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When Artificial Intelligence Tools Meet "Non-Violent" Learning Environments (SDG 4.3): Crossroads with Smart Education

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Abstract: This paper continues the series of publications of our interdisciplinary research findings at the crossroads of higher education sustainability (SDG 4.3), smart education, and artificial intelligence (AI) tools. AI has begun to be used by universities to increase the quality of higher educational services. AI tools are expected to help university teachers in the teaching process. Students also use AI to help them complete their tasks. At the same time, AI may threaten Sustainable Development Goal 4 (SDG 4). In particular, this is a "blank spot" in the study of AI and non-violent learning environments (SDG 4.3). The aim of the study was to verify competing statistical hypotheses. To achieve this aim, the authors used modern, economically sound methods. The authors processed the responses of 1102 students from eight Eastern European universities using a special electronic questionnaire. The authors statistically processed the student survey results and then tested a pair of conflicting statistical hypotheses. The authors adopted a standard level ($\alpha = 0.05$) of hypothesis checking. Testing statistical hypotheses led to obtaining two statistically substantiated new scientific facts: (1) The requirement for "non-violent" learning environments does not meet some students' needs. (2) The number of these students can be up to 31.94%. Summary: The new scientific facts are helpful for further developing world pedagogical theory and practice. They are the basis for forecasting and preparing for managerial actions aimed at SDG 4.3.

Keywords: artificial intelligence tools; "non-violent" learning environments; smart education; university student; learner; SDG 4.3

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1. Introduction

Sustainability in higher education is becoming increasingly urgent due to the beginning of intensive use of artificial intelligence (AI) in educational processes. In this manuscript, the authors tried to comprehensively study such an aspect of Sustainable Development Goal 4.3 as "non-violent" learning environments in higher education. The authors emphasized the combination of 'non-violent' learning environments with smart education and AI.

A "non-violent" learning environment is challenging to measure directly. However, its study is possible by measuring an indirect sign. Therefore, the authors turned to students' opinions about the impact of AI tools on a single and indivisible educational process.

In the first article of Special Issue [1], its authors write about the sustainability of higher education by moving from e-learning to smart education. Indeed, after the COVID-19 pandemic, e-learning has become commonplace in higher education [2–8].

As the starting point of the movement [1], "e-learning" has been developed in various countries from East to West: Australia [9], Malaysia [10], China [11], Japan [12], India [2,13], Afghanistan [3], Palestine [4], Saudi Arabia [14], Ukraine [7], Belgium [15], Spain [16], Kenya [17], Ghana [18], the USA [19], and Canada [20], etc. E-learning is actively used in the 21st century (from the early 2000s [9,12,13] to 2023 [2–5]). Remote and rural areas in developing countries are not obstacles to the spread of e-education [13,17,18]. The influence of socio-economic and technical conditions, age, and gender on various aspects of the use of e-learning has been carefully studied in the mentioned [2–20] and other publications.

In a previous paper [21], the authors published the first results regarding AI and "safe" learning environments. This new manuscript continues our work on studying the role of AI in the educational process and is devoted to studying students' opinions about the "non-violent" learning environment.

The authors of this manuscript explored the conditions of the current challenge of sustainability in higher education. The authors presented a logically complete and empirically grounded manuscript. The manuscript highlights new facts about sustainability.

The study explored "non-violent" learning environments (SDG 4.3) in light of smart education and AI tools. The aim of the study was to verify competing statistical hypotheses.

1.1. Bibliometric Analysis

To establish the place and role of AI in a non-violent learning environment, let us turn to the results of bibliometric analysis. The dataset for bibliometric analysis is a set of articles for the query (keyword) "non-violent", which are indexed by the Scopus database (https://www.scopus.com/, accessed on 1 July 2024).

The first stage of bibliometric analysis was carried out using SciVal, an incorporated software from the Scopus database (https://www.scival.com/, accessed on 1 July 2024).

Initial data:

1. Number of articles—3625.
2. Field of knowledge—all branches.
3. Publication type—all types.
4. Publication period—2019–2023 (2023 data as of the date of access to the Scopus database).
5. Total number of topic clusters generated by SciVal—476.

Table 1 presents the main topic clusters.

Table 1. Topic clusters on the query "non-violent" (illustrations—screenshots from SciVal).

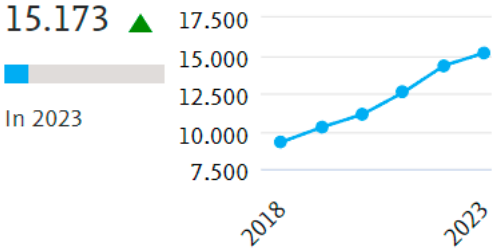
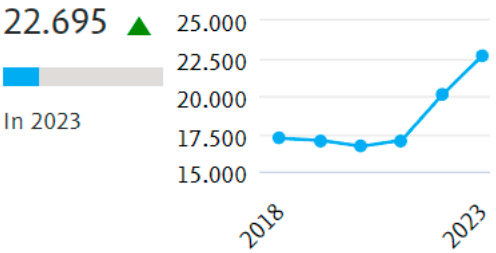
Topic Cluster	Area	Prominence Percentile, Progress
Educational Policy; Academic Performance; Finance	Social Sciences; Economics, Econometrics, and Finance	
Educational Policy; Education Research; Intergenerational Mobility	Social Sciences	

