# The Impact of Digital Technologies on Training Art Students to Achieve Sustainable Development Goals

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ABSTRACT

The aim of this study was to determine the impact of digital technologies in the education of Art students in their knowledge and attitude towards the Sustainable Development Goals (SDGs). A survey was used in this study to determine the students' digital literacy, as well as to identify their level of knowledge of the Sustainable Development Goals and their attitude towards these goals. Mathematical methods of data processing, Cronbach's Alpha, Kaiser's Measure, and Pearson correlation coefficient were also applied. It was found that the level of digital literacy, as well as the knowledge and attitude of students towards the SDGs, depend on their major. It is also assumed that the students' attitude towards the SDGs depends on the political, economic, and social situation in the country. The results of the research complement the existing theoretical knowledge, and also recommend the methodology for determining the impact of digital technologies on shaping students' attitudes towards the SDGs. It can be tested for other majors as well.

KEYWORDS: Digitization, sustainable development, Digital literacy, Communication technology, Art styles.

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# El impacto de las tecnologías digitales en la formación de estudiantes de Arte para alcanzar los objetivos de desarrollo sostenible

RESUMEN

El objetivo de este estudio fue determinar el impacto de las tecnologías digitales en la educación de los estudiantes de Arte en su conocimiento y actitud hacia los Objetivos de Desarrollo Sostenible (ODS). En este estudio se utilizó una encuesta para determinar la alfabetización digital de los estudiantes, así como para identificar su nivel de conocimiento de los Objetivos de Desarrollo Sostenible y su actitud hacia estos objetivos. También se aplicaron métodos matemáticos de procesamiento de datos, Alfa de Cronbach, Medida de Kaiser y coeficiente de correlación de Pearson. Se encontró que el nivel de alfabetización digital, así como el conocimiento y la actitud de los estudiantes hacia los ODS, dependen de su carrera. También se asume que la actitud de los estudiantes hacia los ODS depende de la situación política, económica y social del país. Los resultados de la investigación complementan el conocimiento teórico existente y también recomiendan la metodología para determinar el impacto de las tecnologías digitales en la formación de las actitudes de los estudiantes hacia los ODS. También se puede probar para otras carreras.

PALABRAS CLAVES: Digitalización, Desarrollo medioambiental, Iniciación a la informática, Tecnología de la comunicación, Estilo artístico.

Introduction

The period of rapid industrial development is accompanied not only by satisfying the material needs of people, but also by the depletion of natural resources and the growth of population inequality, which leads to climate change and wars (Mittal & Rama devi Pani, 2021). In 2015, the 2030 Agenda defined 17 Sustainable Development Goals in order to reduce the negative impact of these factors. The achievement of those Goals will enable preserving our planet for future generations in a state no worse than the current one (Palomares et al., 2021). The education system is tasked to transform society towards achieving the SDGs (Saitua-Iribar et al., 2020), as education is the basis of ecological, economic, and social development (García-Hernández et al., 2022). It is a guide to a better life, both for society as a whole and for each person in particular. Education should change the behavioural approach of society in order to achieve sustainability. This process has many challenges and various strategies are being implemented to address them (Shava et al., 2021).

Different countries have different approaches to the implementation of the values provided by SDGs and communicating them to the society. For example, in Japan,

schoolchildren and students can choose subjects related to the SDGs, while in Sweden, the SDGs are part of the curriculum (Yuan et al., 2022). Ukrainian universities are developing recommendations for taking into account the SDGs and ensuring quality education aimed at providing the necessary knowledge, skills and abilities to achieve them (Stukalo & Lytvyn, 2021). Students are also involved in various public events related to the sustainable development. Higher education institutions (HEIs) post information on sustainable development on official websites, change curricula, prepare students for lifelong learning, etc.

The issue of the relationship between the use of digital technologies during students' education and their awareness of the SDGs is not sufficiently covered in the academic literature. Therefore, the aim of this work was to study the impact of increasing the use of digital technologies during education in art majors on students' knowledge and attitude towards the SDGs. In particular, the matter is about students of the following art majors: Music Art, Performing Arts, Visual Arts, Decorative Arts, and Restoration. For this purpose, the following research objectives were set:

1) Determine the level of digital literacy of art students as a possible indicator of the frequency of use of digital technologies;

2) Evaluate the level of art students' knowledge and attitude to the SDGs;

3) Establish the dependence of the level of students' knowledge about the SDGs and their attitude towards the latter on the level of digital literacy.


## 1. Literature review

The dynamics of achieving the SDGs are usually studied discretely, in other words, individual goals are studied. De Miguel González and Sebastián-López (2022) studied Goals 5 (gender equality) and 11 (sustainable cities and communities). Wickramasinghe and Razak (2023) argue that education is a tool for simultaneous achievement several of the 17 SDGs, not only Goal 4, which directly relates to education (ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.). For example, Goal 1 — No poverty — can be achieved thanks to education, which leads to the achievement of Goal 2 — Zero hunger, while Goal 5 — Gender Equality — can be achieved thanks to the education of women. Education develops industry and creates innovation (Goal 9). Education contributes to reducing the difference between different population groups, which corresponds to Goal

10 — Reduced inequalities. Education promotes a more conscious attitude of people to their own health and to the environment. However, as Oie (2021) points out, the SDGs are interrelated and one cannot achieve some goals while neglecting others.

