International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 05, 2020
ISSN: 1475-7192

The Humanitarian Potential of Astronomy in Secondary Schools - As A Source of Humanization of Education in Teaching

Dadaboeva Feruzakhon Olimjonovna

Abstract--- *The article considers the humanization of education as an important pedagogical problem. The state, content and essence of humanization of the content of natural sciences in modern teaching are covered. The humanitarian potential of the subject of astronomy in general education schools is considered as a source of humanization of education in its teaching.*

Keywords--- *Humanization of Education, Humanitarian Potential, Humanitarian Education, Subject, Educational Process, Educative and Developmental Tasks of Education.*

I. INTRODUCTION

The Law "On Education" adopted in the country requires strict adherence to such principles as "humanism", "humanization of teaching", "democratization of education" as important principles of education [1]. Accordingly, the idea of humanism in education plays an important role in the implementation of such factors as the idea of teaching his personality, respect for the personality of the student, indifference to his interests. Humanization in education promotes the teaching of the humanities on the basis of the content of all subjects in the curriculum of the educational institution, including natural sciences.

At this point, let's clarify the idea of "humanization of educational content". This idea can be interpreted in two ways: First, the humanization of educational content also implies the application of methods developed in the natural sciences to the social sciences. This situation is related to figurative thinking [2].

Secondly, the content of the voluntary natural-scientific subject (including physics, astronomy, chemical biology, etc.) also has a strong humanitarian content, such as the socio –humanitarian subject, which at first glance is not noticeable. In the teaching of Natural Sciences, the any approach associated with the manifestation of the content of humanization, which is "hidden" in them, that is, the organization of natural sciences (including astronomy) through the use of all the tools, methods and forms necessary for this, is called humanization, which plays an important role in the full implementation of the educational and developmental functions.

The problem of the humanization of astronomy education in schools was first explained by the Methodist scholar E.P. Levitan in the 70ies and 80iss of the last century [3].

For many years, the teaching of physics, mathematics and astronomy, with little emphasis on their ability to educate students in the humanities, the humanities, and the underutilization of the above-mentioned potential, has led to negative feelings in students in various educational institutions. It is no secret that it does not fit.

Dadaboeva Feruzakhon Olimjonovna, PhD Student, Tashkent State University of the Uzbek Language and Literature named after Alisher Navoi.

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

II. THE MAIN FINDINGS AND RESULTS

At the current stage of the scientific and technological revolution, the moral, environmental, war and peace problems of civilization, the spiritual height of our youth, who are active builders of our society in the future public education system, the important humanitarian potential of the natural sciences,

It is known that the science of astronomy, which is associated with the daily needs of man, was formed in antiquity, rich in historical materials, plays an important role in organizing its teaching on the basis of humanization of education, increasing the effectiveness of education in this regard.

Well-known Methodists on the different approaches and ways to identify the humanitarian potential of the content of physics and astronomy education and its implementation in teaching – V.G. Razumovsky [4], L.V. Tarasov [5, 6], E.P. Levitan [7, 8], M. Mamadazimovs [9] have been conducting research for many years. They wrote about the ideas of physics, astronomy and other natural sciences in the formation of humanity, the formation of worldviews, and the humanitarian potential of education in cultivating positively developed human qualities (aesthetic, spiritual, etc.).

In accordance with the objectives set out in the Action Strategy for the further development of the Republic of Uzbekistan [10], the curriculum in connection with the introduction of 11-year secondary education [11], 34 hours in the 11th grade of secondary schools on the basis of science programs; and 68 hours of astronomy were taught in specialized schools [12].

The purpose of teaching an astronomy course at such an educational institution is to form in students a scientific understanding of all observed astronomical phenomena, as well as to develop in them an interest in the world of astronomical phenomena.

The course also aims to develop students' ability to know the world, to develop their thinking, to educate them in the spirit of experiencing the practical importance of astronomy in everyday life, in particular, its positive impact on the worldview. The course "Astronomy" develops the practical significance of astronomy in the life of ancient peoples, including the peoples of the East (measuring time, geography, finding horizons, etc.), as well as modern knowledge about the structure of the universe and the role of the Earth in it. One of the important didactic requirements is the content of theoretical and practical lessons, organized by the teacher, enriched with humanitarian ideas.

There is a table for the organization of lessons on humanities (Table 1). The elements of the table are in the form of a matrix, and their intersection points allow the selection of a particular methodological tool. It will also be possible to identify ways to organize it and use it in class. According to the objectives of the lesson, depending on the direction of the class, it is intended to design different lessons, both in form and content.