Table 1. *Cont.*

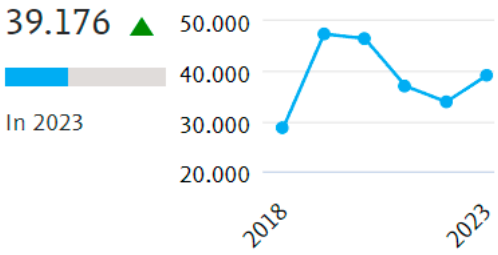
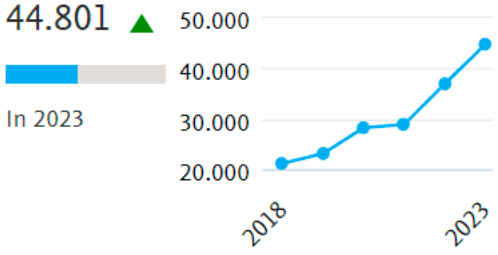
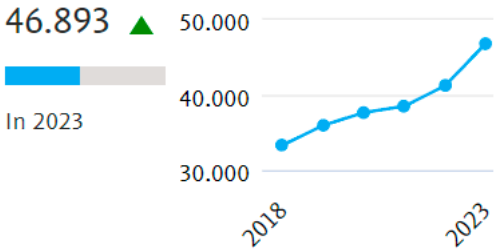
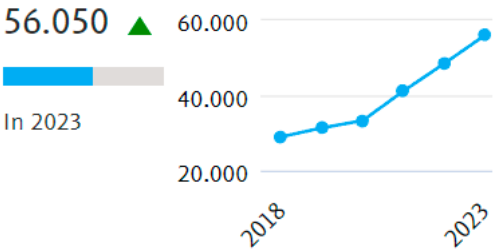
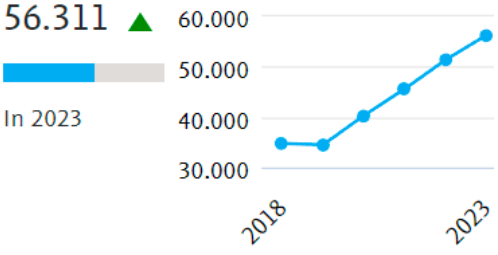
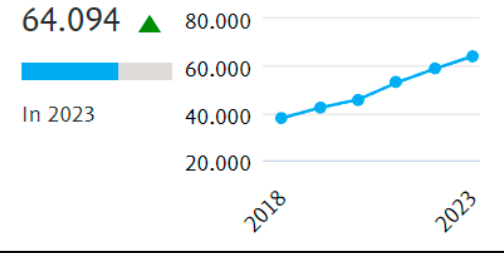
Topic Cluster	Area	Prominence Percentile, Progress
Critical Thinking; High School Student; Learning Outcome	Social Sciences	
Academic Performance; Student Success; Self-Efficacy	Social Sciences	
Reflective Practice; Professional Development; Student Learning	Social Sciences; Psychology	
Formative Assessment; Student Learning; Recall (Cognitive Psychology)	Social Sciences	
Sustainable Development Goals; Industrial Sector; Student Learning	Social Sciences	
Self-Efficacy; Academic Performance; High School Student	Social Sciences	

Table 1. *Cont.*

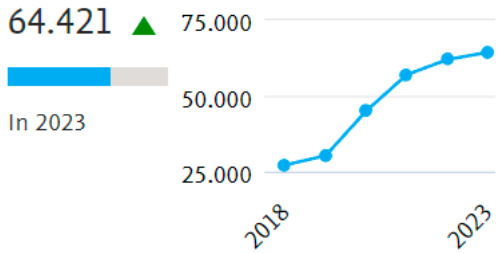
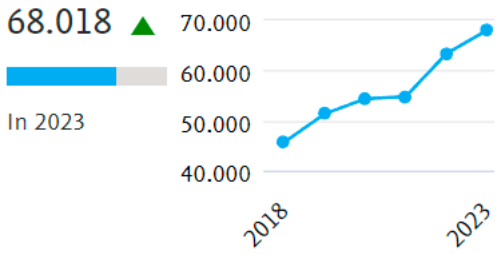
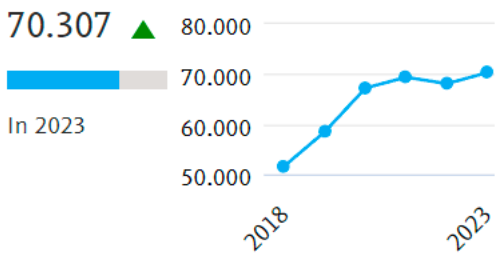
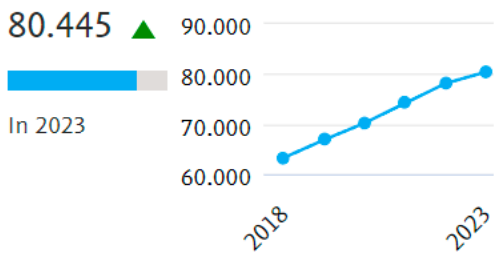
Topic Cluster	Area	Prominence Percentile, Progress
Information and Communication Technologies; Educational Technology; Pre-Service Teacher	Social Sciences; Business, Management, and Accounting	
Creative Thinking; Giftedness; Gifted Education	Social Sciences;	
Science Education; High School Student; Student Learning	Social Sciences	
Professional Development; Educational Policy; Pre-Service Teacher	Social Sciences	

Figure 1 presents a map of topic clusters.

Analysis of topic clusters allowed us to trace the following patterns concerning the basic keyword of this article:

1. The keyword "non-violent" relates to education and SDG 4. The search results show the presence of about 20 clusters related to education topics.
2. The maximum value of the popularity percentile for the studied clusters is 80, and the minimum is 15. Popular clusters are devoted to various aspects of the student-teacher relationship. The cluster percentile values and the increase in percentiles show that the topic of non-violent learning environments is gaining popularity.
3. About ten query "non-violent" clusters are related to artificial intelligence. However, the study of artificial intelligence is limited only to the technical component (methods, tools, and software). It does not focus on the ideological component (the role of AI in students' lives).
4. In the clusters, there are no traces of assessing students' opinions regarding the characteristics of a non-violent learning environment. Thus, studying the students' opinions regarding the non-violent learning environment is necessary.

5. Among the clusters for the request "non-violent" are those associated with student development in the educational field. This fact indicates the need for additional study of the role of AI in the non-violent learning environment and its prospects.
6. Clusters on the request "non-violent", which are related to educational topics, study this problem mainly in the field of knowledge "Social sciences". This fact emphasizes the importance of the ideological (not technical) component of the relationship between AI and stakeholders in the educational process.