According to Bachmann et al. (2022), digital technologies are widely used to achieve sustainable development. For example, Triki et al. (2023) studied their impact on the development of one of the regions of the Kingdom of Saudi Arabia. A web-based Sustainable Development Programme in Ethiopia and Rwanda was developed through digital technologies (Bälter et al., 2022). Hess et al. (2021) presents the results of a study of the use of digital technologies for the preservation of cultural heritage. Palomares et al. (2021) established the contribution of artificial intelligence to the prospects of achieving the SDGs. Kaputa et al. (2022) state that digital technologies provide access to education to more people and reduce its cost. García-Hernández et al. (2022) note that they promote the development of critical thinking, creativity, teamwork and communication, self-sufficiency, and responsibility. However, as Palomares et al. (2021) indicate, the use of digital technologies still has certain difficulties: insufficient number of developed digital resources, insufficient preparation of teachers and learners, technical support of participants in the educational process, high energy consumption of computing equipment, issues of ethics, confidentiality, security, and property rights.

De Miguel González and Sebastián-López (2022) emphasizes that the introduction of the study of SDGs in the study of a certain academic subject requires teachers to have specific knowledge and skills, a deep understanding of their connections with the subject being studied. Hurd and Ormsby (2020) states that special tools and educational resources are needed to implement the SDGs in education. For example, Choi et al. (2022) developed an educational programme that contributed to the achievement of Goal 4 — Quality education. According to Kilanioti (2022), game-based learning is a common teaching method for introducing students to the SDGs.

Shava et al. (2021) considered art as a method of introducing citizens into the SDGs. Besides, as Oie (2021) notes, art is a tool for achieving the SDGs. Chapman and O'Gorman (2022) state that art help transform education for sustainable development. It is a unique language for inclusive education. For example, music can reach where words cannot. Art enables seeing the world in a new way and imagine a different future. It draws on the expertise of others to support sustainable development. Art makes it possible to visualize the

negative impact of human activity on the environment, thereby more strongly activating neural mechanisms, causing a range of emotions and achieving the attitude towards it necessary to preserve the environment. So, art can cause a feeling of discomfort, which in turn can play the role of a catalyst for the development of empathy and compassion. Art also helps to develop teamwork skills, creative cooperation, mutual respect and mutual assistance, for example, during dramatic play, dance, joint performance of musical works, etc. Horwitz and Thyrén (2022) consider that art is a tool for preparing students for a sustainable and healthy working life. Therefore, educational programmes of HEIs should include art. Music education for adults improves their quality of life, while helping to build relationships between members of society, music and culture and contributing to the achievement of the SDGs (Vernia-Carrasco, 2022).

To achieve Goal 4 (education for all), various engineering inventions are created for people with special abilities. For example, a Braille tablet for the visually impaired, a prosthetic guitar for a one-handed guitarist (Foss & Liu, 2022). The continuity and accessibility of education is ensured through digital technologies. For example, e-Hakseupteo, the electronic learning platform, was used to study music remotely (Park, 2022).

Veland et al. (2022) considered music from two perspectives: 1) as a tool of personal, practical, and political transformation in accordance with the SDGs; 2) as a metaphor and illustration of the historical context for the implementation of the SDGs. Achieving the SDGs is a process of joint creativity of the improvisers of sustainable development.

## 2. Methods

### 2.1. Research Design

The research was conducted in three stages.

The first stage involved the study of the state of development of digital literacy, the level of awareness, understanding of the SDGs, and the assessment of the attitude of art students (compared with other majors) to the SDGs.

The second stage provided for a pedagogical experiment conducted among students of 3 art majors. It was aimed at simultaneously increasing the students' digital literacy as a whole and actively introducing them during the study of specialized artistic subjects as

simulators of musical instruments, means of search, distribution, reproduction, creation of information. Emphasis was also placed on raising students' awareness of the SDGs and their participation in activities aimed at spreading the SDGs through art. For this purpose, sections introducing into the SDGs, as well as the role of musical art in achieving the SDGs, were included in the curricula. Students' digital literacy was improved through additional educational courses.

The third stage provided for determining the impact of the pedagogical experiment conducted in art majors on the level of students' digital literacy and their awareness of the SDGs, as well as the interdependence of the last two values.

In general, the study lasted one academic year, from September 2022 to May 2023.

## 2.2. Sampling

The sample included 753 students of nine HEIs of Ukraine. Students studied different majors: Music Art (159 people), Performing Arts (84), Fine Arts, Decorative Arts, Restoration (133), Journalism (52), Law (56), Physics and Astronomy (15), Ecology (29), Mathematics (27), Computer Science (59), Agronomy (63), Medicine (76). Art students only took part in the pedagogical experiment (181 – control group, 195 – experimental group). The age range of the respondents was 18-27 years. The sample also included 17 teachers who taught students majoring in Music Art, Performing Arts, Fine Arts, Decorative Arts, and Restoration. The age range of teachers was 31-65 years. All teachers had an academic degree: 3 DScs, 14 PhDs.

## 2.3. Methods

Digital literacy was determined by using the technique (Choi et al., 2022) of dividing digital competence into areas of competence. And students were asked to rate each of them on a 4-point Likert scale, where 1 is poorly mastered, 4 is perfectly mastered.

The level of awareness of sampled students, their understanding of the SDGs and their attitude towards the latter were assessed using the methods of Ilham et al. (2021), Smaniotto et al. (2020) and Chen et al. (2021) on a five-point Likert scale. The questionnaires were translated into Ukrainian, adjusted according to the objectives of this study, and checked by three experts. The experts involved Doctor of Philology, Doctor of

Pedagogy, and Doctor of Psychology.

The reliability of the study was determined using the Cronbach's alpha, which was higher than 0.7. Validity was determined through the Kaiser's Measure. It was also acceptable — more than 0.7. Correlation was determined by using the Pearson correlation coefficient.

Participation in the study was voluntary, anonymous and free of charge.

