, 2020). It can be understood as an adaptation to the natural environment and the knowledge of its limits, peculiarities, and needs - the so-called traditional ecological knowledge (Berkes, 1993; Ruggerio, 2021). We can say that our ancestors lived according to principles based on sound knowledge and beliefs about the peculiarities of living beings and plants, natural phenomena, features of the environment (e.g., landscapes), and more generally, the laws of the ecosystem (Berkes, 1993; Potočnik, 2017). Today, there are seven dimensions that are essential for understanding the term "sustainability" and its normative content - the ecological dimension, the political dimension, the ethical dimension, the socio-economic dimension, the democratic dimension, the cultural dimension, and the theological dimension (Vogt & Weber, 2019). We can say that "sustainability" is a broad and complex concept that requires the inclusion of several factors. Primarily, it stands for the creation of a balance that allows the needs of the present to be met without jeopardizing the ability of future generations to meet their own needs (Ruggerio, 2021). In the survey, we present pre-service teachers' perceptions of sustainability in visual arts education, focussing on arts materials and viewed through the prism of different practises.

### Literature Review

Both scientific literature and various policy documents emphasize the significant role of education, including towards understanding the specifics of the concept of "sustainability" and especially towards the inclusion of sustainable practices and principles at all levels of education (Mahat et al., 2022; Wulandari et al., 2024). In the field of education, it is useful to start from the so-called "17 Sustainable Development Goals" (United Nations, n.d.), which can serve as a guide for a

<sup>\*</sup> Corresponding author:

Robert Potočnik, University of Ljubljana, Slovenia. ✉ [robert.potocnik@pef.uni-lj.si](mailto:robert.potocnik@pef.uni-lj.si)

teacher or pre-service teacher to include topics in lessons in different areas or when working with students of different ages (Ariyatun et al., 2024).

Visual arts education is a broad term and encompasses various practices and areas of expression and contribute to the holistic development of the student's personality, in particular the development of creativity and imagination, fine motor skills, expression of feelings and thoughts (Webster-Stratton, 1999), development of visual thinking and critical thinking (Fried et al., 2023). By this term we mean, in a basic sense, the creation of artworks or the creation of visual arts solutions with different motifs and ways of expression (Tacol & Šupšakova, 2018), as well as the understanding of different visual arts concepts, in connection with works of visual arts or the specifics of the language of visual arts - paintings, statues, architecture and other arts practices (Tacol, 2003). Also, the specifics of cultural landscapes (Potočnik, 2017), the contents of the care of cultural heritage (Potočnik, 2018a, 2020) and the specifics of visual arts materials and tools (visual arts techniques) (Potočnik & Devetak, 2021). Key to understanding the complexity of sustainability in visual arts education is an understanding of sustainable arts materials - they are produced in a way that has the least impact on the environment, minimizes supply chains and considers local production or ethical practices (Dyllick & Rost, 2017). The use of recycled materials in artistic creation and its processing plays an especially significant role from a sustainability perspective (Frelih, 2011). Sustainability in the context of arts materials can also be understood as alternative use of materials - from natural materials, biodegradable materials, own processing of natural materials for artistic creation and the like (Potočnik, 2018a). Natural and local materials (e.g., wood, lime, clay, straw, etc.) in combination with modern materials offer innovative solutions in the design of buildings and cities (Abyzov et al., 2020; Popovac et al., 2018).

Sustainability in visual arts education also includes the content of cultural heritage preservation. In this case, the right choice of materials is important when it comes to the longevity of artworks - reversibility, compatibility of materials or understanding the chemical properties of arts materials, etc. (Horikoshi, 2021; Potočnik & Devetak, 2023). It is also important to understand what environment the cultural heritage needs - temperature, humidity, light exposure, etc. (Camuffo, 2019; Potočnik, 2018b, 2020). As well as understanding the specifics of arts conservation - stabilization, protective measures against further deterioration, preventive protection (Potočnik, 2020) and restoration - towards an easier visual understanding of cultural heritage (Potočnik, 2018b).

Sustainability in visual arts education can also be understood as an artistic activity itself, where attention is focused on the expression of thoughts, ideas, and statements (Zupančič, 2006). In contemporary arts itself, sustainable themes are prevalent (Zhang & Shen, 2024) as they are a powerful source for disseminating important ideas, messages, and critical appeals to the public about content (Jónsdóttir, 2017), such as socially engaged arts, community-based arts, participatory arts, and many others (Bojc & Potočnik, 2024).

The concept of sustainability in visual arts education is a relatively new way of looking at content (Jónsdóttir, 2017; Zupančič, 2006). Content related to the specifics of sustainability can be found in various educational practices, e.g., socially engaged arts pedagogy, critical arts education, etc. (Pavlou, 2024), but for the implementation of the mentioned specificities, a deep understanding of the complexity by the teacher is required, with the aim of appropriate treatment with the students (Zupančič, 2006), as the guidelines prescribe the need for systematic inclusion in the educational process at all levels of education (Laurie et al., 2016).

In reviewing the literature, we found that there is a lack of content on how to meaningfully incorporate the principles of sustainability into visual arts education, particularly in learning and understanding arts materials and their specificities - their composition, their sustainable approaches (e.g., selection of materials that can be properly recycled), which also impacts on their use (e.g., in the classroom), or more generally in relation to awareness of the facts of the materials of artworks and consequently in relation to the care of cultural heritage. We also notice a lack in visual arts education when it comes to strengthening students' critical and responsible attitude towards the care of cultural heritage (e.g., the renovation of existing architecture) in the context of sustainable development.

## Methodology

### *Research Design*

In the present research, special attention was paid to the specifics of understanding the complexity of the term "sustainability" of pre-service teachers who come from a different educational background (4 different European countries) and who will also carry out visual arts activities with different age groups of students in their future work. The major focus of this study was how pre-service teachers understand the specificities of visual arts materials in general and in the context of cultural heritage, architecture, and their own artistic creations in relation to the concept of "sustainability". According to the research problem the following research questions were formed:

1. In what context do pre-service teachers associate the concept of "sustainability" and "materials in architecture, cultural heritage and contemporary arts"?
2. In what context have pre-service teachers engaged with the contents of "sustainability" in their previous education in relation to learning about the specifics of visual arts (artmaking), cultural heritage (tradition), materials (visual arts techniques)?

3. How do they understand the specific characteristics of "sustainable cities" in general and from the perspective of architecture, heritage, and materials?
4. What kind of messages emerge in their artworks that address the content of sustainability in visual arts?