This, in turn, allows students to diversify their activities. Therefore, teaching can be presented not only as mastering the standards set by the teacher, but also focusing on the teacher's personal experience and potential. At the same time, in the process of teaching, the general methods of learning activities turn into their own personal, individual methods, resulting in the acquisition of personal experience.

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

Table 1: A Matrix for Organizing Lessons in the Humanitarians

The tools needed for the formation, development, education, upbringing of a person	Methods of organizing and demonstrating student activities	Listen to the teacher's story	Working with text	Theatrical	Review audio and video plots	Educational trips	Creating an "image" of the event	Problem solving
Physical experiments, observation of astronomical events		+	+	+	+	+	+	
Poems		+	+			+	+	+
Fairy tales		+	+	+	+	+		+
Writings from literary and scientific-popular works		+	+					+
Pictures, photo reproduction		+	+				+	+
Musical pieces		+	+	+	+	+	+	+
Stories enriched with ecological content		+	+		+	+		+
Interdisciplinary stories		+					+	+
Biographies of scientists		+	+	+	+	+	+	
History of findings (events)		+	+	+	+	+	+	
Documentary materials: description of initial experiments, excerpts from the works of scientists		+	+		+	+		
Multimedia presentation		+	+		+	+	+	+

When talking about the humanitarians foundations of school science education, we mentioned the need for methods and tools in the humanities. These sciences disperse a particular conceptual apparatus, which allows for the correction of the value components of cognitive activity. The combination of tools and methodological receptions has a broad impact on students. The task of the teacher is to carry out rational mastery, to connect different means meaningfully into one whole.

For example, materials of astronomical content are often found in works of fiction and science fiction. In particular, the works of science fiction writers G. Wells, A. Azimov, the Strugatsky brothers, Efremov, the famous writer L.N. Tolstoy contain a lot of material. In the works of Uzbek writers O. Yakubov ("Ulugbek's Treasure"), P. Kadyrov ("Starry Nights"), O. Hoshimov ("Sun scales", "Quasars"), among our poets A. Aripov ("Discontentment of the Years"), H. Khudoiberdieva's (Loyalty) poems often praise the beauty of the starry sky, the crescent moon and the full moon, and the fact that our planet Earth is a unique celestial body (A. Aripov's poem "Dwarf Planet").

Creating interesting questions based on these materials and recommending them to students, or using them as didactic materials in teaching astronomy, gives effective positive results. In the eyes of students, natural phenomena, including astronomical phenomena, the relief of celestial bodies, the structure of the solar system are embodied as part of the existing beauties in nature, in which these phenomena are of great interest.

Initially, questionnaire, interview and observation techniques were used to study the interests, outlook and level of knowledge of 478 pupils of 11 classes of 8 schools in different regions of the Republic (listed in the table) in

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

order to determine the extent to which the recommended methodology for the application of its strong humanitarian potential in the teaching of astronomy is effective. A variety of excellent, good, satisfactory, and unsatisfactory grade evaluations were used to evaluate their results.

Table 2: Preliminary Results to Determine the Interests, World Views and Level of Knowledge of 11th grade Students in Astronomy

Objects	Number of Students	"excellent",	"good"	"satisfactory"	"unsatisfactory"
Schools in Tashkent	214	14	63	129	8
	100%	6,54%	29,44%	60,28%	3,74%
Schools in Fergana	196	15	49	125	7
	100%	7,65%	25,00%	63,78%	3,57%
Schools in Surkhandarya	68	4	21	38	5
	100%	5,88%	30,88%	55,88%	7,35%
Total	478	33	133	292	20
	100%	6,90%	27,82%	61,09%	4,18%

The humanization of the natural sciences (astronomy) has shown that the application of the humanities potential of astronomical education in teaching has a positive effect on the study of the materials provided in the curriculum, leads to the development of positive qualities, competencies and quality and effectiveness of lessons.

In the second stage of the pedagogical experiment, the following positive aspects of the use of its humanitarian potential in the teaching of astronomy were identified:

1. Astronomy is one of the most ancient sciences, and the principle of history has a special place in its teaching;
2. To make the teaching of the humanities of the natural sciences (astronomy) interesting, understandable and surprising for students;

The results of the experiments showed that the natural sciences (astronomy) contribute to the humanization of teaching, the impact on the educational process, in particular, the quality of students' knowledge, the development of scientific worldviews, and the formation of aesthetic and environmental cultures.