### 3. Results

Table 1 presents the results of the assessment of digital literacy carried out at the beginning among students of 11 different majors, 3 of which are artistic, where the assessment was also carried out after the pedagogical experiment.

The conducted assessment of students' digital literacy (Table 1) showed that it is major-dependent. Students obtaining higher education in art majors had the lowest digital literacy among all students in the sample (61.2, 62.1 and 63.2 points). Students majoring in Computer Science had the highest digital literacy (86.4 points).

**Table 1.** Students' digital literacy

| Area of competence | Majors | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Musical Art | | | Fine Arts, Decorative Arts, Restoration | | | Performing Arts | | | Journalism | Law | Physics and... | Ecology | Mathematics | Computer... | Agronomy | Medicine |
| | Before | After | | Before | After | | Before | After | | | | | | | | | |
| | EG and CG | EG | CG | EG and CG | EG | CG | EG and CG | EG | CG | | | | | | | | |
| Basics of Hardware and Software. Basic Knowledge: | | | | | | | | | | | | | | | | | |
| Hardware | 3.4 | 3.8 | 3.4 | 3.4 | 3.5 | 3.4 | 3.5 | 3.7 | 3.5 | 3.6 | 3.7 | 3.8 | 3.7 | 3.8 | 4.0 | 3.7 | 3.7 |
| Software | 2.6 | 2.9 | 2.7 | 2.8 | 3.0 | 2.8 | 2.7 | 3.0 | 2.8 | 2.9 | 2.9 | 3.4 | 3.1 | 3.2 | 3.9 | 3.1 | 3.0 |
| Work with data | | | | | | | | | | | | | | | | | |
| Search | 2.9 | 3.3 | 2.9 | 2.8 | 3.2 | 2.9 | 2.9 | 3.4 | 3.0 | 3.5 | 3.1 | 3.5 | 3.2 | 3.7 | 3.8 | 3.1 | 2.9 |
| Filtration | 2.7 | 2.9 | 2.8 | 2.7 | 3.0 | 2.8 | 2.6 | 2.9 | 2.6 | 3.1 | 2.9 | 2.9 | 2.7 | 2.8 | 3.2 | 2.7 | 2.8 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Evaluation | 2.6 | 2.8 | 2.7 | 2.6 | 2.9 | 2.6 | 2.5 | 2.8 | 2.5 | 3.0 | 2.8 | 2.9 | 2.6 | 2.9 | 3.1 | 2.6 | 2.7 |
| Management | 2.4 | 2.9 | 2.5 | 2.3 | 2.8 | 2.5 | 2.4 | 2.9 | 2.5 | 2.8 | 2.5 | 2.9 | 2.5 | 2.8 | 3.2 | 2.5 | 2.6 |
| **Communication and cooperation** | | | | | | | | | | | | | | | | | |
| Interaction with digital devices | 2.4 | 2.7 | 2.5 | 2.5 | 2.8 | 2.6 | 2.7 | 2.8 | 2.7 | 2.9 | 2.8 | 3.1 | 2.9 | 3.1 | 3.8 | 2.7 | 2.9 |
| Information exchange using digital technologies | 2.8 | 3.1 | 2.9 | 2.8 | 3.0 | 2.8 | 2.9 | 3.1 | 2.9 | 3.4 | 3.1 | 3.4 | 3.2 | 3.5 | 3.9 | 3.2 | 3.1 |
| Involvement in the global digital space | 2.0 | 2.4 | 2.1 | 2.1 | 2.5 | 2.2 | 2.1 | 2.5 | 2.2 | 3.1 | 2.7 | 2.4 | 2.3 | 2.4 | 3.0 | 2.5 | 2.4 |
| Cooperation mediated by digital technologies | 1.9 | 2.6 | 2.0 | 2.0 | 2.6 | 2.0 | 2.1 | 2.6 | 2.2 | 2.7 | 2.5 | 2.6 | 2.3 | 2.3 | 3.4 | 3.1 | 3.2 |
| Ethics of Internet communication | 2.9 | 3.1 | 2.9 | 2.8 | 3.0 | 2.8 | 2.9 | 3.1 | 2.9 | 3.1 | 3.0 | 2.9 | 2.8 | 2.9 | 3.3 | 2.9 | 2.8 |
| **Creation of digital content** | | | | | | | | | | | | | | | | | |
| Creation and development | 2.7 | 3.0 | 2.8 | 2.8 | 3.1 | 2.8 | 2.8 | 3.1 | 2.8 | 3.7 | 3.1 | 2.9 | 2.8 | 2.9 | 3.4 | 2.8 | 2.7 |
| Integration | 2.6 | 2.9 | 2.7 | 2.7 | 3.0 | 2.8 | 2.8 | 3.0 | 2.8 | 3.5 | 2.9 | 2.8 | 2.6 | 2.7 | 3.4 | 2.7 | 2.6 |
| Export | 2.6 | 2.9 | 2.6 | 2.6 | 2.8 | 2.6 | 2.7 | 2.8 | 2.7 | 3.6 | 3.0 | 2.7 | 2.6 | 2.8 | 3.3 | 2.6 | 2.5 |
| Copyright | 2.9 | 3.2 | 2.9 | 2.8 | 3.1 | 2.8 | 2.9 | 3.1 | 2.9 | 3.1 | 3.1 | 3.0 | 2.9 | 2.9 | 3.4 | 2.8 | 2.7 |
| Programming | 1.3 | 1.6 | 1.5 | 1.2 | 1.6 | 1.2 | 1.3 | 1.4 | 1.3 | .7 | 1.6 | 2.1 | 1.7 | 2.0 | 3.1 | 1.5 | 1.6 |
| **Security** | | | | | | | | | | | | | | | | | |
| Protection of digital devices | 2.7 | 3.3 | 2.8 | 2.9 | 3.4 | 3.0 | 2.8 | 3.3 | 2.9 | 3.0 | 3.1 | 3.4 | 3.1 | 3.2 | 3.9 | 3.1 | 3.0 |
| Privacy protection | 2.6 | 3.1 | 2.7 | 2.8 | 3.1 | 2.9 | 2.7 | 3.1 | 2.8 | 2.9 | 3.0 | 3.3 | 3.0 | 3.1 | 3.8 | 3.0 | 2.9 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Protection of health and well-being | 2.9 | 3.0 | 2.9 | 2.9 | 3.0 | 2.9 | 2.8 | 3.0 | 2.8 | 2.9 | 2.8 | 2.8 | 3.1 | 2.7 | 2.8 | 2.8 | 3.2 |
| Environmental protection | 2.3 | 2.7 | 2.3 | 2.2 | 2.8 | 2.3 | 2.4 | 2.8 | 2.5 | 3.1 | 2.9 | 2.6 | 3.6 | 2.4 | 2.7 | 2.6 | 2.5 |
| Solving problems | | | | | | | | | | | | | | | | | |
| Identification of technical problems | 2.1 | 2.8 | 2.2 | 2.1 | 2.7 | 2.2 | 2.2 | 2.7 | 2.3 | 2.7 | 2.9 | 3.1 | 2.8 | 2.9 | 3.8 | 2.8 | 2.4 |
| Solving technical problems | 2.0 | 2.7 | 2.1 | 1.9 | 2.6 | 2.0 | 1.9 | 2.6 | 2.0 | 2.2 | 2.2 | 2.7 | 2.4 | 2.6 | 3.7 | 2.5 | 2.3 |
| Creative use of digital technologies | 2.3 | 2.9 | 2.4 | 2.4 | 2.9 | 2.3 | 2.5 | 2.9 | 2.6 | 2.8 | 2.9 | 3.0 | 2.8 | 2.7 | 3.6 | 2.7 | 2.5 |
| Identifying gaps in digital literacy | 2.0 | 2.5 | 2.1 | 2.2 | 2.6 | 2.3 | 2.1 | 2.7 | 2.2 | 2.5 | 2.7 | 2.9 | 2.6 | 2.8 | 3.2 | 2.3 | 2.1 |
| Computational thinking | 1.6 | 2.2 | 1.7 | 1.8 | 2.0 | 1.9 | 2.0 | 2.5 | 2.1 | 2.3 | 2.5 | 3.1 | 2.8 | 3.2 | 3.7 | 2.2 | 2.0 |
| Total | 61.2 | 71.3 | 63.1 | 62.1 | 71.0 | 65.7 | 63.2 | 71.8 | 54.5 | 74.1 | 70.7 | 74.2 | 70.1 | 72.3 | 86.4 | 68.5 | 67.1 |