#### *Sample and Data Collection*

A qualitative research methodology was used in this study with the free association method (Kris, 1992; Sato & James, 1999). A sample included 5 female international Erasmus students (one from Spain, one from Poland, two from Slovak Republic and one from Bosnia and Hercegovina) which participated in course "Selected topics in Visual Arts activities" at the faculty of Education, University of Ljubljana, in a summer term in year 2024. The average age was 22.6 years (SD = 1.5 years). Two of them complete their studies at the 1st level (Bachelor) and three at the 2nd level (Master). All participants are studying to become teachers (two kindergartens, two primary schools and one adult education teacher). All of them will carry out visual arts activities with different age groups in their future work. In a qualitative study, a sample of five people is a sufficient number for the researcher to confirm the data obtained (Cohen et al., 2007).

#### *Analyzing of Data*

The free association method (Kris, 1992; Sato & James, 1999) was used to determine future teachers' understanding of the specificities of visual arts materials in general and in the context of architecture, cultural heritage, contemporary art practices, and their own artistic creation in relation to the concept of "sustainability". The content analysis method (Busch, 2012) of the pre-service teachers' interview responses was used to determine the significance of implementation concerns for sustainability in relation to visual arts and the educational process. The online interview was conducted in the same way for all participants - after prior consultation, the time for the interview was set, asked a question, or provided material for free associations and allowed the participants to respond. The conversation lasted between 50 and 55 minutes. The interview was conducted in English and the visual material was shared via a PowerPoint presentation in the Zoom online environment. The questions in the interview are identical to the questions we wrote down in the section where we present the results (highlighted text in italics). The interviews were recorded so that content analysis was done on the transcripts later. The obtained interviews were transcribed and analysed using the method of content analysis and coding procedure: 1) editing material, 2) determining coding units, 3) coding, 4) selection and definition of relevant concepts and formation of categories, 5) definition of categories and 6) formation of final theoretical formulations (Vogrinc, 2008; Mesec, 1997). All authors conducted an analysis of the interviews and codes were determined. The codes were then discussed, and the agreement was 95%. In cases where the authors assigned different codes to certain data, the discussion led to agreement on how a code should be assigned for certain data with open-ended questions. The data were included in a narrative description of the results.

### **Results**

The table 1 below contains the answers to the questions from the interview - *Please observe the pictures and formulate at least 10 associations (words or sentences) that describe the connection between the photos shown and the concepts of "sustainability" and "materials in architecture"*.

*Table 1. Associations (Words or Phrases) That Describe the Connection Between the Photos Shown and the Concepts of "Sustainability" and "Materials in Architecture". We Have Included Each Word or Phrase in the Table. If the Word or Phrase Occurred More Than Once, the Number of Repetitions Was Given in Brackets*

|                                                                                     |                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | Figure 1. Traditional architecture in the countryside from the end of the 19th century, the surroundings of the town Ptuj, Slovenia. (Photo: www.kam.si)                                                                                                                       |
| concepts in connection with materials                                               | wood (4), straw (2), bricks (2), branches, dried grass, »poor« materials, biodegradable materials                                                                                                                                                                              |
| concepts / phrases in connection with architecture and experiencing the building    | natural colours, round shapes, farmhouse, unstable, horizontality, "Indians," west, tinny, cold, cozy, familiar, functional, »do it on your own,« not overthinking, poverty, small windows; ossified feeling                                                                   |
| concepts / phrases in connection with the cultural landscape                        | countryside (2), surrounded by trees (2), big garden, designed to blend into the natural environment                                                                                                                                                                           |
| concepts / phrases in connection with sustainability                                | own well (2), local resources (2), thick walls (2) - to keep the house cold all year round, organic, ecological, own cultivation - corn, generations, good insulation, environmentally friendly, supports the local economy, material that lasts a long time                   |
|   | Figure 2. Contemporary architecture in the Slovenian countryside, 2020. (Photo: www.mojmojster.net)                                                                                                                                                                            |
| concepts in connection with materials                                               | wood (4), natural materials (3), new materials                                                                                                                                                                                                                                 |
| concepts related to architecture and building experience                            | bright / natural lighting (4), big windows/glass walls (4), modern design (3), bright colours, simple shapes, simple construction, without decoration, comfortable, pretty, relaxed, open, small family                                                                        |
| concepts in connection with the cultural landscape                                  | fitting in the landscape (2), connect with nature, natural environment                                                                                                                                                                                                         |
| concepts / phrases in connection with sustainability                                | trees (2), renewable sources (2), green, garden, low energy, breathable, moveable, natural exterior, natural ventilation – no need for air conditioning, potential for integrating solar panels, minimalistic - reduces the need for using unnecessary materials and resources |
|  | Figure 3. Family house in central Slovenia, in the countryside near a larger town, built in 2007. (Photo: www.rocco-nepremicnine.si)                                                                                                                                           |
| concepts in connection with materials                                               | new materials (2), no natural materials (2), eco-friendly building materials                                                                                                                                                                                                   |

Table 1. Continued

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| concepts / phrases related to architecture and experiencing the building            | unnecessary elements / columns/ "marble" (4), power /luxury /appearance is more important than other things (4) windows (3), modern design (3), inappropriate colours/ dark roof (2), universal appearance, big, ugly, looking a bit like a castle (kitsch), two floors, big garage, huge roof, family house, big backyard, formal, bright, functional, tidy, »Kardashians house"                                                                          |
| concepts / phrases in connection with the cultural landscape                        | doesn't blend too well in the nature (2)                                                                                                                                                                                                                                                                                                                                                                                                                   |
| concepts / phrases in connection with sustainability                                | foreign materials – transport (2), demanding to heat or cooling, weak isolation, for investment - not for living, large windows - natural lighting, green spaces, potential for solar panels                                                                                                                                                                                                                                                               |
|    | Figure 4. Preservation of architecture in the Slovenian countryside, which is protected as a cultural monument – Štanjel, Slovenia.<br>(Photo: <a href="http://www.gore-ljudje.net">www.gore-ljudje.net</a> )                                                                                                                                                                                                                                              |
| concepts in connection with materials                                               | stone (3), red brick, wood                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| concepts related to architecture and experiencing a place                           | old style / traditional construction (2), houses out of rocks, disorganised, familiar, welcoming, friendly, community, pretty, vintage, narrow streets, small windows, thick walls, harsh conditions, need of safety, past, history, small buildings, historical buildings – traditional architecture                                                                                                                                                      |
| concepts in connection with the cultural landscape                                  | perfect combination of human work and nature – aesthetically pleasing landscape (3)                                                                                                                                                                                                                                                                                                                                                                        |
| concepts / phrases in connection with sustainability                                | natural shadow air circulation/preserving cool air through the summer/ stone walls regulate naturally temperature inside the buildings (3), human respect to the nature and building techniques – need for protection (2), surrounded by forest, bright colour of buildings (not overheating through summer), challenge to heat, local materials, community living – shared resources, methods which are providing durability and long-term sustainability |
|  | Figure 5. "Bosco Verticale", Milan, Italy, 2014, buildings that integrate a botanical element into their architectural body.<br>(Photo: <a href="http://www.worldarchitecture.org/">www.worldarchitecture.org/</a> )                                                                                                                                                                                                                                       |
| concepts in connection with materials                                               | usage of plants (2), glass, new sources and materials                                                                                                                                                                                                                                                                                                                                                                                                      |
| concepts related to architecture and building experience                            | modern/contemporary (3), ecological (2), green spaces (2), mixing work with plant care, verticality, overwhelming, controversial cities, green architecture                                                                                                                                                                                                                                                                                                |
| concepts / phrases in connection with the cultural landscape                        | combination of nature and architecture                                                                                                                                                                                                                                                                                                                                                                                                                     |
| concepts / phrases in connection with sustainability                                | shadow /cooling / humidity control (5), filtrate the air/ oxygen/easier to breathe (4), green spaces (4), natural insulation/less insulation (3), mix of nature and architecture - environmentally friendly (3), trying to look ecological and environment friendly, improves wellbeing of residents, environmentally friendly buildings, adapts to climate changes, comfortable living conditions                                                         |