The idea of humanization of astronomical education was implemented, the theoretical knowledge, attitudes, behavior and interests of students were constantly monitored, and students' knowledge was determined. Thus, the answers "excellent", "good", "satisfactory", "unsatisfactory" are the main criteria in determining the quality of students' knowledge of astronomy, theoretical knowledge, practical skills and abilities, their scientific outlook. Their final results are given in the table below.

Table 3: Final Results of 11th Grade Students in Determining their Interest in Astronomy, World View and their Level of Knowledge

Objects	Number of students	"excellent",	"good"	"satisfactory"	"unsatisfactory"
Schools in Tashkent	214	38	117	58	1
	100%	17,76%	54,67	27,10%	0,47%
Schools in Fergana	196	33	98	64	1
	100%	16,84%	50,00%	32,65%	0,51%
Schools in Surkhandarya	68	8	42	17	1
	100%	11,76%	61,76%	25,00%	1,47%
Total	478	79	257	139	3
	100%	16,53%	53,77%	29,08%	0,63%

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

Mathematical statistical methods were used to perform statistical analysis of these results. A statistical analysis of the results was conducted in order to compare the initial and final results.

The idea of humanizing astronomical education was put into practice

In order to compare the mastery of the initial and final results of the students' knowledge indicators, the average value of the mastery of the students was taken as $X = \frac{\sum x_i m_j}{N}$.

Here x_i –is the mastery index (estimated value), which are 2, 3, 4, 5; values are graded as "excellent", "good", "satisfactory", or "unsatisfactory". m_j –is the number of repetitions of the marks, N is the number of participants in the experiment.

In this case, as the N_0 hypothesis, the expected probabilities of the students on the types of assessment of the initial and final results are equal, and there is a difference in the expected probabilities as an alternative hypothesis N_1. Here is used $\chi 2$criteria to test this statistical hypothesis.

That is, we use formula

$$T_{кузатув} = \frac{1}{n_1 n_2} \sum_{i=1}^{C} \frac{(n_1 O_{2i} - n_2 O_{1i})^2}{O_{1i} + O_{2i}}$$. Where: T - is the statistical value, $n_1$and n_2 -are the experimental tests, n_1- is the number of students who participated in the initial assessment, n2 is the number of students who participated in the final assessment, $O_{1i}$and O_{2i} are the number of grades obtained for the initial and final assessment types, respectively.

As a pedagogical hypothesis, the value of $T_{кузатув}$ is compared to $T_{кр}$. If $T_{кузатув} > T_{кр}$, the hypothesis H_0 (research is ineffective) is rejected and the hypothesis H_1 (research is effective) is accepted.

Where: $T_{кр}$ – the normalized deviation confidence probability is determined on the basis of p. The degree of freedom is found by the formula K=C-1. C-Types of evaluation.

Since the χ^2 criteria were based on 4 types of assessments based on the criteria in the initial and final assessments selected by the experimental trial studies, the value of C is 4, respectively. If we assume that p=0,05, then the value of K is equal to 3. The χ^2values obtained from table $T_{кр}$ are 7.81.

In our experiments, the numerical values and formula given in the table were used because the value of C was 4.

Table 4

Types of assessment,C	Degree of Freedom, K	Critical value,$T_{кр}$	T is the formula for calculating the statistical value
C=4	K=3	$T_{кр}$=7,81	$T = \frac{1}{n_1 n_2}\left(\frac{(n_1 O_{21} - n_2 O_{11})^2}{O_{11} + O_{21}} + \frac{(n_1 O_{22} - n_2 O_{12})^2}{O_{12} + O_{22}} + \frac{(n_1 O_{23} - n_2 O_{13})^2}{O_{13} + O_{23}} + \frac{(n_1 O_{24} - n_2 O_{14})^2}{O_{14} + O_{24}}\right)$

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

We also use formulas for finding confidence intervals to determine the effectiveness of the evaluation of initial and final results. That is, the confidence deviations in finding the confidence interval for the initial and final results are $\Delta_x = t_\gamma \cdot \frac{S_x}{\sqrt{n}}$ for the final results, and $\Delta_y = t_\gamma \cdot \frac{S_y}{\sqrt{n}}$ for the initial test. Here $S_x = \sum_{i=1}^{n=8} \frac{n_i(x_i-x)^2}{m-1}$; is the sample variance, which is found by the following formula $S_y = \sum_{i=1}^{n=8} \frac{n_i (y_i-y)^2}{n-1}$; 13. From the results found, we find a confidence interval for the experimental group: $\overline{X} - t_{кр} \cdot \frac{S_x}{\sqrt{n}} \le a_x \le \overline{X} + t_{кр} \cdot \frac{S_x}{\sqrt{n}}$ confidence interval for the control group: $\overline{Y} - t_{кр} \cdot \frac{S_y}{\sqrt{n}} \le a_y \le \overline{Y} + t_{кр} \cdot \frac{S_y}{\sqrt{n}}$.