As Table 1 shows, active use of digital technologies in the process of education of art students contributed to the development of their digital literacy. The total score in the experimental group increased by 10.1; 8.9 and 11.3 in the three artistic majors considered in this work. At the same time, the intergroup variance, which was caused by the heterogeneity of the sample, associated with conducting the research in different HEIs, had a value ranging from 187 to 532. It differed from the intragroup variance, which is caused by random factors not taken into account in this study. This proves the invalidity of the null hypothesis.

The level of students' awareness of the SDGs was different in different majors. For example, 19% of students majoring in Musical Art (Figure 1), 13% of students majoring in Visual Arts, Decorative Arts, Restoration (Figure 2) and 4% — in Performing Arts (Figure 3) never heard about the SDGs and the 2030 Agenda. Compared to students of other majors (Figure 4), this is a high indicator of lack of awareness. More than 30% of students majoring

in Ecology, Medicine, Agronomy, and Journalism studied it at HEIs. About 40% of all students heard about it from other sources.
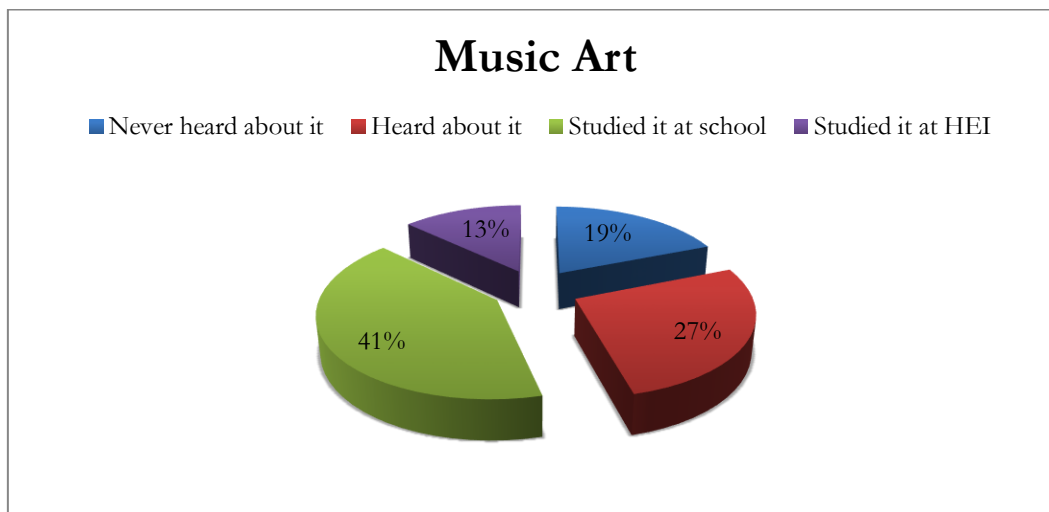


