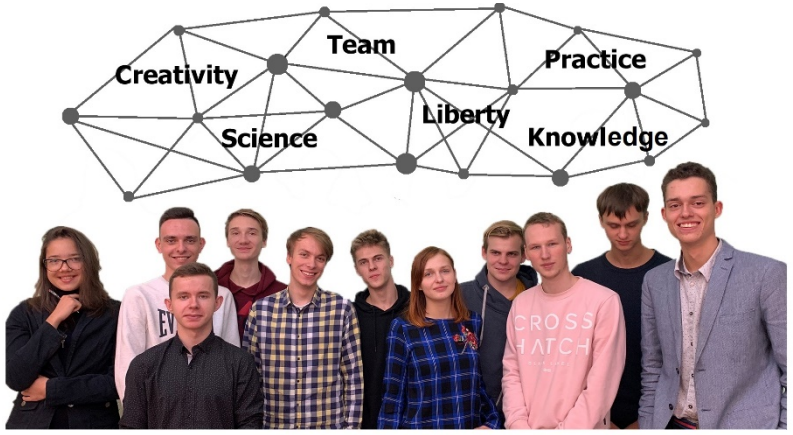
Belarusian experience in reducing gender gap in Natural Science using heuristic learning approach in physics education in university

Tashlykova-Bushkevich Iya,
Bobryk Aliaksei,
Rusetskaya Tatiana

Belarusian State University of Informatics and Radioelectronics (BSUIR), Minsk, Belarus

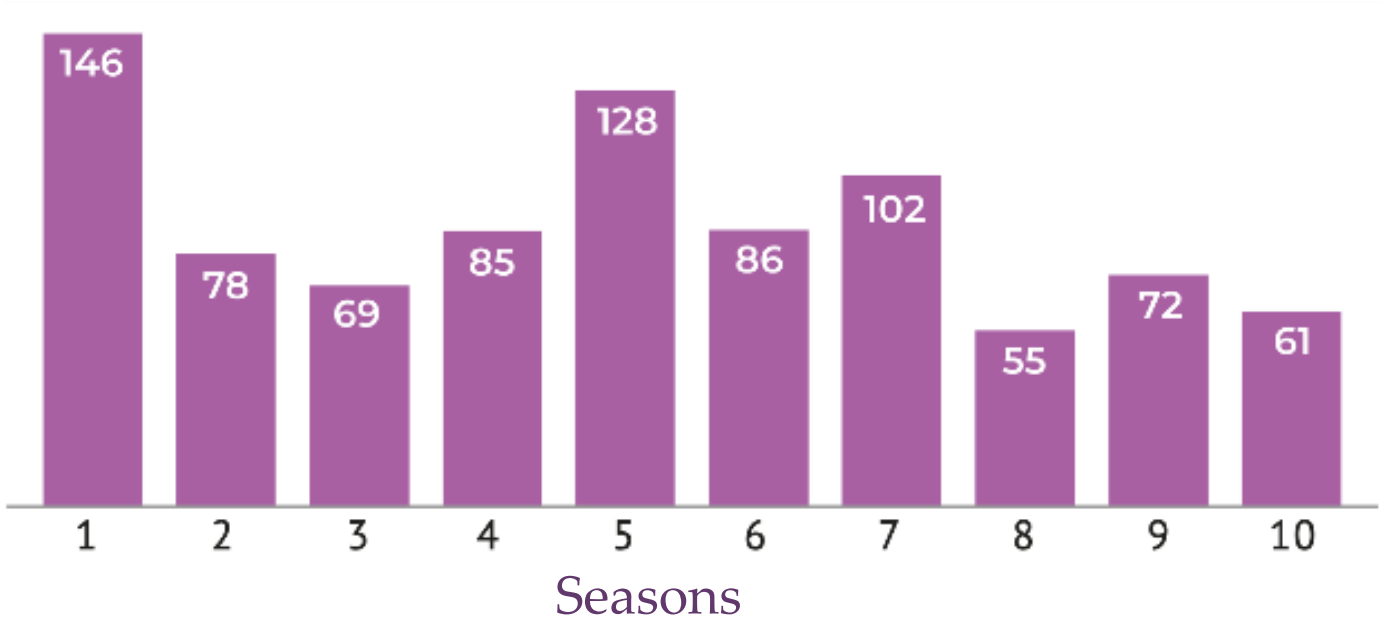
Overall objective

Reveal the **prospects of the heuristic educational approach* in universities** to increase the involvement of girls in physics and reduce the gender gap in Natural Science



***Heuristic learning** is a state of the art method of teaching and learning that seeks to develop students' cognitive, creative and organizational skills, and encourages students to extend the boundaries of their personalities and to take an outside view of themselves.