Table 1. Continued

Figure 6. Urban environment. (Photo: [www.news.com.au](http://www.news.com.au))

|                                                                      |                                                                                                                                                                                                              |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| concepts in connection with materials                                | glass (3), concrete (3), iron (2)                                                                                                                                                                            |
| concepts / phrases related to architecture and experiencing the city | without parks, overwhelming (2), organised, verticality, high, work, cold, routine, dark colours, very depressing and with no soul                                                                           |
| concepts in connection with the cultural landscape                   | no greenery/ absence of green and plants (4)                                                                                                                                                                 |
| concepts / phrases in connection with sustainability                 | pollution/no fresh air / contamination /lot of heavy materials/ breathing problems (5), needs for nature (4), not sustainable (2), no thinking about humans and their needs, progress, from the future, cars |

The table 2 below contains the answers to the questions from the interview - *Please observe the pictures and formulate at least 10 associations (words or sentences) that describe the connection between the photos shown and the concepts of "sustainability" and "materials in cultural heritage / contemporary art".*

*Table 2. Associations (words or phrases) that describe the connection between the photos shown and the concepts of "sustainability" and "materials in cultural heritage / contemporary art". We have included each word or phrase in the table. If the word or phrase occurred more than once, the number of repetitions was given in brackets.*



Figure 7. Detail of the oil painting before and after the conservation-restoration intervention. (Photo: <http://www.restavratorstvo-sentjost.si>)

|                                                             |                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| concepts in connection with materials                       | chemicals, "better materials," "old materials," canvas, linen, cotton, less harmful materials"                                                                                                                                                                                            |
| concepts related to work of art                             | painting, print                                                                                                                                                                                                                                                                           |
| concepts / phrases related to the care of cultural heritage | conservation (3), repair (2), reconstruction/ remade (2), renovation (2), preserving, making the colours brighter/less of colour (2), survive longer / maintenance (2), respectful / precious (2), on display / community (2), take care, friendly, being careful, human made, aging, old |
| concepts in connection with sustainability                  | future generation (3), education (2), progress (2), environmentally friendly                                                                                                                                                                                                              |



Figure 8. Marjetica Potrč. Caracas Dry Toilet (<http://stefaniehessler.com/entries/dry-toilet>) Marjetica Potrč is a Slovenian artist and architect. Her projects combine a utopian vision of bottom-up initiatives conducted by citizens of favelas and slums, and a certain utilitarian approach by which she attempts to find ways of dealing with problems concerning infrastructure and ecological sustainability. In her drawings and sculptural installations, Potrč points to how customized inventions by individuals and communities can work better than the master visions of urban planners (Hessler, 2012).

Table 2. Continued

|                                            |                                                                                                                                                                                                                                   |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| concepts in connection with materials      | /                                                                                                                                                                                                                                 |
| concepts related to contemporary art       | respectful to environment/ecological/less materials (4), dealing with issues (3), original, diseases, not too healthy, part of culture but not heritage, developing countries, disrespect to art, lack of comfort, easy way to go |
| concepts in connection with sustainability | good for nature (2), creating natural compost, but I am wondering where it was stored, it makes the living comfortable, forward thinking, sustainable, ecological, economical, useful, no water needs                             |

In the interview, the third question related to whether they knew of contemporary artists (from their country or internationally) who address issues of "sustainability" in their art - sustainability becomes part of the creative process of the emerging **artist**. Two pre-service teachers do not know of any contemporary artists who incorporate "sustainability" into their creative process. Three named the following artists: Joanna Rajkowska, Ana Mendieta, Banksy, and Chris Jordan.

The fourth question in the interview related to the context in which the content of "sustainability" was considered in their previous education in connection with learning the specific features of the visual arts (visual arts education), cultural heritage (traditions), materials (visual arts techniques). Table 3 below shows the content that the pre-service teachers from the research connect with their previous experiences in education on the content of "sustainability" with learning the specific features of education (visual arts education, others), cultural heritage (traditions), materials (visual arts techniques).

Table 3. Content That the Future Teachers From the Research Connect With Their Previous Experiences in Education on the Content of "Sustainability" With Learning the Specific Features of Education (Visual Arts Education, Others), Cultural Heritage (Traditions), Materials (Visual Arts Techniques)

| Future Teacher | Education                       | Cultural Heritage (Traditions)                    | Materials (Visual Arts Techniques)                          | Other                                                                                                                                                                                                                                                   |
|----------------|---------------------------------|---------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1              | /                               | /                                                 | /                                                           | /                                                                                                                                                                                                                                                       |
| 2              | visual arts and history classes | some topics that mainly deal with waste and water | waste material                                              | "First time I really dealt with and worked with these topics was on this subject on my Erasmus - to create my own sustainability works and learn new artists about it."                                                                                 |
| 3              | /                               | /                                                 | waste material                                              | /                                                                                                                                                                                                                                                       |
| 4              | /                               | /                                                 | /                                                           | "In none of this. I taught myself, out of my own interest. Sustainability is especially important for future generations, as is the study of art techniques, traditions, and visual arts. Art is what feeds the soul and tradition is what grounds it." |
| 5              | /                               | /                                                 | ecological material, used material, natural, waste material | /                                                                                                                                                                                                                                                       |

In the survey with pre-service teachers, the fifth question was: How do you understand the characteristics of "sustainable cities" in general from the perspective of architecture, heritage, and materials? Table 4 below shows the contents that the future teachers emphasized in their answers.