**Figure 1.** The level of awareness of the students majoring in Musical Art about the SDGs and the 2030 Agenda
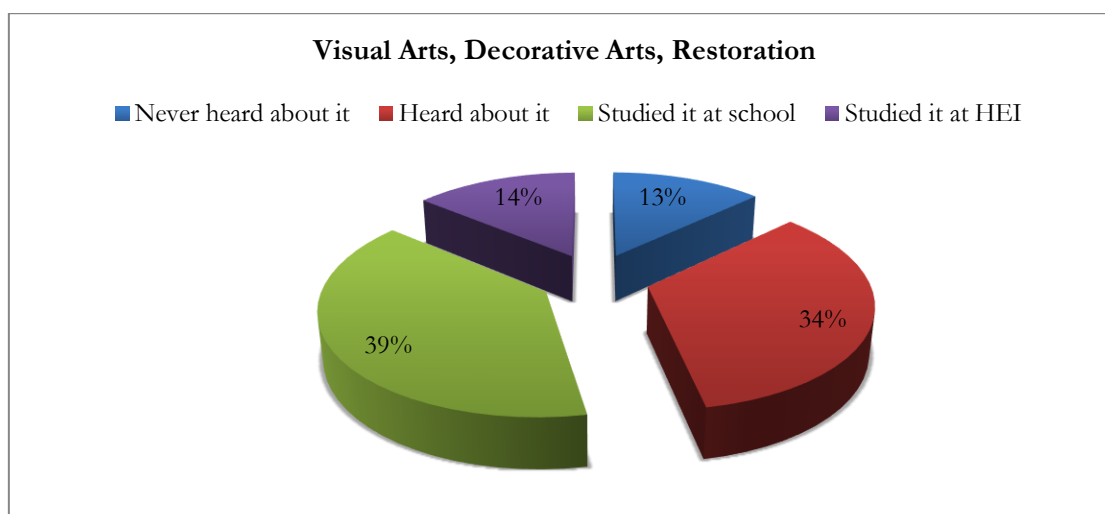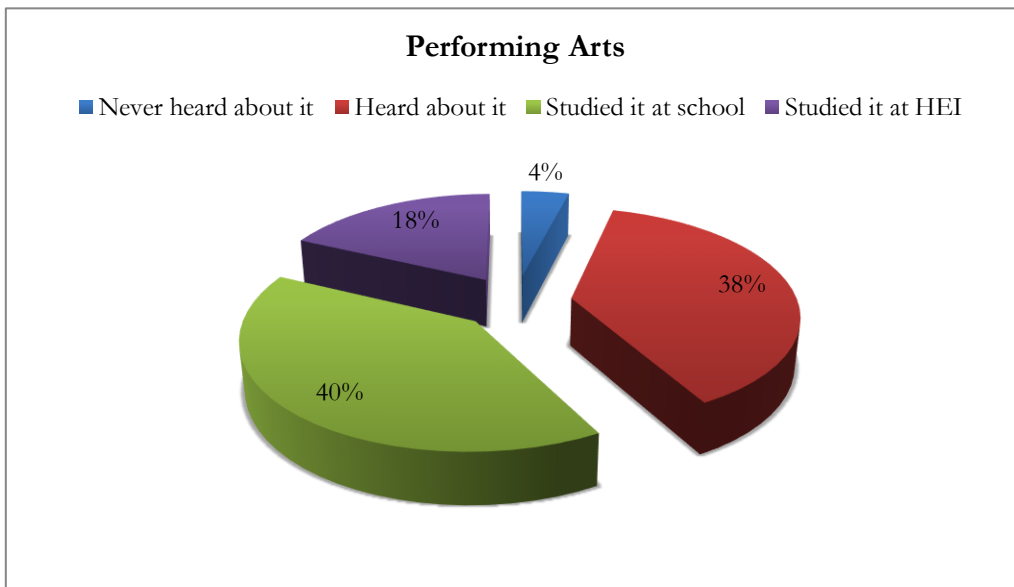


**Figure 2.** The level of awareness of students majoring in Fine Arts, Decorative Arts and Restoration about the SDGs and the 2030 Agenda

As sources of information, in addition to school and HEIs, students of art majors also named web sources (an average of 8 percent for three art majors), television (27 percent), the Internet and social networks (22 percent), magazines/books/newspapers (4 percent ), extracurricular activities or sustainable development courses (2%), and others (1%).

Figure 5 and Table 2 present the results of the assessment of students' attitude to the

study of the SDGs at the beginning of the research.