Confidence interval boundary values overlap or intersect with each other, resulting in loss of reliability. It should therefore be assumed that the confidence intervals in each test do not intersect.

We now present a statistical analysis of the initial and final results in Tables 2 and 9. In this case, we compile a statistical series of tables, taking into account the performance of students who participated in the experimental work in all schools, the implementation of the idea of humanization of astronomical education, and create the following table from their values:

Table 5

Groups	**5**	**4**	**3**	**2**	
Option 1 (final evaluation)	O_{11}= 79	O_{12}=257	O_{13}=139	O_{14}=3	n_1=478
Option 2 (final evaluation)	O_{21}=33	O_{22}=133	O_{23}=292	O_{24}=20	n_2=478
∑	$O_{11}+O_{21}$=112	$O_{12}+O_{22}$=390	$O_{13}+O_{23}$=131	$O_{14}+O_{24}$=23	n_1+n_2 =263

$$T = \frac{1}{478 \cdot 478}\left(\frac{(478 \cdot 33 - 478 \cdot 79)^2}{112} + \frac{(478 \cdot 133 - 478 \cdot 257)^2}{390} + \frac{(478 \cdot 292 - 478 \cdot 139)^2}{131} + \frac{(478 \cdot 20 - 478 \cdot 3)^2}{23}\right) = 112{,}63$$

According to the above calculation, the first hypothesis is accepted because it is $T_{кузатув}$=11,26>$T_{кр}$=7,81. We now calculate the average mastery values for both phases. Here we set the initial average mastery value to $\overline{X_д}$ and the final average mastery value to $\overline{X_я}$:

$$\overline{X_д} = \frac{1}{478}\left[33 \cdot 5 + 133 \cdot 4 + 292 \cdot 3 + 20 \cdot 2\right] = 3{,}37$$

$$\overline{X_я} = \frac{1}{478}\left[79 \cdot 5 + 257 \cdot 4 + 139 \cdot 3 + 3 \cdot 2\right] = 3{,}86$$

Efficiency coefficient: $\eta = \frac{3{,}86}{3{,}37} = 1{,}14$.

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

It can be seen that the levels of knowledge according to the results obtained in the final stage differ from each other in the level of knowledge of the students in the initial stage and provide evidence that their efficiency is 1.14 times higher.

If we find the confidence interval in the initial stage based on the above statistical formulas in order to verify that the confidence interval does not fall over one another $3{,}31 \le a_x \le 3{,}44$, then the confidence interval in the final stage is equal to $3{,}80 \le a_x \le 3{,}92$, which leads to the fact that they do not intersect with the other.

Now we will list the similar calculated values in table 6 statistical values for all schools.

Table 6

Educational institutions	stages	χ^2	T_{kp}	Average value	Efficiency coefficient	Selective variance	Reliable deviation	Confidence interval	Criteria summary
Schools in Tashkent	first	59,68	7,81	3,39	1,15	0,44	0,09	3,30; 3,48	H_1
	end			3,90		0,46	0,09	3,81; 3,99	
Schools in Fergana region	first	47,27	7,81	3,37	1,14	0,46	0,09	3,27; 3,46	H_1
	end			3,83		0,49	0,10	3,73; 3,93	
Schools in surkhandarya region	first	19,02	7,81	3,35	1,14	0,49	0,17	3,19; 3,52	H_1
	end			3,84		0,40	0,15	3,69; 3,99	
Total	first	112,63	7,81	3,37	1,14	0,46	0,06	3,31; 3,44	H_1
	end			3,86		0,46	0,06	3,80; 3,92	

The diagram of the average value of these calculations in the educational institution and the performance indicators take the following view