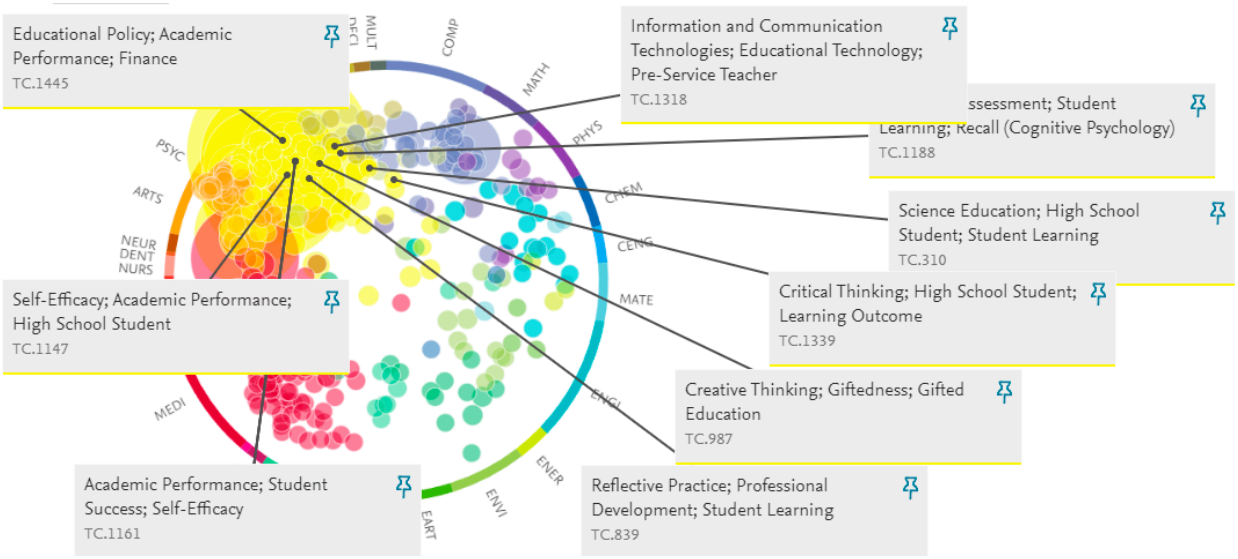


Figure 1. Topic clusters on the query "non-violent" (https://www.scopus.com/, accessed on 1 July 2024, analysis tool—SciVal).

1.2. Construct Review

The endpoint in this movement—"smart education" [1]—is more complex. First of all, many definitions are divided into "smart learning space" [22–25], "smart learning" [26–28], "smart learning technologies" [29–31] and "smart education" [32–40].

"Smart learning" is 'a new learning paradigm which serves learners . . .' [27]. European researchers identify smart learning as "digital education" [1]. Specifically, text-free smart learning refers to technology-enabled learning that uses non-text features and tailored learning materials based on human needs [26]. The understanding of smart learning has different interpretations in different cultures [21].

"Smart education" is described in [34]. In an earlier article, "smart education" is defined as 'an educational system that allows students to learn using up-to-date technology and enables students to study with various materials based on their aptitudes and intellectual levels' [39]. R. Bajaja and V. Sharma understand "smart education" more narrowly (personalized learning . . . using AI) [21]. In the source [22], the authors mention "smart education" but do not define this term.

According to article [38], "the goal of smart education is to foster smart learners. . .". Other researchers write that "the essence of smart education is to create intelligent environments. . ." [21]. Smart education provides new learning opportunities for people with disabilities [41]. The author of article [34] draws attention to the fact that smart education is not only technology. Article [34] demonstrates "smart education" as a system of educators, technologies, and learners. Source [38] also describes a scheme where "smart education" includes "learners". So, two sources associate "smart education" with "learners" [34,38]. Another source connects "smart education" with students [39].

A brief review of the issue showed that the sustainability of higher education can be associated with e-learning and smart education [1]. Smart education deals with new educational technologies (including AI tools) [1,21,34,42–47]. Smart education also improves

the conditions for personalized learning [41], which connects educational technologies, including AI tools, with learners [34,38]. And the United Nations proposes an international definition of SDG 4 [21,48]. SDG 4 includes 'equal access to affordable. . . higher education (4.3)' [21,48].

One of the three enablers of SDG 4 is "Effective learning environments". It involves "non-violent learning environments" (https://campaignforeducation.org/en/key-frameworks/, accessed on 14 June 2024).

Returning to "smart education", the authors note that it improves the conditions for personalized, inclusive learning [41]. Examples of the use of AI in smart education include learning analytics [49,50], educational data mining [51], and early warning systems for pedagogical problems [52]. Works [41,49–52] show that AI quickly provides new teaching methods, adapted curricula, and even modified assessment methods [53,54]. The authors of studies [34,41] proved that personalized learning provides more effective learning for learners.

R. Bajaja and V. Sharma write that the use of AI satisfies the condition of "personalized learning" in the narrow sense of "smart education" [21]. AI fulfills the condition "any place, any time" as an element of modern digital learning [55,56], forming the necessary skills of learners [57,58].

To summarize the above [1,21,41,49–54], we note that AI has become an integral part of the functioning of educational organizations. AI helps personalize learning by tailoring programs to the individual needs of students. Machine learning algorithms help analyze training data, identify trends, and provide personalized recommendations to improve learning efficiency. Thanks to AI, educational institutions can create interactive learning platforms, promoting the development of critical thinking among learners. So, AI satisfies the "inclusive environment" condition. Testing the "safe" learning environment when using AI tools is not the purpose of this manuscript [21].

Therefore, in this manuscript, the authors tested when AI tools meet the requirements of a "non-violent" learning environment (SDG 4.3). This question is open in world pedagogical theory and practice.

Suppose students have a negative attitude towards using AI in teaching. You cannot conclude that the "non-violent" environment condition is met. Indeed, despite the positive expectations, the following concerns can be expressed:

1. The first concern may be the potential loss of personal interaction between university teachers and learners. Students may fear that automated learning systems may limit opportunities for communication, sharing ideas, and learning soft skills, which are also crucial in shaping education.
2. The automation of certain aspects of teaching may cause job losses for teachers, especially in routine tasks, which may entail the need for new skills and adaptation to the professional community. However, as the author's research shows [59], students do not consider this option as likely over the next five years.
3. "Matthew effect". If access to AI tools is uneven, students from less affluent backgrounds or regions may face additional challenges. This may create a digital divide where some students have more significant opportunities to use high-tech educational resources than other students, resulting in the failure to meet the requirements of other SDGs, such as SDG 4.5.

These fears can be both real and imagined. For example, the loss of interaction with a teacher is not felt as acutely because online learning has become commonplace in the pandemic era [2–8].

Thus, by surveying students about their attitudes towards AI, the authors check the compliance of the "non-violence" condition with the possibility of achieving SDG 4.3.

1.3. Connection: "Smart Education (Approach)–AI (Technical Tools)–Student (Stakeholder)–Survey (Feedback Tool)"

A logical connection: "smart education (approach)–AI (technical tool)–student (stakeholder)–survey (feedback tool)" is built in Figure 2.