Background: the “HiP”



The project "**Heuristics in Physics**" (“HiP”) in BSUIR* has been running for 5 years and has organized
10 seasons*. The graph shows the number of participants in each of them

*1 season= 1 semester

143 subscribers

628 subscribers

447 subscribers

***The Belarusian State University of Informatics and Radioelectronics is a large national research and educational center possessing great workforce, scientific and training capacities, up-to-date laboratory equipment and extensive infrastructure in Belarus.**

Background: IAEA award

In 2022, BSUIR students (2 girls and a boy) from the project “HiP” **won the International student competition** of the International Atomic Energy Agency (IAEA) "The role of nuclear technology in addressing climate change".

IAEA

International Atomic Energy Agency

INTERNATIONAL STUDENT CONTEST 2022

„Role of nuclear technology in addressing climate change“

Eastern European and Asian Region Winner

PRESENTED TO THE GROUP “IT.BY”:

Kira SAVINTSEVA
Kirill PAVLOV
Lyubov PANFILOVA

ADVISOR: Iya TASHLYKOVA-BUSHKEVICH

28 September 2022
Vienna, Austria

Mikhail Chudakov
Deputy Director General, Department of Nuclear Energy
International Atomic Energy Agency

Gender gap: statistics of the “HiP”

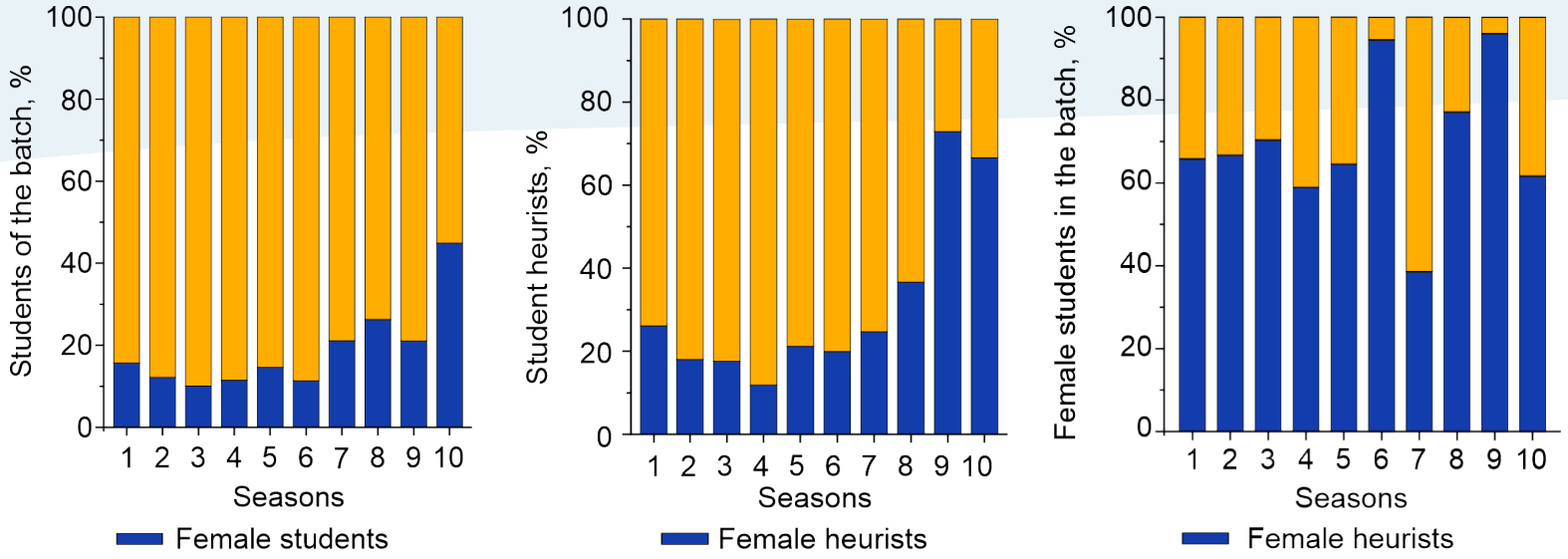


Fig. 1 (*a*) (*b*) (*c*)

The number of girls in the academic batches was studied, see **Fig. 1a**. Next, the proportion of women among all participants in the "Heuristics in Physics" project, see **Fig. 1b**, and the proportion of women who took part in the project in respect to their total number in the batches, see in **Fig.1c**, were determined.

Highlights

- engineering and IT students are more often male;
- there is a necessity of creating a healthy atmosphere for the educational training of female students;
- the number of girls interested in Natural Science is growing