Table 4. Content That Pre-Service Teachers Have Answered in Relation to The Concepts of "Sustainable Cities" in General and From the Perspective of Architecture, Heritage, and Materials

| Future Teacher | Sustainable Cities                                                                                                                                         | Architecture / Heritage / Materials                                                              | Others                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1              | offer good living comfort, no or fewer cars, space to relax, places to unwind, plenty of nature, good public transport, use of bicycles, reduced emissions | renovation of architecture, reuse of the existing building, architecture, more nature in general | "It is true that it would be exceedingly difficult to create a perfect, sustainable city. Therefore, for the time being, we can content ourselves with taking better care of existing cities and making good choices when creating future cities. For example, we should not build on protected land or on areas that are rich in fertility and vegetation. We need to adapt to the use of sustainable or recycled building materials." |
| 2              | complete redefinition of urban life (unbearable life in an urban environment)                                                                              | natural materials and their re-use                                                               | "Today, life in modern skyscrapers is unbearable - hot summers and very cold winters, no air, no wind, no isolation - natural materials were so much better, so much more sustainable. People (used to) know what was best for which climate. We have moved so far away from that now that we are melting into our own modern disasters."                                                                                               |
| 3              | back to nature                                                                                                                                             | use of stones, wood, soil, straw in new way is sustainable                                       | /                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 4              | cooperation and future policy                                                                                                                              | /                                                                                                | "The sustainable city will only exist if all citizens are willing to take care of it. But it is even more important to find developers, investors and architects who are prepared to create sustainable cities."                                                                                                                                                                                                                        |
| 5              | /                                                                                                                                                          | re-use of waste                                                                                  | "It is about utilizing waste and reducing it or making sure it is not wasted."                                                                                                                                                                                                                                                                                                                                                          |

In the last question in the interview, we asked the future teachers from the re-search to present us their artworks in which they give their message/idea/concept (solutions...) in response to the concept of "sustainability" and "materials/heritage/visual arts education/ architecture and/or contemporary art". All five pre-service teachers present their artwork. There were 3 models (architectural solution) and two paintings, one in the technique of tempera and the other of collage, made from waste materials. In addition, all the models were made from wastepaper of varying quality. We can conclude that all the artworks convey the message of reusing materials for visual arts (paper, textiles, other materials...). The motifs of the artworks are also partly related to the sustainability measures; we can find ideas on how to make our building more sustainable by producing and use energy (solar, wind...) and resources (water, food...) self-sufficiently, combined with a high awareness of the importance of the natural environment and coexistence with plants and other living beings. We have also identified the need for a clean environment in terms of integrated urban solutions, as well as the need for a high-quality aesthetic design of both the interior and exterior. The aesthetic experience of the pre-service teacher is also related to the use of natural materials (e.g., wood, stone...) as well as very technologically advanced solutions (e.g., the use of a heat pump for heating/cooling, the use of ventilation systems, solar systems, wind systems, larger glass surfaces and similar...). As many as three out of five respondents emphasized the need for a socially and emotionally stable environment for living, as evidenced by concrete solutions (e.g., an environment in nature, in seclusion, in an urban and green setting, etc.).



In Figures 9 and 10 below you can see the solutions of the artworks and the authors' interpretations.

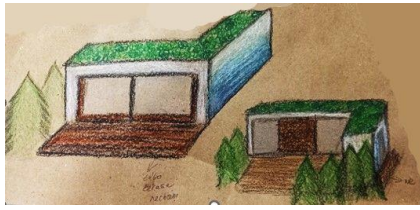


Figure 9. Artwork with the sustainable massage.

"I did this in class and was inspired by Danish architecture. I tried to use as many natural materials as possible - a lot of wood, as part of the heritage. I also incorporated a green roof and large windows to strengthen the connection to nature. And my idea is that the combination of modern materials and heritage materials is a connection or a search for good practices from the past for the future... maybe sometimes it is not possible to choose only sustainable materials... but in any case, to look for solutions that go in the direction of sustainability, because the transition is also a kind of path to sustainability... So, try to think about connections, look for ways to combine the unsustainable with the sustainable so that they somehow flow together... Even a small step is a step."



Figure 10. Artwork with the sustainable massage

"For this model I used old cardboard and sticks that I found on the ground during a walk. This type of building is designed to be built in harmony with nature. It's meant to stand in the forest, so it does not require major changes to the surface by building a huge base for a house. The living space is also small and is maximized for what people need to live comfortably."

## Discussion

*In the first research question, we asked ourselves, in what context do pre-service teachers associate the concept of "sustainability" and "materials in architecture, cultural heritage, and contemporary arts"?*

Table 1 shows that the pre-service teachers see the example of architectural heritage in the Slovenian countryside (Figure 1) as an example of sustainability. The building materials they mention - wood, straw, and brick - are associated with materials that are natural, local and have a long lifespan, which they understand as sustain-able materials (Ilvitskaya et al., 2019). Also, the construction method (thick walls, small openings), which ensures good regulation/insulation of the building (Popovac et al., 2018). Pre-service teachers also emphasized self-sufficiency (e.g., owning a well, food processing, etc.). The architecture is in harmony with nature, i.e., it belongs to the cultural landscape - it merges with it. We are positively surprised by the fact that most pre-service teachers from the survey emphasize or point out the importance of integrating architecture into the cultural landscape itself, which we also see in other studies as important didactic content in the direction of strengthening the students' responsible attitude towards interventions in the cultural landscape (Potočnik, 2017). However, it is also pointed out that the architecture mentioned symbolizes "poverty". Other studies also point out that architectural heritage can symbolize backwardness among teachers (Martínez Rodríguez & Fontal Merillas, 2020; Potočnik, 2020). Therefore, it is particularly important to raise awareness of the possibility of renovating architectural heritage towards a scheme that combines the needs of modern humans and the preservation of the cultural identity of the building itself (Potočnik, 2017, 2020). This concept that the architectural heritage is renovated with the help of professionals in a way that meets the needs of modern humans and preserves the identity of the building must be strengthened at all levels of education as well as among pre-service and in-service teachers (Potočnik, 2017, 2020; Thornton, 2008). A contemporary building in the Slovenian countryside (Figure 2) by pre-service teachers symbolizes architecture that works according to the principles of sustainable construction. They emphasize the use of wood and modern materials. A large glass surface is exposed, which brings light into the interior and symbolizes comfort, relaxation, and openness. As we have already shown in the example of architectural heritage (Figure 1), future teachers also point out in modern architecture (Figure 2) that the building is in harmony with nature or blends harmoniously into the context of the cultural landscape (Potočnik, 2017). The building is for pre-service teachers' energy efficient, e.g., it does not need air conditioning or is "breathable". They suggest additional good practices towards self-sufficiency (e.g.,