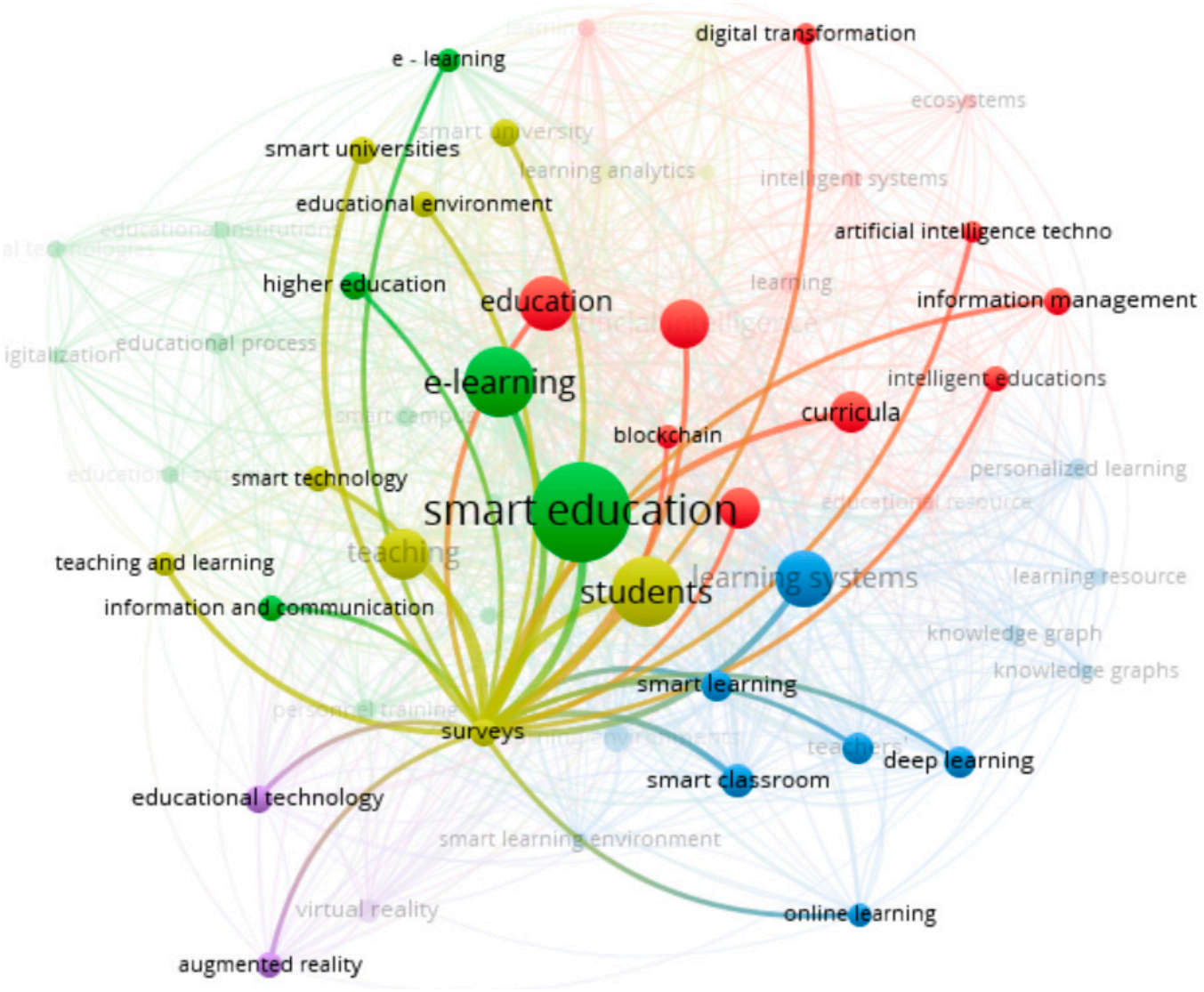


Figure 2. Interconnection between clusters 1 and 4 (https://www.scopus.com/ accessed on 1 July 2024, analysis tool—VOSviewer).

The main links of this chain are studied in works devoted to:

- The concept of "smart education" as a breakthrough technology and the role of AI in it [60–64];
- AI in solving educational problems and beyond [65–69];
- optimization of the process of "smartization" of educational activity using AI [35,44,70–73];
- Decision-making and studying behavioral reactions when introducing AI as an element of smart education [41,42,74];
- Students in the smart education model and their attitude towards AI [33,43,75,76].

1.4. Summarizing

1. Some important definitions of our manuscript are:

1.1 "Non-Violent" learning environments are an educational space where students can freely express their thoughts, ideas, and feelings without fear of being subjected to physical or emotional violence (SDG 4.3).
1.2 Smart education provides personalized learning using AI anywhere, anytime.
1.3 Artificial intelligence tools for teachers are software programs and platforms that use artificial intelligence technologies to enhance the teaching and learning experience.

2. "Non-violent" learning environments (SDG 4.3) may be considered together with e-learning, smart education, and AI tools. Students' achievements, i.e., learners, are the ultimate goal of smart education [34,38]. Smart education and AI tools are associated with each other [34,37,41–45,49–54].
3. AI and its capabilities in the smart education concept are the subject of technical research and the search for optimal software solutions. Assessing the attitudes of stakeholders (learners) towards AI is essential to optimizing the interaction between AI and stakeholders (learners).
4. Introducing AI tools in educational services has created gaps for global pedagogical theory and practice. Studying the attitudes of stakeholders (learners) towards AI will enrich global pedagogical theory and practice in verifying the requirements of a "non-violent" learning environment (SDG 4.3).

Thus, the study is relevant.

In practical terms, the value of the study is in obtaining statistically sound, completely new empirical datasets. Rapid implementation of artificial intelligence in business, society, politics, and education drives the need for further empirical data. Based on the normative and target documents of the SDGs, one condition of SDG 4.3 was considered. The authors have analyzed Eastern European university students' opinions on SDG 4.3. This topic is: How do you feel about using artificial intelligence in the teaching process?

Testing statistical hypotheses helped to obtain statistically substantiated new scientific facts about student opinions. The statistically substantiated new scientific facts received by the authors are the starting point for monitoring student attitudes on a given topic.

A practical relevance of our research is underlined by the United Nations' interest in AI tools (https://news.un.org/en/story/2023/10/1142867, accessed on 12 June 2024).