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

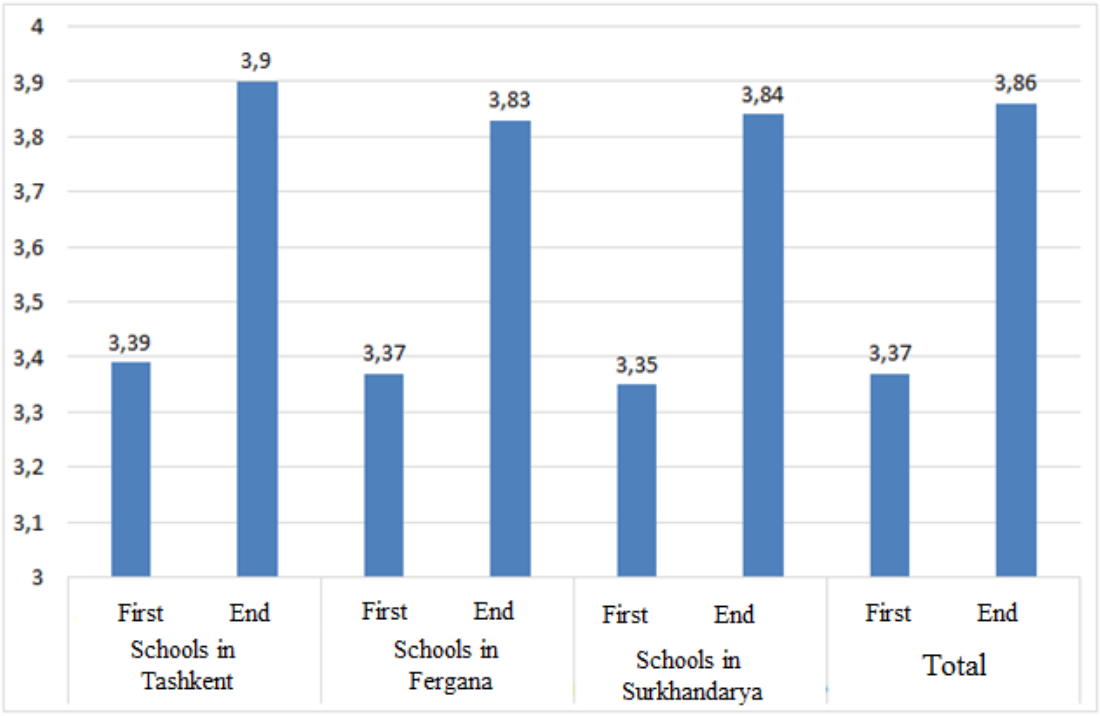

Figure 1: Diagram of the Average Value in an Educational Institution

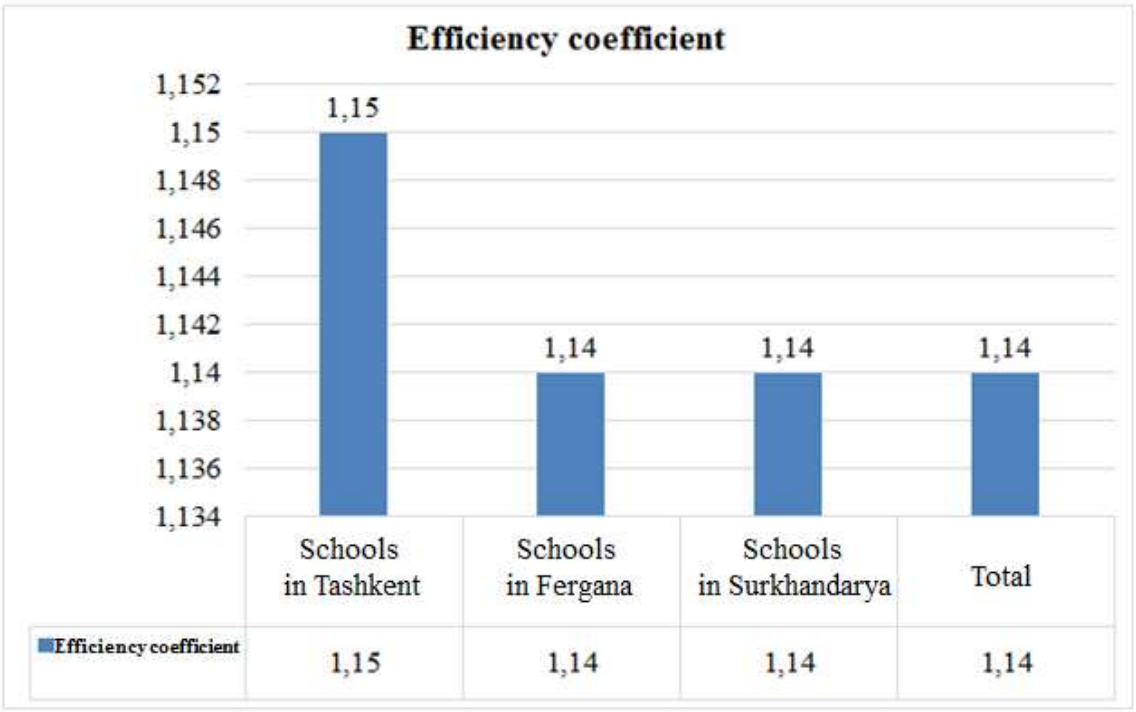

Figure 2: Performance Indicators of Educational Institutions

According to the results of this calculation, the efficiency of the research work was proved by statistical methods to be on average 14% higher, and the results of the research work proved to be effective.