the integration of solar panels). Using the example of a contemporary building (Figure 2), the pre-service teachers also pointed out the simple construction or the fact that the building does not contain superfluous decoration. We emphasize this in comparison to a contemporary building in the countryside (Figure 3), where the pre-service teachers criticized exactly that – excessive decoration (un-necessary elements / pillars / “marble”). The building (Figure 3) thus symbolizes for them “that appearance - power, luxury - is more important than other things”, they also call it “Kardashian's house” or “house for investment - not for living in”. It is a fact that the house represents the status of the owner (Deu, 2009), but it is also true that the profession indicates that people are generally poorly educated architecturally (Černivec, 2010) - in terms of decoration, color of the facade, harmony in relationships with respect to the size of the building, openings, etc. (Potočnik, 2020), which can lead to poor architectural solutions that spoil the architectural landscape of the country (Potočnik, 2017). Pre-service teachers also pointed out that the building does not fit into the environment of the Slovenian countryside, because with its universal appearance (a design that can be found everywhere in the world) it does not follow the principles of the identity of the countryside (Deu, 2009; Potočnik, 2017, 2018b, 2020). Pre-service teachers also point out the lack of sustainability of the building - they doubt the quality of the building materials in the sense that they are not environmentally friendly (Akadiri, 2015). They also point out that it is especially important that they are not locally sourced or that they are likely to be delivered from far away, which is not in line with sustainability principles (Velenturf & Purnell, 2021). They believe that the building has “weak” insulation and see the potential for solar panels. Pre-service teachers understand the settlement shown (Figure 4), which is protected as a cultural monument in Slovenia, as an architectural whole or a series of structures that fit into the natural environment. There are opinions that architectural design represents a “perfect combination of human work and nature in a way that is aesthetically pleasing”. Pre-service teachers point to the material - stone, red roof tiles and wood, which is material of local origin (Orhon & Altin, 2020). For them, the settlement or cultural landscape is an example of architectural heritage that they experience in a romantic, nostalgic way (Bogataj, 1992), and they emphasize the quality that needs to be protected (Potočnik, 2017). In terms of sustainability, the architecture and building design presented is an example of best practices of how our ancestors knew how to build and live in harmony with nature (Berkes, 1993; Potočnik, 2020).

The architectural design (Figure 5) for the pre-service teachers symbolizes the future in terms of sustainable architecture in cities. In addition to glass and modern materials, they also emphasize materials such as plants, which contribute most to the sustainability of the building when it comes to humidity regulation, cooling, or shade in the summer periods. The findings show that natural green spaces cool cities and thus effectively and very sustainably maintain a tolerable temperature level during heat waves and prevent cities from overheating (Kumar et al., 2024). They also emphasize the quality of life in such a building and in the wider environment, which is an important sustainability aspect (Sassi, 2016). The building (Figure 5) is perceived as modern architecture, which opens the door to nature in the city. At the same time, however, pre-service teachers also express doubts about the actual quality of such buildings in terms of the sustainability of the materials (their composition, origin, etc.), but also just the maintenance of green spaces and the like, which is also emphasized by other studies (Yudelsson, 2016).

Figure 6 for pre-service teachers depicts an environment that does not function according to the principles of sustainability. The visible materials are glass, concrete, and iron. The city functions as a place struggling with pollution problems, which is a major challenge for megalomaniac cities (Molina & Molina, 2004). There are no green spaces in the neighbourhood, and this should go in the direction of greening (Chenyang et al., 2022). The urban environment of the pre-service teachers is repulsive, i.e., the quality of life in such an environment is not high (Glaeser, 2011).

From Table 2 we can see that the pre-service teachers in Figure 7 recognize interventions in the painting heritage with the aim of preservation. Conservation - restoration of cultural heritage is neglected in visual arts education, depending on the teachers' attitude towards the content and their willingness to teach (Potočnik, 2018a, 2020; Thornton, 2008). In connection with materials, pre-service teachers refer to terms such as “chemicals, better materials, harmful materials...”, meaning professional interventions in works of arts with the aim of preserving them for longer, maintaining them and making the “couleurs brighter”. Learning about the specific needs of cultural heritage and the particularities of the materials from which artifacts are made can be the content of interdisciplinary connections (Potočnik & Devetak, 2020; Potočnik et al., 2022), because research shows that students and pre-service teachers insufficiently understand the basic specificity of artworks in relation to their materials, which is basically the foundation for understanding their specificity and uniqueness (Potočnik & Devetak, 2023). In terms of sustainability, pre-service teachers recognize the importance of artworks, e.g., for future generations and education (United Nations, n.d.). In the last photo from the interview (Figure 8), the pre-service teachers have recognized the message of the contemporary artist, the search for solutions, or rather, “what everyone can do for a better world, according to their abilities” (Pahljina & Miljković, 2022). Most of them realize that the content is art because of its message on the subject, highlighting the issue of sustainability and creativity (Zhang & Shen, 2024). Examples of contemporary artistic practices that make us think, form our own opinions, etc., must serve as a starting point for creating our own artistic solutions, including in the direction of conveying opinions or creating artistic solutions at different educational levels (Jónsdóttir, 2017; Zupančič, 2006).

In the second research question we asked ourselves in *what context have pre-service teachers engaged with the contents of sustainability in their previous education in relation to learning about the specifics of visual arts (artmaking), cultural heritage (tradition), materials (visual arts techniques)?*

From Table 3, we can see that only one pre-service teacher was partially familiar with the topic of sustainability in the context of education in their own country; all others who participated in the survey did not discuss the content directly in the context of education. Our observations show that the content is not systematically included in lessons, especially not in visual arts education, which requires curricular adaptations according to contemporary guidelines (Jónsdóttir, 2017; Zupančič, 2006). Pre-service teachers understand best that they contribute to sustainability when they use waste material for arts activities. All participants did this as part of their visual arts education activities, but for practical reasons and not so much out of awareness that such principles also contribute to sustainable practices. When asked about experiences with sustainability in education, one person pointed out that in the past herself learned about sustainability issues, including towards cultural heritage and the search for innovative solutions based on the experiences of our ancestors, both in terms of materials and as activities that fulfil or give meaning to her soul (Pahljina & Miljković, 2022).