The authors verified competing statistical hypotheses but did not consider random deviations.

Research Hypothesis: the number of students with a negative attitude towards using AI in the teaching process is zero. This means that there are no students who have a negative attitude towards the use of AI in teaching. In other words, students are generally positive or neutral about using AI in the teaching process. We will take these results as confirmation that the "non-violent" environment requirement is met.

Alternative Hypothesis: the number of students with a negative attitude towards using AI in the teaching process is greater than zero. This means some students have a negative attitude towards using AI in teaching.

Research Hypothesis: $\mu_0 = 0.00\%$.

Alternative Hypothesis: $\mu_0 > 0.00\%$.

The two statistically substantiated new scientific facts can enrich global pedagogical theory and practice in verifying compliance with the requirements of a "non-violent" environment for SDG 4.3. They help to better predict, on a rigorous scientific basis, changes in student behavior in higher education.

The complex of studies carried out by the authors led to the following main summaries:

- "Non-violent" learning environments may be considered together with e-learning, smart education, SDG 4.3, and AI tools.

These are two statistically substantiated new scientific facts that link smart education, AI tools, and SDG 4.3:

(1) Some students do not meet the "non-violent" learning environment requirements.

(2) The number of these students can be up to 31.94%.

- These two statistically substantiated new scientific facts are helpful for generalization, comprehension, and further development of world pedagogical theory and practice.
- Under the guidance of experienced managers, managerial actions aimed at SDG 4.3 should be developed to ensure "non-violent" learning environments.

2. Materials and Methods

2.1. Common Description

The study was conducted from February 2023 to June 2024 at 8 Polish, Kazakh, Slovak, and Ukrainian universities (Table 2). The general design of the study was to explore the relationship between "non-violent" learning environments (SDG 4.3 [77,78]), smart education, and AI tools, as well as empirically test the bottlenecks in the existing relationship (if any). Conceptually, the authors decided to test in countries with non-zero (low and medium) total enrollment rates in higher education [79].

Table 2. Common description [21,59].

No	University	Number of Respondents	Female	Male	Other
1.	Karaganda University named after Academician Buketov	73	43	29	1
2.	University of Economics and Innovation in Lublin (WSEI University)	45	33	12	0
3.	National Louis University	364	283	81	0
4.	Mieszko I University of Applied Sciences in Poznan	56	17	39	0
5.	University of Economics in Bratislava	61	27	34	0
6.	West Ukrainian National University	118	86	31	1
7.	Taras Shevchenko National University of Kyiv	144	88	54	2
8.	Ternopil National Pedagogical University named after V. Hnatyuk	243	211	32	0
	Sum	1104	788	312	4

The countries are numbered in Table 2: 1—Kazakhstan; 2–4—Poland; 5—Slovakia; 6–8—Ukraine.

The description of the respondents (Table 2) will be used in Section 2.3.

The authors have formulated and explored the pair of competing hypotheses.

The study was carried out using cost-effective and reliable research methods [80,81]:

- Study and analysis of scientific sources and documents for building a theoretical framework for the research;
- Bibliometric multi-step analysis;
- Questioning of students using an electronic questionnaire hosted in the Cloud of National Louis University as an empirical part of the research on SDG 4.3 (sustainability in higher education);
- Formal processing and graphical visualization of questioning results based on standard tools;
- Verification of statistical hypotheses through standard tools.

The approach to conducting bibliometric analysis (VOSviewer, https://www.vosviewer.com, Scopus database add-on for bibliometric analysis, and SciVal, https://www.scival.com, accessed on 1 July 2024) is described in [21,59].

2.2. Questioning of Students

The Eastern European market of educational services was selected for the study [21,59,82–86]. Countries were chosen to ensure maximum diversity. Three of these

countries are a part of Eastern Europe, and one has a part in Eastern Europe [21,59]. The universities were both public and private. So, such a combination of countries and universities fulfills the condition of maximum socio-cultural diversity.

Students were invited to participate in the survey by sending letters to their email addresses.

As the authors showed above, the survey was conducted for students not involved in professional AI studies. Any mass study of AI in educational programs was an exception rather than a rule. Students of AI-related specialties are surveyed. However, the analysis of their answers is not planned at this study stage.

The authors have created a questionnaire according to standard requirements [80]. It includes (Table 3): (1) appeal to respondents, (2) metrics, and (3) body.

Table 3. Three parts of the questionnaire.

No	Parts	Content
1.	Appeal to respondents	Dear Colleague, Please write down your answers in a simple questionnaire. It will take less than five minutes and help you understand your attitude toward artificial intelligence (AI). The interview is voluntary and anonymous. By answering questions, you are participating in the creation of a new future. Please click the blue "Zapisz Ankietę" button after the questionnaire. Thank you for your time.
2.	Metrics (questions 1–4)	1. Gender 2. Age 3. Study (degree) 4. Country
3.	Body (12 questions from 5 to 16)	5. How do you feel about artificial intelligence? 6. How do you feel about using artificial intelligence in the teaching process? (a central question) 7. How often do your professors use artificial intelligence in the teaching process? 8. How often do you need to use artificial intelligence in the learning process? 9. Multiple: In what situations do you use artificial intelligence during learning? 10. Do you think artificial intelligence threatens higher education in the next five years? 11. Do you think artificial intelligence is a threat for future generations? 12. Do you fear that using artificial intelligence in higher education will get out of control within the next five years? 13. How often do you use artificial intelligence in your learning process? 14. Will artificial intelligence replace university teachers in 5 years? 15. If artificial intelligence replaces university teachers, how would you feel about it? 16. Will you be happy if artificial intelligence replaces university teachers?

Some methodological provisions of the questioning were published in sources [59,80]. In the first part, we informed the respondents about the anonymous and voluntary participation in the interview (Table 3).

The body included 12 questions. We addressed the central question aimed at the requirements of "non-violent" learning environments (Table 3): 6. How do you feel about using artificial intelligence in the teaching process?

Respondents could choose one of five answers [87]:

1. Definitely positively;
2. Rather positively;
3. Hard to say;
4. Rather negatively;
5. Definitely negatively.

The questionnaire was completed electronically. The questionnaire was hosted in the National Louis University cloud. The authors generated a separate questionnaire for each group of students from Table 2.