Educational activity of girls & skills

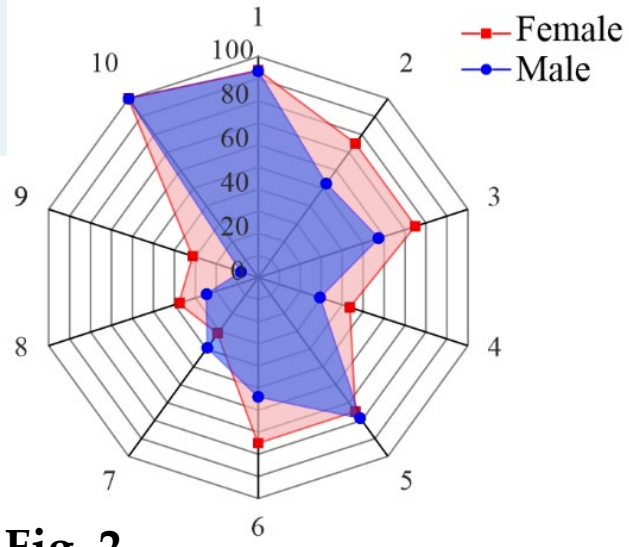


Fig. 2

(**1**) Teamwork skills
(**2**) Communication skills
(**3**) Inventiveness
(**4**) Getting to know students in other groups
(**5**) Creativity
(**6**) Critical thinking
(**7**) Knowledge of video processing programs
(**8**) Self-presentation
(**9**) Skills for future profession
(**10**) Advanced physics knowledge

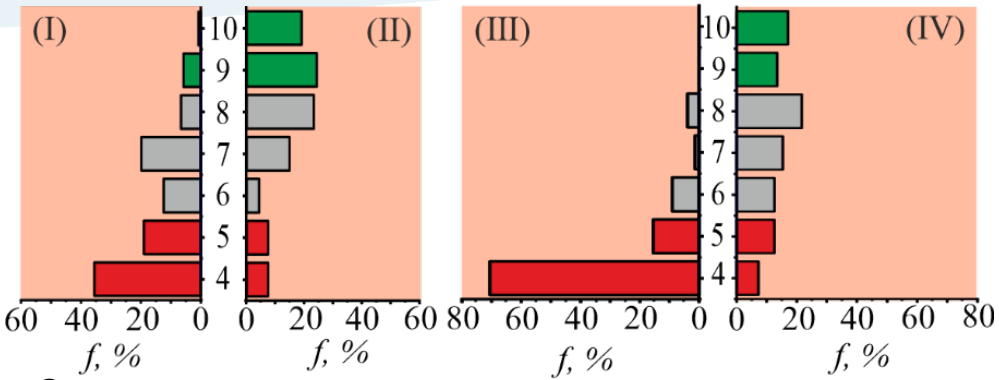


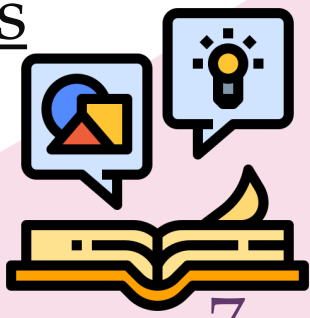
Fig. 3 Students' Physics exam grades: studies without (I, III) and with (II, IV) "HiP" project during a semester in 2019 and 2020 years

Highlights

- heuristic educational approach improves academic performance and boosts the development of hard-skills and soft-skills of students in the process of studying physics;
- project "HiP" helps girls to gain more skills than boys;
- there is a tendency for girls to participate in leadership positions more often

Conclusions

1. The developed **author's pedagogical technology** on organization of lectures on Physics with elements of heuristic learning involves students into the process of production of own educational product in the form of creative works as visual demonstration materials at lectures and practical trainings on physics.
2. **Gender evaluation findings** revealed a high level of participation of girls in the production of creative works.
3. The above outlined **heuristic learning approaches introduced in teaching Physics** to IT-students amplify existing good practices which enhance the participation of girls and young women in science to decrease the gender gap in Natural Science.



References

1. Toirjonovich, A. Z. (2023). Creative Self-Development of the Personality of the Future Teacher. CENTRAL ASIAN JOURNAL OF SOCIAL SCIENCES AND HISTORY, 4(2), 49-56
2. Tashlykova-Bushkevich, I.I., Dedina, A.V. (2021). Professional and personal development of students of a technical university in teaching physics using the problem heuristic approach in a lecture course. UNIVERSITY PEDAGOGICAL JOURNAL. 1, 11–21. in Russian.
3. Tashlykova-Bushkevich, I.I. (2019). Approbation of the author's technology for organising lectures with students in physics with elements of heuristic learning. VYSHJEJSHAJA SHKOLA. 1, 40–45. in Russian.
4. Tashlykova-Bushkevich, I.I., Turlo, A. V., Dedina, A.V., Stoliar, I. A., Nichyporchyk, P.A. (2022). Heuristic opportunities in education: «Heuristics in Physics» project experience in physics teaching to engineering students. UNIVERSITY PEDAGOGICAL JOURNAL. 1, 32–42. in Russian.
5. Korol', A. D., Vorotnickij, Yu. I. (2022). Cifrovaya transformaciya obrazovaniya i vyzovy XXI veka. Vysshee obrazovanie v Rossii, 31(6), 48-61. in Russian.

Acknowledgements

Authors are thankful to **the Belarussian Physical Society** (VA "BPS") for supporting the project "Heuristics in Physics".

Thank you!



Project “Heuristics in Physics”
in BSUIR

iya.itb@bsuir.by