In third research question we asked ourselves *how do pre-service teachers understand the specific characteristics of "sustainable cities" in general and from the perspective of architecture, heritage, and materials?*

The content is partly related to the content of the first research question, in which we asked about sustainability in architecture and cultural (architectural) heritage, and which is linked to the specificities of cities. Table 4 shows what the pre-service teachers also stated. Pre-service teachers understand "sustainable cities" as places that offer their inhabitants good living conditions, with no or few cars, green spaces and coexistence with nature, efficient public transport, the possibility of safe bicycle use, care for emissions, etc. (Chenyang et al., 2022; Kumar et al., 2024; Molina & Molina, 2004; Sassi, 2016). They pointed out the renovation of existing architecture, the conversion of existing buildings and the like, which goes in the direction of sustainability practices (Potočnik, 2020; Potočnik & Devetak, 2020). It is also pointed out that there is a need to preserve protected land or areas that are rich in fertility and vegetation (Dyderski et al., 2017), and to think about the building material itself - to what extent it can be sustainable (Orhon & Altin, 2020). We also see a return to natural materials and a life that is more connected to nature. This is also related to the understanding of sustainable cities as a place where people can relax or where the environment is healthy for life (Glaeser, 2011). However, we need to think in terms of reusing materials as resources are limited (Minunno et al., 2020). When thinking about the content of "sustainable cities", the pre-service teachers conclude with a thought about the positive attitude of people towards this topic and the importance of politics or decision-makers: "The sustainable cities will only exist if all citizens are willing to take care of it. But it is even more important to find politicians, developers, investors, and architects who are willing to create sustainable cities".

The final, fourth research question was: *What kind of messages emerge in the artworks of pre-service teachers that address the content of sustainability in visual arts?*

We can conclude that all artworks convey the message of reusing materials for visual arts (paper, textiles, other materials...), which is in line with the sustainable guidelines in visual arts education (Frelih, 2011; Kokko & Räisänen, 2019). The motifs of the artworks are also partly related to the sustainability measures. We find ideas on how to make our building more sustainable by producing and using energy (solar, wind...) and resources (water, food...) self-sufficiently, combined with a high awareness of the importance of the natural environment and coexistence with plants and other living beings. We have also recognized the need for a clean environment in terms of integrated urban solutions, as well as the need for high-quality aesthetic design of both indoor and outdoor spaces. The aesthetic experience of the pre-service teacher is also related to the use of natural materials (e.g., wood, stone...) as well as very technologically advanced solutions (e.g., the use of a heat pump for heating/cooling, the use of ventilation systems, solar systems, wind systems, larger glass surfaces and the like...). We were also surprised by the fact that three out of five respondents emphasized the need for a socially and emotionally stable environment for the exit, which is reflected in concrete solutions (e.g., an environment in nature, in seclusion, in an urban and green environment, etc.). The research has also shown that the knowledge of pre-service teachers about artists creating in relation to sustainability issues is limited, which is an indication for all that more attention should be paid to the mentioned content in education in the future (Jónsdóttir, 2017; Zupančič, 2006).

### Conclusion

Pre-service teachers usually recognize examples of good practice in architecture, the cultural landscape, and various other visual arts messages - they know what good sustainable practice in the environment and the arts is and what is not. They are critical of materials that are not locally sourced, impossible to reuse, or that have too much impact on the environment. Pre-service teachers were not taught these topics during their previous education, and only waste materials were used in visual arts lessons without them understanding or being associated with the issue of sustainability. Pre-service teachers see the future in the systematic organization of society towards sustainable development but believe that in addition to the individual, the political direction also plays a significant role, e.g., regulated legislation, policies of cities, municipalities, etc. (Biermann et al., 2022). In the context of visual arts education, they also see the preservation of cultural heritage (from architecture - as reuse or renovation, as well as sustainable materials) in terms of sustainable practices. However, they show less understanding of the specifics of materials as carriers of material cultural heritage or of the artworks themselves, as well as of contemporary artistic practices that emphasize themes related to sustainable issues or development.

### Recommendations

It is useful to consider the above content in the context of cross-curricular integration, in any case, it makes sense to think in terms of the systematic inclusion of sustainability content and all levels of education, as we have already pointed out in several places in the article. The research opens additional possibilities for expanding the treatment of content - primarily towards analysing different approaches and needs in the treatment of content, as well as towards training pre-service teachers to use content in activities directly related to visual arts. From the conclusion can be drawn that pre-service teacher should be exposed interdisciplinary approaches in reaching sustainability goals in visual arts education and wider. The recommendation may more specifically aim to raise awareness of the specificities of arts materials and arts techniques characteristic of particular cultural environments when different materials are used in artistic creation, or awareness and recognition of the specificities of the materials of artworks and more generally of the needs of cultural heritage. Pre-service and in-service teachers can generally pay more attention to materials that follow the principles of sustainability in terms of reuse, recycling or understanding the needs of cultural heritage (e.g., artworks, architecture, cultural landscapes and the like that are characteristic of specific cultural environments) in artistic design. The content of the materials can be considered both in advance and through various contemporary practises, with the aim of raising awareness of the concept of sustainability and - most particularly - considering the specificities of the local environment.

### Limitations

This study also has some limitations - only 5 pre-service teachers participated in this study, and the results obtained cannot be generalized. If more pre-service teachers were involved, conclusions could also be drawn based on the specifics of the environment or countries from which the foreign students come. In any case, these are guidelines for improving or continuing research in the future. In the future, the research could aim to define the specificities of art materials and techniques in different educational environments and analyse their curricula in order to learn about the specificities of materials in visual arts education and adopt an interdisciplinary approach that is in line with the principles of the concepts of sustainability. It would also be useful in the future to examine how the content of cultural heritage care is reflected in the curricula of other countries and to look for possible links with the materials themselves and other contemporary practices that could be used within education through the prism of sustainability.

### Acknowledgments

The authors acknowledge the support from the Slovenian Research Agency through research core funding »Strategies for Education for Sustainable Development applying Innovative Student-Centred Educational Approaches (ID: P5-0451)« and financial support from the project Additional activities to encourage talented 1st and 2nd degree students as part of the RSF measure »Development and implementation of pilot activities to encourage the talented« (S.D.1.2).

### Ethics Statements

The studies involving human participants were reviewed and approved by the University of Ljubljana. The participants provided their written informed consent to participate in this study.

### Authorship Contribution Statement

Potočnik: Conceptualization, design, data acquisition, analysis, writing, editing. Devetak: Supervision, critical revision of manuscript. Ribič: Writing, editing

### References

- Abyzov, V. A., Pushkarova, K. K., Kochevykh, M. O., Honchar, O. A., & Bazeliuk, N. L. (2020). Innovative building materials in creation an architectural environment. *IOP Conference Series: Materials Science and Engineering*, 907, Article 012035. <https://doi.org/10.1088/1757-899X/907/1/012035>
- Akadiri, P. O. (2015). Understanding barriers affecting the selection of sustainable materials in building projects. *Journal of Building Engineering*, 4, 86-93. <https://doi.org/10.1016/j.jobbe.2015.08.006>
- Ariyatun, A., Sudarmin, S., Wardani, S., Saptono, S., & Winarto, W. (2024). Bibliometric analysis of environmental literacy in sustainable development: A comprehensive review based on Scopus data from 2013 to 2023. *International Journal of Educational Methodology*, 10(1), 179-195. <https://doi.org/10.12973/ijem.10.1.979>
- Berkes, F. (1993). Traditional ecological knowledge in perspective. In J. T. Inglis (Eds.), *Traditional ecological knowledge: Concepts and cases* (pp. 1-10). The International Program on Traditional Ecological Knowledge and, Canadian Museum of Nature.
- Biermann, F., Hickmann, T., Sénit, C.-A., Beisheim, M., Bernstein, S., Chasek, P., Grop, L., Kim, R. E., Kotze, L. J., Nilsson, M., Llanos, A. O., Okereke, C., Pradhan, P., Raven, R., Sun, Y., Vijge, M. J., van Vuuren, D., & Wicke, B. (2022). Scientific evidence on the political impact of the Sustainable Development Goals. *Nature Sustainability*, 5, 795-800. <https://doi.org/10.1038/s41893-022-00909-5>