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

III. CONCLUSIONS

Based on the results of pedagogical experiments and their analysis, the following conclusions were drawn:

1. There was an exchange of views with science teachers on the problems and shortcomings in the teaching of astronomy in the country.
2. Questionnaires were conducted from students to determine a clear goal for improving the teaching of astronomy.
3. Assessment of students' knowledge, identification of their scientific views, questionnaires and other reasonable criteria for assessing their knowledge were developed and conducted on this basis.
4. In obtaining the applied statistical data, mathematical-statistical processing was carried out on the basis of the Student-Fisher criterion.
5. The results obtained in the teaching of astronomy using the humanization of astronomical education were analyzed on the basis of the mathematical statistical method mentioned above.
6. In the teaching of natural sciences (astronomy), using the humanization of astronomical education, the results of experimental classes were analyzed and substantiated on the basis of the tested X-square method, which is higher than the results in control classes.
7. In the humanization of astronomical education, the use of its humanitarian potential, the expansion and deepening of astronomical knowledge in students, the expansion of their scientific worldview has been confirmed by sufficient evidence.
8. Based on the content of the main stages of pedagogical experimental work, it was convinced that the use of its strong humanitarian potential in the teaching of astronomy will be sufficiently effective not only in education but also in the educational process.

REFERENCES

[1] National training program. Bulletin of the Oliy Majlis of the Republic of Uzbekistan, 1997. – pp. 11-12.
[2] Pedagogy encyclopedia. I skin. – *Tashkent: State Scientific Publishing House "National Encyclopedia of Uzbekistan".* 2015 - pp. 230–236.
[3] Levitan E.P. The humanization of school astronomy // *Earth and the Universe.* - 1983. No. 5. - pp. 52–55.
[4] Razumovsky V.G., Tarasov L.V. The humanization of natural education *// Philosophy Issues.* 1989. No. 4.
[5] Tarasov L.V. The need for restructuring the teaching of natural subjects based on the integrative-humanitarian approach // Physics at school. *Scientific and theoretical journal.* No. 4. 1989. - pp. 32–44.
[6] Tarasov L.V. Humanitarianization as one of the directions of the restructuring of the teaching of physics at school // *Physics at School.* 1988. No. 2. - Pp. 29–33.
[7] Levitan E.P. The humanization of astronomy from the standpoint of the interests of students // *Physics in School.* - 1999. No. 1. - pp. 42–45.
[8] Levitan E.P. Descriptive astronomy and the humanization of education // *Earth and the Universe.* - 1990. No. 1. - pp. 92–97.
[9] Mamadazimov M.M., Dadaboeva F. Humanization of natural sciences - one of the important principles of education. –*Jizzakh: Education, Fan and Innovation* - No. 2, 2015. - pp. 24–26.
[10] Decree of the President of the Republic of Uzbekistan No. PD-4947 of February 7, 2017 on the Action Strategy for the further development of the Republic of Uzbekistan.
[11] Decree of the President of the Republic of Uzbekistan dated 25.01.2018 Decree No. PD-5313 "On measures to radically improve the system of general secondary, secondary special and vocational education".

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

[12] Resolution of the President of the Republic of Uzbekistan dated September 14, 2017 No PD-3275 on the establishment of a specialized state boarding school named after Mirzo Ulugbek and the Park of Astronomy and Aeronautics // *Collection of legislation of the Republic of Uzbekistan.* 2017, No. 38, Article 1032.

[13] Karimov N., Doniyorov A. Conflicting Views Regarding the Hadiths, *IJITEE*, ISSN: 2278-3075, Volume-8 Issue-12, October 2019, pp. 2090-2094.

[14] Wang, H. A., & Marsh, D. D. (2002). Science instruction with a humanistic twist: teachers' perception and practice in using the history of science in their classrooms. *Science & Education*, *11*(2), 169-189.

DOI: 10.37200/IJPR/V24I5/PR2020626
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020