All students gave answers voluntarily, without any additional motivation, including payments. The survey was also anonymous. The voluntariness and anonymity of the survey were declared in the introductory part of the questionnaire and in the invitation letter to participate in the survey (Table 3).

In formal processing, the authors summarize the first two answer options in further calculations. These options are considered a positive answer. The last two answers are summed up and considered a negative answer. The middle option is regarded as a neutral opinion. We used the methodology described in the source [88] to calculate statistical indicators.

2.3. Respondent Groups

To provide a reliable comparison, all respondents were undergraduate students. All respondents did not professionally study AI tools.

For the empirical part of the study, sequential (nested) sampling was used [80]. The authors aimed for maximum diversity when selecting groups. Table 2 shows a common description of the respondents.

There were 1104 respondents (Table 2) from 8 groups of students from 4 countries. There were 312 men and 788 women. Only four respondents reported an "other" gender identity.

The age of the participants is 18–64 years old. Only undergraduate students took part in the survey.

2.4. Methodology of Verification of Statistical Hypotheses

The methodology for verifying statistical hypotheses is borrowed from well-known sources [80,81]. Some verification details concerning this study are described in papers [21,59].

T-statistics was used for calculation [80,81] with a standard checking level (0.05) in all tests. A one-sided test for a pair of hypotheses was chosen [80,81].

After discussing the results, it became possible to summarize and write a conclusion.

3. Results

3.1. Analysis of Answers to the Question: How Do You Feel about Using Artificial Intelligence in the Teaching Process?

The respondents' choices for this question are shown in Table 4. *N* denotes the total number of answers.

Table 4 demonstrates 1102 replies from 1104 students. This ratio does not affect the quality of the result.

Table 4 shows that respondents' answers differ among different groups. At first glance, positive choices outweigh negative ones. Interestingly, the number of choices for the "Definitely negatively" answer is zero in one group of respondents.

The results are visualized in Figure 3.

Table 4. Distribution of answers.

Group of Respondents	*N*	Definitely Positively	Rather Positively	Hard to Say	Rather Negatively	Definitely Negatively
1. Kazakhstan	72	9	22	18	11	12
2. Poland	44	5	23	12	3	1
3. Poland	364	71	156	82	43	12
4. Poland	56	10	16	15	12	3
5. Slovakia	61	27	24	7	3	0
6. Ukraine	118	31	46	32	8	1
7. Ukraine	144	30	55	25	26	8
8. Ukraine	243	58	113	52	18	2
Total	1102	241	455	243	124	39

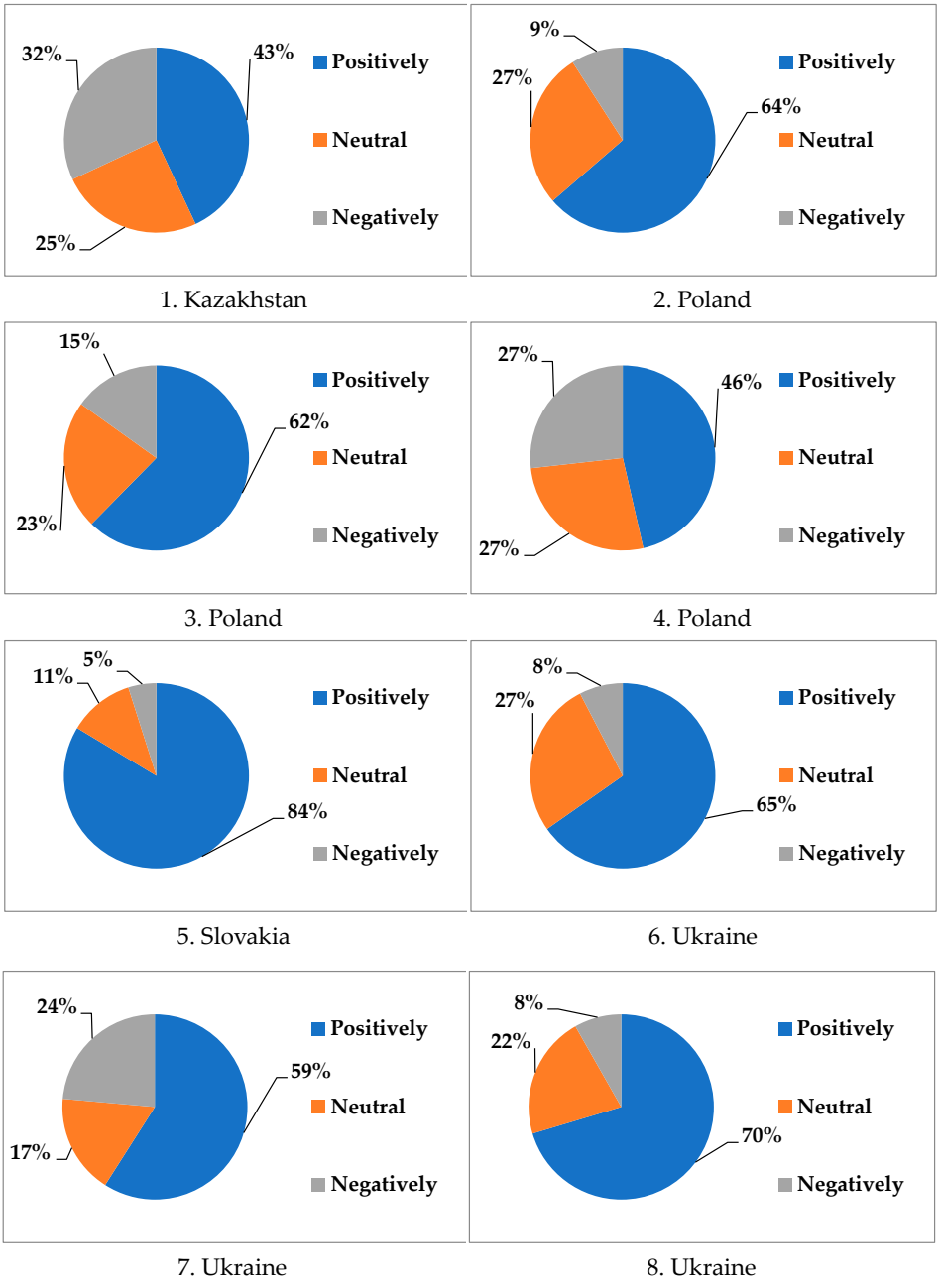


Figure 3. Student opinions: How do you feel about using artificial intelligence in the teaching process?