- Bogataj, J. (1992). *Sto srečanj z dediščino na Slovenskem* [Hundred meetings with heritage in Slovenia]. Prešernova Družba.
- Bojc, D., & Potočnik, R. (2024). Secondary School Students' Response to Learning the Concept of Destruction and Transformation of an Artwork into Another Artwork in the Visual Arts Class. *Center for Educational Policy Studies Journal*. Advance online publication. <https://doi.org/10.26529/cepsj.1734>
- Busch, C. (2012). Using Content analysis. Colorado State University. <https://writing.colostate.edu/guides/pdfs/guide61.pdf>
- Camuffo, D. (2019). *Microclimate for cultural heritage: Measurement, risk assessment, conservation, restoration, and maintenance of indoor and outdoor monuments*. Elsevier.
- Chenyang, D., Maruthaveeran, S., & Shahidan, M. F. (2022). The usage, constraints and preferences of green space at disadvantage neighborhood: A review of empirical evidence. *Urban Forestry and Urban Greening*, 75, Article 127696. <https://doi.org/10.1016/j.ufug.2022.127696>
- Cohen, L., Manion, L., & Morrison, K. (2007). Metode istraživanja u obrazovanju [Research Methods in Education]. Naklada Slap. <https://bit.ly/4eQegEW>
- Černivec, U. (2010). Pogovor z dr. Živo Deu o skrbi za arhitekturno dediščino na Slovenskem [Conversation with Dr. Živo Deu on the care of architectural heritage in Slovenia]. <https://bit.ly/3V7tpL3>
- Deu, Ž. (2009). Varstvo identitetne podobe slovenskih kulturnih krajin [Protection of the identity of Slovenian cultural landscapes]. In M. Kitek Kuzman et al. (Eds.), *Gradnja z lesom* (pp. 226-231). Biotehniška fakulteta.
- Dyderski, M. K., Wrońska-Pilarek, D., & Jagodziński, A. M. (2017). Ecological lands for conservation of vascular plant diversity in the urban environment. *Urban Ecosystems*, 20, 639-650. <https://doi.org/10.1007/s11252-016-0625-2>
- Dyllick, T., & Rost, Z. (2017). Towards true product sustainability. *Journal of Cleaner Production*, 162, 346-360. <https://doi.org/10.1016/j.jclepro.2017.05.189>
- Frelih, Č. (2011). Trajnostna načela likovnega izobraževanja [Sustainable principles of visual arts education]. *Trajnostni razvoj kot načelo vzgoje in izobraževanja pri likovni in glasbeni vzgoji ter filozofiji. Zbornik referatov in razprav* (pp. 43-57). Državni svet Republike Slovenije.
- Fried, L., Lovering, C., Falconer, S., Francis, J., Johnston, R., Lombardi, K., Runions, K., Forde, K., Crosby, N., & Blue, L. (2023). Developing a resource for arts educators to enhance the social and emotional well-being of young people. *International Journal of Education and the Arts*, 24(23), 1-20. <https://doi.org/10.26209/ijea24n23>
- Vogrinc, J. (2008). *Kvalitativno raziskovanje na pedagoškem področju* [Qualitative research in the pedagogical field]. Pedagoška fakulteta. <http://pefprints.pef.uni-lj.si/179/1/Vogrinc1.pdf>
- Glaeser, E. (2011). Cities, productivity, and quality of life. *Science*, 333(6042), 592-594. <https://doi.org/10.1126/science.1209264>
- Hessler, S. (2012). Marjetica Potrc. Caracas Dry Toilet. <http://stefaniehessler.com/entries/dry-toilet>
- Horikoshi, R. (2021). Teaching introductory chemistry through world cultural heritage history. *Chemistry Teacher International*, 3(3), 1-10. <https://doi.org/10.1515/cti-2019-0023>
- Ilvitskaya, S. V., Lobkov, V. A., & Lobkova, T. V. (2019, December). Natural materials in sustainable architecture building system. *IOP Conference Series: Materials Science and Engineering*, 687(5), Article 055030. <https://doi.org/10.1088/1757-899X/687/5/055030>
- Jónsdóttir, Á. B. (2017). *Artistic actions for sustainability: Potential of art in education for sustainability*. Lapland University Press.
- Kokko, S., & Räisänen, R. (2019). Craft education in sustaining and developing craft traditions: Reflections from Finnish craft teacher education. *Techne serien - Forskning i Slöjdpedagogik och Slöjdvetsenskap*, 26(1), 27-43. <https://bit.ly/4eUwDi>
- Kris, A. O. (1992). Interpretation and the method of free association. *Psychoanalytic Inquiry*, 12(2), 208-224. <https://doi.org/10.1080/07351699209533893>
- Kumar, P., Debele, S. E., Khalili, S., Halios, C. H., Sahani, J., Aghamohammadi, N., Andrade, M. d. F., Athanassiadou, M., Bhui, K., Calvillo, N., Cao, S.-J., Caulon, F., Edmondson, J. L., Fletcher, D., Dias de Freitas, E., Guo, H., Hort, M. C., Katti, M., Kjeldsen, T. R., ... Jones, L. (2024). Urban heat mitigation by green and blue infrastructure: Drivers, effectiveness, and future needs. *The Innovation*, 5(2), Article 100588. <https://doi.org/10.1016/j.xinn.2024.100588>