**Figure 3.** The level of awareness of students majoring in Performing Arts about the SDGs and the 2030 Agenda
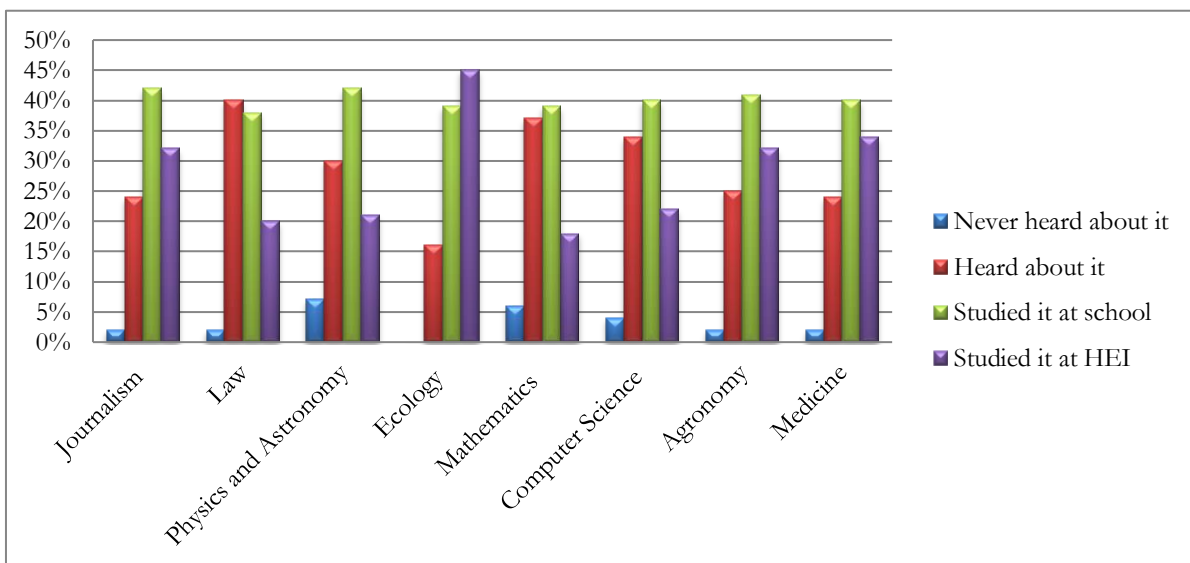


**Figure 4.** The level of awareness of students of other majors about the SDGs and the 2030 Agenda

Selectivity in the attitude of students towards the SDGs was revealed. Moreover, this selectivity was major-dependant.

The positive dynamics of the attitude of art students to the SDGs after the pedagogical experiment (Table 2) is evident. The total number of points for 17 SDGs scored by the students of the experimental group after the experiment increased by 10.9; 10.5 and 9.7 points

in three art majors. At the same time, the intergroup variance ranged from 219 to 683.

**Table 2.** The results of the assessment of students' attitudes towards each of the SDGs

| | SDGs | Music Art | | | Fine Arts, Decorative Arts, Restoration | | | Performing Arts | | | Journalism | Law | Physics and Astronomy | Ecology | Mathematics | Computer Science | Agronomy | Medicine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Before | After | | Before | After | | Before | After | | | | | | | | | |
| | | EG and CG | EG | CG | EG and CG | EG | CG | EG and CG | EG | CG | | | | | | | | |
| | | Average score | | | | | | | | | | | | | | | | |
| 1 | No poverty | 3.8 | 4.1 | 3.8 | 3.6 | 3.9 | 3.6 | 3.7 | 4.1 | 3.7 | 4.1 | 3.8 | 3.9 | 3.8 | 3.9 | 3.9 | 3.8 | 3.8 |
| 2 | Zero hunger | 2.1 | 2.8 | 2.2 | 2.2 | 3.1 | 2.3 | 2.1 | 2.9 | 2.2 | 2.2 | 2.1 | 2.3 | 2.2 | 2.1 | 2.1 | 4.2 | 2.2 |
| 3 | Good health and well-being | 3.4 | 3.9 | 3.4 | 3.1 | 3.8 | 3.2 | 3.3 | 4.0 | 3.3 | 3.4 | 3.2 | 3.3 | 3.5 | 3.2 | 3.2 | 3.4 | 3.9 |
| 4 | Quality education | 3.2 | 3.8 | 3.3 | 3.3 | 4.0 | 3.3 | 3.4 | 4.1 | 3.4 | 3.5 | 3.2 | 3.4 | 3.2 | 3.1 | 3.5 | 3.1 | 3.2 |

| 5 | Gender equality | 2.7 | 3.2 | 2.8 | 2.6 | 3.1 | 2.6 | 2.9 | 3.0 | 2.9 | 2.7 | 2.6 | 2.5 | 2.5 | 2.3 | 2.4 | 2.5 | 2.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | Clean water and sanitation | 2.5 | 3.4 | 2.6 | 2.7 | 3.4 | 2.8 | 2.8 | 3.6 | 2.9 | 3.1 | 2.9 | 2.8 | 3.7 | 2.7 | 2.9 | 2.8 | 3.5 |
| 7 | Affordable and clean energy | 2.9 | 3.7 | 2.9 | 2.8 | 3.3 | 2.8 | 2.9 | 3.5 | 3.0 | 3.3 | 3.1 | 4.1 | 4.0 | 3.2 | 3.4 | 3.0 | 3.7 |
| 8 | Decent work and economic growth | 3.7 | 4.0 | 3.7 | 3.8 | 4.1 | 3.8 | 3.6 | 4.1 | 3.6 | 3.7 | 3.4 | 3.6 | 3.5 | 3.8 | 4.2 | 4.1 | 4.0 |
| 9 | Industry, innovation and infrastructure | 3.3 | 3.9 | 3.4 | 3.4 | 4.0 | 3.5 | 3.5 | 4.2 | 3.5 | 3.4 | 3.5 | 3.9 | 4.1 | 3.7 | 4.3 | 4.2 | 4.3 |
| 10 | Reduced inequalities | 3.6 | 4.1 | 3.6 | 3.5 | 4.1 | 3.5 | 3.7 | 4.3 | 3.7 | 3.7 | 3.6 | 3.5 | 3.4 | 3.6 | 4.1 | 3.7 | 3.7 |
| 11 | Sustainable cities and communities | 2.8 | 3.5 | 2.9 | 2.7 | 3.5 | 2.7 | 2.9 | 3.4 | 2.9 | 3.3 | 3.2 | 3.1 | 3.5 | 3.1 | 3.2 | 3.3 | 3.4 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | Responsible consumption and production | 2.4 | 3.1 | 2.5 | 2.6 | 3.2 | 2.7 | 2.9 | 3.5 | 3.0 | 3.5 | 2.4 | 3.4 | 4.1 | 2.9 | 3.5 | 3.1 | 3.0 |
| 13 | Climate action | 2.1 | 2.9 | 2.2 | 2.3 | 3.1 | 2.4 | 2.4 | 3.2 | 2.4 | 3.7 | 3.1 | 3.0 | 4.6 | 2.8 | 3.4 | 3.9 | 3.1 |
| 14 | Life below water | 1.9 | 2.8 | 1.9 | 2.0 | 2.9 | 2.1 | 2.2 | 3.0 | 2.2 | 2.9 | 2.7 | 2.9 | 4.2 | 2.8 | 3.1 | 2.3 | 2.4 |
| 15 | Life on land | 2.2 | 2.9 | 2.2 | 2.3 | 2.8 | 2.3 | 2.4 | 3.1 | 2.4 | 2.8 | 2.6 | 2.3 | 4.1 | 2.2 | 2.5 | 2.9 | 2.7 |
| 16 | Peace, justice and strong institutions | 3.9 | 4.4 | 4.0 | 4.1 | 4.4 | 4.1 | 4.2 | 4.5 | 4.3 | 4.3 | 4.3 | 4.2 | 4.3 | 4.2 | 4.1 | 4.4 | 4.4 |
| 17 | Partnerships for the goals | 2.7 | 3.5 | 2.7 | 2.9 | 3.7 | 2.9 | 2.9 | 3.0 | 3.0 | 4.1 | 3.7 | 3.5 | 4.2 | 3.3 | 3.4 | 2.9 | 3.7 |
| | Total | 49.2 | 60 | 50.1 | 49.9 | 60.4 | 50.6 | 51.8 | 61.5 | 52.4 | 57.7 | 53.4 | 55.7 | 62.9 | 52.9 | 57.2 | 57.6 | 57.4 |
| | Max | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |

The dependence of students' attitude towards the SDGs on their digital literacy was established as a characteristic of the frequency of use of digital technologies (Figure 6). k=1.1 was calculated.
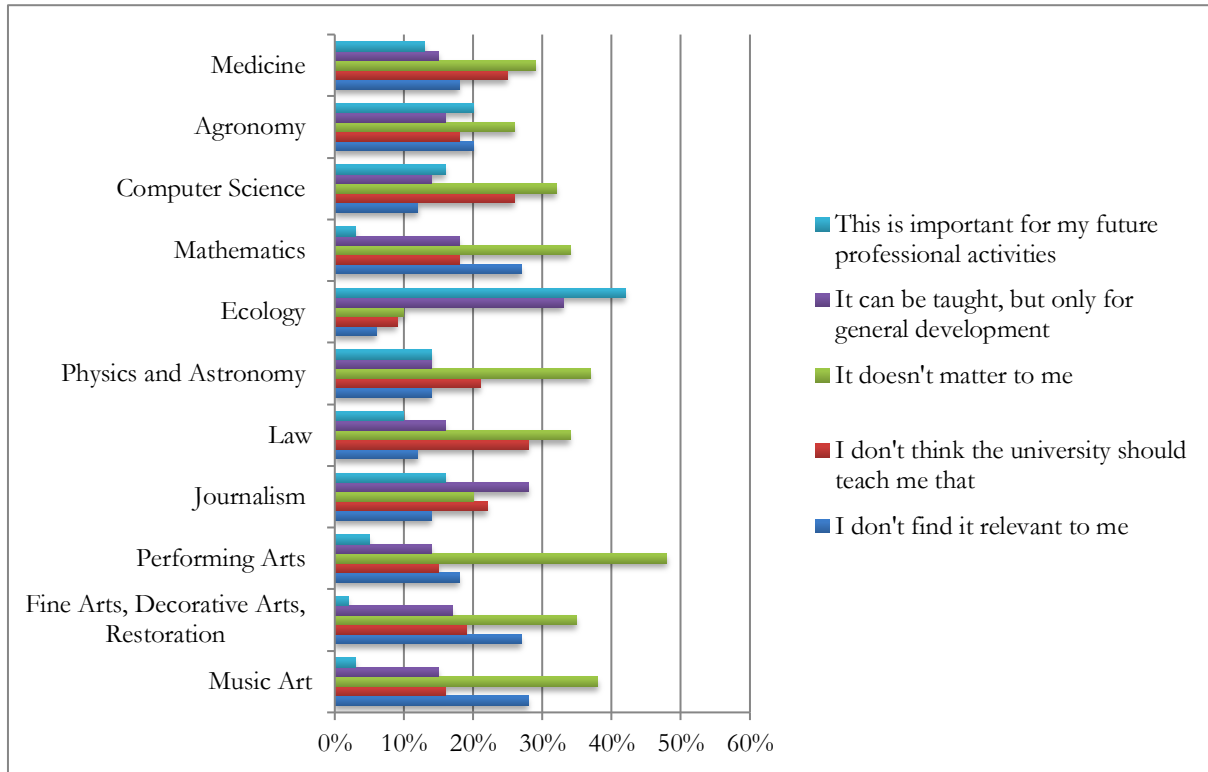
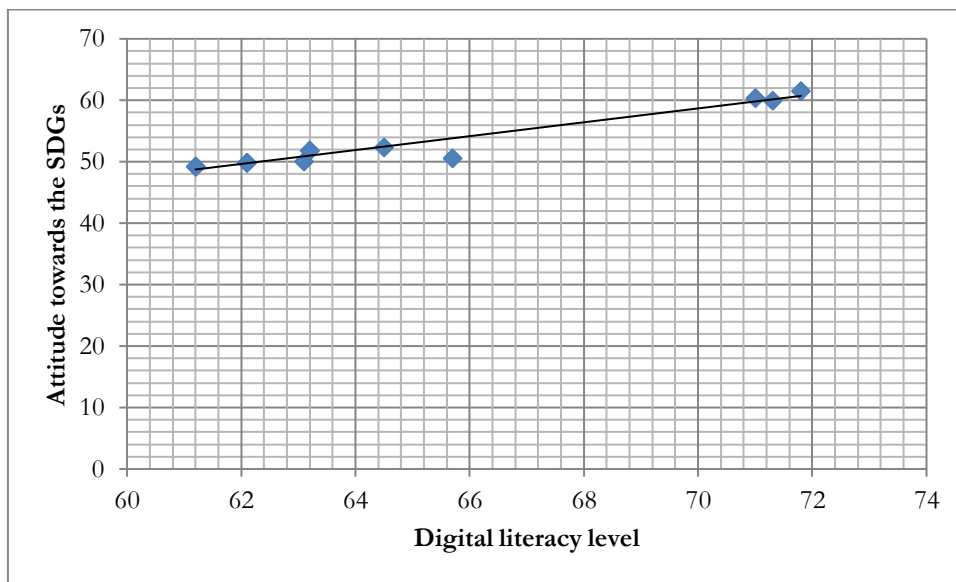**Figure 5.** The results of the survey of students' attitude towards the study of SDGs