Figure 3 confirms that positive choices of respondents prevail over negative ones. In groups 2, 3, 5–8, positive choices dominate the sum of neutral and negative choices. The negative selections vary from 5% in group 5 to 32% in group 1. Do you know whether this number of negative selections results from random deviations or objective reasons? We need to verify the statistical hypotheses to obtain the correct answer.

3.2. Verification of Statistical Hypotheses: The Number of Students with a Negative Attitude towards Using AI in the Teaching Process Is Zero

Table 5 demonstrates statistical indicators. Negative responses like "Rather negatively" and "Definitely negatively" were set to 1.0, and the other responses were set to 0.0 [87,88].

Table 5. Statistical indicators of responses [88].

Group of Respondents	N	$M_{(x)}$	δ_x	δ_{x-1}
1. Kazakhstan	72	31.94	46.62	46.95
2. Poland	44	9.09	28.75	29.08
3. Poland	364	15.11	35.81	35.86
4. Poland	56	26.79	44.28	44.69
5. Slovakia	61	4.92	21.62	21.80
6. Ukraine	118	7.63	26.54	26.66
7. Ukraine	144	23.61	42.47	42.62
8. Ukraine	243	8.23	27.48	27.54
Population	1102	14.70	35.48	35.52

Table 5 demonstrates the $M(x)$ values range from 4.92% to 31.94%. Data on verification of statistical hypotheses for each group of respondents are shown in Table 6.

Table 6. Verification of statistical hypotheses (one-way verification, $\mu_0 = 0.00\%$).

Statistical Indicators	Value for Respondent Groups:							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Sample size, N	72	44	364	56	61	118	144	243
The average of the sample, $M_{(x)}$	31.94	9.09	15.11	26.79	4.92	7.63	23.61	8.23
The standard deviation for the sample, δ_x	46.62	28.75	35.81	44.28	21.62	26.54	42.47	27.48
Average error, $\dot{S}_{\dot{X}} = \delta_x/\sqrt{n}$	5.494	4.334	1.877	5.917	2.768	2.443	3.539	1.763
Value $\lvert t_{stat} \rvert$ for $\mu_0 = 0.00\%$, $(M_{(x)} - \mu_0)/\dot{S}_{\dot{X}}$	5.813	2.097	8.050	4.528	1.777	3.123	6.671	4.669
Value t_{tabl} for the standard testing level of α (0.05)	1.645	1.645	1.645	1.645	1.645	1.645	1.645	1.645
$\lvert t_{stat} \rvert > t_{tabl}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Verifying our two statistical hypotheses (Table 6) demonstrates that the t-statistics $\lvert t_{stat} \rvert$ is more than the t_{tabl} for every group. Thus, the Alternative Hypothesis was accepted.

4. Discussion

The "learners" survey is an essential tool of the "service economy" [89–94]. These works [82,89–94] emphasize that the consumer (in our case, "learners" or students) plays an important role. If university teachers and students are recognized as two sides of educational services, the importance of the study is beyond doubt.

Smart education deals with AI tools and other new educational technologies [1,21,34,42–47,59]. Smart education also improves the conditions for personalized learning [41]. This connects educational technologies, for example, AI tools, with learners [34,38].

The quality of education and approaches to organizing the educational process with maximum involvement of students in assessment activities may also contain different approaches to the use of AI. As data from articles [95,96] show, information systems

can be successfully used in developing solutions for quality control, quality assurance, and testing elements of quality systems, which opens up additional prospects for using AI in educational organizations. In the context of the service economy, the quality of education is crucial as a factor in socio-economic development [97,98], digitalization of education [93,99,100], strategies for using AI [94,101,102], etc.

When students have negative attitudes towards using AI in the teaching process, you cannot conclude that "non-violent" environment requirements are met (Section 1).

The values of $M(x)$ for students with a negative attitude towards using AI in the teaching process range from 4.92% to 31.94% (Table 4).

At a standard verification level (0.05), the Alternative Hypothesis was accepted: the number of students with a negative attitude towards using AI in the teaching process is greater than zero. The study showed that students with a negative attitude toward using AI in teaching could range from 4.92% to 31.94%. We have a statistically substantiated new scientific fact that up to about 1/3 of the number of students are (maybe) under the pressure of AI tools towards which they have a negative attitude. Some students do not meet the conditions of a "non-violent" learning environment. There may be up to 31.94% of such students.

The results are the reason for managerial actions aimed at "non-violent" learning environments (SDG 4.3).

This manuscript continues the research that began in [59]. Table 7 compares the previous [59] and current results.

Table 7. Comparison of the previous [59] and current results.

Indicator	$M_{(x)}$	δ_x
Students with negative attitudes towards the use of AI in the teaching process	4.92–31.94%	21.62–46.62%
Students confident that AI will replace university teachers [59]	10.85%	31.10%

Table 7 shows the boundaries within which statistical indicators lie. The difference in $M(x)$ is about 25.00%. However, the students from paper [59] fall within the range of $M(x)$ variation for the problem studied in this manuscript. The value of δ_x from [59] also falls within the range of δ_x for the problem studied in this manuscript. The new datasets correlate with datasets published in [59]. The opinions of "learners" were also studied in articles [20,21,26,33,44,59,75,83,103–105]. However, the authors of articles [20,21,26,33,44,75,83,103,104] do not provide comparable statistical data.

This study has limitations. First, the authors surveyed respondents from Eastern European universities. It is helpful to survey students at other universities from regions with low overall higher education enrollment rates [79]. Second, the authors did not take managerial actions aimed at "non-violent" learning environments (SDG 4.3). The new data are the basis for forecasting and preparing such actions. Third, the authors have left the analysis of demographic characteristics for one of the future manuscripts.

So, in this paper, the authors studied the conditions of "non-violent" learning environments.

"Non-violent" learning environments contribute to the formation of a positive image of educational institutions and create a favorable educational environment for all participants in the process. Social sustainability can be improved by forming more harmonious relationships in educational groups and developing tolerance and respect for others.

The author's new facts can become the basis for forecasting and preparing managerial actions for "non-violent" learning environments. Such activities should be undertaken under experienced managers' guidance in close cooperation between scientists and politicians, government members, and university leaders.

Introducing "non-violent" learning environments will help reduce the fear of students in higher education. This contributes to the effective assimilation of knowledge. Thanks to

this, education becomes more accessible, which contributes to improving education quality and public literacy.