- Laurie, R., Nonoyama-Tarumi, Y., Mckeown, R., & Hopkins, C. (2016). Contributions of education for sustainable development (ESD) to quality education: A synthesis of research. *Journal of Education for Sustainable Development*, 10(2), 226-242. <https://doi.org/10.1177/0973408216661442>
- Mahat, H., Norkhaidi, S. B., Saleh, Y., Hashim, M., Nayan, N., Said, Z. M., Matnoor, M., & Hamid, N. (2022). A study on the responsibility of environmental ethics among secondary school students in the 21st century. *International Journal of Educational Methodology*, 8(3), 585-593. <https://doi.org/10.12973/ijem.8.3.585>
- Martínez Rodríguez, M., & Fontal Merillas, O. (2020). Dealing with heritage as curricular content in Spain's Primary Education. *The Curriculum Journal*, 31(1), 77-96. <https://doi.org/10.1002/curj.7>
- Mesec, B. (1997). *Metodologija raziskovanja v socialnem delu I* [Research Methodology in Social Work I]. Visoka šola za socialno delo.
- Minunno, R., O'Grady, T., Morrison, G. M., & Gruner, R. L. (2020). Exploring environmental benefits of reuse and recycle practices: A circular economy case study of a modular building. *Resources, Conservation and Recycling*, 160, Article 104855. <https://doi.org/10.1016/j.resconrec.2020.104855>
- Molina, M. J., & Molina, L. T. (2004). Megacities and atmospheric pollution. *Journal of the Air and Waste Management Association*, 54(6), 644-680. <https://doi.org/10.1080/10473289.2004.10470936>
- Orhon, A. V., & Altin, M. (2020). Utilization of Alternative Building Materials for Sustainable Construction. In I. Dincer, C. O. Colpan, & M. A. Ezan (Eds.), *Environmentally Benign Energy Solutions* (pp. 727-750). Springer. [https://doi.org/10.1007/978-3-030-20637-6\\_36](https://doi.org/10.1007/978-3-030-20637-6_36)
- Pahljina, C., & Miljković, D. (2022). Utjecaj logopedagoške edukacije učitelja na neke aspekte njihovog profesionalnog i osobnog života [The impact of teacher's logopedagogical education on some aspects of their professional and personal life]. *Napredak: Časopis za interdisciplinarna istraživanja u odgoju i obrazovanju*, 163(1-2), 9-24. <https://hrcak.srce.hr/279082>
- Pavlou, V. (Ed.). (2024). *Critical arts education for sustainable societies: A handbook for arts educators*. Frederick University.
- Popovac, M., Kuzman, M. K., & Mišćević, L. (2018). Natural and Regionally Available Materials for a Sustainable Future ... sustainable and resilient building design. In S. Kosanović, T. Klein, T. Konstantinou, A. Radivojević, & L. Hildebrand (Eds.), *Sustainable and resilient building design approaches, methods and tools* (pp. 185-203). TU Delft Open.
- Potočnik, R. (2017). Implementing contents of conservation and protection of cultural landscape in fine art classes. *Croatian Journal of Education*, 19(3), 137-155. <https://doi.org/10.15516/cje.v19i0.2684>
- Potočnik, R. (2018a). Effective approaches to heritage education: Raising awareness through fine art practice. *International Journal of Education Through Art*, 13(3), 285-294. [https://doi.org/10.1386/eta.13.3.285\\_1](https://doi.org/10.1386/eta.13.3.285_1)
- Potočnik, R. (2018b). *Heritage preservation education in primary school fine art activities*. Digit. [https://issuu.com/digitsro/docs/potocnik\\_monograph\\_digit](https://issuu.com/digitsro/docs/potocnik_monograph_digit)
- Potočnik, R. (2020). Heritage preservation education: Teachers' preconceptions and teachers' implementation in visual arts classes. *Center for Educational Policy Studies Journal*, 10(2), 49-76. <https://doi.org/10.26529/cepsj.792>
- Potočnik, R., & Devetak, I. (2020). *Heritage preservation and interdisciplinary approach through Fine Art and Science Education*. Digit.
- Potočnik, R., & Devetak, I. (2021). Pre-service teachers' conceptions about materials of fine art paintings. *Pedagoška obzorja*, 36(2), 128-141.
- Potočnik, R., & Devetak, I. (2023). Pre-service teachers' views on chemistry of fine art materials of cultural heritage. *Chemistry Teacher International*, 5(1), 19-27. <https://doi.org/10.1515/cti-2022-0053>
- Potočnik, R., Košir, T., & Devetak, I. (2022). Slovenian primary school teachers' opinion on interdisciplinary approach between fine art and science education. *European Journal of Educational Research*, 11(1), 435-443. <https://doi.org/10.12973/eu-jer.11.1.435>
- Ruggerio, C. A. (2021). Sustainability and sustainable development: A review of principles and definitions. *Science of the Total Environment*, 786, Article 147481. <https://doi.org/10.1016/j.scitotenv.2021.147481>
- Sassi, P. (2016). Built environment sustainability and quality of life (BESQoL) assessment methodology. *Engaging stakeholders in education for sustainable development at university level* (pp. 21-32). Springer. [https://doi.org/10.1007/978-3-319-26734-0\\_2](https://doi.org/10.1007/978-3-319-26734-0_2)
- Sato, M., & James, P. (1999). Nature and environment as perceived by university students and their supervisors. *International Journal of Environmental Education and Information*, 18, 165-172.



- Tacol, T. (2003). Likovno izražaje, didaktična izhodišča za problemski pouk likovne vzgoje v osnovi šoli [Art expressions, didactic starting points for problem-based art education in primary school]. Debora.
- Tacol, T., & Šupšakova, B. (2018). Likovni razvoj in simbol v vizualni komunikaciji otroka [Art development and symbol in the visual communication of the child]. Debora.
- Thornton, L. (2008). Current trends in historic preservation education at the primary and secondary school levels. *Preservation Education and Research*, 1(1), 67-76.
- United Nations. (n.d.). *Transforming our world: The 2030 agenda for sustainable development*. <https://sdgs.un.org/2030agenda>
- Velenturf, A. P. M., & Purnell, P. (2021). Principles for a sustainable circular economy. *Sustainable production and consumption*, 27, 1437-1457. <https://doi.org/10.1016/j.spc.2021.02.018>
- Vogt, M., & Weber, C. (2019). Current challenges to the concept of sustainability. *Global Sustainability*, 2, Article e4. <https://doi.org/10.1017/sus.2019.1>
- Webster-Stratton, C. (1999). *How to promote children's social and emotional competence*. Sage.
- Wulandari, F. E., Susantini, E., & Hariyono, E. (2024). Web-based module on biotechnology: Fostering preservice science teachers' eco-literacy skills. *International Journal of Educational Methodology*, 10(1), 45-63. <https://doi.org/10.12973/ijem.10.1.845>
- Yudelson, J. (2016). *Reinventing green building: Why certification systems aren't working and what we can do about it*. New Society Publishers.
- Zhang, L., & Shen, T. (2024). Integrating sustainability into contemporary art and design: An interdisciplinary approach. *Sustainability*, 16(15), Article 6539. <https://doi.org/10.3390/su16156539>
- Zupančič, T. (2006). *Metoda likovnopedagoškega koncepta: Priročnik za učitelje* [Method of the visual arts pedagogic concept: A manual for teachers]. Zavod Republike Slovenije za šolstvo.