**Figure 6.** Dependence of students' attitude towards the SDGs on their digital literacy

Table 3 presents the results of the assessment of reliability, validity and correlation.

**Table 3.** Reliability, validity, correlation of the study

|  | Value of the parameter | | |
|---|---|---|---|
|  | Cronbach's Alpha | Kaiser's Measure | Pearson correlation coefficient |
| Digital literacy | 0.73 | 0.72 |  |
| Assessment of the SDGs | 0.75 | 0.77 | 0.579 |

## 4. Discussion

The study found that 19%, 13%, and 4% of students, respectively, of the three arts majors had never heard of the SDGs. A survey conducted by Smaniotto et al. (2020) among first-year students of 9 Italian HEIs revealed low knowledge about sustainable development, but recorded students' interest in this issue. A survey conducted in Saitua-Iribar et al. (2020) showed that about 43% of students were not familiar with the SDGs while studying any of the subjects at the university.

The students' attitude towards SDGs is studied in this work. It was found that only 3%, 2%, and 5% of art students, respectively, believed that knowledge of SDGs was important for their future professional activities. The largest proportion of students that agreed with this statement — 42% — was students majoring in Ecology. Another survey of five schools in Malaysia found that young people have a low attitude towards the SDGs (Ilham et al., 2021; Kuzmenko et al., 2022). At the same time, a comparison of knowledge about the environment of students of science and art majors revealed that students of science majors are more ecologically aware than students of art majors.

A survey conducted in Ukraine in Stukalo and Lytvyn (2021) found that about 11% of respondents did not notice the mention of the SDGs in university documents. Half of the interviewees noted that their educational institution regularly holds events dedicated to the implementation of the SDGs. And 5% believe that no such events are held in institutions. A total of 25% of the respondents assure that the websites of their educational institutions do not have information about the SDGs, 42% believe that the information posted on the websites related to the achievement of the SDGs is not enough, 31% have the opposite opinion.

The participants of the experiment (Bälter et al., 2022; Snihur et al., 2021) indicated which of the materials were most useful when learning about the SDGs: 96% indicated

formative questions, 88% — modular questions, 76% — viewing a web page, 72% — watching a video, 64% — webinars, 56% — completion of group assignments. Digital technologies were also used to achieve the SDGs, to support communication and share knowledge and information about the SDGs among partners located in different countries and continents. For example, Lenkaitis (2022) studied the impact of synchronous computer-mediated communication on the awareness of SDGs by teachers in the USA, Colombia, and Poland.

The students' attitude towards the importance of achieving a particular SDG in different countries was different. For example, in China, students pay the most attention to Goal 13. The first five goals, as well as Goal 10 are of particular importance (Yuan et al., 2022). Other studies (Chen et al., 2021) showed the following priorities: Good health and well-being (almost 50%), Quality education (41%), and No poverty (32%). Students considered Goals 8, 12, and 17 to be the least important (41%, 30%, and 38% of students held this opinion, respectively). Other studies showed that students are most concerned about gender equality, health, and well-being (Yuan et al., 2022). In this study, students rated the SDGs as follows: Goal 16 (Peace, justice and strong institutions) was the most important to them. Goal 1 (No poverty) ranks second, Goal 8 (decent work and economic growth) ranks third. It is worth noting that the study was conducted in Ukraine in 2022-2023. Therefore, it can be assumed that the situation in the country had an impact on the students' choice. However, Veland et al. (2022) claims that the SDGs cannot be considered and implemented selectively, partially or individually.

Conclusions

Achievement of sustainable development requires working towards achieving the SDGs for all countries, regardless of their economic, political and social status. At the same time, education plays an important role. Educational institutions should form a responsible attitude towards the environment in future generations. Art is one of the tools on the way to achieving the SDGs. Therefore, the necessary transformation of future artists' consciousness is important. Multi-functional digital technologies can help achieve this goal. As this study showed that the active use of digital technologies in the educational process contributed not only to increasing the digital literacy of students, but also expanded and deepened their

knowledge about the SDGs, as well as changed their attitude towards them despite the fact that art students usually have the least digital literacy compared to students studying in other fields. The results of this study can be useful to teachers and researchers who are seeking to find ways of transforming the education system in order to achieve the SDGs. Further research should be conducted with the aim of studying the dependence of students' attitudes towards the SDGs on the economic, political and social situation in the country of study and residence.

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