In a previous paper [21], the authors studied the "safe" learning environment. The condition of an "inclusive and effective" learning environment remained open for study from the point of view of implementing SDG 4.3.

The integration of AI tools in educational settings presents both opportunities and challenges when it comes to creating non-violent learning environments that align with SDG 4.3. As we explore this crossroads with smart education, it is crucial to consider how AI can contribute to ensuring equal access to affordable and quality technical, vocational, and higher education for all.

1. Personalized learning experiences.

AI tools have the potential to revolutionize education by providing personalized learning experiences tailored to individual needs. By adapting content and pacing to each student's strengths and weaknesses, AI can enhance engagement, comprehension, and academic success. This personalization aligns with the principles of non-violent learning environments, as it promotes inclusivity and respects the unique needs of each learner.

2. Automated grading and feedback.

AI-powered grading systems and real-time feedback mechanisms can significantly reduce the workload on educators, allowing them to focus more on teaching and mentoring students. By providing instant feedback and continuous assessment, AI tools can help students identify areas for improvement promptly, fostering a growth mindset and resilience. This automated support contributes to a more harmonious learning environment by reducing stress and burnout among teachers.

3. Democratization of education.

AI technologies have the potential to break down geographical and socio-economic barriers, providing access to high-quality educational resources for all students, regardless of their location or background. This democratization of education aligns with the goals of SDG 4.3, as it ensures that every learner has the opportunity to succeed and contribute to a more equitable society.

4. Ethical considerations and data privacy.

While the benefits of AI in education are substantial, ethical considerations regarding data privacy and algorithmic bias must be addressed. Ensuring that AI tools are implemented responsibly is crucial to maintaining trust and safeguarding the rights of students. Educational institutions must prioritize ethical guidelines and transparent practices to mitigate risks associated with AI use, such as perpetuating biases or infringing on individual privacy.

5. Balancing technology and human interaction.

The successful integration of AI in education hinges on finding a balance between technology and traditional teaching methods. While AI can enhance learning, it should not replace the essential human elements of teaching, such as empathy, mentorship, and social interaction. Maintaining this balance is vital for fostering a non-violent, collaborative learning environment where students feel supported and valued as individuals.

6. Preparing students for the future.

As AI continues to evolve, educational institutions must prepare students for a future where technology plays an increasingly integral role. By incorporating AI into curricula, schools can equip learners with the skills necessary to navigate a technology-driven world, fostering adaptability, critical thinking, and digital literacy. This preparation aligns with the principles of non-violent education, as it empowers students to become active and engaged citizens in a rapidly changing global landscape.

The intersection of AI tools and non-violent learning environments presents both challenges and opportunities for creating equitable and inclusive educational systems that align with SDG 4.3. By embracing the potential of AI while addressing ethical concerns and prioritizing human interaction, educational institutions can enhance personalized learning, reduce workloads for educators, and democratize access to quality education. However, it is crucial to maintain a balance between technology and human elements, ensuring that AI tools complement and support, rather than replace, the essential human aspects of teaching and learning. As we navigate this crossroads, collaboration among educators, policymakers, and technologists will be vital to harnessing the full potential of AI in creating a more just, peaceful, and sustainable future for all learners.

5. Conclusions

Integrating AI in educational settings significantly shifts how learning environments are structured and experienced. As we navigate the crossroads of smart education, several key conclusions can be drawn regarding the role of AI in fostering non-violent, constructive learning environments.

Personalized learning experiences: AI tools facilitate personalized learning by adapting educational content to meet students' individual needs. This customization enhances engagement and comprehension, allowing learners to progress at their own pace. AI promotes a more inclusive and supportive educational atmosphere by focusing on each student's unique strengths and weaknesses.

Enhanced accessibility: AI technologies break down geographical and socio-economic barriers, providing all students access to high-quality educational resources. This democratization of education fosters equity and ensures that every learner has the opportunity to succeed, regardless of their background.

Improved administrative efficiency: Automating administrative tasks through AI allows educators to dedicate more time to teaching and mentoring students. This shift enhances the quality of education and reduces teacher stress and burnout, contributing to a healthier, more positive learning environment.

Real-time feedback and continuous assessment: AI systems enable continuous assessment and instant feedback, helping students identify areas for improvement promptly. This ongoing support encourages a growth mindset and fosters resilience, as learners can adjust their approaches based on immediate insights.

Ethical considerations and data privacy: While the benefits of AI in education are substantial, ethical considerations regarding data privacy and algorithmic bias must be addressed. Ensuring that AI tools are implemented responsibly is crucial to maintaining trust and safeguarding the rights of students. Educational institutions must prioritize ethical guidelines and transparent practices to mitigate risks associated with AI use.

Balancing technology and human interaction: The successful integration of AI in education hinges on finding a balance between technology and traditional teaching methods. While AI can enhance learning, it should not replace the essential human elements of teaching, such as empathy, mentorship, and social interaction. Maintaining this balance is vital for fostering a non-violent, collaborative learning environment.

Preparation for future challenges: As AI evolves, educational institutions must prepare students for a future where technology plays an increasingly integral role. By incorporating AI into curricula, schools can equip learners with the skills necessary to navigate a technology-driven world, fostering adaptability and critical thinking.

The intersection of AI tools and non-violent learning environments presents opportunities and challenges. By embracing the potential of AI while addressing ethical concerns and prioritizing human interaction, educational institutions can create dynamic, inclusive, and compelling learning experiences that prepare students for success in the 21st century. The thoughtful implementation of AI in education can lead to transformative outcomes, ultimately fostering a smarter, more equitable future for all learners.

SDG 4.3 may be considered together with e-learning, smart education, "non-violent" learning environments, and AI tools. Assessing the attitude of stakeholders (learners) towards AI is essential for optimizing students' use of AI tools and further improving global pedagogical theory and broad pedagogical practice.

The study of student attitudes toward AI tools in higher education institutions led to two statistically substantiated new scientific facts. These two facts link together smart education, AI tools, "non-violent" learning environments, and SDG 4.3:

- Some students do not meet the requirements of "non-violent" learning environments.
- The number of these students can be up to 31.94%.

The two statistically substantiated new scientific facts are helpful for the generalization, comprehension, and further development of world pedagogical theory and practice.

Future research goals may be to evaluate the impact of AI on the "effective" learning environments (SDG 4.3). Also, we would like to evaluate the research limitations.

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